Porteføljestyret for Banebrytende forskning

Dato	**Sted**
06.06.2025	Norges forskningsråd
10:00-16:00	Før lunsj møterom Abel 1 og 2 Etter lunsj møterom Nansen 5

Sak PS-BF 23/25	Fellesmøte	10:00-12:15
	Lunsj	12:15-13:00
Sak PS-BF 24/25	Godkjenning av sakslisten	13:00-
Sak PS-BF 25/25	Godkjent møteprotokoll fra porteføljestyremøte 2/25	-
Sak PS-BF 26/25	Spørsmål om habilitet	-13:05
Sak PS-BF 27/25	Orienteringer Skriftlige: 1. Vurdering av forskningsbehov for Nasjonaljubileet 2030 2. Særbehandling av kjønn i løpende Forskerprosjekter i banebrytende forskning 3. Endringer i Forskerprosjekt med internasjonal mobilitet i banebrytende forskning Muntlige: 1. Orientering fra møte mellom styret og PS-lederne 3. juni 2. EUI	13:05-13:20
Sak PS-BF 28/25	FRIPRO-tildelinger U.off., jf. Offl. §14	13:20-13:40
Sak PS-BF 29/25	Banebrytende forskning – utvikling av løpende forskerprosjekt-utlysninger	13:40-14:00
Sak PS-BF 30/25	Sentre for fremragende forskning (SFF-VI) – Prosess for trinn 1	14:00-14:15
Sak PS-BF 31/25	Håndtering av konsekvensene av situasjonen for forskning i USA	14:15-14:30
	Pause	14:30-14:40
Sak PS-BF 32/25	Presentasjon av de nasjonale rapportene for fagevalueringene EVALMIT og EVALMEDHELSE	14:40-15:10
Sak PS-BF 33/25	Strategiske veivalg for utvikling av porteføljen	15:10-15:30
Sak PS-BF 34/25	Norsk veikart for forskningsinfrastruktur	15:30-15:50

Sak PS-BF 35/25	Eventuelt	15:50-
Sak PS-BF 36/25	Godkjenning av møteprotokoll	-16:00

Fellesmøte for porteføljestyrene for Banebrytende forskning og Forskningssystemet 6.6.2025 kl. 10:00-12:15
Tema: Forskningssystemet og banebrytende forskning

Agenda

10.00-10.05	**Velkommen** v/Områdedirektør Benedicte Løseth
10.05-10:15	**Presentasjon av porteføljene** v/Tanja Storsul og Terje Lohndal
10.15-10.40	**Diskusjonstema** *5 min. innlegg om hvert av temaene under fra porteføljestyremedlemmer + 5 min koordinering. Disse temaene vil bli benyttet i gruppearbeidet.* 1. *Forskningssystemet, forskningskultur og banebrytende forskning (David Budtz Pedersen)* 2. *Forskningsinfrastruktur og banebrytende forskning (Inge Jonassen)* 3. *Forskningens rolle i en ustabil verden (Tanja Storsul)* 4. *Hvordan utnytte banebrytende forskning til innovasjon og bedret konkurranseevne? (Rebecca Borsch)*
10.40-11.10	**Gruppearbeid** *4 grupper - En gruppe for hvert tema over*
11:10-11:35	**Presentasjon av gruppearbeid** *4 grupper med 5 min per gruppe + 5 min koordinering*
11:35-12:05	**Diskusjon i plenum**
12.05-12.15	**Sluttord/Oppsummering av møtet** *Porteføljestyrelederne oppsummerer*
12.15-13:00	**Lunsj**

Møteleder: En av avdelingsdirektørene

Gruppearbeid

Hver gruppe består av 6-7 personer omtrent likt fordelt fra begge porteføljestyrer.

Gruppe 1 – Forskningssystemet, forskningskultur og banebrytende forskning

Medlemmer: David Budtz Pedersen, Terje Lohndal, Marie Rognes, Cathrine Holst, Ingeborg Palm Helland (ordstyrer), Tove Klæboe Nilsen

Spørsmål til diskusjon:

- *Hvilken betydning har god forskningskultur for banebrytende forskning?*
- *Hvordan bør et velfungerende forskningssystem understøtte banebrytende forskning?*
- *På hvilke områder er det viktig at PS-Forskningssystemet og PS-Banebrytende forskning samvirker for å legge forholdene best mulig til rette for banebrytende forskning og et velfungerende forskningssystem?*

Gruppe 2 - Forskningsinfrastruktur og banebrytende forskning

Medlemmer: Inge Jonassen, Barbara van Loon, Magne Sydnes, Sven Stafstrøm, Ågot Aakra, Dagfinn Myhre (ordstyrer)

Spørsmål til diskusjon:

- *Hvordan øke utnyttelse av de nasjonale forskningsinfrastrukturene og bedre samarbeidet om nasjonale prioriteringer av hvilke infrastrukturer det bør investeres i?*
- *Hvordan øke utnyttelsen/hente ut potensialet av medlemskapet i internasjonale forskningsinfrastrukturene?*
- Skisser gjerne hvilket ansvar ulike aktører har/bør ha – Forskningsrådet, forskningsmiljøene, institusjonenes ledelse og infrastrukturene selv.

Gruppe 3 – Forskningens rolle i en ustabil verden

Medlemmer: Jarle Trondal, Marianne Fyhn, Inger Skjelsbæk (ordstyrer), Sandrine Benard, Tanja Storsul, Magnus Gulbrandsen

Spørsmål til diskusjon:

- ➢ Sårbarhet, strategisk autonomi, økt proteksjonisme.
- ➢ Konkurranse- og innovasjonsevne, disruptiv teknologi/deep tech (EU)
- ➢ Demokrati, ytringsfrihet og akademisk frihet, inkl. USA og DEI

- *Hvilke konsekvenser får dette for Norge og Forskningsrådet?*
- *Hvordan påvirker det vår forskningskultur?*
- *Hvordan bør vi posisjonere oss?*

Gruppe 4 – Hvordan utnytte banebrytende forskning til innovasjon og bedret konkurranseevne?

Medlemmer: Rasmus Larsen, Tine Urberg Nærland, Anette Bayer (ordstyrer), Rebecca Borsch, Rune Dahl Fitjar, Marit Lofnes Mellingen

Spørsmål til diskusjon:

Hva trengs for å få til en bedre utnyttelse av banebrytende forskning til innovasjon og bedret konkurranseevne?
Hvordan kan dette gjøres uten at forskningen målrettes?
Hvordan kan dette gjøres uten at den vitenskapelige kvaliteten svekkes?

Porteføljestyret for Banebrytende forskning, møte 2/25

Dato	**Sted**
04. april kl. 08.30-10.30	Zoom

Til stede	Terje Lohndal - leder Anette Bayer Cathrine Holst Inge Jonassen Rasmus Larsen Barbara van Loon Tine Uberg Nærland David Budtz Pedersen Marie Rognes Inger Skjelsbæk Magne Olav Sydnes Jarle Trondal
Forfall	Marianne Fyhn Åsa Sandnes (KD observatør)
Til stede fra Forskningsrådet	Områdedirektør Benedicte Løseth Avdelingsdirektør Petter Helgesen Spesialrådgiver Harald H. Simonsen Spesialrådgiver Heidi Roggen
Sak PS-BF 14/25	**Godkjenning av sakslisten**
Vedtak:	Sakslisten godkjennes.
Sak PS-BF 15/25	**Godkjent møteprotokoll fra porteføljestyremøte 1/25** Møteprotokollen er godkjent i møte 1/25.
Sak PS-BF 16/25	**Spørsmål om habilitet** Saksgrunnlag: Saksfremlegg
Vedtak:	Habilitet for sak 18 tas opp under behandlingen av saken. Alle porteføljestyrets medlemmer er habile i behandlingen av de øvrige saker på sakslisten.
Sak PS-BF 17/25	**Orienteringer** Skriftlige og muntlige orienteringer: 1. Søknadsbehandling av toppforskere og radikale forskningsidéer Vedlegg 1 Toppforskere – vurderingskriterier
Vedtak:	Porteføljestyret tar informasjonen om søknadsbehandlingsmetoder for *toppforskere* og *radikale forskningsidéer* til etterretning.

Sak PS-BF 18/25 FRIPRO - tildelinger U.off. jf. Offl. § 14

Saksgrunnlag:

Saksfremlegg

- Vedlegg 1 Om utlysningene
- Vedlegg 2 Prosjektdeltakere
- Vedlegg 3 Habilitet
- Vedlegg 4 Kvalifiserte søknader
- Vedlegg 5 Ikke-kvalifiserte søknader
- Vedlegg 6 Bevilgningsprinsipper og administrativ prosedyre
- Vedlegg 7 Gjennomgang av bruk av bevilgningsprinsipper
- Vedlegg 8 Søknadsdokumenter
- Vedlegg 9 Ny behandling av søknad 354728

Vedtak:

1. Porteføljestyret for banebrytende forskning vedtar at følgende porteføljestyre-medlemmer regnes som inhabile for disse søknadene og vedtaksforslagene. Porteføljestyremedlemmene deltar ikke i diskusjon eller vedtak for søknadene de er inhabile for.
    a. Vedtaksforslag 3:
        i. Anette Bayer: 357532
        ii. Cathrine Holst: 356102
        iii. Inger Skjelsbæk 356102
    b. Vedtaksforslag 4:
        i. Anette Bayer: 356366 og 354724
        ii. Inge Jonassen: 354724
        iii. Magne Olav Sydnes: 354724
        iv. Marie E. Rognes: 357122
        v. Terje Lohndal: 356322 og 356380
2. Porteføljestyret for banebrytende forskning vedtar at alle søknader til behandling i FRIPRO om Forskerprosjekt, med karakter 5 eller lavere på minst ett vurderingskriterium, avslås en bloc i henhold til FRIPRO – Bevilgningsprinsipper vedtatt av porteføljestyret for banebrytende forskning 12. april 2024, sak 14-24, regel 2.1. Dette gjelder søknadene 354555, 354603, 354703, 354728, 354985, 355325, 355430, 355455, 355506, 355535, 355551, 355624, 355667, 355694, 355728, 356139, 356276, 356291, 356320, 356363, 356809, 356817, 356820, 356826, 356833, 356837, 356854, 356875, 356882, 356893, 356906, 356909, 356910, 356913, 356926, 356943, 356947, 356952, 356982, 356992, 356997, 357008, 357049, 357065, 357069, 357073, 357077, 357086, 357088, 357098, 357099, 357114, 357157, 357190, 357250, 357289, 357297, 357313, 357316, 357318, 357512, 357518, 357544 og 357810.
3. Porteføljestyret for banebrytende forskning tildeler 73,9 millioner kroner til åtte søknader til FRIPRO om Forskerprosjekt. Søknadene innvilges i henhold til FRIPRO – Bevilgningsprinsipper vedtatt av porteføljestyret for banebrytende forskning 12. april 2024, sak 14-24, regel 2.2. Dette gjelder søknad 355155, 356102, 356278, 356951, 357091, 357285, 357455 og 357532.
4. Porteføljestyret for banebrytende forskning tildeler 142,2 millioner kroner til femten søknader til FRIPRO om Forskerprosjekt. Søknadene innvilges i henhold til FRIPRO – Bevilgningsprinsipper vedtatt av porteføljestyret for banebrytende forskning 12.

	april 2024, sak 14-24, regel 2.4. Dette gjelder søknad 354724, 355619, 356103, 356106, 356305, 356315, 356322, 356366, 356380, 356805, 357034, 357093, 357102, 357122 og 357314.
Sak PS-BF 19/25	**FRIPRO-Utvikling av ordningen** Saksgrunnlag: Saksfremlegg
Vedtak:	Administrasjonen tar porteføljestyrets kommentarer og synspunkter med seg i videre saksgang.
Sak PS-BF 20/25	**FRIPRO – internasjonalt mobilitetsstipend** Saksgrunnlag: Saksfremlegg
Vedtak:	Administrasjonen tar porteføljestyrets kommentarer og synspunkter med seg i videre saksgang.
Sak PS-BF 21/25	**Eventuelt** Det var ingen saker under eventuelt.
Sak PS-BF 22/25	**Godkjenning av møteprotokoll**
Vedtak:	Porteføljestyret godkjenner møteprotokollen.

Saksfremlegg

Sak PS-BF 26/25
Spørsmål om habilitet

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret for Banebrytende forskning **Fra** Områdedirektør Benedicte Løseth	Petter Helgesen	Harald H. Simonsen	1. Bestemmelser om habilitet og tillit i Norges forskningsråd - kort

BESLUTNINGSSAK

Forslag til vedtak	Habilitet for sak 28 tas opp under behandlingen av saken. Alle porteføljestyrets medlemmer er habile i behandlingen av de øvrige saker på sakslisten.
Kort bakgrunn	Møtet er et tildelingsmøte for tildeling av midler til FRIPRO-søknader, For slike tildelingssaker er det spesielt viktig at porteføljestyret diskuterer spørsmål om habilitet knyttet til styrets medlemmer med hensyn til de søknader som skal behandles på møtet.
Hvorfor saken fremmes til dette møtet	Alle møter i porteføljestyrene skal ha en sak hvor styret vurderer medlemmenes habilitet knyttet til sakene som skal behandles på møtet.
Hovedpunkter	Habilitet for sak 28 tas opp under behandlingen av saken. Medlemmer som er inhabile forlater møtet og deltar ikke i diskusjon og vedtak knyttet til søknadene de er inhabile for. Det er ingen inhabilitet knyttet til andre saker på sakslisten.
Forberedelse / prosess	En liste over prosjektledere og deltagere i søknadene som skal behandles i sak 28, ble lagt ut i porteføljestyrets Teams-rom før møtet. Porteføljestyrets medlemmer ble før møtet bedt om å melde inn vurdering av sin habilitet knyttet til søknadene som skal behandles. Et forslag til inhabile medlemmer er laget av administrasjonen basert på innspillene.
Videre saksgang	Følges opp i møtet.

Bestemmelser om habilitet og tillit i Norges forskningsråd – kortversjon

Forskningsrådet er omfattet av habilitetsbestemmelsene i Forvaltningslovens kapittel II "Om ugildhet". Bestemmelsene gjelder også eksterne enkeltpersoner som bidrar i Forskningsrådets saksbehandling, som fageksperter. Forskningsrådet har i tillegg vedtatt egne bestemmelser om habilitet og tillit. Disse er på noen punkter strengere enn lovens regler. De viktigste bestemmelsene for vurdering av habilitet er følgende:

Fra bestemmelsene:

2 Definisjoner

I disse bestemmelsene menes med:

Part – person som en avgjørelse retter seg mot eller som saken ellers direkte gjelder, jf. forvaltningslovens § 2 e). Som part regnes normalt også enkeltperson som er direkte identifisert i en søknad og som har en sentral rolle i prosjektet.

3 Habilitetskrav og avgjørelse av habilitetsspørsmålet

3.1 Automatisk inhabilitet

Ansatt, ekspert eller medlem av styrende og rådgivende organer i Forskningsrådet samt enhver annen som utfører tjeneste eller arbeid for Forskningsrådet, er i alle tilfelle inhabil til å tilrettelegge grunnlaget for en avgjørelse, eller treffe avgjørelse i en sak

a) når han eller hun selv er part i saken
b) når han eller hun er i slekt eller svogerskap med en part i opp- eller nedstigende linje eller i sidelinje så nært som søsken
c) når han eller hun er eller har vært gift eller partner med eller er forlovet med, eller er samboer med, eller er fosterfar, fostermor eller fosterbarn til en part.
d) når han eller hun er verge eller fullmektig for en part i saken eller har vært verge eller fullmektig for en part etter at saken begynte
e) når han eller hun leder eller har en ledende stilling i, eller er medlem av styringsorgan eller bedriftsforsamling for en offentlig eller privat virksomhet, som er part i saken
f) når han eller hun er, eller for mindre enn 3 år siden har vært, veileder for en part med sikte på doktorgrad

3.2 Inhabilitet etter skjønn

Ansatt, ekspert eller medlem av styrende og rådgivende organer i Forskningsrådet samt enhver annen som utfører tjeneste eller arbeid for Forskningsrådet, er inhabil til å tilrettelegge grunnlaget for en avgjørelse, eller treffe avgjørelse i en sak når det foreligger særegne forhold som er egnet til å svekke tilliten til hans eller hennes upartiskhet.

Ved vurderingen skal det blant annet legges vekt på om avgjørelsen i saken kan innebære særlig fordel, tap eller ulempe for ham eller henne selv eller noen som han eller hun har nær personlig tilknytning til. Det skal også legges vekt på om ugildhetsinnsigelse er reist av en part.

Kommentar til 3.2:
I skjønnsvurderingen skal en særlig vurdere og vektlegge følgende:

- personlig interesse for utfallet av saken
- nært faglig samarbeid, herunder vurdere betydningen av samforfatterskap og veiledning
- nært vennskap
- personlig eller faglig motsetningsforhold
- personlig eierskap – aksjer e.l.

Fra veiledningen:

3. Generelt om habilitetsvurdering

Ved vurdering av habilitetsforhold vil det ofte være behov for å bruke skjønn. Ved vurdering av habilitet må følgende overordnede spørsmål stilles:

- Er det noen forhold i saken som kan svekke, eller kan antas å svekke, vedkommendes profesjonelle dømmekraft?
- Er det noen forhold i saken som kan svekke, eller kan antas å svekke, vedkommendes profesjonelle dømmekraft sett utenfra?
- Er vedkommendes opptreden egnet til å svekke tilliten til beslutningen?

Det skal legges vekt på muligheten for personlig fordel, tap eller ulempe som følge av utfallet av saken.

Nedenfor er det satt opp en oversikt over hvilke forhold som bør vurderes når man skal avgjøre om en person er inhabil.

Sjekkpunkter	**Nærmere beskrivelse**
a) Automatisk inhabilitet	Se bestemmelsene om automatisk inhabilitet
b) Nær personlig/faglig tilknytning	Nært personlig vennskap (det må være mer enn bare bekjentskap), faglig fellesskap, for eksempel samarbeid eller samforfatterskap av nyere dato etc. Både omfang og nærhet i tid er elementer i vurderingen av nærhet i samarbeid/-samforfatterskap (se kapittel 4.1 om faglig samarbeid). Ved vurdering av om nære personlige eller faglige forhold fører til inhabilitet, må det vurderes om avgjørelsen av den aktuelle saken har betydning for den man har et nært forhold til (jf. punkt c).
c) Mulighet for personlig vinning/tap/ulempe	For å bli inhabil skal man selv, eller noen man har et nært forhold til (punkt b), ha noen grad av personlig interesse av utfallet av en sak. I Forskningsrådet vil det normalt dreie seg

	om utfallet av en prosjektbevilgningssak. Den personlige interessen kan være av faglig og/eller økonomisk art. For universitetsansatte kan egeninteressen ofte være av faglig art. Man kan ha en egeninteresse av at ens fagmiljø blir styrket, får økt anerkjennelse, eller får finansiert nytt utstyr, selv om man ikke selv er direkte involvert i det aktuelle prosjektet, fordi dette kan øke ens egne muligheter for fremtidig støtte. For en bedriftsansatt, spesielt fra en liten bedrift, kan egeninteressen være av økonomisk art, det kan trygge arbeidsplassen for alle om bedriften får en bevilgning. For ansatte ved forskningsinstitutter kan begge forhold være aktuelle, avhengig av instituttets størrelse og mangfold (se kapittel 5).
d) Andre særegne forhold som er egnet til å svekke tilliten til en beslutning hvis vedkommende deltar	Er det noen forhold som kan svekke, eller kan antas å svekke, den profesjonelle dømmekraften sett utenfra, for eksempel knyttet til kravet om forsvarlig saksbehandling, likebehandling eller saklighet? Kontrollspørsmålet må være: Hvordan tar dette seg ut utenfra? Det må være en vurdering som bygger på mer enn løse antagelser og spekulasjoner. Man må vurdere det slik at det er overveiende sannsynlig, at noen vil reise spørsmål ved en persons upartiskhet, og at dette vil svekke tilliten til den aktuelle beslutningen.

Det er viktig at alle aktuelle momenter vurderes i hvert enkelt tilfelle. Hvis flere momenter gjør seg gjeldende samtidig, kan det lettere føre til inhabilitet.

4. Vurdering av inhabilitet etter skjønn

Når det ikke foreligger automatisk inhabilitet, er det viktig å vurdere inhabilitet ut fra reglene om skjønn. Det er ulike faktorer som må vurderes under denne kategorien. Vurderingstemaene er om det foreligger andre særegne forhold som er egnet til å svekke tilliten til en beslutning dersom vedkommende deltar i saksbehandlingen. Det skal bl.a. legges vekt på om avgjørelsen i saken kan innebære en mulighet for fordel, tap eller ulempe for vedkommende selv eller noen han eller hun har nær personlig tilknytning til.

Habilitetskravene kan bli noe strengere jo vanskeligere, viktigere og mer skjønnspreget en sak er, og også når den enkeltes mulighet for å påvirke den endelige avgjørelse i en sak er stor. Det er viktig at det ikke skapes tvil om vedkommendes tilknytning til saken eller partene.

Nedenfor drøftes en del typiske situasjoner som er aktuelle i Forskningsrådet

4.1 Nært faglig samarbeid, herunder samforfatterskap og veiledning

Den som har, eller inntil nylig har hatt, et nært faglig samarbeid med en person eller institusjon som er part i saken vil kunne bli inhabil fordi et nært faglig samarbeid kan påvirke evnen til upartisk vurdering.

Generelt skal det mye til for at samarbeid i tjeneste skal medføre inhabilitet. Det er først hvis samarbeidet er særlig nært og omfattende at det kan bli spørsmål om inhabilitet av den grunn alene.

Vanlig samarbeid i tjeneste og kontakt grunnet i arbeid innen samme fagfelt vil normalt ikke føre til inhabilitet. Forvaltningsloven åpner for en bred skjønnsmessig vurdering der det avgjørende er om det er konstatert et «særegent forhold» og om det er «egnet til å svekke tilliten» til upartisk vurdering. Forskning kan imidlertid ha særtrekk som skiller det fra annet samarbeid i tjeneste, fordi forskning er en mer personlig virksomhet.

Der kriteriene for rettmessig forfatterskap er oppfylt (jfr. definisjonen i etikkom.no) vil det foreligge et samarbeid, men det er ikke gitt at det medfører inhabilitet. Antall bidragsytere til en publikasjon, og rollen vedkommende har hatt, kan si noe om sannsynligheten for at samarbeidet er så nært at det vil medføre inhabilitet. Antall sampublikasjoner og utgivelseshyppigheten er også faktorer som må vurderes.

Samforfatterskap som ikke fyller vilkårene for rettmessig forfatterskap, vil ikke føre til inhabilitet med mindre det også foreligger samarbeid ut over samforfatterskapet som er av en slik karakter at det fører til inhabilitet.

- Redaktøransvar vil normalt ikke medføre inhabilitet.
- Ved rettmessig samforfatterskap som ligger nær 3 år tilbake i tid kan det være aktuelt å undersøke når samarbeidet fant sted, fordi det kan ha gått en tid før publikasjonen kom på trykk.

Veiledning
En person som har vært veileder for en part med sikte på doktorgrad for mer enn tre år siden (jf. bestemmelsenes punkt 3.1 f) må vurdere sin habilitet ut fra spørsmålene i de tre kulepunktene i kapittel 3 i veiledningen. Det samme gjelder for den som er, eller har vært, veileder for en part med sikte på andre eksamener enn doktorgrad.

5. Inhabilitet for ansatt ved samme institusjon (kollega-inhabilitet)

Når det gjelder kollegainhabilitet, kan både reglene om automatisk inhabilitet og inhabilitet etter skjønn komme til anvendelse.

Flere momenter må vurderes når en person skal være med på å fatte vedtak som gjelder søknader fra den institusjonen der vedkommende er ansatt.

- Hvilken posisjon har vedkommende i institusjonen?
  - Under ellers like forhold vil inhabilitet kunne oppstå oftere når vedkommende har en sentral posisjon i den virksomhet der vedkommende er ansatt.
- Eierrettigheter i form av aksjer eller lignende i den institusjonen hvor vedkommende er ansatt, må vurderes.
  - Høy stilling ved institusjonen kan medføre at selv en mindre aksjepost vil kunne utløse inhabilitet. Omvendt vil en stor aksjepost kunne bidra til å utløse inhabilitet også for en vanlig ansatt i vedkommende institusjon.

Vurdering av inhabilitet vil kunne påvirkes av hvilken sektor (universitetssektoren, instituttsektoren eller næringslivet) vedkommende er tilknyttet.

Under følger noen momenter som kan brukes ved habilitetsvurderingen basert på vedkommendes tilknytning til de ulike sektorene:

Universitetssektoren

Den som er rektor, dekan eller instituttleder vil være inhabil til å behandle søknader fra egen enhet i henhold til bestemmelsenes punkt 3.1 e). Det samme gjelder den som sitter i styret for universitetet, fakultetet eller instituttet.

Forsker/professor vil ofte kunne være inhabil for søknader der forskere fra egen forskergruppe, eller nære faglige samarbeidspartnere, er sentrale. Det at man kommer fra samme institutt, behøver ikke å medføre inhabilitet. Dette vil være avhengig av instituttets størrelse (antall forskere) og den faglige relasjonen mellom søker og vedkommende forsker/professor. Dette må vurderes konkret i hvert enkelt tilfelle.

Instituttsektoren

Den som er leder, eller har ledende stilling, ved et institutt vil være inhabil i henhold til bestemmelsenes punkt 3.1.e). Det samme gjelder den som sitter i styret for instituttet.

Forsker-/professorstilling vil, på samme måte som for universitetssektoren, ofte kunne medføre inhabilitet for søknader der forskere fra egen forskergruppe eller nære faglige samarbeidspartnere er sentrale. I tillegg må det vurderes hvilken betydning det har for den ansatte at en søknad fra instituttet blir innvilget. I denne vurderingen må det legges særlig vekt på prosjektets betydning for instituttets økonomi og renommé.

Næringslivet

Den som er leder, eller har ledende stilling, i et selskap vil være inhabil i henhold til bestemmelsenes punkt 3.1.e). Det samme gjelder den som sitter i styret for selskapet.

Ansatte i et selskap som søker om forskningsmidler, vil, på samme måte som for universitets- og instituttsektoren, ofte kunne være inhabile for søknader der personer fra eget fagmiljø eller nære faglige samarbeidspartnere er sentrale. I tillegg må det vurderes hvilken betydning det har for de ansatte at en søknad fra selskapet blir innvilget. I denne vurderingen må det legges særlig vekt på prosjektets betydning for selskapets økonomi og renommé.

Saksfremlegg
Porteføljestyremøte 3/24

Sak PS-BF 27-1/25
Vurdering av forskningsbehov knyttet til Nasjonaljubileet 2030

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret	Petter Helgesen	Christian Lund	1. Oppdragsbrev fra KD 2. Søknad fra Nasjonaljubileet 2030 – Nettverk for forskning og kunnskaps-formidling
Fra			
Områdedirektør			
Benedicte Løseth			

ORIENTERINGSSAK

Forslag til vedtak	Porteføljestyret tar saken til orientering.
Kort bakgrunn	Kunnskapsdepartementet har bedt Forskningsrådet om å gjøre en kortfattet vurdering av forskningsbehovet knyttet til Nasjonaljubileet 2030 (vedlegg 1). Oppdraget er omtalt i KDs tildelingsbrev til Forskningsrådet for 2025.
Hvorfor saken fremmes til dette møtet	Forskningsrådet mottok brev om oppdraget 2.april, med frist for å levere notat 1.oktober.
Hovedpunkter	KD fikk i 2024 en søknad fra «Nasjonaljubileet 2030 - Nettverk for forskning og kunnskapsformidling» om støtte til finansiering av et forskningsprogram gjennom Forskningsrådet etter modellen til «forskning for grunnlovsjubileet 2014» (vedlegg 2). Regjeringen prioriterte ikke midler til dette i statsbudsjettet for 2025, og KD ga Nettverket tilbakemelding om at de ville be Forskningsrådet om å kartlegge behovet for en øremerket finansiering knyttet til Nasjonaljubileet 2030. En slik øremerket prioritering må eventuelt skje gjennom en omprioritering innenfor Forskningsrådets eksisterende rammer. KD ber Forskningsrådet om å: 1) gjøre en kortfattet vurdering av forskningsbehovet knyttet til Nasjonaljubileet 2030 2) omtale eventuelt behovet for en øremerket forskningssatsing knyttet til Nasjonaljubileet 2030 3) omtale behovet for prioritering av dette opp mot andre tiltak
Forberedelse / prosess	Administrasjonen har utviklet saken.
Videre saksgang	Forskningsrådets administrasjon vil utarbeide et kortfattet notat til KD.

Sak PS-BANEBR 27-2/25 Særbehandling av kjønn i løpende forskerprosjekt-utlysninger

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret for banebrytende forskning	Petter Helgesen	Heidi Roggen	

Fra

Områdedirektør
Benedicte Løseth

ORIENTERINGSSAK

Forslag til vedtak

Porteføljestyret tar informasjonen om endringer i særbehandling av kjønn i banebrytende forsknings løpende forskerprosjekt-utlysninger til etterretning.

Kort bakgrunn

I banebrytende forsknings løpende forskerprosjekt-utlysninger er det beskrevet at søknader med kvinnelig prosjektleder prioriteres når søknadene ellers vurderes likt. Føringen har vært en del av FRIPROs utlysninger i mange år, og var lenge et krav i alle Forskningsrådets utlysninger. Prioriteringen innebærer at søknader med kvinnelig prosjektleder rangeres foran mannlige når søknadene har like karakterer, i valg av søknader til finansiering.

Porteføljestyret for banebrytende forskning drøftet saken i sitt møte 4.april, som del av sak PS-BANEBRYT 19/25, og ble i møtet bedt om å gi administrasjonen råd om dagens prioritering av kvinnelige prosjektledere skulle avvikles eller erstattes med en kjønnsnøytral og fagspesifikk prioritering av det underrepresenterte kjønn. Porteføljestyret anbefalte det siste alternativet siden det fortsatt er stor ubalanse mellom kjønnene innenfor noen fagområder.

Hvorfor saken fremmes til dette møtet

Administrasjonen har vedtatt nye prinsipper for særbehandling av kjønn i henhold til gjeldende lovverk og informerer med dette porteføljestyret om vedtaket.

Hovedpunkter

Positiv særbehandling basert på kjønn er kun tillatt når særbehandlingen er egnet til å fremme lovens formål og når det er et rimelig forhold mellom formålet og hvor inngripende særbehandlingen er. Særbehandlingen skal opphøre når formålet med den er oppnådd. Det er vanlig å definere en underrepresentasjon som at det ene kjønnet utgjør under 40 prosent av totalen. Etter innføring av løpende mottak og behandling er den samlede kjønnsbalansen i FRIPRO blant innsendte søknader, ca. 35 prosent søknader med kvinnelig prosjektleder og 65 prosent med mannlig. Fem av åtte fagfellegrupper er likevel innenfor 40/60-fordelingen (tabell 1).

Tabell 1 – Kjønnsfordeling blant innsendte søknader, fordelt på fagfellegrupper

Fagfellegruppe	Kvinneandel
1 – humaniora	51 %
2 – samfunnsvitenskap	41 %
3 – psykologi og mental helse	46 %
4 – human livsvitenskap	41 %
5 – biologi	47 %
6 – fysikk og kjemi	20 %
7 – geo- og ingeniørvitenskap	12 %
8 – matematikk og ikt	22 %
Totalt	**35 %**

En juridisk vurdering av Forskningsrådet tilsier at særbehandlingen ikke kan gjelde FRIPRO som helhet fordi den da også dekker fagfelt hvor det allerede er kjønns-balanse. Særbehandlingen slik den har vært, kan derfor ikke videreføres. Alternativene var å avvikle særbehandlingen *eller* å erstatte den med én som er spissere innrettet mot fagfelt hvor det er tydelig ubalanse mellom kjønnene.

Forskningsrådets administrasjon har gjort en helhetlig vurdering og har kommet fram til å benytte en positiv særbehandling av kjønn per fagfellegruppe når kjønnsbalansen over det siste året er utenfor 40/60.

Forberedelse / prosess	Administrasjonen har utviklet saken.
Videre saksgang	Administrasjonen vi legge fram en vedtakssak for porteføljestyret om oppdaterte bevilgningsprinsipper og administrativ prosedyre for FRIPRO i sitt møte i september, som tar inn de nye prinsippene for særbehandling av kjønn.

Sak PS-BANEBRYT 27-3/25

Sak PS-BANEBRYT 27-3/25
FRIPRO – internasjonalt mobilitetsstipend

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret for banebrytende forskning	Petter Helgesen	Heidi Roggen	

Fra

Områdedirektør
Benedicte Løseth

ORIENTERINGSSAK

Forslag til vedtak	Porteføljestyret tar informasjonen om endringer i internasjonalt mobilitetsstipend til etterretning.
Kort bakgrunn	Treårig forskerprosjekt med internasjonal mobilitet ble innført i 2014. Formålet med ordningen er å fremme internasjonal mobilitet og karriereutvikling blant norske forskere tidlig i karrieren, og bidra til kunnskapsoverføring til norske miljøer. Prosjekt-ledere 0-7 år etter doktorgraden har fått midler til treårige prosjekter med to år i utlandet og deretter ett år i Norge. Hovedmålgruppen er forskere uten eller med lite tidligere internasjonal forskermobilitet. En rapport om mobilitetsstipendet fra 2021 ga et overordnet positivt bilde av ordningen, men viste at den ikke traff ønsket målgruppe i tilstrekkelig grad. Det ble derfor gjort noen justeringer i krav til prosjektleder. Søknadsdata og tilbakemeldinger fra sektoren og porteføljestyret, viser at situasjonen er bedret, men at det er ønskelig med ytterligere endringer. Tilsøkningen er lav og prosjektledernes tilknytning til Norge er fortsatt begrenset. Porteføljestyret for banebrytende forskning drøftet ordningen i sitt møte 4.april, sak PS-BANEBRYT 20/25, og ble i møtet bedt om å gi administrasjonen råd om mulige justeringer eller i ytterste konsekvens at ordningen avvikles. Porteføljestyret anbefalte å beholde ordningen samtidig som det gjøres endringer da behovet for økt internasjonal mobilitet for norske forskere fortsatt er tydelig. Spesielt ble det pekt på behovet for å øke ordningens fleksibilitet og kravet til tilknytning til Norge.
Hvorfor saken fremmes til dette møtet	Administrasjonen har vedtatt endringer av ordningen, og informerer med dette porteføljestyret om endringene.
Hovedpunkter	Tilsøkningen til ordningen er lav, med kun 20 innsendte søknader i 2024 og svak tilknytning til Norge blant søkerne. Sektoren har i tilbakemeldinger til Forskningsrådet pekt på at kravet til to års sammenhengende utenlandsopphold er hovedårsaken deres forskere gir for å ikke søke på denne utlysningen. Administrasjonen har gjort en helhetlig vurdering og kommet fram til å endre ordningen. For å gjøre den mer attraktiv for den primære målgruppen, er det behov for en større fleksibilitet både i lengden på utenlandsoppholdet og når oppholdet må gjennomføres, og ordningen bør spisses slik at den i større grad bidrar til ny internasjonal mobilitet.

Følgende endringer er vedtatt:

Dagens krav	Anbefalte endringer
3 års prosjektperiode	3-4 års prosjektperiode
2 år i utlandet + 1 år i Norge	1-2 år i utlandet. Mulighet for å dele opp utenlandsoppholdet i flere deler.
Maks to måneder i Norge før utenlandsoppholdet.	Maks 1 år i Norge før utenlandsoppholdet/-ene og minst 6 mnd. etter.
Prosjektlederen kan ikke ha bodd eller jobbet i landet de skal til i mer enn **12** måneder i løpet av de **3** foregående årene.	Prosjektlederen kan ikke ha bodd eller jobbet i landet de skal til i mer enn **6** måneder i løpet av de **5** foregående årene.
Prosjektlederen må ha bodd eller jobbet i Norge i minst **12** måneder i løpet av de siste syv foregående årene.	Ingen endringer
Prosjektlederen må ha en mastergrad eller ph.d. fra en norsk forskningsorganisasjon.	Ingen endringer

Forberedelse / prosess

Administrasjonen har utviklet saken.

Videre saksgang

Administrasjonen vil oppdatere utlysningen for nye regler, følge med på tilsøkningen til ordningen, og rapportere til porteføljestyret i løpet av 2026.

Sak PS-BANEBR 29/25 Banebrytende forskning – utvikling av løpende forskerprosjekt-utlysninger

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret for banebrytende forskning	Petter Helgesen	Heidi Roggen	

Fra

Områdedirektør
Benedicte Løseth

DRØFTINGSSAK

Forslag til vedtak	Administrasjonen tar porteføljestyrets kommentarer og synspunkter med seg i videre saksgang.
Kort bakgrunn	FRIPRO er Forskningsrådets største finansieringsordning for fri, grunnleggende forskning ved forskningsinstitusjoner. Sammen med virkemidlene *toppforskere* og *radikale forskningsidéer*, inngår FRIPRO i Forskningsrådets virkemidler for banebrytende forskning, som støtter langsiktig, grunnleggende og fremragende forskning. Målet er vitenskapelig og faglig fornyelse, å bygge verdensledende fagmiljøer og å bidra til karrierebygging og internasjonal mobilitet for spesielt dyktige forskere. Satsingene har de siste årene vært gjennom store endringer med overgang fra årlig søknadsfrist til løpende søknadsmottak, og innføring av karantene for når en prosjektleder kan søke igjen. Porteføljestyret for banebrytende forskning drøftet saken i sitt møte 4.april, som del av sak PS-BANEBRYT 19/25. I møtet ble porteføljestyret bedt om å gi innspill knyttet til erfaring med dagens karantene- og kvalifiseringsregler. Porteføljestyret er tilfreds med at endringene i FRIPRO har ført til at innvilgelsesandelen er øket til om lag 20 %. Samtidig ble det gitt innspill på at karantene- og kvalifiseringsgrensene kan ha hatt for stor effekt også for søknader som har potensial til å flytte forskningsfronten.
Hvorfor saken fremmes til dette møtet	Vi har nå om lag ett års erfaring etter omlegging til løpende søknadsmottak og –behandling, og ber porteføljestyret om råd og innspill knyttet til planlagte justeringer av ordningen.
Hovedpunkter	Denne saken handler om tre deler av dagens regelverk: 1. **Kvalifiseringsgrense**: karaktergrense for hvilke søknader som er kvalifiserte til å bli vurdert for finansiering. 2. **Karantenegrenser**: karaktergrenser for når en prosjektleder kan søke banebrytende forsknings løpende forskerprosjekt-utlysninger igjen. 3. **Bevilgningsprinsipper**: regler for valg av søknader til finansiering og avslag. FRIPROs bevilgningsprinsipper og administrative prosedyre legger faste regler for valg av søknader til finansiering og avslag som anvendes ved hver tildeling. Prinsip-pene benytter den såkalte FRIPRO-rangeringen som trekker inn kvalifiseringsgrense og kjønnsprioritering. Selve kvalifiseringsgrensen og kjønnsprioriteringen fastsettes av administrasjonen, mens bevilgningsprinsippene og administrativ prosedyre besluttes av porteføljestyret. Karantenegrensene fastsettes av administrasjonen.

Administrasjonen ønsker innspill fra porteføljestyret på justeringer av kvalifiserings- og karantenegrenser i denne saken. Videre ønskes det innspill på hvordan bevilgnings-prinsippene skal utformes etter eventuelle justeringer. Justering av kjønnsprioritering er omtalt i orienteringssak 27-2/25.

Kvalifiseringsgrense

Forskningens vitenskapelige kvalitet, kreativitet og potensial for å flytte forsknings-fronten er kjernen i de løpende forskerprosjekt-utlysningene i banebrytende forskning. Søknader til de fire utlysningene om *toppforskere*, *erfarne forskere*, *tidlig karriere* og *internasjonal mobilitet* vurderes etter fire vurderingskriterier: *potensial*, *kvalitet*, *gjen-nomføring* og *virkninger*.[1] De to første dekker nettopp denne kjernen i banebrytende forskning. I FRIPROs bevilgningsprinsipper vektes derfor *potensial* og *kvalitet* tyngst, deretter *gjennomføring* og til slutt *virkninger* blant kvalifiserte søknader.

Per i dag er kvalifiseringskravet for de fire utlysningene i banebrytende forskning at søknaden må få karakter 6 eller 7 på alle fire kriterier for å være aktuell for finansiering. Dette sidestiller de fire kriteriene for selve kvalifiseringen og er et strengere krav enn for andre forskerprosjektutlysninger i Forskningsrådet. Konsekvensen er at noen søknader med toppkarakter på de viktigste kriteriene ikke er kvalifisert fordi de har karakter 5 (meget godt) på et av de mindre viktige kriteriene.

Administrasjonen vurderer å endre kvalifiseringsgrensen sånn at slike søknader vil kvalifisere for finansiering. Målet er å spisse virkemidlene for banebrytende forskning til de elementene av prosjektene som retter seg mot hovedformålene i satsingen.

Forslag til justert kvalifiseringsgrense:

Søknader som får karakter 6 eller 7 på vurderingskriteriene *Forskningskvalitet – potensial for å flytte forskningsfronten* og *Forskningskvalitet – kvalitet i FoU-aktiviteter*, og karakter 5, 6 eller 7 på vurderingskriteriene *Gjennomføring* og *Virkninger og effekter*, og som også får en gjennomsnittskarakter på 6,0 eller høyere, er kvalifisert for å bli vurdert for finansiering.

Administrasjonen ber porteføljestyret om å gi innspill til den foreslåtte justerte kvalifiseringsgrensen.

[1]De fire vurderingskriteriene er *Forskningskvalitet – potensial for å flytte forskningsfronten* (potensial), *forskningskvalitet – kvalitet i FoU-aktiviteter* (kvalitet), *virkninger og effekter* (virkninger) og *gjennomføring*. Karakterskalaen går fra 1-7 hvor de tre øverste karakterene er definert som *7 – fremragende*, *6 – svært godt* og *5 – meget godt*.

Karantenegrenser

Karantenegrensene ble innført våren 2023 for å redusere søknadsmengden til FRIPRO og ressursbruk i sektoren og i Forskningsrådet. Banebrytende forskning benytter karantene i utlysningene *toppforskere*, *erfarne forskere* og *tidlig karriere*. Karantenen forlenger tiden før en forsker igjen kan være prosjektleder for en søknad til banebrytende forsknings løpende forskerprosjekt-utlysninger. Karantenegrensene er som vist i tabellen under.

Tabell 1 – Gjeldende karantenegrenser. Karantenegrensene er gjennomsnittskarakter for de fire vurderingskriteriene, som hver får en karakter på en karakterskala 1-7, hvor 7 er best.

Utlysning	**To år**	**Ett år**	**Ingen**
Toppforskere	1-3	3,25- 5,5	5,75-7
Erfarne forskere	1-3	3,25- 5,5	5,75-7
Tidlig karriere	Ingen	1-4,5	4,75-7

Intensjonen med å innføre karantene var i hovedsak å redusere antall søknader som ble sendt inn uten å være helt ferdige og klare for vurdering. Som forventet har overgangen til løpende søknadsmottak og -behandling og innføring av karantene endret søkeratferden betydelig og gitt en stor reduksjon i søknadsmasse. Men den bremsende effekten av tiltakene ser ut til å være større enn estimert også for sterke søknader med potensial for å flytte forskningsfronten og bidra til sterk nasjonal konkurranse. Dette understrekes også i tilbakemeldinger fra sektoren.

Kvalifiserings- og karantenegrensene, sammen med tilgjengelig budsjett, deler inn søknadene i tre grupper:

1) innvilgede søknader
2) avslåtte søknader *uten* karantene
3) avslåtte søknader *med* karantene

Fordelingen av søknadene i de tre gruppene har betydning for hvordan virkemidlene fungerer både i dag og for fremtidig tilsøkning. Søkere i gruppe 2 kan forbedre søknaden og sende den inn igjen ett år etter de sendte inn den opprinnelige søknaden, og det er hensiktsmessig å ha en tilstrekkelig andel i denne gruppen. Forskningsrådet har som mål at våre nasjonale ordninger er i tråd med relevante europeiske ordninger. For ERC er gruppe 2 om lag to ganger så stor som gruppe 1. Så langt i løpende søknadsbehandling i FRIPRO, er gruppe 2 kun ca. 60 % så stor som gruppe 1 for *erfarne forskere*.

Å redusere grensene for ett-års karantene noe vil øke antallet søkere som kan sende inn ny søknad etter ett år, betydelig. Samtidig vil det trolig også påvirke søkeradferd slik at antallet søknader med potensial for å flytte forskningsfronten, vil øke noe. En justering av grensene bør ikke være for stor for å beholde motivasjonen til å utvikle søknadene til høyest mulig kvalitet før de sendes inn.

Administrasjonen vurderer å justere ned grensen for ett års karantene med 0,5, slik at karantenegrensene blir som følger:

Tabell 2 – Nye karantenegrenser

Utlysning	**To år**	**Ett år**	**Ingen**
Toppforskere	1-3	3,25- 5,0	5,25-7
Erfarne forskere	1-3	3,25- 5,0	5,25-7
Tidlig karriere	Ingen	1-4,0	4,25-7

De nye grensene medfører at andelen søknader med karantene ville gått ned fra i overkant av 40 % til i overkant av 20 % for tidligere behandlede søknader. Reduksjonen er estimert å gi størst effekt for *toppforskere* og *erfarne forskere* hvor karaktergrensene er høyest.

Administrasjonen ber porteføljestyret om innspill til den foreslåtte endringen.

Bevilgningsprinsipper

Dette punktet belyses overordnet i dette saksfremlegget med mulighet for å diskutere flere detaljer i selve møtet.

FRIPROs bevilgningsprinsipper og administrative prosedyre beskriver regler for valg av søknader til finansiering og avslag (vedlegg 1 og 2). Prinsippene vekter kriteriene *potensial* og *kvalitet* tyngst, deretter *gjennomføring* og til slutt *virkninger* blant kvalifiserte søknader. I tillegg prioriteres søknader med kvinnelig prosjektleder fremfor mannlig prosjektleder ved ellers lik vurdering. Dette gir den såkalte FRIPRO-rangeringen som i dag har 24 trinn. Grunnprinsippet ved tildeling er at søknader fortrinnsvis innvilges fra øverste tilgjengelige FRIPRO-rangering hvor det er søknader til behandling.

Den vedtatte endringen i kjønnsprioritering (se sak 27-2/25), vil halvere antallet trinn i FRIPRO-rangeringen siden kjønnsprioriteringen nå blir kjønnsnøytral og skal benyttes kun for fagområder der det er en ubalanse. Kjønnsprioritering vil i stedet bli tatt inn i standard søknadsprioritering.

Spørsmålet er om prinsippene for prioritering av søknader skal beholdes også når det åpnes for at søknader med karakter 5 («meget godt») på kriteriene *gjennomføring* og *virkninger* også er kvalifisert. Det vil medføre at søknader med karakter 5 på ett eller begge disse kriteriene vil kunne bli prioritert høyere enn søknader som får 6 eller 7 på alle kriteriene.

Administrasjonen ber porteføljestyret om innspill til revidering av FRIPRO bevilgningsprinsipper.

Forberedelse / prosess	Administrasjonen har utviklet saken basert på innspill fra Porteføljestyret for banebrytende forskning.
Videre saksgang	Administrasjonen tar innspill fra porteføljestyret inn i forberedelsene av administrative vedtak om endringer i kvalifiserings- og karantenegrenser, og forberedelsene av en vedtakssak til porteføljestyrets neste møte for oppdatering av bevilgningsprinsipper for banebrytende forskning.

Saksfremlegg

Sak PS-BF 30/25
Sentre for fremragende forskning (SFF-VI), prosess og føringer for trinn1

Til	**Ansvarlig Direktør**	**Saksbehandler**	**Vedlegg**
Porteføljestyret for Banebrytende forskning	Petter Helgesen	Sigrid M. Kraggerud	Ingen

Fra

Områdedirektør

Benedicte Løseth

BESLUTNINGSSAK

Forslag til vedtak

Porteføljestyret vedtar følgende tildelingsprosess for trinn 1 av Sentre for fremragende forskning (SFF), SFF-VI:

1. Porteføljestyret vedtar, basert på innstillingen fra den vitenskapelige komiteen for trinn 1, hvilke søkere som inviteres til å søke til trinn 2. Komiteen innstiller 30-36 søkere til å bli invitert til trinn 2. Innstillingslisten utarbeides ved at:
   a. Den vitenskapelige komiteen i trinn 1 innstiller de 7 beste søknadene fra hver underkomite; Livsvitenskap, Naturvitenskap og teknologi og Humaniora og samfunnsvitenskap på de første plassene. Det betyr at nr. 1-21 på listen, forbeholdes de syv beste søknadene innen hvert fagområde, basert på vurderingskriteriene.
   b. Den vitenskapelige komiteen i trinn 1 innstiller deretter, på plass 22-30/36 søknadene i rangert rekkefølge uavhengig av fagområde.
   c. Moderat kjønnskvotering benyttes ved ellers lik vurdering mellom søknader, der søknader med kvinnelig senterleder innstilles foran mannlig.
2. De søknadene som ikke kommer med på listen over innstilte søknader (ikke god nok kvalitet) avslås av porteføljestyret *en bloc*.

Kort bakgrunn

Porteføljestyret ble høsten 2024, i møte 5/24, sak 51/24, presentert for utlysnings- og søknadsbehandlingsprosessen for den sjette generasjonen SFF. Porteføljestyret drøftet strategiske føringer for senterstørrelse, innstillingen fra den vitenskapelige komiteen og sin rolle i beslutningsprosessen.

Porteføljestyret vedtok følgende prosess for utlysning og søknadsbehandling av Sentre for fremragende forskning (SFF) i porteføljestyrets møte i desember (møte 6/24, sak 61/24):

1. Det settes en øvre grense for Forskningsrådets finansiering på 160 mill. kr. per senter.
2. Porteføljestyret vil ikke differensiere Forskningsrådets finansiering mellom ulike fagområder. Det vil heller ikke åpnes for å kunne søke om tilleggsfinansiering fra SFF ordningen for kostbart utstyr eller infrastruktur.
3. Porteføljestyret ønsker ikke at Forskningsrådets finansiering skal kunne endres fra søkt beløp gjennom forhandlinger.

4. Porteføljestyret beslutter, basert på innstillingen fra den vitenskapelige komiteen i Trinn 1, hvilke søkere som inviteres til å søke til Trinn 2.
5. I bevilgningsmøtet (høst 2027) beslutter Porteføljestyret kun hvilke sentre som skal finansieres innenfor rammen, og tildeler i henhold til søkt beløp.
6. Porteføljestyret ønsker at den vitenskapelige komiteen i Trinn 2
    a. innstiller de to beste søknadene fra hvert hovedfagområde (Humaniora og Samfunnsvitenskap/Livsvitenskap/Naturvitenskap og teknologi) på "sikker plass"– til sammen seks søknader
    b. i tillegg innstiller søknader opp til plass nr.15, utover de 6 beste søknadene på "sikker plass". Disse søknadene rangeres basert på vitenskapelig kvalitet uavhengig av fagområde.

For de søknadene som innstilles og rangeres jfr. pkt. 6b. over, vil Porteføljestyret ikke legge andre kriterier til grunn for sin porteføljevurdering enn søknadenes vitenskapelige kvalitet.

Hvorfor saken fremmes til dette møtet

Saken fremmes i dette møtet slik at Porteføljestyret kan beslutte overordnede strategiske føringer knyttet til beslutningsprosessen i trinn 1.

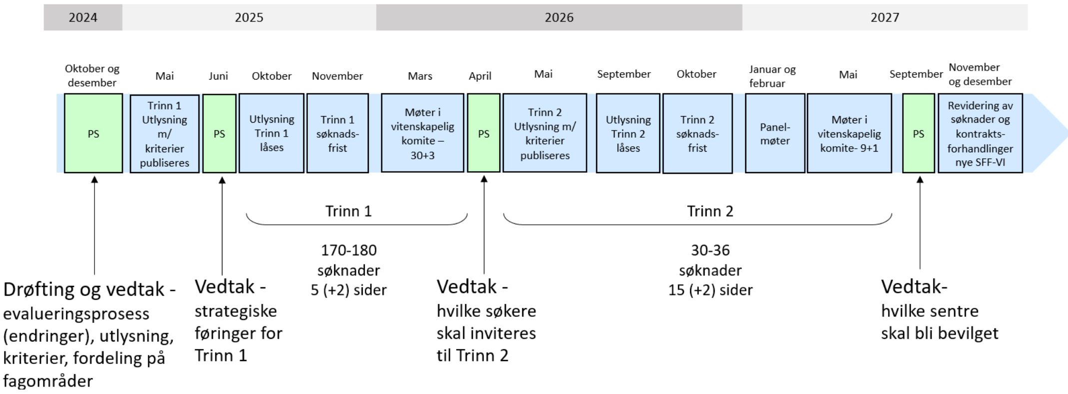
Hovedpunkter

Prosessen for senterutvelgelsen i SFF-VI og utlysningen i trinn 1

Utvelgelsen av nye SFF-sentre skjer gjennom en todelt søknadsprosess, med separate utlysninger for hvert trinn. Total tildelingsramme for SFF-VI utlysningen er 1760 millioner kroner. Den øvre grensen for Forskningsrådets finansiering er 160 millioner kroner pr. senter.

Porteføljestyret har ansvar for å godkjenne prosessene og gjøre beslutninger.
I trinn 1 mottar Forskningsrådet korte søknader (5+2 sider). En vitenskapelig komité med 33 medlemmer vurderer søknadene. Porteføljestyret fatter det formelle vedtaket om hvilke søkere som inviteres videre til trinn 2, og hvilke som får avslag. Vedtaket baseres på den vitenskapelige komiteens vurderinger og rangering. Kun inviterte søkere kan søke SFF-VI utlysningen i trinn 2, hvor søkerne sender inn en fullstendig søknad (15+2 sider).

Tidsplanen og prosessen for SFF-VI er illustrert i figuren nedenfor, hvor PS er Porteføljestyret for Banebrytende forskning (lysegrønn).



Søknadsbehandlingen i SFF-VI trinn 1.

I første trinn av søknadsbehandlingen vurderes alle innkomne søknader av en vitenskapelig komité bestående av om lag 33 medlemmer. Komiteen er organisert i tre underkomiteer, fordelt etter hovedfagområdene:

- Humaniora og samfunnsvitenskap
- Livsvitenskap
- Naturvitenskap og teknologi

Navnene på komitémedlemmene offentliggjøres før søknadsfristen. Søkerne velger hvilken underkomité som primært skal behandle søknaden. For tverrfaglige søknader kan det også angis en sekundær underkomité. Disse søknadene vurderes i begge underkomiteer, men det er den primære som gir den endelige vurderingen i trinn 1. I SFF-VI brukes det nå fire vurderingskriterier, og det gis ingen samlet karakter. De fire kriteriene er:

- Forskningskvalitet - potensial for å flytte forskningsfronten
- Forskningskvalitet - kvalitet i FoU-aktiviteter
- Virkninger og effekter
- Gjennomføring

Navnet på kriteriene er de samme som brukes i FRIPRO, men beskrivelsen av hva som skal vurderes er spesielt utformet for SFF utlysningen.

Komitemedlemmene leser og vurderer et stort antall søknader, og hver underkomité utarbeider en rangert liste med søknader de mener bør gå videre til trinn 2. Disse diskuteres deretter i samlet komite som har ansvar for å innstille hvilke 30-36 søkere som skal inviteres til trinn 2.

Komiteen skal i sitt arbeid følge føringene fra Porteføljestyret. For å sikre faglig bredde på søknadene i trinn 2, foreslår administrasjonen at porteføljestyret vedtar at den vitenskapelige komiteen i trinn 1 innstiller de 7 høyest rangerte søknadene fra hver underkomite; Livsvitenskap, Naturvitenskap og teknologi og Humaniora og samfunnsvitenskap på de første 21 plassene. Komiteen innstiller deretter søknadene til plass 22-30/36 basert på vurderingen av underkomiteene og diskusjon i plenum. Komiteen kan, basert på faglig kvalitet, velge å ta med flere søknader fra en underkomite enn fra en annen. I tillegg foreslår administrasjonen at det benyttes moderat kjønnskvotering for senterleder ved ellers lik vurdering mellom søknader, der søknader med kvinnelig senterleder innstilles foran mannlig.

Porteføljestyrets rolle
Porteføljestyret for Banebrytende forskning har en sentral rolle i å kvalitetssikre søknadsbehandlingen og fatte de formelle vedtakene. Etter trinn 1, mottar porteføljestyret den vitenskapelige komiteens rangerte anbefaling, og fatter vedtak om hvilke 30–36 søkere som skal inviteres til trinn 2.

Forberedelse / prosess

Porteføljestyret drøftet først saken i møte 5/24 (sak 51/24). Vedtak om prosessen, med noen føringer for trinn 2, ble fattet i møte 6/24 (sak 61/24). Administrasjonen har lagt diskusjon og vedtak i disse sakene til grunn i forberedelsen av saken.

Videre saksgang

Porteføljestyrets vedtak og innspill innarbeides i den planlagte prosessen for søknadsbehandlingen i SFF-VI. Utlysningen vil bli åpnet for søknader 1.oktober 2025.

Saksfremlegg
Porteføljestyremøte 3/25

Sak PS-BF 31/25
Håndtering av konsekvensene av situasjonen for forskning i USA

Til	**Ansvarlig Direktør**	**Saksbehandler**	**Vedlegg**
Porteføljestyrene	Benedicte Løseth	Yngvill R. Tømmerberg Harald H. Simonsen	

Fra

Administrerende direktør

Mari Sundli Tveit

DRØFTINGSSAK

Forslag til vedtak

Porteføljestyret tar informasjonen til orientering.

Kort bakgrunn

Amerikanske myndigheter har iverksatt og varslet en rekke tiltak med store konsekvenser for amerikansk, internasjonal og også norsk forskning. Dette inkluderer redusert tilgang til eller fjerning av forskningsdata, kraftige kutt i forskningsbevilgningene, oppsigelser, avslutning av prosjekter og innsnevring av akademisk frihet.

For å få oversikt over mulige konsekvenser som grunnlag for å foreslå tiltak, har Forskningsrådet etablert en intern task force. Task force skal foreslå tiltak knyttet til både rådgivning, tilskudd og dialog. Gruppen skal konsentrere seg om områder med størst skadevirkning, og være fleksibel i forhold til endringer i utfordringsbildet.

Hvorfor saken fremmes til dette møtet

Saken fremmes for at porteføljestyrene skal være orientert om

- arbeidet som pågår i Forskningsrådet som følge av situasjonen i USA
- erklæring fra Forskningsråds styre om de grunnleggende prinsippene for vitenskapelig kvalitet, akademisk frihet og ytringsfrihet må holdes i hevd og aktivt forsvares
- oppdrag fra Kunnskapsdepartementet

Videre bør porteføljestyrene vurdere tiltak og gi råd innenfor sitt ansvarsområde for å redusere skadevirkninger av endringene i amerikansk forskningspolitikk for norske forsknings- og innovasjonsaktører.

Hovedpunkter

Forskningsrådet har iverksatt flere tiltak for å håndtere konsekvensene av endringene i amerikansk forskningspolitikk, og vi er bedt om å koordinere sikring av datasett og lagringskapasitet nasjonalt. Forskningsrådet skal følge tett med på andre europeiske lands erfaringer og eventuelle tiltak som iverksettes internasjonalt for å sikre datatilgang og lagringskapasitet. Her er det mange aktører både nasjonalt og internasjonalt, og det er behov for å opptre koordinert. Vi vil komme tilbake med informasjon om dette når tiltak er konkretisert. Det er også behov for å vurdere behov for omprioriteringer av midler for å redusere skadevirkninger av at viktige forskningsområder mister viktig finansiering. Her er det også stor internasjonal oppmerksomhet. Situasjonen i USA er også på høyt på agendaen i Science Europe og Global Research Council, hvor Forskningsrådet spiller en sentral rolle.

Forskningsrådet følger opp prosjekter med samarbeidspartnere i USA. Det kommer frem at det er mye usikkerhet og mulig påvirkning i pågående og planlagt samarbeid mellom USA og Norge. Det er også etablert en e-postadresse for alle henvendelser om samarbeid med USA. Nedenfor følger en orientering om iverksatte tiltak samt hva porteføljestyrene kan bidra med for avhjelpe situasjonen.

1. *Erklæring fra Norges forskningsråds styre*

Forskningsrådets styre vedtok i møte 3/2025 følgende erklæring som ligger til grunn for Forskningsrådets arbeid med egne virkemidler, rådgiving, samfunnsdialog og i samarbeid nasjonalt og internasjonalt:

«Vitenskapelig kvalitet, akademisk frihet og ytringsfrihet er selve fundamentet for fri og uavhengig forskning og en av grunnplankene i demokratiet. Det er helt avgjørende at internasjonalt forskningssamarbeid bygger på likeverd.

Forskningsrådets styre vil understreke at disse grunnleggende prinsippene må holdes i hevd og aktivt forsvares. Akademisk frihet er under press i mange land, og for tiden aktualisert av situasjonen i USA. Forskningsrådets styre oppfordrer norske forskningsaktører til å stå imot press og sikre at man ikke uforvarende innskrenker institusjonenes og forskernes rett til autonomi.

Forskningsrådets styre ber også Forskningsrådets administrasjon sørge for at de samme prinsippene blir fulgt i Forskningsrådets portefølje og i øvrig arbeid. Styret gir full støtte til administrasjonens håndtering av situasjonen, nasjonalt og internasjonalt.»

2. *Tiltak for rekruttering av internasjonale talentfulle forskere*

På oppdrag fra Kunnskapsdepartementet skal Forskningsrådet se på hvilke ordninger som kan iverksettes for å bidra til målrettet rekruttering av internasjonale talentfulle forskere, inkludert forskere med tilholdssted i USA. Forskningsrådets styre vil behandle et forslag til prinsipper og behandlingsprosedyre for den nye ordningen på styremøtet 2. juni.

Det er foreslått en ramme på 300 mill. kroner fordelt på tildelinger i årene 2025, 2026, 2027 og 2028. Målet med ordningen er at norske forskningsinstitusjoner skal ha en særlig mulighet til å knytte til seg talentfulle internasjonale forskere som kan etablere seg i Norge, og derigjennom å bidra til kvalitetsheving og faglig merverdi til forskningsmiljøene senteret eller prosjektet er tilknyttet. Ordningen knyttes til alle Forskningsrådets senterordninger og Forskningsrådets ordning FRIPRO – erfarne forskere. Det vil være løpende søknadsbehandling og søknadene behandles fortløpende inntil midlene er oppbrukt. Porteføljestyret for forskningssystemet gis ansvaret for oppfølgingen av ordningen.

3. *Oppfølging av forskingssamarbeid med USA*

I 2025 finansierer Forskningsrådet godt over 300 prosjekter der norske og amerikanske forskere har et formalisert forskningssamarbeid.

Samarbeidspartnernes kompetanse og deltakelse spiller ofte en viktig rolle i vurderingen av kvaliteten i et prosjekt. Forskningsrådet praktiserer i utgangspunktet ikke andre retningslinjer eller unntak for amerikanske samarbeidspartnere enn samarbeidspartnere i andre land. Men dersom endringer i prosjekter på grunn av situasjonen i USA kan gjennomføres i en nedskalert versjon, og målene kan nås, vil vi vurdere fortsatt tilskudd for å unngå at norske forskningsmiljøer skal bli skadelidende. Forslag til endringer i prosjektene som kan tolkes som at Forskningsrådet går på akkord med akademiske prinsipper eller gir manglende transparens i prosjektinnhold eller kostnader, vil ikke bli akseptert.

4. *Porteføljestyrenes rolle*

Det arbeides kontinuerlig med tiltak for å håndtere konsekvensene av situasjonen for forskning i USA, som det kan være relevante for porteføljestyrene å bidra til, både på kort og lengre sikt. Men ulike porteføljestyrer vil kunne berøres ulikt avhengig av hvilke forskningsområder de dekker og graden, innretningen og avhengigheten av internasjonalt samarbeid, spesielt med kobling til USA.

I lys av porteføljestyrets ansvarsområde ber vi dere vurdere hvilke utfordringer endringene i amerikansk forskningspolitikk fører til, og vurdere aktuelle prioriteringer og tiltak i arbeidet med investeringsplanen for 2026-2028. Dette kan omfatte bl.a. rekruttering, prioriteringer i utlysninger, nettverksstøtte, tiltak som kompenserer for at amerikanske forskere trekker seg fra prosjekter.

Når porteføljestyret gir innspill til budsjettforslag for 2027, ber vi dere vurdere behovet for strukturelle eller faglige tiltak og perspektiver for å redusere konsekvenser av endringene i amerikansk forskningspolitikk. Dette kan være både vekstforslag og omprioritering av budsjett. Administrasjonen vil ta med disse innspillene i utviklingen av satsningsforslag.

Forberedelse / prosess	Administrasjonen har utviklet saken.
Videre saksgang	Saken følges opp i porteføljestyrenene.

Sak PS-BF 32/25 Presentasjon av de nasjonale rapportene for fagevalueringene EVALMEDHELSE og EVALMIT

Til

Porteføljestyret for banebrytende forskning

Ansvarlig Direktør

Petter Helgesen

Saksbehandler

Marianne Grønsleth
Hilde G. Nielsen

Vedlegg

1. Nasjonal rapport for EVALMEDHELSE
2. Nasjonal rapport for EVALMIT

Fra

Områdedirektør

Benedicte Løseth

DRØFTINGSSAK

Forslag til vedtak

Administrasjonen tar med seg porteføljestyrets innspill og kommentarer i det videre arbeidet med oppfølging av evalueringene

Kort bakgrunn

Fagevaluering av medisin og helsefag (EVALMEDHELSE) og fagevaluering av matematikk, IKT og teknologi (EVALMIT) som har pågått siden 2023, er nå ferdigstilt. De nasjonale rapportene for evalueringene ble offentliggjort 7. april (EVALMIT) og 8. april (EVALMEDHELSE) 2025. Evalueringene er også presentert i åpne møter av lederne av de nasjonale komiteene for hver evaluering. Forskningsrådet har allerede iverksatt oppfølgingstiltak for evalueringene gjennom utlysningene av nettverksstøtte og forskerskoler for oppfølgning av alle de fire fagevalueringene som er nå er gjennomført (EVALBIOVIT, EVALNAT, EVALMEDHELSE og EVALMIT).

Hvorfor saken fremmes til dette møtet

De nasjonale rapportene for evalueringene fremlegges for porteføljestyret til diskusjon.

Hovedpunkter

Forskningsrådet har i perioden 2022-2025 gjennomført disse fire evalueringene (EVALBIOVIT, EVALNAT, EVALMEDHELSE og EVALMIT). Totalt er 680 forskergrupper og 174 administrative enheter evaluert innenfor sektorene UH, institutt og helseforetak. Dette utgjør involvering av rundt 21 000 forskere innenfor de fire nevnte fagområdene. I tillegg til de fire nasjonale rapportene, er det utarbeidet evalueringsrapporter for alle involverte administrative enheter og tilhørende forskergrupper. Disse rapportene gir anbefalinger til de enkelte enhetene og forskergruppene.

De nasjonale rapportene gir anbefalinger rettet både til institusjonenes ledelse, til Forskningsrådet og til departementene. Oppfølgingsarbeidet vil foregå i tett samarbeid med relevante miljøer innenfor hver av evalueringene og med andre relevante fagavdelinger og tilhørende porteføljestyrer i Forskningsrådet (mat og bioressurser, klima og miljø, helse og innovasjon).

Forskningsrådet har allerede iverksatt oppfølgingstiltak for evalueringene gjennom utlysningene av nettverksstøtte og forskerskoler for oppfølgning av alle de fire fagevalueringene som nå er gjennomført.

EVALBIOVIT og EVALNAT ble lansert våren 2024 og er tidligere presentert i porteføljestyret.

Fagevaluering av medisin og helsefag 2023-2025

Fagevaluering av medisin og helsefag har pågått siden 2023 og 8. april 2025 ble den nasjonale rapporten fra evalueringen lansert. Rapporten er utarbeidet av en internasjonal komite som har bestått av lederne av de åtte evalueringskomiteene i EVALMEDHELSE. Den nasjonale rapporten er viktig for norsk medisinsk og helsefaglig forskning og gir et viktig bidrag til kunnskapsgrunnlaget til Forskningsrådet. Rapporten gir også en helt nødvendig innsikt om bruk av virkemidlene til Forskningsrådet og i rådgivning til departementene.

Hovedanbefalingene i den nasjonale rapporten til EVALMEDHELSE er:

- Bedre koordinering av forskningsfinansiering for å øke konkurranseevnen til medisinsk og helsefaglig forskning i Norge.
- Øke konkurranseevnen til norsk medisinsk og helsefaglig forskning ved å fokusere på målrettede programmer på tvers av administrative enheter og organisasjoner, og koble disse til internasjonal toppforskning.
- Gjør medisinsk og helsefaglig forskning mer attraktiv for unge og/eller utenlandske forskere, og utvikle klare karriereveier for forskere.
- Utvikle et nasjonalt koordineringssystem for alle helseregistrene, hvilket vil være unikt i et internasjonalt perspektiv.
- Øke samfunnseffektene av medisinsk og helsefaglig forskning og formidle effektene.

Fagevaluering av matematikk, IKT og teknologi (EVALMIT) 2023-2025

Fagevaluering av matematikk, IKT og teknologi har pågått siden 2023 og 7. april 2025 ble den nasjonale rapporten lansert. Den nasjonale rapporten er utarbeidet av en internasjonal komite bestående av syv medlemmer inklusive lederne av de fem delevaluerings-komiteene.

Hovedkonklusjonen er at matematikk-, IKT- og teknologifagene har mange forskningsgrupper som holder høyt nivå, men det er også forskningsgrupper med utfordringer.

En kort oppsummering av komiteens anbefalinger:

- Øk evnen til norsk MIT-forskning til å respondere bedre på teknologiske utviklingstrekk og samfunnets behov. Bygg opp ny forskningskapasitet i betydelig grad der det er spesielle behov, for eksempel innenfor kunstig intelligens.
- Sikre kunnskapsgrunnlaget for MIT ved å styrke støtten til grunnleggende forskning, særlig innenfor matematiske fag, men uten at dette svekker innsatsen innenfor anvendt forskning.
- Foreta en gjennomgang av de nasjonale målsetningene for å øke forskningsintensiteten i de nyere delene av universitets- og høyskolesektoren, og etabler virkemidler som kobler nye og etablerte institusjoner og forskningsmiljøer, for å styrke både forskningskvalitet og -kapasitet.
- Viderefør og styrk målet om økt deltakelse i EUs rammeprogram for forskning og innovasjon.
- Gjennomgå effekten av eksisterende tiltak for å redusere kjønnsforskjeller i forskning og styrk innsatsen gjennom karrierestøtte til kvinnelige forskere. Undersøk konsekvensene av å øke rekrutteringen til forskningsmiljøet fra utlandet.

Spørsmål til diskusjon
Forskningsrådet har nå gjennomført 4 store fagevalueringer som til sammen dekker om lag 80% av norsk forskning. Samlet utgjør disse evalueringene et omfattende kunnskapsgrunnlag om status for store deler av norsk forskning. Funn og anbefalinger fra evalueringene gjør det naturlig å reise noen spørsmål som det er viktig at porteføljestyret diskuterer.

Evalueringene peker på noen forskningssvake fagområder som det anbefales å styrke. Dette reiser spørsmål knyttet til:

- Hvilken rolle bør Forskningsrådet ha i å bidra til å løfte forskningssvake områder?
- Hvilken rolle bør Porteføljestyret for Banebrytende forskning ha i å bidra til å løfte forskningssvake områder?
- Hvilke verktøy kan være aktuelt å benytte for å løfte forskningssvake områder?
- Hvilken rolle har Forskningsrådet ifm. nasjonale fagstrategier?

Deltagelse i evalueringene er frivillig, og evalueringene omfatter derfor ikke alle relevante forskningsmiljøer.

- Bør deltagelse i evalueringene være obligatorisk for alle de relevante forskningsmiljøene i UH- og instituttsektor?

Forberedelse / prosess	Fagevalueringene er gjennomført av Forskningsrådets administrasjon i tråd med vedtak i porteføljestyrene for livsvitenskap og naturvitenskap og teknologi
Videre saksgang	Administrasjonen vil komme tilbake på neste porteføljestyremøte med en drøftingssak om behovet for ytterligere oppfølgingstiltak for de fire fagevalueringene som nå er gjennomført.

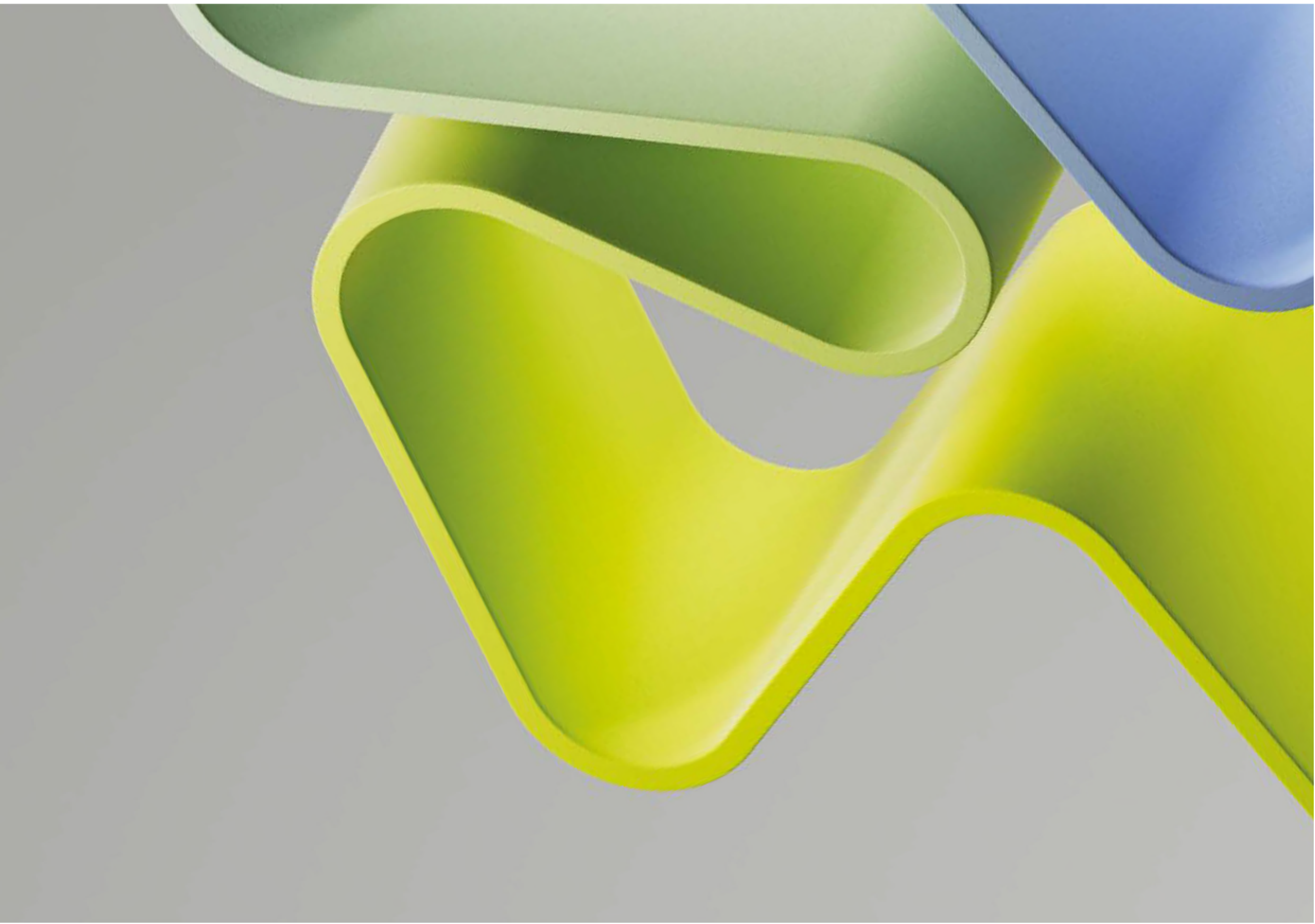
The Research Council of Norway

National report

Evaluation of Medicine and Health in Norway 2023-2024

March 2025

(corrected May 2025)



Content

Preface by the Research Council of Norway

The Research Council of Norway (RCN) has been given the mission by the Ministry of Education and Research to perform subject-specific evaluations. The RCN carried out an evaluation of Norwegian research within medicine and health in 2023-2024. The evaluation of medicine and health is a part of the evaluation of life sciences, which is being carried out as two evaluations: Evaluation of Biosciences 2022-2023 and Evaluation of Medicine and Health 2023-2024.

The primary aim of the evaluation of medicine and health is to reveal and confirm the quality and the relevance of research performed at Norwegian Higher Education Institutions (HEIs), the institute sector and the health trusts (HT).

The evaluation was carried out by international peers with reference to the Evaluation protocol for life sciences in Norway 2022-2023.

The evaluation has been done at three levels. First, three hundred and fifteen research groups were evaluated by eighteen expert panels divided by subjects and disciplines within the field of medicine and health across sectors. Thereafter, eight evaluation committees were established to evaluate the sixty-eight participating administrative units (faculty/institute/department/division/centre). The assessments and recommendations from the evaluation committees are compiled in 68 reports. These reports give important input to the individual administrative units. Each administrative unit has a responsibility to follow up on the recommendations provided in their evaluation unit report. The chairs of the eight evaluation committees constitute the national evaluation committee which was requested to compile a report based on the assessments and recommendations from the 68 independent evaluation unit reports. The national report will be used by the Research Council in developing national funding schemes and in dialogue with the ministries and institutions involved in the development of medicine and health research.

The national report pays specific attention to:

- Strengths and weaknesses of the research area in the international context
- The general resource situation regarding funding, personnel, and infrastructure
- PhD training, recruitment, mobility, and diversity
- Research cooperation nationally and internationally
- Societal impact and the role of research in society, including Open Science

Lysaker March 1st, 2025

Composition of the national committee

This national report offers an overall assessment of the state of medicine and health research in Norway and present recommendations for future development. All committee members support the conclusions and recommendations.

Professor
Martin Ingvar (chair)
Karolinska Institutet

Professor
Falko Sniehotta
Heidelberg University

Professor Dame
Til Wykes
King's College London

Professor emerita
Ingalill Rahm Hallberg
Lund University

Professor
Anja Krumeich
Maastricht University

Professor
Søren Brunak
University of Copenhagen

Professor
Johan Hellgren
University of Gøteborg

Professor
Jørgen Frøkiær
Aarhus University

Geert van der Veen, Managing Partner, Technopolis Group, was secretary to the committee.

Executive summary

This is the report of the national evaluation committee, which was asked by the RCN to evaluate Medical and health research in Norway over the period 2012-2022 to identify and confirm the quality and the relevance of research performed at Norwegian Higher Education Institutions (HEIs), across the Institute Sector and across the health trusts (HT)[1]. The report builds on the previous evaluations of 317 research groups and 68 administrative units in this research field, which were carried out in 2024 and documented in separate reports.

Public medical and health research is, with 15% of all research expenditure in Norway an important research area. The quality of the research is generally good to excellent in terms of both output and scientific impact, although there is variation in quality (size and location of admin units matter, as does ambition level) and potential to achieve much more.

Funding for medical and health research is for a large part (64%) core funding independent of the institution's performance, coming from the relevant government sources. This is, considered from an international perspective, quite high. Most of the other funding is assignments and competitive funding, coming from RCN, ministries or other national sources (excl. industry). International funding and industry funding are low. This does not only limit the research budgets but also has effects on participation in the international research arena (low international funding) as well as on societal impact (low industry funding).

Research infrastructures are generally at a good level, but there is room for improvement regarding the levels of access and engagement. The position of registries is of specific importance, driven by the trend towards personalised medicine and the need for quantitatively based evidence. Norway has a good national health registry system, complemented by many generally not yet nationally coordinated clinical registers. A coordinated national approach, developed in collaboration with the research community, can make this registry system outstanding in international perspective.

To further strengthen the research in Norway, research careers need to be made more attractive and offer opportunities for career progression and personal development, including opportunities to learn about the rapid research design and methods development.

Co-publication analysis shows here is a lot of cooperation in the medical and health research in Norway, both nationally and internationally. At the national level (admin units from) the big universities and big university hospitals have a central position in these cooperations. A more programme based (instead of project based, i.e. longer term wider investments over longer periods of time) form of national cooperation addressing complex societal challenges and aimed at achieving impacts together, would be beneficial. Interdisciplinary and intersectional research can increase the contribution of esp. smaller units to high quality research and impact. User involvement in research increases relevance and likelihood of research success and impact, should be part of the approach, but is now variable and in most places low.

Internationally, only a few administrative units collaborate in EU projects, and even fewer are leading EU projects. More international outreach (also beyond EU, e.g. NIH) could help raise the standing of Norwegian research and help attract research to Norway. Focus should be on cooperating with the best international partners in the field, not necessarily on partners that are already known.

The national committee finds the integration between research and knowledge translation, implementation and implementation science underdeveloped and not forming a continuous

[1] The health trusts are in this evaluation (EVALMEDHELSE) processed and evaluated as an own sector.

process from discovery, intervention to implementation. Generally, the interface to industry is ad hoc and unstructured. Similarly for initiatives around vendor funding for startups. In the institute sector, the interface towards (national) policy is better.

Norway shares with the rest of Europe the split ownership between primary and secondary care. The latter is organised at the level of regions whereas the municipalities are responsible for all primary health care and also care and social service for the elderly. There is a need for evidence based knowledge in this area but at the same time the research environment is often not ideal either because funding is limited or because the research done is not enough practice oriented. An improvement of the scientific output from this segment of healthcare cannot be expected without a decisive and coordinated effort (organisation, funding, policies and competence).

Institutes like NORCE and, esp. smaller, HEI outside big cities would benefit for going for a more permanent long term relationship providing research and implementation programmes rather than commissioned projects.

Despite the opportunities for improvement of societal impact, there are many good examples of (societal) impact of research, ranging from new medicines and treatment methods, new health policies and startup companies to prevention of diseases, lower costs for health care, new clinical guidelines and wellbeing of patients and public.

Main recommendations are (see chapter 7 for full details):

- Improve the coordination of research funding to promote the competitiveness of the medical and health research in Norway.
- Increase the competitiveness of Norwegian medical and health research by focusing research on goal-oriented programmes across administrative units and organisations and connecting these to international state of the art.
- Make medical and health research more attractive for young and/or foreign staff and develop clear career perspectives for researchers.
- Develop and implement a good, nationally coordinated registry system as a backbone for and a strong asset of Norwegian medical and health research.
- Increase societal impact of medical and health research and communicate this impact.

Sammendrag

Dette er rapporten fra den nasjonale evalueringskomitéen i EVALMEDHELSE som på oppdrag fra Forskningsrådet er bedt om å evaluere norsk medisinsk og helsefaglig forskning for å identifisere og bekrefte kvalitet og relevans av forskning utført ved norske høyere utdanningsinstitusjoner (HEI), på tvers av instituttsektoren og på tvers av helseforetak[2] i perioden 2012-2022. Rapporten bygger på evalueringer av 68 innmeldte administrative enheter og inkluderer evaluering av deres til sammen 317 forskningsgrupper. Evalueringen ble gjennomført i 2024.

Offentlig medisinsk og helseforskning utgjør 15 % av alle forskningsutgifter i Norge og er et viktig forskningsområde. Kvalitet på forskning som utføres er generelt god til utmerket på bakgrunn av oppnådde resultater og forventede samfunnseffekter, selv om det er variasjon i kvalitet (størrelse og plassering av administrasjonsenheter betyr noe, det samme gjør ambisjonsnivå). Det er et stort potensial for å oppnå mye mer.

Finansiering av medisinsk og helsefaglig forskning er for en stor del (64 %) basisfinansiering uavhengig av institusjonens ytelse, og kommer fra ulike offentlige kilder. Dette er ganske høyt sett fra et internasjonalt perspektiv. Mesteparten av den øvrige finansieringen er oppdrag og konkurranseutsattemidler fra Forskningsrådet, departementer eller andre nasjonale kilder (industri ikke inkludert). Internasjonal finansiering og industrifinansiering er lav. Dette begrenser ikke bare forskningsbudsjettene, men det medfører lav deltakelse på den internasjonale forskningsarenaen (lav internasjonal finansiering) samt reduserte samfunnseffekter (lav industrifinansiering).

Forskningsinfrastrukturen er generelt sett god, men det er rom for forbedringer både når det gjelder tilgang til og bruk av infrastruktur. Helseregistrenes posisjon har en spesiell betydning og er drevet av trender som persontilpasset medisin og økt behovet for dokumentasjon. Norge har mange nasjonale helseregistre i tillegg til mange ennå ikke nasjonalt koordinert, kliniske registre. En nasjonal koordinering av helseregisterne vil være enestående i internasjonalt perspektiv.

For å styrke medisin- og helseforskningen i Norge ytterligere, må forskerkarrierer gjøres mer attraktive og det må være muligheter for karriereutvikling og personlig utvikling, inkludert muligheter til innføring og opplæring i rask forskningsdesign og metodeutvikling.

Sampubliseringsanalyse viser at det er mye samarbeid innen medisinsk og helsefaglig forskning i Norge, både nasjonalt og internasjonalt. På nasjonalt nivå har de store universitetene (administrative enhetene) og de store universitetssykehusene (administrative enhetene) en sentral posisjon i disse samarbeidene. Det anbefales en mer programbasert form for nasjonalt samarbeid (langsiktig bredere investeringer over lengre perioder) som adresserer komplekse samfunnsutfordringer og har som mål å oppnå felles samfunnseffekter. Tverrfaglig og tverrsektoriell forskning vil bidra til forskning av høy kvalitet og gi samfunnseffekter, men vil også bidra til mer forskning av høy kvalitet i de mindre forskningsenhetene. Brukerinvolvering i forskning øker relevans og sannsynlighet for at forskningsresultater oftere tas i bruk og bør være obligatorisk i all forskning. Det er stor variasjon i inkludering av brukere, for det meste er det liten involvering.

[2] Deltakende helseforetak er i denne evalueringen omtalt samlet som en egen sektor.

Det er bare noen få administrative enheter som deltar i EU-prosjekter, men det er enda færre som leder EU-prosjekter. Mer internasjonalt samarbeid også utover EU, f.eks. NIH, kan bidra til å heve statusen til norsk medisinsk og helsefaglig forskning. I tillegg vil denne type samarbied også bidra til å tiltrekke forskningkompetanse til Norge. Det bør fokuseres mer på å samarbeide med de beste internasjonale partnerne på feltet/ene og mindre på å inngå samarbeid med partnere som allerede er kjent for miljøene.

Den nasjonale komiteen finner at integrasjonen mellom forskning og kunnskapsoverføring, implementering og implementeringsvitenskap, er underutviklet og ikke danner en helhetlig prosess fra oppdagelse, intervensjon til implementering. Generelt er kommunikasjonen mot industrien ad hoc og ustrukturert. Det samme gjelder for initiativer rundt leverandørfinansiering for oppstartsbedrifter. I instituttsektoren er grensesnittet mot gjeldende politikk bedre.

Norge har, som resten av Europa, delt eierskap mellom primær- og spesialisthelsetjenesten. Sistnevnte er organisert på regionsnivå, mens kommunene er ansvarlige for all primærhelsetjeneste og også omsorg og sosiale tjenester for eldre. Det er behov for evidensbasert kunnskap på dette området, men samtidig er eksisterede forskningsmiljøer ofte ikke det ideelle stedene for denne type forskning enten fordi finansieringen er begrenset eller fordi forskningen som utføres ikke er nok praksisorientert. En forbedring av det vitenskapelige utbyttet fra dette segmentet av helsetjenesten kan ikke forventes uten en avgjørende og koordinert innsats (organisering, finansiering, politikk og kompetanse).

Institutter som NORCE og spesielt mindre administrative enheter i UH-sektoren utenfor de store byene vil ha fordel av å gå for et mer permanent langsiktig forhold som gir forsknings- og implementeringsprogrammer i stedet for oppdragsprosjekter.

Til tross for mulighetene for forbedring av samfunnseffekter, er det mange gode eksempler på (sammfunns)effekter av forskning som spenner fra nye medisiner og behandlingsmetoder, nye helsepolitikker og oppstartsbedrifter til lavere kostnader for helsevesenet, nye kliniske retningslinjer og økt pasienters og publikums velvære.

Hovedanbefalingene (se kapittel 7 for utfyllende informasjon) er:

- *Bedre koordinering av forskningsfinansiering for å øke konkurranseevnen til medisinsk og helsefaglig forskning i Norge.*
- *Øke konkurranseevnen til norsk medisinsk og helsefaglig forskning ved å fokusere på målrettede programmer på tvers av administrative enheter og organisasjoner, og koble disse til internasjonal toppforskning.*
- *Gjør medisinsk og helsefaglig forskning mer attraktiv for unge og/eller utenlandske forskere, og utvikle klare karriereveier for forskere.*
- *Utvikle et nasjonal koordineringsystem for alle helseregistrene, hvilket vil være unikt i et internasjonalt perspektiv.*
- *Øke samfunnseffektene av medisinsk og helsefaglig forskning og formidle effektene.*

Det er det engelske sammendraget som er det gjeldende.

1. General observations on Norwegian medicine and health research

This evaluation concerns the research in the field of medical sciences in the public sector, the largest thematic area in Norwegian research, in 2019 totalling NOK 12.0 bln, or approximately 15% of total research.

In international perspective, the Norwegian medical and health research has a very strong specialisation in health sciences and in psychology (across almost all subfields) and an average specialisation in clinical sciences (however, within clinical sciences the fields of psychiatry and rheumatology show a high specialisation as well).

The expenditure on medical and health research is divided across three sectors: the higher education sector (universities and other higher education institutions (HEI), appr. 60%), the institute sector (national research institutes, appr. 20%) and the business sector (appr. 20%). The R&D expenditure in the health trusts (hospitals)[3] was appr. 40% partly in the HEI (university hospitals), partly in the institute sector.[4]

In this evaluation 317 research groups in 68 administrative units participated. Participation in the evaluation was voluntary, and not all organisations performing medical and health research in Norway joined. No figures are available on the participation rate, but according to RCN most of the administrative units that were expected to carry out medicine and health research participated in this evaluation. Overall, more than 9200 researchers were working in the units participating in the evaluation, ranging from small to large, from very focused on one topic to rather broad, and coming from across the country.[5]

In this respect the Committee underwrites that themes can be relevant in specific places, e.g.:

- Younger universities and health trusts outside the big cities often experience structural and capacity limitations to do research at the international scientific forefront. They however are in a position to address issues in research and teaching with high relevance to the regional and national scene.
- Some specialised research can, because of numbers of patients, numbers of staff and high investments needed, only be done in the large university hospitals. Admin units in smaller health trusts and universities have therefore often chosen topics for research that are relevant to their community and that are not necessarily in direct competition to the larger units, for instance the adoption of nursing research as a focus.
- Institutes have operational tasks, especially NIPH (Norwegian Institute of Public Health) and STAMI (The National Institute of Occupational Health in Norway), surveillance of health and health threats in general and for STAMI occupational health. They also have the task to raise preparedness to deal with fast or slowly emerging health threats, which is dependent on ongoing research, skills and methods development as well as to make sure that data/surveillance is available allowing the researchers to change mode quickly when needed.

[3] The health trusts are not a separate sector in national R&D statistics but are included in both HEIs and the institute sector. In EVALMEDHELSE, health trusts/hospital sector are referred to as a separate sector.
[4] RCN, 2021
[5] SSBN, 2024a

2. Strength and weakness of Norwegian medicine and health research in an international context

Medical and health sciences have been the largest research area in the HEI sector in Norway for many years, amounting to approximately one quarter of all research in the HEI sector[6]. In the HEI, Clinical medical fields, health sciences and basic medical/dental fields are the major research fields, accounting for almost two thirds of medical and health research (in the HEI). Psychology and social sciences account for 10% and 6%, respectively. Sports sciences is in international comparison fairly large with 2.5 %. Research on medical technology however is small with only 1.1% (although some medical technology research may take place outside the sample of evaluated admin units)[7].

In 2022 the medical and health researchers in Norway contributed to 7800 publications in medical health sciences, 37% more than in 2013, but stable as fraction of total Norwegian research output across all fields of science. The higher education sector accounts for 57% of the publications, the health trust sector for 35% and the institute sector for 8%. In terms of citation, the Norwegian publications are cited 37% more often than the world average for publications in comparable fields period 2013-2021[8], this is in line with e.g. Denmark, Sweden, Netherlands, USA and China (but clearly behind UK, the leader in this area UK)[9]. Almost all administrative units participating in the evaluation have more than 10% of their publications in the top 10% best cited publications in the field they are active in[10]. In general terms, this means that the Norwegian research is cited well, in some areas/admin units very well.

The quality of research and publications, as evaluated by the 18 expert panels, was on average high (in between ‘Quality that is recognised internationally in terms of originality, significance and rigour’ and ‘Quality that is internationally excellent in terms of originality, significance and rigour, but which falls short on the highest standards of excellence’) with the highest scores in the institute sector, closely followed by the health trusts and the higher education institutions. The quality of the research however varies quite a lot as is shown by the distribution of the scores for the research groups on the quality dimension. Although almost all research meets the published definition of research for the purposes of this assessment, however, there is still 10% of the groups that only just meets the published definition.

17% of the research groups has, according to the evaluation panels, a research and publication quality that is ‘outstanding in terms of originality, significance and rigour’, meaning they are among the international leaders in their field. Another 38% has a research and publication quality that is ‘internationally excellent in terms of originality, significance and rigour but which falls short of the highest standards of excellence’. On the other criterion for research quality (‘contribution of the research group to the research process’) 18% of the

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[6] SSBN, 2024a
[7] SSBN, 2024a
[8] NIFU, 2024b
[9] NIFU, 2024a
[10] NIFU, 2024b

research groups has the highest score (‘The group has played an outstanding role in the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication’) and 41% the next highest score (‘The group has played a very considerable role in the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication’). There is a strong correlation between the two scores on the quality dimension.

The variation in scores is much higher in the higher education institution and health trusts sectors than in the institute sector (where all scores are average or above). Based on this evidence the national evaluation committee for EVALMEDHELSE concluded that, with a few exceptions, research quality and integrity in Norwegian public research in the field of health are good to excellent in terms of both output and scientific impact.

Some admin units have very high levels of internationally excellent research. In general, these are larger units embedded in bigger university organisations that have high levels of resources. However, there are also pockets of excellence in admin units that have limited resources as well: these groups have a strong research focus and choose strong research partners. In order to achieve excellence, size matters, as well as ambition.

Most groups that produce lower quality research have only a few permanent researchers, often only parttime working on research, with a large teaching load (e.g. in colleges) and/or large clinical tasks in the health trusts (or operational tasks in the institute sector). For such small groups it is very difficult to meet the high and expensive (methodological) demands for research at an international level. Especially in regions outside the bigger cities this may be the case, since there the hospital trusts and HEI are small anyway because the population in the region is too small to make large units viable.

In other units, ambitions are too low to really be able to excel. The focus is too short term (next 5 years), and too broad, without a strong strategy,), a tendency that is amplified by funding of bottom-up researcher led approaches instead of funding of research programmes that nudge towards enduring research directions.

3. The general resource situation

3.1 Funding

In 2021 total expenditure in Norway on R&D in medical and health sciences in the higher education and health sectors was 9932 MNOK. The expenditure was 41% in university hospitals, 11% in other health trusts, 33% in universities, 49% in other higher education institutions and 9% in institutes[11].

Research institutes participating in this evaluation get most of their general income for surveillance of the health situation and health threats to the country, reporting to ministries about it and respond to specific requests from ministries. This requires them to be updated, monitor, analyse and report on all the areas under their umbrella. In turn that requires methods in place as well as developing new methods, for which research is necessary, and therefore a contribution for research is included in the funding from the ministries (STAMI and NIPH) or attract specific funding from ministries (NORCE). All institutes supplement their research funding with competitive RCN funding, EU funding, other national funding and, where appropriate and possible, business funding. With the supplementary funding they are able to double their research budget. The block grant for research is awarded annually, which hinder long term planning and investments. This general concern can be overcome with multiyear funding cycles for all types of funding (projects, programs and base funding). This is important, especially if the balance between base funding and competitive funding is shifted.

The basic funding in the hospital sector (including university hospitals) is embedded in the general budget allocation from the Ministry of Health and Care Services (in 2021, 58% of total budget). In addition 21% of the budget is made available through the health trusts as performance based (70%) and competitive funding (30%). In the HEI sector the basic funding is 69% (as block grant from the Ministry of Education and Research)[12].

The national committee finds the basic funding in terms of percentage of total funding fairly high international perspective, but generally not lavish[13]. Especially organisations with limited research activities (smaller health trusts and HEI) are unlikely to reach critical mass in research without higher basic funding. Furthermore, for international collaborations and long-term project sustainability, basic funding can be a limiting factor.

Besides the basic funding, competitive funding from RCN amounts 11% of funding for medical sciences and health research in Norway. This percentage of competitive funding is considered quite low and does, in the opinion of the national committee, focus too little on goal-oriented programmes with clear roadmaps (and too much on individual projects). Funding from ministries amounts 13%, and this concerns assignments and project subsidies, 7% of funding comes from other national Norwegian sources[14].
International funding (3%), including funding from the EU (2%), is low, and there seem to be many more opportunities here, in Horizon Europe as well as in ERC. Acquiring EU funds is

[11] All data in this chapter from: SSBN, 2024a
[12] NIFU, 2024c
[13] Vetenskapsradet, 2024: In Sweden basic funding for universities is 42.2% (2021),
[14] SSBN, 2025

(generally) more difficult than acquiring national funds and this requires a more professional approach to project development and administration (e.g. by way of EU service offices). The benefits are much broader than only financial: EU projects also give access to networks at the forefront of science and technology and can help further develop the research agenda. Business funding is also rather low (2%). Industrial pharma and MedTech activities are limited in Norway, but the opportunities to work with international companies are not developed.

The admin units in this evaluation representing Norwegian health research, could, or maybe even should in the eyes of the national committee, find opportunities for further funding in international programmes as well as with industry (esp. in the field of medical technologies, which seems not to be the focus of the research in admin units in the evaluation, but which is a sizeable industrial sector in Norway).

National funding should prioritise creating synergies within the Norwegian research system. This requires stronger coordination among major funders to align goals, key performance indicators, and program areas. Additionally, efforts to build critical research mass outside major urban administrative centers should be supported through increased base funding for smaller research organisations, with interagency coordination ensuring effectiveness.

Programme funding should take precedence over project funding at the ministries and RCN and could partially replace base funding. These programmes should drive collaborative efforts toward concrete (medical) goals, promote cross-organisational cooperation, and ensure broad access to methodological expertise. They should also enhance knowledge transfer across Norway and expand patient datasets, turning geographic diversity into an advantage. Over time, such programmes could evolve into virtual research centers, similar to the NIPH Centre for Fertility and Health.

3.2. Personnel[15]

Overall, 9212 researchers were working in the units participating in the evaluation: 4045 (44%) in the higher education sector (University of Oslo (UiO), Norwegian University of Science and Technology (NTNU), University of Bergen (UiB) and University of Tromsø (UiT), account for 77% of these); 4469 (49%) in the health trust sector (of which 2036 in Oslo University Hospital (OUS), and 833 in Haukeland University Hospital (HUH, Bergen) and 698 (8%) in the institute sector (of which 465 in the Norwegian Institute of Public Health). The growth in researchers in the higher education sector and health trusts since 2013 was similar (around 40%). The number of researchers in the institute sector did grow more modestly with 16%.

In the Higher Education Institutions, the growth was mainly in the personnel groups of assistant professors and researchers/postdocs (70% and 59% resp.). The number of professors and PhDs also increased considerably (21% and 27%). In general, the ratio professor/associate professor/postdoc/PhD is approximately 1:1:1:1,5, in international perspective a low number of postdocs and PhDs per (senior) researcher. The low number of postdocs limits the career perspectives for young researchers that have just received their

[15] SSBN, 2024a

PhD degree. Training of more PhDs will strengthen research, hospitals, industry and policy: not all PhD graduates will pursue a career in research.

In 2021, the average age of professors was 58 years, with 40% of the professors over 62 years of age, which makes succession plans necessary. Associate professors are on average 50 years old.

Most staff originate from Norway, and it is assumed (based on number of foreign PhD holders) that 23% of all researchers in the medical evaluated HEI were foreign researchers (excluding PhD students), most of them in the researchers and postdoc group. The percentage of foreign researchers has not increased since 2017. The number of foreign PhD students is estimated at 26% (based on awarded doctoral degrees in 2021).

In the health trust sector, in 2021, 41% of staff was senior physician, 10% physician, 4% psychologist, 33% researcher/postdoc and 12% PhD student. The average age of senior researchers in health trusts is much lower than in HEI (e.g. 51 years for senior physicians and 39 for physicians). Only 16% of the senior physicians is older than 62 years of age, probably since the clinical work in health trusts is quite strenuous esp. in the combination of research, and not often done at higher ages. The researcher/postdoc group in health trusts is older than the comparable group in HEI (47 against 39). In most health trusts, there is a clear tension between clinical practice and research, that leads to high workloads as well as to pressure on research, since patients always get priority.

Foreigners are rarely employed in health trusts. Only in the group of researchers/postdocs 10% has a foreign background[16], probably because in health trusts client contact is important in most functions, and for this fluent Norwegian is a prerequisite condition.

In the institute sector the average age is 46 (constant over the last 10 years) with a 10% staff above the age of 62 years. The number of foreign researchers is 13%.

From the evaluations of the research groups and admin units it becomes clear that there are difficulties in recruiting and retaining early-career researchers (e.g., PhD students and postdocs), especially in remote locations. The Norwegian language requirement is an issue that reduces the opportunities to attract foreigners (and keep them).

To strengthen the research in Norway, research careers need to be made more attractive. New groups of young researchers need to be attracted, career perspective should be provided (special attention for postdocs), and (in hospital trusts) competition between clinical work and research should be tackled. Specific attention should be paid to regions outside Oslo.

3.3. Infrastructure

Research Infrastructures are an enabler of research. Since 2010 Norway has had a roadmap for research infrastructure (broader than just medicine and health) that is aligned with the European ESFRI roadmap and updated after each major call for funding for research infrastructure under the auspices of the Research Council. The most recent roadmap was published in 2023. Sharing and reuse of research data, international cooperation on research infrastructures and sustainability are the overarching objectives of

[16] SSBN, 2024a

this roadmap[17]. The roadmap includes infrastructures for clinical trials in the primary and specialist health services, registries and biobanks, as well as technology platforms related to bioinformatics/systems biology, gene sequencing and various 'omics' techniques, NMR analyses and other imaging technologies and structural determinations. Norway is part of major European initiatives in the fields of imaging technologies, clinical research and biobanks.

The evaluation shows there are some very good examples of available research infrastructure, but also that there is room for improvement regarding the levels of access and engagement. It should be considered how infrastructures increasingly could become drivers of research projects rather than mainly service cores.

Some equipment is too expensive for one organisation, e.g. technological equipment like PET scanners, a cyclotron or a supercomputer. The acquisition of this type of equipment needs a national approach (or even a Nordic approach) and sharing across organisations: not only sharing the equipment but sharing the actual research projects so that a broad knowledge base is developed. Maintenance and operation needs also to be shared, and competences for operation should have a large continuity and should not be dependent on temporary staff.

Registries have played an important role in medical and health research in the past years, driven by the need for quantitative evidence. Norway has a good national health registry system, complemented by many generally not yet technically and semantically coordinated National Quality Registers and some very good longitudinal datasets (like the HUNT study and the Tromsø study).The insight that the causes and effects of diseases are determined by many personal factors including genetics, environmental factors, etc. have led to great expectations in the field of personalised medicine, but integrated availability of structured electronic patient record data is a prerequisite for effective development of personal treatment. Norway has a good starting position but should invest to keep up with international developments. Raw electronic patient data should be made available and made accessible real time. Central competence building across the various registries should be promoted (esp. in the way data are formed (semantic level), stored and transferred (technical) and made accessible (legal level)), and visibility of the data should be promoted or even enforced at a national level so that the registries can become a backbone for the Norwegian health system and a strong asset for Norwegian research.

[17] RCN, 2023

4. PhD training, Recruitment, Mobility and Diversity

4.1 PhD training

Statistics Norway reports 1896 PhD students in 2021 in the participating administrative units, 72% in the higher education sector and 28% in the health trusts (PhDs in health trusts can only receive their PhD degree from a degree-granting institution). No data are provided about PhD students among the staff of the institutes but based on the self-evaluations and interviews with the institutes, there are quite a number of PhDs that are located in institutes where they do their research work. They get their degree from a university (degree granting institution). Interaction between actual workplace and academic promotor is not always optimal. The four largest employers of PhDs in the HEI are the UiO (362, 26% of HEI total), NTNU (318, 23%), UiB (231, 17%) and UiT, the Arctic University of Norway (185, 14%). In the health trust sector 80% of the PhD students is employed in the university hospitals, of which again 65% (319) in OUS.

All in all, 44% of all medical PhD students are located in Oslo[18]. The number of PhDs per research field seem to reflect the general distribution of research fields in Norway (see above).

464 students received a PhD degree in the field of Medical and Health Sciences in 2023[19]. PhD students in the Health, Welfare and Sport field take longer to get their degree than the 'average' PhD student in Norway, but the drop-out rate is lower. From those students that started in the period 2018-2023 with a PhD in this field, 15.2% graduated within 3 years (13.9% for all fields); 44.4% graduated within 5 years (48,2%); 35,6% is still in the same course of study (27.7%) and 20.1% dropped out (24.1%)[20].

A national learning environment for research methods and making research designs is lacking in Norway. This means that all admin units develop their own programmes, even where capacity to do so is missing. Academic training of PhDs benefits from a broader learning environment interaction than just with their promotor, or, in institutes, just with the colleagues in the institute. Whether this environment is provided greatly depends on the supervisor or the research group in which the PhD is embedded. Attention to this is necessary.

4.2 Recruitment

From the evaluations of the admin units it becomes clear that there are difficulties in recruiting and retaining early-career researchers (e.g., PhD students and postdocs), especially in remote locations.

[18] SSBN, 2024a

[19] Statista, 2025

[20] SSBN, 2024b

The models to recruit externally at the early independent career stage were widely different. More focus on start-up packages and considering these an investment for the dynamic future of research environments would help.

4.3 Mobility

Numbers about staff mobility are not provided to the evaluation committee, and especially about national mobility there are no indications about mobility either.

In terms of international mobility, the assumption of Statistics Norway that most researchers with a foreign PhD degree are foreigners[21], suggest that getting a PhD abroad and then returning to Norway is uncommon. However actual data are not provided/not known.

As stated above it is estimated that 23% of all researchers in the medical evaluated HEI were foreign researchers (excluding PhD students), while the number of foreign PhD students is estimated at 26%[22]. In health trusts foreigners are rare (10% in the group of researchers/postdocs 10%). In the institute sector the number of foreign researchers is 13%. Overall, this would mean that approximately 1250 researchers (or 13.6%) in the evaluated admin units are of foreign origin. The share of foreign R&D personnel has slowly increased over the years but is still low. The Norwegian language requirement is an issue that reduces the opportunities to attract foreigners (and keep them), especially in health trusts, but also in other organisations.

Career perspectives for researchers are unclear: The gap between getting a PhD degree and becoming a professor or senior physician is too large. There is a low number of postdocs (making it difficult for PhD graduates to make it to the next step) and opportunities for postdocs to obtain permanent positions are also limited. With a large number of professors in the HEI retiring within a couple of years there seem to be some new perspectives, but the group below professor level is also already quite old. Succession plans for leadership are not common.

4.4 Diversity

In the medical and health sciences, women form the majority of researchers: 62% in HEI, 54% in in HT and 63% in the research institutes. In the most advanced career levels (professors, senior physicians) the percentage of women increased from just above 30% in 2013 to 47% in 2021 (data for HEI and health trusts). This means that in absolute numbers the number of female staff in the highest categories doubled! At all the other levels female researchers are in the majority: 59-70% in the HEI and 55-67% in the health trusts[23]. Data on gender at management level are not known, although, based on impression of the national evaluation committee, women are represented less pronounced than at lower levels.

In the institute sector, gender equality policies are in place and well implemented. Even though there is still some progress to be made to promote women to the more advanced

[21] SSBN, 2024a

[22] For comparison (Statista, 2025): In 2023, 54% of PhD graduates (across all disciplines) was female, 40% were non-Norwegian citizens

[23] SSBN, 2024a

career levels, attention should also be paid to attract more men to this research field (and to higher education in general).

What is really missing from an international perspective, is a strategy on other social exclusion as well as on ethnicity including indigenous populations in Norway. This could have advantages for health research, not only in terms of attracting more researchers, but also on the choice of research topics.

These data are collected at admin unit level, but not available at a national level because of GDPR.

5. Research Cooperation nationally and internationally

5.1 Admin units' cooperation within and between different sectors

The network analysis provided by NIFU[24] (based on the national co-publications) shows that the national network in Norway is quite connected. The administrative units from UiO and the OUS that participated in this evaluation have, as part of the biggest organisations in the Norwegian medical and health research system, a central role. Other bigger universities are connected to many smaller universities and health trusts as well. Some smaller universities and health trusts also have surprisingly high numbers of connections, also across the sectors. There is also cooperation with NIPH (broad) and the cancer registry (inside cancer research). NORCE and the STAMI are not showing in the network graph. The cooperation pattern of the topics they are covering seems to be outside the core areas of the admin units covered by EVALMEDHELSE.

Even though there are many co-publications, nationwide cooperation focused on common goals (with aligned or even integrated research agendas, e.g. within specific programmes or even a national strategy) may be a way to lift research quality further. Countrywide knowledge exchange needs to be incentivised, and research results need to be exchanged in an open way between institutions. The rest of the country needs connection to the larger universities and university hospitals like in Oslo, Bergen, Trondheim or Stavanger, not competition with them.

Interdisciplinary and intersectional research is important to address complex societal challenges. Several administrative units faced difficulties initiating and operationalising interdisciplinary efforts, suggesting a need for better infrastructure and support systems to enable such collaborations. A good way to do this would be to organise research not along discipline or (internal) group, but more programmatic, along common goals, facilitating internal and external cooperation.

5.2 Admin units research cooperation nationally and internationally[25]

Co-authorship is a commonly used indicator of research cooperation. In the field of medical sciences 53% of the publications show national co-authorship and 65% of the publications show international co-authorship. National co-authorship is much higher than in other science fields (24% average national co-publication rate for all Norwegian research publications), which shows that the medical field is well connected nationally, but which is also a sign of the larger size of the medical and health research field in Norway than other

[24] NIFU, 2024b

[25] Data in this chapter from: NIFU, 2024c and NIFU, 2024d

research fields. The international co-publication rate is, according to the national committee in line with countries comparable to Norway.

Patterns in international cooperation are less clear than national cooperation patterns. Although there are high numbers of international co-publications, only a few administrative units collaborate in EU projects, and even fewer are leading EU projects. For a majority of admin units, the amount of international funding including EU funding is low.

More international outreach (also beyond EU, e.g. NIH) could help raise the standing of Norwegian research and help attract people to Norway. Focus should be on cooperating with the best international partners in the field, not necessarily on partners that are already known. Norwegian researchers should also have the ambition to lead more of these international projects.

6. Societal impact and the role of research in society, including Open science

6.1 General reflections

Open Science

Policies and practice with regard to open science seem well established if it comes to publishing in open access journals. The means/abilities to implement open science strategies at lower levels in the system are not always provided. Open Access Publication is not/hardly affordable in small centres. Policies and practice with regard to open science with regard to availability of research data are to a lesser extent implemented.

Most administrative units did not touch upon issues beyond publication and data availability. This can affect research in the future, e.g. with linking raw personal data to personal medicine approaches Norway is much behind rest of Europe.

User involvement in research

User involvement is about including all the relevant users, e.g. patients, health trust staff, industry representatives, policy makers, etc. in all stages of the research, from research design to research evaluation. This is likely to increase relevance, since user needs are clear from the beginning and can be integrated into the research approach. It also increases the likelihood of success, since user reflections can form an extra input in the research phase, and user experiments may be easier to arrange. Experience from the national committee shows that user involvement increases when funders (or others) ask before a project is started how end users are involved in setting up the project and how they will be involved in using the knowledge.

Even though RCN introduced user involvement as a criterion in all applications in 2015, in Norway, user involvement and engagement are underdeveloped. In the research group evaluations however, only a small minority of the groups was considered to have an outstanding social partner involvement in all aspects of the research, while more than 1/3d of the groups showed no or only a modest attention to this aspect. The evaluation committee would expect that the admin units should look widely at involvement techniques that are successfully used in other countries, to develop clear plans with the resources that are required to implement this as soon as possible.

Societal impact

Societal impact of research in the medical field cannot easily captured in one number. It can have many forms, including effects on prevention of disease, effects on patients and public, effects on treatment methods, effects on costs of treatment, effects on education, effects on policies, new products for industry with economic effects like turnover, profits and employment, etc.

Societal impact of (medical) research is not systematically and centrally monitored in Norway. There is also limited communication to the general public of how the research impacts society.

Reports from the regional health authorities to the Ministry of Health and Care Services on innovation activities in the Health Trusts indicate increasing activity since 2015 (stagnated by COVID in 2021 and 2022)[26]. In addition, to get a better picture of impact, for this evaluation the administrative units were asked to provide case descriptions to identify what they considered noteworthy societal impacts of their research. In total almost 250 case studies were received. Based on this information case studies and the description of societal impact that the research groups provided in their self-evaluations, the peer review panels that evaluated the research groups, gave a qualitative appreciation of the societal impact of the group, ranging from “There is little documentation of the contribution of the group to economic, societal and/or cultural development in Norway and/or internationally” via “The group’s contribution to economic, societal and/or cultural development in Norway and/or internationally is on par with what is expected from groups in the same research field” to “The group has contributed extensively to economic, societal and/or cultural development in Norway and/or internationally”. According to this assessment, the societal impact of medical and health research in Norway is in line with impact elsewhere. In about 45% of the groups there is more than average impact, including approximately 14% of groups contributing extensively.

The national committee recognises there are many good examples of (societal) impact of research (see examples below). Despite this, the committee finds the integration between research, knowledge translation, and implementation in society underdeveloped and not forming a continuous process from discovery to implementation. Connections between disciplines relevant across the value chain should be enhanced. This can also be part of a programmatic approach as described in 3.1.

Generally, the interface to industry was ad hoc and unstructured. Similarly for initiatives around vendor funding for startups. There is in many places a mindset that research cannot be translated, but there are also examples of admin units that made a difference over the past years. Overall, the medical and health research field in Norway seems to be lacking strategies on how to become attractive to industry to, for instance regarding ease of locating and ease of investment.

Especially in the institute sector, and related to their overall task, the interface towards policy is better developed although there is room for development both in terms of the administrative and management structure and the way collaboration between research and knowledge translation is shaped. NORCE even has a special knowledge translation centre, to implement research-based knowledge into practice. However, in the institute sector, research is generally quite descriptive not interventionist and, here again, the focus is more on projects than on programmes, limiting the opportunities to get evidence for policy makers to deal with societal problems.

Norway shares with the rest of Europe the split ownership between primary and secondary care. The latter is organised at the level of regions whereas the municipalities are responsible for all primary health care and also care and social service for the elderly. There

[26] NIFU, 2024e

is a need for evidence based knowledge in this area but at the same time the research environment is often not ideal either because funding is limited or because the research done is not enough practice oriented. An improvement of the scientific output from this segment of healthcare cannot be expected without a decisive and coordinated effort (organisation, funding, policies and competence).

Institutes like NORCE and local HEI would benefit for going for a more permanent long term relationship providing research and implementation programmes rather than commissioned projects.

6.2 Review of the EVALMEDHELSE impact cases

Of the almost 250 impact cases that were submitted by the administrative units as part of EVALMEDHELSE to illustrate their societal impact, eleven are presented below in a short summary. All impact cases submitted to EVALMEDHELSE will be available in a summary report on the Research Council's website from April 2025.

The eleven selected cases do neither cover all impacts that the medical and health research in Norway has had in the past 10 years (it is only a small sample), nor do they necessarily represent the best examples of impact (since it depends very much on the criteria that are used to quantify impact, what is considered the largest impact). The eleven cases were selected by the national committee to illustrate the different pathways that can lead form research to impact and the different impacts medical and health research can have.

The cases come from all three sectors in Norwegian research (HEI, INST and HT), include examples from bigger and smaller organisations (or from collaborating partners), and from all over Norway. The impact case studies also cover various medical domains (biotechnology, cardiology, handling of the Covid pandemic, nursing, oncology, psychology).

Many cases have effect on multiple issues. The examples include cases of impact on new medicines and treatment methods (case studies C, D, G); impact on clinical guidelines (nationally and internationally, case studies F, J, K); patient treatment/recovery (case studies C, J); impacts on societal costs of disease (case studies A, J); impact on cooperation with industry (case study B); impact on public policy (case studies A, B, F, G, H, J, K); impact on economic activity (case studies B, C, D); impact on education (case study E); impact on well-being of patients (case studies A, B, E, I); new economic activity in spin-offs (case studies C, D); impact on costs of health care (case studies H,J); and impact on public awareness (case studies A, F, I).

Together, the case descriptions provide a good picture of the impacts of medical research in Norway in the past 10 years. There is a great potential in continuously publicising various examples of impact in order to further the understanding of the need for research funding in the eye of the public.

Case study A: Sami Nursing, University of Tromsø.

Reasoning: In order to provide care to the Sámi in their native language the University of Tromsø has created a Bachelor's programme in Sámi Nursing.

The Bachelor's programme in Sámi Nursing holds significant importance not only for the Sámi community but also for the broader population. This program emphasises the Northern Sámi language, Sámi cultural studies, contemporary Sámi issues, and the concept of cultural safety within the nursing profession. The availability of nurses fluent in Sámi is crucial for patient care in the North and serves as a valuable measure of quality in the provision of healthcare services.

Case study B: Therapy Light rooms / Innovative Light solutions to improve health and quality of life (Psychology, University of Bergen)

Reasoning: This is included as it has links to industry as well as improving the lives of those with dementia and their caretakers. The new lights are likely to be adopted nationally and probably internationally, with economic effects for the industry partner.

Baseline mapping demonstrated that light conditions in nursing home dementia units were below the industrial standards, regardless of season, and not suitable according to scientific standards to support a robust circadian rhythm. A randomised controlled trial demonstrated immediate benefits on sleep and psychiatric symptoms of a dynamic ceiling-mounted light therapy on nursing home patients with dementia. The project influenced public policy and services, prompting a heightened focus on enhancing lighting in both the light and health industries. The light therapy improved sleep as observed by the nursing home staff and neuropsychiatric symptoms, in particular depression. The new and improved LED technology is more economic and environmentally friendly with less power consumption. The industry partner has received more requests from different nursing homes. Although this impact is in its early stages it has a lot of potential for wide international impact

Case study C: Cardiac biomarkers (Akershus University Hospital and Institute of Clinical Medicine, University of Oslo)

Reasoning: The impact of the research group in developing biomarkers for severe cardiac disease to guide clinical decisions is of direct relevance for patient care. Several clinical trials have been conducted using the biomarkers. The observations in the group have also generated intellectual property rights and led to establishment of two spin-off biotechnology companies.

The Cardiovascular Research Group at Akershus University Hospital (Ahus, hospital) and Campus Ahus (University of Oslo) is a leading international group in studies on cardiac biomarkers. Cardiovascular disease and myocardial dysfunction are among leading causes of death in the Western world. Biomarkers are imperative for guiding clinical decisions and follow up principles in care of cardiovascular disease. The cardiovascular research group at Ahus hospital and Campus Ahus perform clinical and experimental studies of cardiac biomarkers, and as examples have demonstrated high-sensitivity cardiac troponin I and T to identify subclinical and clinical myocardial injury, and the novel biomarker secretoneurin as a novel cardiac biomarker for heart failure. The administrative unit offers large clinical cohorts and state-of-the-art laboratories, collaboration with international enterprises as well as national diagnostic companies are established.

The work from 2012-2022 includes clinical studies with established cardiac biomarkers, which have direct relevance on patient care, and integrated, translational research on novel cardiac biomarkers. The work was performed in close collaboration with industry partners and has led to significant advancements for clinical care, intellectual property rights (IPR), and the establishment and development of two Norwegian biotechnology companies. As the principal partner of CardiNor AS (Oslo, Norway), a CE-approved SN ELISA assay was developed, which is currently validated in clinical studies. In parallel molecular work, SN is pursued as a drug concept for treatment of ventricular arrhythmias with on-going IPR work.

Case study D: Fostering biotech excellence, a case showcasing innovations and startups (Division of Laboratory Medicine - KLM, Oslo University Hospital and University of Oslo).

Reasoning: The impact of Vaccibody is demonstrated both in the financial success and the successful production of numerous vaccines including the first Nykode based on targeted vaccines against cancer and infectious disease. Nextera was based on a novel phage display technology applied in target discovery and TCR and antibody drug development in oncology and autoimmunity. Authera is a pre-clinical-stage biotechnology company dedicated to the discovery and development of novel therapeutic biologics.

Innovations in the RCN CoE Centre for Immune Regulation (CIR) led to three startup companies in the Biotech sector. The first, Vaccibody (now Nykode) was based on targeted vaccines against cancer and infectious disease. The driven innovation relating to Vaccibody included 10 PhDs and > 50 research papers, encompassing a diverse collection of publications on vaccines for cancer and infectious disease. The technology was based upon targeted delivery of vaccine antigen for strong B (antibody) and T cell responses. Vaccibody was established in 2007, currently has 200 employees, is listed on the Oslo Stock Exchange and has extensive list of trials and industrial collaborations.

Nextera was based on a novel phage display technology applied in target discovery and TCR and antibody drug development in oncology and autoimmunity.

Authera was based upon breakthrough understandings of complex FcRn biology and its ligands, IgG antibodies and albumin, and collaborates with a range of global biotech and pharma companies. All three companies have expanding activities, value and impact and exemplify an emergent biotech sector in Norway.

Case study E: Bridging Body and Mind through effective interventions, tools, and health literacy (Oslo University, Psychology Department, IPS)

> **Reasoning:** The cost of chronic pain is very high on social welfare. This adaptation of ACT for chronic pain has had effects on four separate areas in Norway – policy, workplace integration, public awareness and literacy and is cost-effective. All impact is national but it is likely that this will also have international impact in the future.

This research (Randomised controlled trials (RCTs) on Acceptance and Commitment Therapy-based work rehabilitation and IPS adaptations for chronic pain) realised significant improvements in workforce reintegration and mental well-being, which in turn led to:

1. National Health Policy Changes: The research contributed to workplace health interventions recognised by the Norwegian Directorate of Health, including ACT-based programmes and IPS adaptations that are now part of Norway's recommended treatment approaches for chronic pain and mental health in the workplace.
2. Improvement in Workforce Reintegration: The ACT-based work rehabilitation model has significantly reduced long-term sick leave and improved work participation rates. This intervention has been adopted in Norwegian health services as a key method for helping individuals on extended leave due to chronic pain or mental health issues re-enter the workforce effectively.
3. Health Literacy and Public Awareness: Through publications, seminars, and collaborations, including the Oslo Chronic Fatigue Consortium, the Mind Body Lab has reached thousands of practitioners and patients with evidence-based information on managing stress, pain, and fatigue.
4. Cost-effective Health Solutions: By demonstrating the cost-effectiveness of IPS and ACT interventions, the research has informed funding decisions within Norwegian healthcare, highlighting that these methods not only improve patient outcomes but also reduce healthcare expenses by preventing long-term disability and unnecessary treatments fatigue has been widely referenced, with over 16,000 views, and has influenced public and professional understanding of chronic stress management.

Case study F: NIPH, division of Mental and physical health: Real-time surveillance of covid-19 immunisation program in Norway

> **Reasoning:** This case is about real-time surveillance of covid-19 immunisation and an excellent example of the interaction between research - decision and policymaking in real-time. An excellent element of this research is inclusion of circular communication between practice, reporting observations, register, real time analysis of data, and reporting to authorities and back into practice. The research had impact on the scientific as it demonstrates the importance of available register data that can be used to master a life-threatening situation like a pandemic.

"Real-time surveillance of covid-19 immunisation program in Norway" is an excellent example of research that in real-time provided evidence-based knowledge that changed policy recommendations and clinical practice to manage the pandemic and protect the public from severe complications related to immunisation for covid-19. The ability to, in real-time, monitor and adapt the immunisation program would not have been possible without the long history of building registers, having access to scientific resources and experiences, and the political mandate to monitor, analyse and pass on the latest knowledge to those taking it to national decision making and into practice. An excellent element of this research is inclusion of circular communication between practice, reporting observations, register, real time analysis of data, and reporting to authorities and back into practice. The research had impact on the scientific community via publications in high impact journals, and international and European organisations responsible for dealing with the pandemic. Real-time recommendations on which vaccine to use, on handling of risk or side effects of different vaccines, etc., had a highly important impact on the public. The research also had public impact as a measure to counter rumours and inform societal debate regarding vaccine safety by providing evidence-based knowledge. Another lesson to be learned is the importance of investing in infrastructure and international collaboration to handle public health threats in real-time.

Case study G : Nucleic acid extraction – Covid diagnostics for a nation, NTNU; Faculty of Medicine and Health Sciences

Reasoning: This case highlights the importance of long-lasting expertise in basic research for the timely development of diagnostic test for COVID19, also thanks to a cross disciplinary collaboration at NTNU. NTNU has a strong international reputation and over time managed to build strong collaborative networks within and outside the University. Thus, an environment was created to conduct research along the entire value chain. The impact case illustrates how all steps constituting this chain have been combined to generate societal impact, including basic research. It also shows the importance of interdisciplinary collaboration and intersectional collaboration at local and national level.

The research has highlighted the importance of long-lasting expertise in basic research for the timely development of diagnostic test for Covid-19 also thanks to a cross disciplinary collaboration at NTNU. This test was the most used extraction test for PCR based corona diagnostics in Norway. The expertise and technology in the research group on nucleic acid extraction and detection, and implementation on advanced liquid handling systems combined with microbial and viral diagnostics expertise was essential for this innovation. Fundamental was also the proximity to the competent research environments of the Department of chemical engineering at NTNU and the proximity to St Olavs University Hospital in Trondheim. Six papers by the research group published in international journals are listed. The NTNU corona test had an enormous impact on the test capacity, monitoring and controlling infection spread in the Norwegian society during the pandemic. This impact case clearly demonstrates how strong and robust basic research teams have a unique potential for innovation which is of particular importance for preparedness.

Case study H: Continuity in general practice as predictor of mortality, acute hospitalisation, and use of out-of- hours care: a registry-based observational study in Norway, University of Bergen; Department for Global Public Health and Primary Care

Reasoning: This case points out how research results were reported in newspapers and led to high level political discussion in several European countries.

Continuity of care in general practice is shown to increase patient satisfaction, improve health, and contribute to more efficient use of total health care. However, when holding different policy goals against each other access has often been prioritised over continuity of care. In the research environment, there has been a focus on the utilisation of health care with continuity of care as one main pillar. Research was conducted with the aim to increase knowledge regarding continuity of care and analyse the association between longitudinal continuity with a named regular general practitioner (RGP). The duration of the RGP-patient relationship (I.e. being listed to the same RGP) was used as a predictor for the use of OOH services, acute hospital admission, and mortality in 2018. The research led to a publication of the study that was covered by media and led to high level political discussions in several European countries.

Case study I: Capitalising on Norwegian birth cohort and registry data to generate real-world evidence about medications in pregnancy, UiO Dept. of Pharmacy

Reasoning: There is a great need for human data and research about the safety and efficacy of medication strategies during pregnancies. The case has established novel insight into the long-term drug safety in utero and is an excellent example of comprehensive data analysis and secondary use of health data giving value back to the population. Of note is also the advanced biostatistical and causal inference methods.

The unique Norwegian birth cohort and health registries were utilised in this multidisciplinary project studying the long-term effects and safety of drugs during pregnancy. The results have helped promoting the safety and well-being of pregnant women and their children. Normal drug testing always excludes pregnant volunteers. Real-life pharmaco-epidemiological studies provide important information on these critical gaps in knowledge for the benefit of the safety and well-being of foetuses and their mothers. The projects have downstream resulted in numerous impactful projects for example articles on the effects of analgesics and antidepressants impacting DNA methylation in the offspring. Further perinatal pharmaco-epigenetic studies were followed and reported.

Case study J: Exercise therapy or arthroscopic partial meniscectomy for degenerative meniscal tear in middle aged patients: randomised controlled trial with two-year follow-up, Martina Hansens Hospital

140 middle-aged patients with degenerative meniscal tears were during October 2009-September 2012 recruited from two Norwegian orthopaedic hospitals, Ullevål University Hospital (54 patients) and Martina Hansens Hospital (MHH-C) (86 patients). The patients were randomised (1:1) to treatment with either surgery or exercise therapy. The surgery was performed as an arthroscopic procedure (“keyhole” surgery) with excision of meniscal tissue and the exerciser therapy program included physiotherapist-assisted strengthening

exercises twice or three times a week over a period of 12 weeks. The follow-ups at 3, 6, 12 and finally 24 months included patient reported outcomes measures (PROMs) and physical performance and muscle strength tests. No difference in patient reported outcomes between the intervention groups 2 years following treatment.

The published article received wide media attention at the time of publication with a high altmetric score and has subsequently been highly cited. This procedure was very common prior to this trial and has now largely been abandoned world-wide.

Case study K: Human papillomavirus (HPV) and cervical cancer prevention strategies, University of Oslo, Institute of Health and Society

Reasoning: This is a good example for excellent health services research influencing guidelines and practice not only in Norway, but also the WHO's Global Strategy to Eliminate Cervical Cancer. Research is excellent throughout and links to impact are clear with strong evidence of population benefit.

The research produced by HELSAM's faculty has informed and impacted national and international recommendations for the prevention and control of human papillomavirus (HPV)-related diseases. Nationally, the changes to Norway's cervical cancer screening and HPV vaccination policies have been influenced by the HELSAM research team. Internationally, researchers at HELSAM were pivotal in designing the WHO's Global Strategy to Eliminate Cervical Cancer, adopted by the World Health Assembly in 2020. Rapid response insights on COVID-related disruptions emphasise the need for adaptive research. Overall, HELSAM's research team, resonates through policy changes, shaping international and national healthcare agendas, and providing timely responses to emerging challenges, exemplifying a transformative influence on both global and local health initiatives.

7. Recommendations

The national committee is of the opinion that the medical and health research in Norway is of good quality and has good societal impact to examples where research is of top level and where there is excellent impact. However, there are opportunities to reach top level across a broader part of the system and for increasing societal impact. In order to achieve this, actions should be taken in the domains of organisation, human resource management, incentives and data management. The five most important recommendations to achieve this are:

1. **Improve the coordination of research funding to promote the competitiveness of the medical and health research in Norway.**
   - ***Aim to create synergies and critical mass across the research system***
   - ✓ ***Organise a strategic discussion on whether the research resources on specific topics should be pooled or whether they should be spread out geographically.*** Take into account experiences on what has been achieved with the (fundamental) restructuring of the research environment in many units, often merging smaller colleges into larger structures. The committee would encourage avoiding duplication and silo based working between organisations and encourage a focus on cooperation (e.g. virtual research groups across organisations) instead of solely promote competition on project level. Also include the role of regions and municipalities (esp. in rural areas), in the health care system and their needs for research in the discussion[27]. Make a decision based on the outcome of the discussion.
   - ✓ ***Increase base funding for smaller health trusts and smaller HEI*****,** so they can be equipped to do good research and become attractive partners in national and international cooperation.
   - ✓ ***Consider central provision of methodological expertise*** to increase research power of smaller admin units which cannot afford developing all methodological expertise inhouse by themselves.

2. **Increase the competitiveness of Norwegian medical and health research by focusing research on goal-oriented programmes across administrative units and organisations and connecting these to international state of the art.**
   - ✓ ***Develop goal oriented research strategies and increase focus in the research*** (either by reducing the number of research topics, or by cooperating with other entities). Such strategies can also provide a basis for better planning of recruitment.
   - ✓ ***Increase collaboration and joint work at*** strategic level as well as in the delivery of the research.
   - ✓ ***Obtain more competitive international funding*****.** Be more ambitious, make resources available for application support for Horizon and ERC, also as a consortium leader, cooperate with the international leaders in the field, look beyond Europe (e.g. NIH).
   - ✓ (for institutes) ***Strengthen the portfolio of intervention studies,*** again moving from projects to goal oriented programmes, and by increasing cooperation (esp. with regional and municipal authorities providing health and social care but also with universities). This increases the opportunities to get evidence for policy makers to deal with (suddenly arising) societal problems.
   - ✓ ***Direct funding from projects (and maybe base funding) to society oriented programmes.*** The programmes should be focused on clear societal targets[28], with clear roadmaps and milestones, where researchers cooperate across research groups and organisations to achieve common goals. This unites larger and smaller groups into

[27] Kunnskapsdepartementet, 2020

[28] Targets could be offering solutions for medical problems but could also be about furthering thematic insights and could involve methodological, ethical or other topics that cut across more clinically oriented research.

networks to mobilise critical mass, it promotes interdisciplinary collaboration across the value chain, involves the different regions as well as user groups across Norway, and contributes to relevance, quality and impact and makes it possible to measure progress.

- ✓ ***Reward research groups/researchers that participate in international programmes,*** e.g. award national bonuses for successful applications in Horizon and/or develop a mechanism for compensation for highly ranked (but not funded) ERC applications. These rewards can lower the threshold to consider (considerable) efforts in applications for these prestigious grants and may create a more international orientation.
- ✓ ***Promote cooperation of public research with industry,*** esp. in the field of medical technologies, which seems not to be the focus of the research in admin units in the evaluation, but which is a sizeable industrial sector in Norway. This could e.g. be done by developing a cooperative industry programmes focused on PhDs and postdocs, look for example at the Luxembourg FNR Industrial fellowship scheme (Industrial Fellowships - FNR)

3. Make medical and health research more attractive for young and/or foreign staff and develop clear career perspectives for researchers.

- ***Develop clear career perspectives for researchers.*** The gap between getting a PhD degree and becoming a professor or senior physician is large. Programme based research has a better base for recruitment than singular research projects.
- ***Put more focus on start-up packages for external recruits at the early independent career stage.*** Consider these an investment for the dynamic future of research environments.
- ***Switch to a more international culture, where English and Norwegian are operating languages.*** Attracting foreign staff is the easiest/fastest solution to attract more staff for research. Having to learn to speak Norwegian is a serious barrier for this.
- ***Develop affirmative action to attract researchers to smaller health trusts outside Oslo and Bergen.*** Consider higher salaries in the North, a number of automatically funded PhDs or post docs with each professor position, etc.
- **Be vigilant about the increasing gender gap** in recruitment to health research and make efforts to understand why men shy away from research.
- ***Develop inclusion strategies that are broader than gender strategies alone.*** Set clear goals and measure progress.
- For admin units in the HT sector: ***Implement incentives to do research, in order to reduce the tension between clinical practice and research.***
- ***Develop succession plans for leadership***, in cases where retirement for present leaders is close. Take the gender balance into account, as women are (still) underrepresented in senior positions.

4. Develop and implement a good, nationally coordinated registry system as a backbone for and a strong asset of Norwegian medical and health research.

- ***Make research across registries possible.*** In order to achieve this, it is necessary to review all registers available and develop an effective organisation structure, using national and international standards for data exchange, including the EU framework for interoperability (Operational, technical, semantic and legal), as well as a nationally established practice for data privacy vs. secondary use of health data (i.e. GDPR vs. EHDS).
- ✓ ***Develop a semantic standard for registries that*** is encouraged for all health registries, clinical registries and longitudinal datasets to use

- ✓ ***Adopt a technical standard for registries*** that is obligatory for all health registries, clinical registries and longitudinal datasets.
- ***Promote the use of structured clinical patient data with real time accessibility.***
- ***Promote the visibility of the data so that the registries can become a backbone for the Norwegian health system***

5. Increase societal impact of medical and health research and communicate this impact

- ***Develop methods to manage impact more explicitly*** and in such a way maximise impact.
- ***Increase user involvement in all stages of research***.
- ***(Develop methods to) Monitor impact (more) systematically***, e.g. use of research in adapting clinical guidelines, number of patients in registries, number of qualified research projects that use the registries etc.
- ***Improve and increase communication about impact of research to the general public***
- ***Provide funding for open access publication and opening up of data as part of research grants.*** *Open Science is strengthening the research system. At present, open science is the responsibility of the admin units, and they make good progress in this field, but esp. smaller admin units in smaller organisation do not have the means to fund open publication.*

Evaluation of medicine and health

Introduction

The Research Council of Norway (RCN) has been given the mission by the Ministry of Education and Research to perform subject-specific evaluations. The evaluation of life sciences is conducted in 2022 - 2024. The evaluation of biosciences takes place in 2022 - 2023, and the evaluation of medicine and health takes place in 2023-2024 (Figure 1).

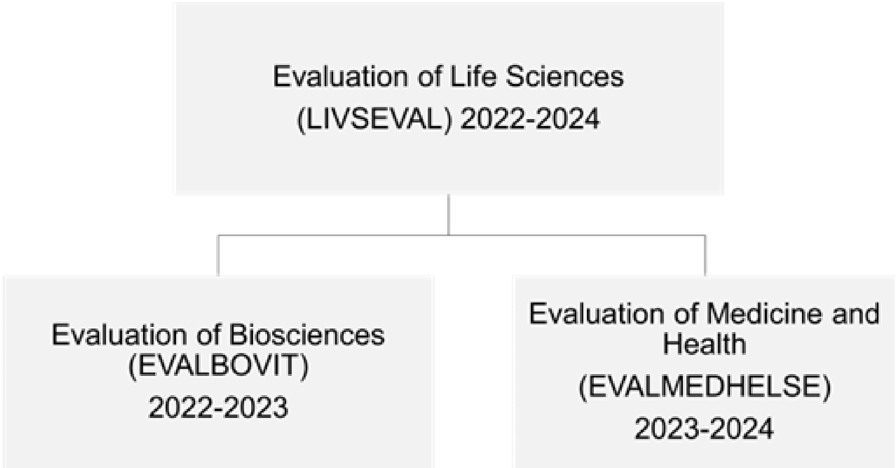

Figure 1. Evaluation of Life Sciences 2022-2024

The primary aim of the evaluation of life sciences is to reveal and confirm the quality and the relevance of research performed at Norwegian Higher Education Institutions (HEIs), the institute sector and the health trusts. The evaluation will result in recommendations for the institutions, the Research Council of Norway (RCN), and the ministries.

Each institution has a responsibility to follow up the evaluation's recommendations given in the evaluation reports to the administrative units. Research Council of Norway aims to use the outcomes of the evaluation as a knowledge base for further discussions with the institutions on issues such as general plans and national measures relating to legal research. The RCN will use the evaluation in its development of funding instruments and in the advice, it gives to the ministries.

Methods

Evaluation protocol

The RCN created the evaluation protocol, decided the assessment criteria (Appendix B) and planned the review process. The evaluation protocol was decided by the portfolio board of Life sciences April 2022.

Terms of reference

The terms of reference and assessment criteria were adapted to the institutions' own strategies and objectives. The institutions' terms of reference contained specific information about the research unit that the evaluation committee was to consider in its assessment (Appendix A in the evaluation protocol).

Registration of administrative unit
All research performing organisations in the field of life sciences were invited to the evaluations. Twenty-two administrative units responded positively to participation in EVALBIOVIT (2022-2023) (Table 1) and sixty eight administrative units responded positive participate in EVALMEDHELSE (2023-2024) (Table 2). Institutions enrolled to the evaluation by submitting Terms of reference for participating administrative unit in addition to research groups.

Table 1. Names of participation administrative units in EVALBIOVIT 2022-2023

Administrative unit	**Institution**
Computational Biology Unit (CBU)	UiB
Department for Biotechnology and Nanomedicine	Sintef Industry
Department of biological sciences	UiB
Department of Biology	NTNU
Department of Biosciences	UiO
Department of Biotechnology and Food Science	NTNU
Department of Chemistry, Bioscience and Environmental Engineering	UiS
Department of Natural history	NTNU
Faculty of Bioscience	NMBU
Faculty of Biosciences and Aquaculture	Nord university
Faculty of Biosciences, Fisheries and Economics	UiT
Faculty of Chemistry, Biotechnology and Food Science	NMBU
Faculty of Environmental Sciences and Natural Resource Management	NMBU
Faculty of Science and Engineering	UiA
Natural History Museum (NHM)	UiO
Nofima	Nofima
Norwegian Institute for Nature Research (NINA)	NINA
Research department	NPI
The Advisory and Research Program unit	Institute of Marine Research
The Arctic University Museum	UiT
The Faculty of Veterinary Medicine	NMBU
University Museum of Bergen	UiB

Table 2. Names of participation administrative units in EVALMEDHELSE 2023-2024

Administrative unit	**Institution**
AHUS	AHUS
Cancer Registry of Norway	Cancer Registry of Norway
Centre for Psychopharmacology	Diakonhjemmet Hospital
Centre for Fertility and Health	NIPH
Department of Biomedicine	UiB
Department of Clinical Dentistry	UiB
Department of Clinical Dentistry	UiT

Department of Clinical Medicine	UiT
Department of Clinical Science I	UiB
Department of Clinical Science II	UiB
Department of Community Medicine	UiT
Department of Global Public Health and Primary Care	UiB
Department of Health and Care Sciences	UiT
Department of Medical Biology (IMB)	UiT
Department of Pharmacy	UiO
Department of Pharmacy	UiT
Department of Physical Performance	NIH
Department of Psychology	NTNU
Department of Psychology	UiT
Department of Psychology	UiO
Department of Research	Sunnaas Rehabilitation Hospital
Department of Social Education	UiT
Department of Sports Medicine	NIH
Division of Cancer Medicine	OUS
Division of Cardiovascular and pulmonary diseases	OUS
Division of Climate and Environmental Health	NIPH
Division of Clinical Neuroscience	OUS
Division of Emergency and Critical Care	OUS
Division of Gynaecology and Obstetrics	OUS
Division of Head, Neck and Reconstructive Surgery	OUS
Division of Health Services	NIPH
Division of Infection Control	NIPH
Division of Laboratory Medicine	OUS
Division of Medicine	OUS
Division of Mental and Physical Health	NIPH
Division of Mental Health and Addiction	OUS
Division of Paediatric and Adolescent Medicine	OUS
Division of Prehospital Services	OUS
Division of Radiology and Nuclear Medicine	OUS
Division of Surgery, Inflammatory Diseases and Transplantation	OUS
Division of Technology and Innovation	OUS
Faculty of Dentistry	UiO
Faculty of Health and Social Sciences	HVL
Faculty of Health and Sport Sciences	UiA
Faculty of Health Sciences	UiS
Faculty of Health Sciences (HV)	OsloMet
Faculty of Health Sciences and Social Care	Molde University College
Faculty of Health, Welfare and Organisation	Østfold University College
Faculty of Medicine and Health Sciences	NTNU
Faculty of Nursing and Health Sciences	Nord universitet
Faculty of Psychology	UiB

Faculty of Social and Health Sciences	HINN
Haukeland University Hospital	HUS
Health and Social Sciences Division	NORCE
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust
Institute of Basic Medical Sciences	UiO
Institute of Health and Society	UiO
Lovisenberg Diaconal Hospital	Lovisenberg Diaconal Hospital
Martina Hansens Hospital	Martina Hansens Hospital
National Institute of Occupational Health	STAMI
NCMM	UiO
RBUP Øst og Sør	RBUP Øst og Sør
RBUP Nord	UiT
REMEDY	Diakonhjemmet Hospital
Research Institute of Modum Bad	Modum Bad
School of Sport Sciences	UiT
St. Olavs Hospital	St. Olavs Hospital
Stavanger University Hospital	SUS

Organisation
The evaluation has been done at three levels (Figure 2).

First evaluation level – Evaluation of research groups in expert panels
The administrative units enrolled their research groups to be assessed by expert panels divided by subjects and disciplines within the field of medicine and health across sectors. The eighteen expert panels consisted of four to six international experts per panel.

Second and main evaluation level – Evaluation of admin units in evaluation committees
The administrative units were assessed by evaluation committees according to sectorial affiliation and/or other relevant similarities between the units. The evaluation committees had expertise in the main disciplines of the medicine and health and various aspects of organization and management of research and higher education. The eight evaluation committees consisted of 4-8 international committee members per evaluation committee.

Third and evaluation of the national level
The national evaluation committee consisted of the eight chairs of the eight evaluation committees. The national committee was requested to compile a report based on the assessments and recommendations from the 68 independent administrative evaluation unit reports.

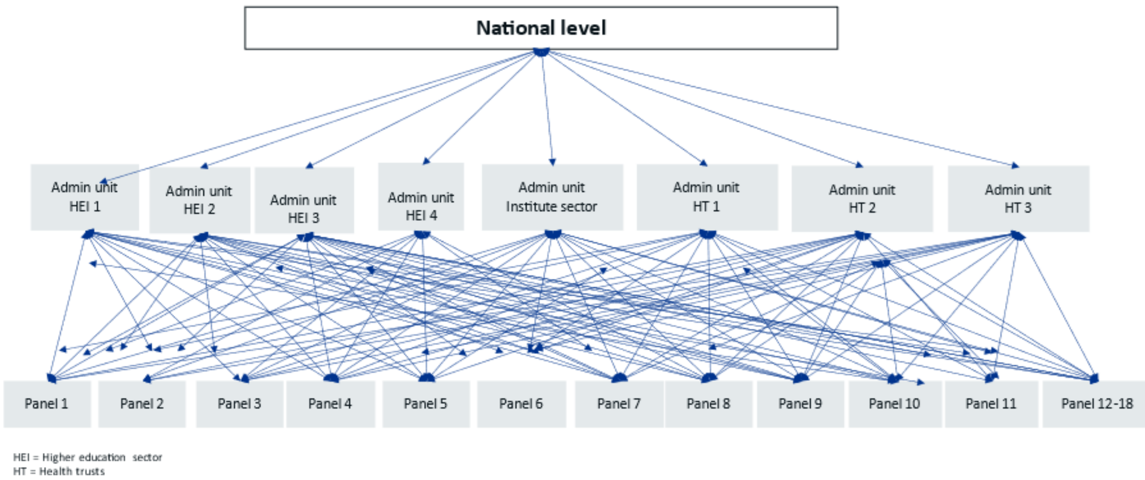

Figure 2. Organisation of the evaluation of medicine and health in three levels; expert panels, evaluation committees and the national level.

External evaluation secretariat

The Research Council has established an external evaluation secretariat for the evaluation. The external secretariat was responsible for the implementation of the evaluation process.

Data

The documentary inputs to the evaluation were:

- Evaluation Protocol Evaluation of life sciences in Norway 2022-2023
- Administrative unit´s Terms of Reference
- Administrative unit's self-assessment report
- Administrative unit's impact cases
- Administrative unit's research groups evaluation reports
- Panel reports from the Expert panels (18 expert panel reports)
- Bibliometric data (*NIFU*)
- Personnel data (*SSB)*
- Funding data – The Research Council´s contribution to medicine and health research (*RCN*)
- Indicators for innovation (RCN)
- Extract from the Student Survey (*NOKUT*)

Limitations

This national report of the evaluation of medicine and health sciences in Norway 2023-2024 is the result of an extensive process of peer review of medicine and health sciences at 3 levels of the Norwegian research system: the research group level, the administrative unit level (department/institute/centre/institution) and the national level. At the lower levels of the evaluation, many comments have been made by those involved in the expert panels and evaluation committees about the evaluation process, most of them focusing on the limited amount of time that evaluators could spend on each group or administrative unit evaluated, and the limited direct interaction that the expert panels had with the groups (only a self-evaluation report) and the evaluation committees with the administrative units (a self-evaluation report and an (online) interview of 1.5 hours with the (management) of the units). Although we share these concerns, we think that this design of the evaluation process has provided good quality inputs for a robust assessment at the national level. Important in achieving robust results have also been the composition of the national evaluation committee, consisting of the chairs of the committees that performed the administrative unit evaluations. Improvements in future evaluations (without increasing costs) are:

- Improved data availability (especially details about the role of hospital trusts as this is not an own sector in national statistics. It is split between the HEI and the institute sector).
- Better instructions for the groups and administrative units preparing the self-evaluations (including more instruction on what the boundaries of groups are).
- Scores that better reflect the underlying idea of research excellence (only 2-3 scores: Quality, Impact, Viability), and better calibration of scores across evaluated research groups (especially at research group level).
- Moving the interviews to earlier in the evaluation process, which will, earlier in the process, give better understanding of the administrative units and increase the time available for writing of the administrative unit reports.
- It would also be good to undertake a discussion about the nature of participation and whether it should be voluntary or obligatory.

References

- (Kunnskapsdepartementet, 2020), Strategi for helhetlig instituttpolitikk
- (NIFU, 2024a), A bibliometric analysis of Norwegian science
- (NIFU, 2024b), Publication and citation analysis - a national profile NIFUWorkingPaper2025-B.pdf
- (NIFU, 2024c), The Norwegian research system – structure and main characteristics, revised version
- (NIFU, 2024d), Compilation report EVALMED, Bibliometric statistics and analyses for administrative units included in the evaluation of medicine and health research in Norway
- (NIFU, 2024e), Indicators for innovation, document prepared for the Evaluation of Medicine and Health 2023-2024
- (NIFU, 2024f), Role of External funding in Norwegian research
- (NOKUT, 2023), Extract from the Survey for academic staff and the Student Survey
- (RCN, 2021), Science & Technology Indicators for Norway 2021, RCN, Oslo, 2021
- (RCN, 2022), Evaluation Protocol Evaluation of life sciences in Norway 2022-2024
- (RCN, 2023), Norwegian Roadmap for Research Infrastructure, RCN, last updated August 2024
- (RCN, 2024a), RCN funding of medicine and health research
- (RCN, 2024b), Norway is not just about the fords, presentation for kick-off EVALMEDHELSE,
- (RCN, 2024c), Overview of EVALMEDHELSE research group evaluation scores, internal document
- (RCN, 2025 a), 68 Administrative unit´s evaluation reports, made for EVALMEDHELSE, available from April 2025
- (RCN, 2025b), 68 Administrative unit’s impact cases, made for EVALMEDHELSE, available from April 2025
- (RCN, 2025c), 18 Expert panel reports, made for EVALMEDHELSE, internal documents
- (SSBN, 2024a), Statistics for use in the evaluation of medical and health sciences
- (SSBN, 2024b) Completion of rates of students in higher education
- (SSBN, 2025), R&D statistics, HelseOmsorg21Monitor, online, Feb 2025
- (Statista, 2025), Norway: doctorate degrees (by study field 2023, by gender 2023, by origin, 2023)
- Vetenskapsradet, 2024, Swedish research barometer 2023

Appendices

The Research Council of Norway

Evaluation of life sciences in Norway 2022-2024

LIVSEVAL protocol version 1.0

By decision of the Portfolio board for life sciences April 5., 2022

The Research Council of Norway
Visiting address: Drammensveien 288
P.O. Box 564
NO-1327 Lysaker

Telephone: +47 22 03 70 00
Telefax: +47 22 03 70 01
post@rcn.no
www.rcn.no

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1 Introduction

Research assessments based on this protocol serve different aims and have different target groups. The primary aim of the evaluation of life sciences is to reveal and confirm the quality and the relevance of research performed at Norwegian Higher Education Institutions (HEIs), and by the institute sector and regional health authorities and health trusts. These institutions will hereafter be collectively referred to as Research Performing Organisations (RPOs). The assessments should serve a formative purpose by contributing to the development of research quality and relevance at these institutions and at the national level.

1.1 Evaluation units

The assessment will comprise a number of *administrative units* submitted for evaluation by the host institution. By assessing these administrative units in light of the goals and strategies set for them by their host institution, it will be possible to learn more about how public funding is used at the institution(s) to facilitate high-quality research and how this research contributes to society. The administrative units will be assessed by evaluation committees according to sectoral affiliation and/or other relevant similarities between the units.

The administrative units will be invited to submit data on their *research groups* to be assessed by expert panels organised by research subject or theme. See Chapter 3 for details on organisation.

Administrative unit	An administrative unit is any part of an RPO that is recognised as a formal (administrative) unit of that RPO, with a designated budget, strategic goals and dedicated management. It may, for instance, be a university faculty or department, a department of an independent research institute or a hospital.
Research group	Designates groups of researchers within the administrative units that fulfil the minimum requirements set out in section 1.2. Research groups are identified and submitted for evaluation by the administrative unit, which may decide to consider itself a single research group.

1.2 Minimum requirements for research groups

1) The research group must be sufficiently large in size, i.e. at least five persons in full-time positions with research obligations. This merely indicates the minimum number, and larger units are preferable. In exceptional cases, the minimum number may include PhD students, postdoctoral fellows and/or non-tenured researchers. *In all cases, a research group must include at least three full-time tenured staff*. Adjunct professors, technical staff and other relevant personnel may be listed as group members but may not be included in the minimum number.

2) The research group subject to assessment must have been established for at least three years. Groups of more recent date may be accepted if they have come into existence as a consequence of major organisational changes within their host institution.
3) The research group should be known as such both within and outside the institution (e.g. have a separate website). It should be able to document common activities and results in the form of co-publications, research databases and infrastructure, software, or shared responsibilities for delivering education, health services or research-based solutions to designated markets.
4) In its self-assessment, the administrative unit should propose a suitable benchmark for the research group. The benchmark will be considered by the expert panels as a reference in their assessment of the performance of the group. The benchmark can be grounded in both academic and extra-academic standards and targets, depending on the purpose of the group and its host institution.

1.3 The evaluation in a nutshell

The assessment concerns:

- research that the administrative unit and its research groups have conducted in the previous 10 years
- the research strategy that the administrative units under evaluation intend to pursue going forward
- the capacity and quality of research in life sciences at the national level

The Research Council of Norway (RCN) will:

- provide a template for the Terms of Reference[1] for the assessment of RPOs and a national-level assessment in life sciences
- appoint members to evaluation committees and expert panels
- provide secretarial services
- commission reports on research personnel and publications based on data in national registries
- take responsibility for following up assessments and recommendations at the national level.

RPOs conducting research in life sciences are expected to take part in the evaluation. The board of each RPO under evaluation is responsible for tailoring the assessment to its own strategies and specific needs and for following them up within their own institution. Each participating RPO will carry out the following steps:

1) Identify the administrative unit(s) to be included as the main unit(s) of assessment
2) Specify the Terms of Reference by including information on specific tasks and/or strategic goals of relevance to the administrative unit(s)

[1] The terms of reference (ToR) document defines all aspects of how the evaluation committees and expert panels will conduct the [research area] evaluation. It defines the objectives and the scope of the evaluation, outlines the responsibilities of the involved parties, and provides a description of the resources available to carry out the evaluation.

3) The administrative unit will, in turn, be invited to register a set of research groups that fulfil the minimum criteria specified above (see section 1.2). The administrative unit may decide to consider itself a single research group.
4) For each research group, the administrative unit should select an appropriate benchmark in consultation with the group in question. This benchmark can be a reference to an academic level of performance or to the group's contributions to other institutional or sectoral purposes (see section 2.4). The benchmark will be used as a reference in the assessment of the unit by the expert panel.
5) The administrative units subject to assessment must provide information about each of their research groups, and about the administrative unit as a whole, by preparing self-assessments and by providing additional documentation in support of the self-assessment.

1.4 Target groups

- Administrative units represented by institutional management and boards
- Research groups represented by researchers and research group leaders
- Research funders
- Government

The evaluation will result in recommendations to the institutions, the RCN and the ministries. The results of the evaluation will also be disseminated for the benefit of potential students, users of research and society at large.

This protocol is intended for all participants in the evaluation. It provides the information required to organise and carry out the research assessments. Questions about the interpretation or implementation of the protocol should be addressed to the RCN.

2 Assessment criteria

The administrative units are to be assessed on the basis of five assessment criteria. The five criteria are applied in accordance with international standards. Finally, the evaluation committee passes judgement on the administrative units as a whole in qualitative terms. In this overall assessment, the committee should relate the assessment of the specific tasks to the strategic goals that the administrative unit has set for itself in the Terms of Reference.

When assessing administrative units, the committees will build on a separate assessment by expert panels of the research groups within the administrative units. See Chapter 3 'Evaluation process and organisation' for a description of the division of tasks.

2.1 Strategy, resources and organisation

The evaluation committee assesses the framework conditions for research in terms of funding, personnel, recruitment and research infrastructure in relation to the strategic aims set for the administrative unit. The administrative unit should address at least the following five specific aspects in its self-assessment: 1) funding sources, 2) national and international cooperation, 3) cross-sector and interdisciplinary cooperation, 4) research careers and mobility, and 5) Open Science. These five aspects relate to how the unit organises and actually performs its research, its composition in terms of leadership and personnel, and how the unit is run on a day-to-day basis.

To contribute to understanding what the administrative unit can or should change to improve its ability to perform, the evaluation committee is invited to focus on factors that may affect performance.

Further, the evaluation committee assesses the extent to which the administrative unit's goals for the future remain scientifically and societally relevant. It is also assessed whether its aims and strategy, as well as the foresight of its leadership and its overall management, are optimal in relation to attaining these goals. Finally, it is assessed whether the plans and resources are adequate to implement this strategy.

2.2 Research production, quality and integrity

The evaluation committee assesses the profile and quality of the administrative unit's research and the contribution the research makes to the body of scholarly knowledge and the knowledge base for other relevant sectors of society. The committee also assesses the scale of the unit's research results (scholarly publications, research infrastructure developed by the unit, and other contributions to the field) and its contribution to Open Science (early knowledge and sharing of data and other relevant digital objects, as well as science communication and collaboration with societal partners, where appropriate).

The evaluation committee considers the administrative unit's policy for research integrity and how violations of such integrity are prevented. It is interested in how the unit deals with research data, data management, confidentiality (GDPR) and integrity, and the extent to which independent and critical pursuit of research is made possible within the unit. Research integrity relates to both the scientific integrity of conducted research and the professional integrity of researchers.

2.3 Diversity and equality

The evaluation committee considers the diversity of the administrative unit, including gender equality. The presence of differences can be a powerful incentive for creativity and talent development in a diverse administrative unit. Diversity is not an end in itself in that regard, but a tool for bringing together different perspectives and opinions.

The evaluation committee considers the strategy and practices of the administrative unit to prevent discrimination on the grounds of gender, age, disability, ethnicity, religion, sexual orientation or other personal characteristics.

2.4 Relevance to institutional and sectoral purposes

The evaluation committee compares the relevance of the administrative unit's activities and results to the specific aspects detailed in the Terms of Reference for each institution and to the relevant sectoral goals (see below).

Higher Education Institutions

There are 36 Higher Education Institutions in Norway that receive public funding from the Ministry for Education and Research. Twenty-one of the 36 institutions are owned by the ministry, whereas the last 15 are privately owned. The HEIs are regulated under the Act relating to universities and university colleges of 1 August 2005.

The purposes of Norwegian HEIs are defined as follows in the Act relating to universities and university colleges[2]

- provide higher education at a high international level;
- conduct research and academic and artistic development work at a high international level;
- disseminate knowledge of the institution's activities and promote an understanding of the principle of academic freedom and application of scientific and artistic methods and results in the teaching of students, in the institution's own general activity as well as in public administration, in cultural life and in business and industry.

In line with these purposes, the Ministry for Research and Education has defined four overall goals for HEIs that receive public funding. These goals have been applied since 2015:

1) High quality in research and education
2) Research and education for welfare, value creation and innovation
3) Access to education (esp. capacity in health and teacher education)
4) Efficiency, diversity and solidity of the higher education sector and research system

The committee is invited to assess to what extent the research activities and results of each administrative unit have contributed to sectoral purposes as defined above. In particular, the committee is invited to take the share of resources spent on education at the administrative units into account and to assess the relevance and contributions of research to education, focusing on the master's and PhD levels. This assessment should be distinguished from an

[2] https://lovdata.no/dokument/NLE/lov/2005-04-01-15?q=universities

assessment of the quality of education in itself, and it is limited to the role of research in fostering high-quality education.

Research institutes (the institute sector)

Norway's large institute sector reflects a practical orientation of state R&D funding that has long historical roots. The Government's strategy for the institute sector[3] applies to the 33 independent research institutes that receive public basic funding through the RCN, in addition to 12 institutes outside the public basic funding system.

The institute sector plays an important and specific role in attaining the overall goal of the national research system, i.e. to increase competitiveness and innovation power to address major societal challenges. The research institutes' contributions to achieving these objectives should therefore form the basis for the evaluation. The main purpose of the sector is to conduct independent applied research for present and future use in the private and public sector. However, some institutes primarily focus on developing a research platform for public policy decisions, others on fulfilling their public responsibilities.

The institutes should:

- maintain a sound academic level, documented through scientific publications in recognised journals
- obtain competitive national and/or international research funding grants
- conduct contract research for private and/or public clients
- demonstrate robustness by having a reasonable number of researchers allocated to each research field

The committee is invited to assess the extent to which the research activities and results of each administrative unit contribute to sectoral purposes and overall goals as defined above. In particular, the committee is invited to assess the level of collaboration between the administrative unit(s) and partners in their own or other sectors.

The hospital sector

There are four regional health authorities (RHFs) in Norway. They are responsible for the specialist health service in their respective regions. The RHFs are regulated through the Health Enterprises Act of 15 June 2001 and are bound by requirements that apply to specialist and other health services, the Health Personnel Act and the Patient Rights Act. Under each of the regional health authorities, there are several health trusts (HFs), which can consist of one or more hospitals. A health trust (HF) is wholly owned by an RHF.

Research is one of the four main tasks of hospital trusts.[4] The three other mains tasks are to ensure good treatment, education and training of patients and relatives. Research is important if the health service is to keep abreast of stay up-to-date with medical developments and carry out critical assessments of established and new diagnostic methods,

[3] Strategy for a holistic institute policy (Kunnskapsdepartementet 2020)

[4] Cf. the Specialist Health Services Act § 3-8 and the Health Enterprises Act §§ 1 and 2

treatment options and technology, and work on quality development and patient safety while caring for and guiding patients.

The committee is invited to assess the extent to which the research activities and results of each administrative unit have contributed to sectoral purposes as described above. The assessment does not include an evaluation of the health services performed by the services.

2.5 Relevance to society

The committee assesses the quality, scale and relevance of contributions targeting specific economic, social or cultural target groups, of advisory reports on policy, of contributions to public debates, and so on. The documentation provided as the basis for the assessment of societal relevance should make it possible to assess relevance to various sectors of society (i.e. business, the public sector, non-governmental organisations and civil society).

When relevant, the administrative units will be asked to link their contributions to national and international goals set for research, including the Norwegian Long-term Plan for Research and Higher Education and the UN Sustainable Development Goals. Sector-specific objectives, e.g. those described in the Development Agreements for the HEIs and other national guidelines for the different sectors, will be assessed as part of criterion 2.4.

The committee is also invited to assess the societal impact of research based on case studies submitted by the administrative units and/or other relevant data presented to the committee. Academic impact will be assessed as part of criterion 2.2.

3 Evaluation process and organisation

The RCN will organise the assessment process as follows:

- Commission a professional secretariat to support the assessment process in the committees and panels, as well as the production of self-assessments within each RPO
- Commission reports on research personnel and publications within life sciences based on data in national registries
- Appoint one or more evaluation committees for the assessment of administrative units.
- Divide the administrative units between the appointed evaluation committees according to sectoral affiliation and/or other relevant similarities between the units.
- Appoint a number of expert panels for the assessment of research groups submitted by the administrative units.
- Divide research groups between expert panels according to similarity of research subjects or themes.
- Task the chairs of the evaluation committees with producing a national-level report building on the assessments of administrative units and a national-level assessments produced by the expert panels.

Committee members and members of the expert panels will be international, have sufficient competence and be able, as a body, to pass judgement based on all relevant assessment criteria. The RCN will facilitate the connection between the assessment levels of panels and committees by appointing committee members as panel chairs.

3.1 Division of tasks between the committee and panel levels

The expert panels will assess research groups across institutions and sectors, focusing on the first two criteria specified in Chapter 2: 'Strategy, resources and organisation' and 'Research production and quality' The assessments from the expert panels will also be used as part of the evidence base for a report on Norwegian research within life sciences (see section 3.3).

The evaluation committees will assess the administrative units based on all the criteria specified in Chapter 2. The assessment of research groups delivered by the expert panels will be a part of the evidence base for the committees' assessments of administrative units. See figure 1 below.

The evaluation committee has sole responsibility for the assessments and any recommendations in the report. The evaluation committee reaches a judgement on the research based on the administrative units and research groups’ self-assessments provided by the RPOs, any additional documents provided by the RCN, and interviews with representatives of the administrative units. The additional documents will include a standardised analysis of research personnel and publications provided by the RCN.

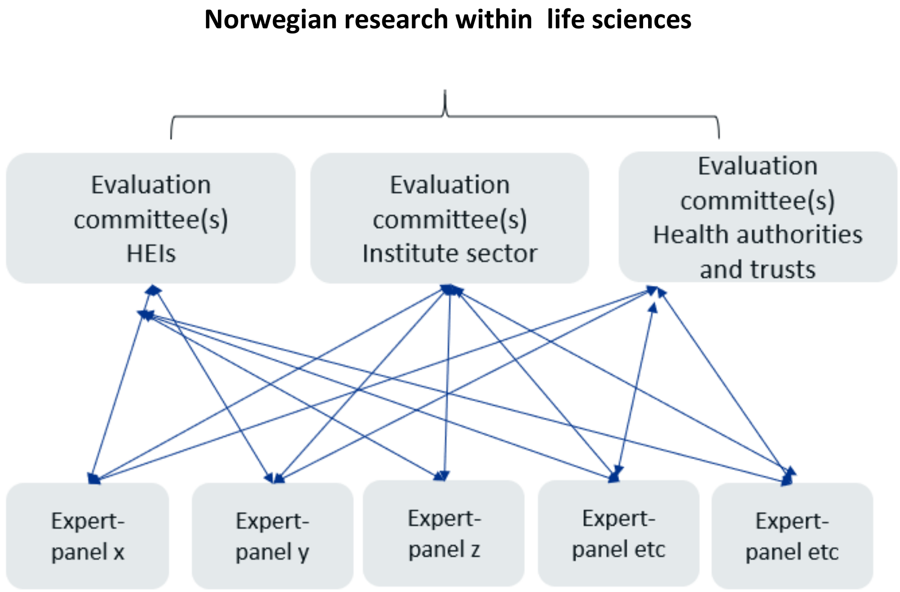

Figure 1. Evaluation committees and expert panels

The evaluation committee takes international trends and developments in science and society into account when forming its judgement. When judging the quality and relevance of the research, the committees shall bear in mind the specific tasks and/or strategic goals that the administrative unit has set for itself including sectoral purposes (see section 2.4 above).

3.2 Accuracy of factual information

The administrative unit under evaluation should be consulted to check the factual information before the final report is delivered to the RCN and the board of the institution hosting the administrative unit.

3.3 National level report

Finally, the RCN will ask the chairs of the evaluation committees to produce a national-level report that builds on the assessments of administrative units and the national-level assessments produced by the expert panels. The committee chairs will present their assessment of Norwegian research in life sciences at the national level in a separate report that pays specific attention to:

- Strengths and weaknesses of the research area in the international context
- The general resource situation regarding funding, personnel and infrastructure
- PhD training, recruitment, mobility and diversity
- Research cooperation nationally and internationally
- Societal impact and the role of research in society, including Open Science

This national-level assessment should be presented to the RCN.

Appendix A: Terms of References (ToR)

[Text in red to be filled in by the Research-performing organisations (RPOs)]

The board of [RPO] mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess [administrative unit] based on the following Terms of Reference.

Assessment
You are asked to assess the organisation, quality and diversity of research conducted by [administrative unit] as well as its relevance to institutional and sectoral purposes, and to society at large. You should do so by judging the unit's performance based on the following five assessment criteria (a. to e.). Be sure to take current international trends and developments in science and society into account in your analysis.

a) Strategy, resources and organisation
b) Research production, quality and integrity
c) Diversity and equality
d) Relevance to institutional and sectoral purposes
e) Relevance to society

For a description of these criteria, see Chapter 2 of the life sciences evaluation protocol. Please provide a written assessment for each of the five criteria. Please also provide recommendations for improvement. We ask you to pay special attention to the following [n] aspects in your assessment:

1. …
2. …
3. …
4. …

…

[To be completed by the board: specific aspects that the evaluation committee should focus on – they may be related to a) strategic issues, or b) an administrative unit's specific tasks.]

In addition, we would like your report to provide a qualitative assessment of [administrative unit] as a whole in relation to its strategic targets. The committee assesses the strategy that the administrative unit intends to pursue in the years ahead and the extent to which it will be capable of meeting its targets for research and society during this period based on available resources and competence. The committee is also invited to make recommendations concerning these two subjects.

Documentation
The necessary documentation will be made available by the life sciences secretariat at Technopolis Group.

The documents will include the following:

- a report on research personnel and publications within life sciences commissioned by RCN
- a self-assessment based on a template provided by the life sciences secretariat
- [to be completed by the board]

Interviews with representatives from the evaluated units
Interviews with the [administrative unit] will be organised by the evaluation secretariat. Such interviews can be organised as a site visit, in another specified location in Norway or as a video conference.

Statement on impartiality and confidence
The assessment should be carried out in accordance with the *Regulations on Impartiality and Confidence in the Research Council of Norway*. A statement on the impartiality of the committee members has been recorded by the RCN as a part of the appointment process. The impartiality and confidence of committee and panel members should be confirmed when evaluation data from [the administrative unit] are made available to the committee and the panels, and before any assessments are made based on these data. The RCN should be notified if questions concerning impartiality and confidence are raised by committee members during the evaluation process.

Assessment report
We ask you to report your findings in an assessment report drawn up in accordance with a format specified by the life sciences secretariat. The committee may suggest adjustments to this format at its first meeting. A draft report should be sent to the [administrative unit] and RCN]. The [administrative unit] should be allowed to check the report for factual inaccuracies; if such inaccuracies are found, they should be reported to the life sciences secretariat within the deadline given by the secretariat. After the committee has made the amendments judged necessary, a corrected version of the assessment report should be sent to the board of [the RPO] and the RCN after all feedback on inaccuracies has been received from [administrative unit].

Appendix B: Data sources

The lists below shows the most relevant data providers and types of data to be included in the evaluation. Data are categorised in two broad categories according to the data source: National registers and self-assessments prepared by the RFOs. The RCN will commission an analysis of data in national registers (R&D-expenditure, personnel, publications etc.) to be used as support for the committees' assessment of administrative units. The analysis will include a set of indicators related to research personnel and publications.

Data providers

- Norwegian Agency for Quality Assurance in Education (NOKUT)
- Research Council of Norway (RCN)
- Statistics Norway (SSB)
- Nordic institute for studies of innovation, research and education (NIFU)

Available data material

1) **Administrative unit**
    a. **Data from administrative units:**
        i. *Self-assessment covering all assessment criteria*
        ii. *Administrative data on funding sources*
        iii. *Administrative data on personnel*
        iv. *Administrative data on research infrastructure and other support structures*
        v. *SWOT analysis*
        vi. *Impact cases*
        vii. *Any supplementary data needed to assess performance related to the Terms of Reference, strategic goals and specific tasks of the unit*
    b. **Data from expert panels**
        i. *Panel report for each expert panel in the evaluation*
        ii. *Assessment reports per participating research group*
    c. **Data from National data providers**
        i. *Publication and citation analysis (NIFU)*
        ii. *Statistics for use in the evaluations (SSB)*
        iii. *The Norwegian Research System (NIFU)*
        iv. *Bibliometrics Higher Education Sector (NIFU)*
        v. *Bibliometrics Institute Sector (NIFU)*
        vi. *Bibliometrics Health Trusts (NIFU)?*
    d. **Data from the Research Council of Norway**
        i. *Research Council of Norway contribution to the evaluation (RCN)*
        ii. *Extract from the Survey of academic staff (NOKUT)*
        iii. *Extract of the Student Survey (NOKUT)*

2) Research groups

b. Data from the research groups

- i. *Self-assessment covering the first two assessment criteria (see Table 1)*
- ii. *Research group data on funding sources*
- iii. *Research group data on personnel*
- iv. *Publication profiles*
- v. *Example publications and other research results (databases, software etc.) The examples should be accompanied by an explanation of the groups' specific contributions to the result*
- vi. *Any supplementary data needed to assess performance related to the benchmark defined by the administrative unit*

c. Data from National data providers

- i. *Publication and citation analysis (NIFU)*

The table below shows how different types of evaluation data may be relevant to different evaluation criteria. Please note that the self-assessment produced by the administrative units in the form of a written account of management, activities, results etc. should cover all criteria. A template for the self-assessment of research groups and administrative units will be commissioned by the RCN from the life sciences secretariat for the evaluation.

Table 1. Types of evaluation data per criterion (changes may occur)

Criteria \ Evaluation units	**Research groups**	**Administrative units**
Strategy, resources and organisation	Self-assessment Data from National data providers	Self-assessment Terms of Reference Research groups assessment reports Data from National data providers and RCN
Research production and quality	Self-assessment Example publications (and other research results)	Self-assessment Expert panel reports Research groups assessment reports Data from National data providers and RCN
Diversity, equality and integrity		Self-assessment Expert panel reports Research groups assessment reports Data from National data providers and RCN
Relevance to institutional and sectoral purposes		Self-assessment Impact cases Data from National data providers and RCN
Relevance to society		Self-assessment Impact cases Data from National data providers and RCN
Overall assessment	*Data related to:* *Benchmark defined by administrative unit*	*Data related to:* *Strategic goals and specific tasks of the admin. unit*

Members of the National Committee of EVALMEDHELSE 2023-2024

Name	Title	Institution	Chair of committee
Falko Sniethotta	Professor	Medicine Mannheim, Germany	Higher Education Institution 1
Til Wykes	Professor dame	King´s College, UK	Higher Education Institution 2
Søren Brunak	Professor	University of Copenhagen, Denmark	Higher Education Institution 3
Anja Kumeich	Professor	Maastricht University, Netherland	Higher Education Institution 4
Ingalill Rahm Hallberg	Professor emerita	Lund University, Sweden	Institute sector
Johan Hallgren	Professor	University of Gothenburg, Sweden	Health Trust 1
Martin Ingvar	Professor	Karolinska Institutet, Sweden	Health Trust 2
Jørgen Frøkiær	Professor	Aarhus university, Denmark	Health Trust 3

Institution	**Administrativ unit**	**Name of research group**	**Panel group**	**Expert panel**
AHUS	AHUS	Cardiovascular Research Group	3b Clinical research	3b-2
AHUS	AHUS	Clinical mental health research group	5 Psychology	5a
AHUS	AHUS	Clinical Neuroscience Group	3b Clinical research	3b-1
AHUS	AHUS	Clinical radiology	3a Clinical research	3a-2
AHUS	AHUS	Department of Clinical Molecular Biology (EpiGen)	2 Molecular Biology	2c
AHUS	AHUS	HØKH	4 Public health	4c
AHUS	AHUS	Microbiology and Infectious diseases	2 Molecular Biology	2a
AHUS	AHUS	Obsteric and Gynecology research group	3a Clinical research	3a-1
AHUS	AHUS	Orthopedic Research Group	3b Clinical research	3b-3
AHUS	AHUS	Pediatric research group AHUS PAEDIA	3a Clinical research	3a-1
AHUS	AHUS	Surgical Research Group (SRG)	3a Clinical research	3a-1
AHUS	AHUS	Translational Cancer Research Group	3a Clinical research	3a-2
Cancer Registery	Cancer Registery of Norway	Cancer Registery	Group 4	4e
Diakonhjemmet Hospital	Center for Psychopharmacology	Center for Psychopharmacology	1 Physiology	1b
Diakonhjemmet Hospital	REMEDY	REMEDY	3b Clinical research	3b-3
Haukeland University Hospital	Haukeland University Hospital	Bergen Multiple Sclerosis Research Group	3b Clinical research	3b-1
Haukeland University Hospital	Haukeland University Hospital	Bergen respiratory research group	3b Clinical research	3b-2
Haukeland University Hospital	Haukeland University Hospital	Broegelmann Research Laboratory	3b Clinical research	3b-3

Haukeland University Hospital	Haukeland University Hospital	Cardiac markers	3b Clinical research	3b-2
Haukeland University Hospital	Haukeland University Hospital	DECODE-PD	3b Clinical research	3b-1
Haukeland University Hospital	Haukeland University Hospital	Endocrine Medicine	3b Clinical research	3b-3
Haukeland University Hospital	Haukeland University Hospital	Oncology	3a-Clinical research	3a-2
Haukeland University Hospital	Haukeland University Hospital	Renal research group	3b Clinical research	3b-2
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Internal medicine HMR	3b Clinical research	3b-3
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Neur-HMR	3b Clinical research	3b-1
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Obstetric and pediatric research group Ålesund	3a Clinical research	3a-1
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Oncology research group	3a Clinical research	3a-2
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Orthopaedic research HMR	3b Clinical research	3b-3
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Psyciatry	5 Psychology	5b
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	Radiology	3a Clinical research	3a-2
Helse Møre og Romsdal hospital trust	Helse Møre og Romsdal hospital trust	SUR-HMR	3b Clinical research	3b-1
Inland Norway University of Applied Sciences	Faculty of Social and Health Sciences	Critical Public Health Research Group	4 Public health	4a

Inland Norway University of Applied Sciences	Faculty of Social and Health Sciences	Health and Mastery in an Interdisciplinary Perspective	4 Public health	4a
Inland Norway University of Applied Sciences	Faculty of Social and Health Sciences	Trainome	1 Physiology	1a
Lovisenberg Diaconal Hospital	Lovisenberg Diaconal Hospital	ClinHealth	4 Public health	4d
Lovisenberg Diaconal Hospital	Lovisenberg Diaconal Hospital	MAGIC	4 Public health	4c
Lovisenberg Diaconal Hospital	Lovisenberg Diaconal Hospital	Psychiatric Genetic Epidemiology	4 Public health	4e
Martina Hansens Hospital	Martina Hansens Hospital	Martina Hansens Hospital Research group	3b Clinical research	3b-3
Modum Bad	Modum Bad	Modum Bad	5 Psychology	5a
Molde University College	Faculty of Health Sciences and Soial Care	Nursing	4 Public health	4d
Molde University College	Faculty of Health Sciences and Soial Care	Physiology	1 Physiology	1a
Møre ad RomsdalHospital trust	Stavanger University Hospital (SUH)	Breast Cancer Research Group	3a Clinical research	3a-2
NIH	Department of Physical Performance	Department of Physical Performance	4 Public health	4b
NIH	Department of Sports Medicine	Department of Sports Medicine	4 Public health	4b
NIPH	Centre for Fertility and Health	Centre for Fertility and Health	4 Public health	4e
NIPH	Division of Climate and Environmental Health	Chemistry toxiology(KMKT)	1 Physiology	1a
NIPH	Division of Climate and Environmental Health	Department of Air Quality and Noise	4 Public health	4b
NIPH	Division of Climate and Environmental Health	Department of food safety	4 Public health	4b
NIPH	Division of Health Services	Centre for Epidemic Interventions Research	4 Public health	4d
NIPH	Division of Health Services	Cluster for Health Services Services	4 Public health	4c

NIPH	Division of Health Services	Cluster for systematic reviwes and health technology assessment	4 Public health	4d
NIPH	Division of Health Services	Global health cluster	4 Public health	4d
NIPH	Division of Infection Control	Centre for Antimicrobial Resistance	4 Public health	4b
NIPH	Division of Infection Control	Department of Bacteriology	2 Molecular Biology	2a
NIPH	Division of Infection Control	Department of Virology	4 Public health	4b
NIPH	Division of Infection Control	Department of Infection control and Preparedness	4 Public health	4b
NIPH	Division of Infection Control	Department of Infection Control and Vaccines	4 Public health	4b
NIPH	Division of Infection Control	Department of Methods Development and Analytics	4 Public health	4b
NIPH	Division of Mental and Physical Health	Centre for Disease Burden	4 Public health	4e
NIPH	Division of Mental and Physical Health	Centre for Evaluation of Public Health Measures	4 Public health	4a
NIPH	Division of Mental and Physical Health	Child Health and Development	5 Psychology	5b
NIPH	Division of Mental and Physical Health	Childhood and Families	5 Psychology	5b
NIPH	Division of Mental and Physical Health	Department of Chronic Diseases	4 Public health	4e
NIPH	Division of Mental and Physical Health	Department of Health Promotion	4 Public health	4a
NIPH	Division of Mental and Physical Health	Mental Health and Suicide	5 Psychology	5b
NIPH	Division of Mental and Physical Health	Physical Health and Aging	4 Public health	4e
NIPH	Division of Mental and Physical Health	PsychGen	5 Psychology	5a
NORCE	Health and Social Sciences Division	Regional Centre for Child and Youth - Mental Health and welfare	5 Psychology	5b

Nord universitet	Faculty of Nursing and Health Sciences	Caring in Health Care	4 Public health	4d
Nord universitet	Faculty of Nursing and Health Sciences	Drug and drug management	4 Public health	4c
Nord universitet	Faculty of Nursing and Health Sciences	Epidemiologym Health- Care and Population - based studies	4 Public health	4c
Nord universitet	Faculty of Nursing and Health Sciences	Equitable Community Participation and Marginalised groups	4 Public health	4a
Nord universitet	Faculty of Nursing and Health Sciences	Ethics, relationships and actions in nursing and health sciences	4 Public health	4f
Nord universitet	Faculty of Nursing and Health Sciences	Mental Health	4 Public health	4a
NTNU	Department of Psychology	Adult Clinical Psychology	5 Psychology	5a
NTNU	Department of Psychology	CES	5 Psychology	5b
NTNU	Department of Psychology	EWeR	5 Psychology	5a
NTNU	Department of Psychology	Healthy workplaces	5 Psychology	5b
NTNU	Department of Psychology	Learning and skill development	5 Psychology	5b
NTNU	Department of Psychology	OPS	5 Psychology	5b
NTNU	Department of Psychology	TtiT	5 Psychology	5b
NTNU	Faculty of Medicine and Health Sciences	Anaesthesia and Emergency Medicine	3b Clinical research	3b-1
NTNU	Faculty of Medicine and Health Sciences	Centre for Care research	4 Public health	4c
NTNU	Faculty of Medicine and Health Sciences	Centre for Excellence in Molecular Inflammation Research (CEMIR)	2 Molecular Biology	2a
NTNU	Faculty of Medicine and Health Sciences	Circuits and Plasticity	1 Physiology	1b

NTNU	Faculty of Medicine and Health Sciences	Exercise, circulation and respiration	1 Physiology	1a
NTNU	Faculty of Medicine and Health Sciences	GeMS	3b Clinical research	3b-1
NTNU	Faculty of Medicine and Health Sciences	HUNT	4 Public health	4e
NTNU	Faculty of Medicine and Health Sciences	IMPACTS	4 Public health	4a
NTNU	Faculty of Medicine and Health Sciences	Integrative Neuroscience Group	2 Molecular Biology	2c
NTNU	Faculty of Medicine and Health Sciences	K.G. Jebsen Centre for Genetic Epidemiology	4 Public health	4e
NTNU	Faculty of Medicine and Health Sciences	MR Unit	3a Clinical research	3a-2
NTNU	Faculty of Medicine and Health Sciences	Musculosekeletal Research group	4 Public health	4d
NTNU	Faculty of Medicine and Health Sciences	NorHEAD	3b Clinical research	3b-1
NTNU	Faculty of Medicine and Health Sciences	NTNU Low Birth Weight in a lifetime perspective	3a Clinical research	3a-1
NTNU	Faculty of Medicine and Health Sciences	Regional Centre for Child and Youth	4 Public health	4a
NTNU	Faculty of Medicine and Health Sciences	Registry research for the health care services	4 Public health	4c
NTNU	Faculty of Medicine and Health Sciences	Research group for cancer and palliative care	3a Clinical research	3a-2
NTNU	Faculty of Medicine and Health Sciences	Sensory and Motor Systems	1 Physiology	1b
NTNU	Faculty of Medicine and Health Sciences	Space, time and memory	1 Physiology	1b
NTNU	Faculty of Medicine and Health Sciences	The ultrasound research group	3a Clinical research	3a-2
NTNU	Faculty of Medicine and Health Sciences	Unit of Laboratory medicine	2 Molecular Biology	2c
NTNU	Faculty of Medicine and health sciences	Women's health and PCOS	3a Clinical research	3a-1
OsloMet	Faculty of Health Sciences	(Re)habilitation - individual, services and socitey	4 Public health	4d

OsloMet	Faculty of Health Sciences	Acute critically ill and injured	4 Public health	4c
OsloMet	Faculty of Health Sciences	Ageing, Health and Welfare	4 Public health	4f
OsloMet	Faculty of Health Sciences	Applied and Experimental Behaviour Analysis in Clinical Practice	4 Public health	4f
OsloMet	Faculty of Health Sciences	Behavioral principles – from animal models to human cultures	5 Psychology	5b
OsloMet	Faculty of Health Sciences	CARE Research group	4 Public health	4a
OsloMet	Faculty of Health Sciences	Clinical Interventions and assistive Technology	3b Clinical research	3b-3
OsloMet	Faculty of Health Sciences	Disease and Environmental Exposures	2 Molecular Biology	2a
OsloMet	Faculty of Health Sciences	Empowerment	4 Public health	4a
OsloMet	Faculty of Health Sciences	Experimental Studies of Complex Human Behavior	4 Public health	4f
OsloMet	Faculty of Health Sciences	Genomics and Microbial Pathogens	2 Molecular Biology	2a
OsloMet	Faculty of Health Sciences	Intervention in work and everyday life	4 Public health	4a
OsloMet	Faculty of Health Sciences	Learning and interaction	4 Public health	4f
OsloMet	Faculty of Health Sciences	Medicines and Patient Safety	4 Public health	4c
OsloMet	Faculty of Health Sciences	Mental Health	5 Psychology	5b
OsloMet	Faculty of Health sciences	Midwifery science	3a Clinical research	3a-1
OsloMet	Faculty of Health Sciences	Musculosekeletal Health	4 Public health	4d
OsloMet	Faculty of Health Sciences	PublicHealthNutrition	4 Public health	4b
OsloMet	Faculty of Health Sciences	Quality of Life	4 Public health	4a

Østfold University College	Faculty of Health, Welfare and Organisation	Miliey therapy and higher education pedagogy	5 Psychology	5b
Østfold University College	Faculty of Health, Welfare and Organisation	Person-centered healthcare and the digital society	4 Public health	4d
Østfold University College	Faculty of Health, Welfare and Organisation	Psychosocial work research group	5 Psychology	5b
Østfold University College	Faculty of Health, Welfare and Organisation	The acute, critically ill patients	4 Public health	4d
Østfold University College	Faculty of Health, Welfare and Organisation	Welfare professions, digitalisation and work	4 Public health	4d
OUS	Division of Cancer Medicine	Department of Cancer Genetics	2 Molecular Biology	2c
OUS	Division of Cancer Medicine	Department of Cancer Immunology	2 Molecular Biology	2b
OUS	Division of Cancer medicine	Department of Haematology	3a Clinical research	3a-2
OUS	Division of Cancer Medicine	Department of Molecular Cell Biology	2 Molecular Biology	2b
OUS	Division of Cancer Medicine	Department of Molecular Oncology	2 Molecular Biology	2c
OUS	Division of Cancer medicine	Department of Oncology, medical physics and of gynecological oncology	3a Clinical research	3a-2
OUS	Division of Cancer Medicine	Department of Radiation Biology	2 Molecular Biology	2c
OUS	Division of Cancer Medicine	Department of Tumor Biology	2 Molecular Biology	2c
OUS	Division of Cancer medicine	Institute for cancer genetics and informatics	3a Clinical research	3a-2
OUS	Division of Cardiovascular and pulmonary diseases	Dept of Cardiology	3b Clinical research	3b-2
OUS	Division of Cardiovascular and pulmonary diseases	IEMR	3b Clinical research	3b-2
OUS	Division of Cardiovascular and pulmonary diseases	Institute for Surgical Research	3b Clinical research	3b-2
OUS	Division of Cardiovascular and pulmonary diseases	TKA	3b Clinical research	3b-2
OUS	Division of Clinical Neuroscience	DivNeuroscience	3b Clinical research	3b-1

OUS	Division of Emergency and Crititical Care	DECC	3b Clinical research	3b-1
OUS	Division of Gynaecology and Obstetrics	MatFetInt	3a Clinical research	3a-1
OUS	Division of Gynaecology and Obstetrics	NorWH	3a Clinical research	3a-1
OUS	Division of Gynaecology and Obstetrics	ResCOG- FFK	3a Clinical research	3a-1
OUS	Division of head, neck and reconstructive surgery (HHA)	Department of Ophthalmology	3a Clinical research	3a-1
OUS	Division of Laboratory Medicine	Department of Forensic Sciences	1 Physiology	1b
OUS	Division of Laboratory Medicine	Department of Immunology	2 Molecular Biology	2a
OUS	Division of Laboratory Medicine	Department of Medical Biochemistry	2 Molecular Biology	2b
OUS	Division of Laboratory Medicine	Department of Medical Genetics	2 Molecular Biology	2c
OUS	Division of Laboratory Medicine	Department of Microbiology	2 Molecular Biology	2a
OUS	Division of Laboratory Medicine	Department of Pathology	2 Molecular Biology	2b
OUS	Division of Laboratory Medicine	Department of pharmacology	1 Physiology	1b
OUS	Division of Medicine	Department of digital health research	4 Public health	4d
OUS	Division of Medicine	Dept Endocrinology	3b Clinical research	3b-2
OUS	Division of Medicine	Dept. of infectious diseases	3b Clinical research	3b-3
OUS	Division of Medicine	MED_GER	3b Clinical research	3b-1
OUS	Division of Medicine	Oslo renal research group & acute medicine research group	3b Clinical research	3b-2
OUS	Division of Medicine	Oslo-CCHR	3b Clinical research	3b-2
OUS	Division of Medicine	Research group for gastroenterology	3b Clinical research	3b-3

OUS	Division of Medicine	The research group for experimental and clinical respiratory medicine	3b Clinical research	3b-2
OUS	Division of Mental Health and Addiction	Child and Adolesecent Mental Health Services	5 Psychology	5a
OUS	Division of Mental Health and Addiction	Eating Disorders Research Group	5 Psychology	5a
OUS	Division of Mental Health and Addiction	National Centre for Suicide Research and Prevention	5 Psychology	5b
OUS	Division of Mental Health and Addiction	Norwegian Centre for Mental Disorders Research	5 Psychology	5a
OUS	Division of Mental Health and Addiction	Personality Psychiatry	5 Psychology	5a
OUS	Division of Mental Health and Addiction	Psychotherapy	5 Psychology	5a
OUS	Division of Mental Health and Addiction	Section for clinical addiction research	5 Psychology	5a
OUS	Division of Mental Health and Addiction	SERAF	5 Psychology	5a
OUS	Division of Paediatric and Adolescent Medicine	Division of Paediatric and Adolescent Medicine	3a Clinical research	3a-1
OUS	Division of Preshospital Services	Prehospital Research Grup	3b Clinical research	3b-1
OUS	Division of Radiology and nuclear medicine	Division of Radiology and Nuclear Medicine	3a Clinical research	3a-2
OUS	Division of Surgery, Inflammatory Diseases and Transplantation	Translational Research Group	2 Molecular Biology	2c
OUS	Division of Surgery, Inflammatory Diseases and Transplantation	RHI	3b Clinical research	3b-3
OUS	Division of Surgery, Inflammatory Diseases and Transplantation	Surgial research group	3b Clinical research	3b-3
OUS	Division of Surgery, Inflammatory Diseases and Transplantation	Transplantation medicine	3b Clinical research	3b-2

OUS	Division of technology and Innovation	The intervention centre	3a Clinical research	3a-2
RBUP Eastern and Southern Norway	RBUP Eastern and Southern Norway	RBUP Eastern and Southern Norway	4 Public health	4d
St. Olavs Hospital	St. Olavs Hospital	BRACT	1 Physiology	1b
St. Olavs Hospital	St. Olavs Hospital	CAG-IBD	3b Clinical research	3b-3
St. Olavs Hospital	St. Olavs Hospital	CAG-Multiple myeloma center	3a Clinical research	3a-2
St. Olavs Hospital	St. Olavs Hospital	Centre for obesity research and innovation	3b Clinical research	3b-2
St. Olavs Hospital	St. Olavs Hospital	NorHEAD	3b Clinical research	3b-1
St. Olavs Hospital	St. Olavs Hospital	Research group for Occupational Medicine	4 Public health	4f
St. Olavs Hospital	St. Olavs Hospital	Trondheim sleep and chronobiology research group	5 Psychology	5a
St. Olavs Hospital	St. Olavs Hospital	Warning Signs and treatment of acute suicide risk in psychiatric chrises	5 Psychology	5a
St. Olavs Hospital	St. Olavs Hospital	Children's and Women's health	3a Clinical research	3a-1
STAMI	STAMI	STAMI	4 Public health	4f
Stavanger University Hospital	Stavanger University Hospital	Breast Cancer Research Group	3a Clinical research	3a-2
Stavanger University Hospital	Stavanger University Hospital	Cardilogy research group	3b Clinical research	3b-2
Stavanger University Hospital	Stavanger University Hospital	Centre for Alchol and Drug Research	5 Psychology	5b
Stavanger University Hospital	Stavanger University Hospital	Clinical Immunology	3b Clinical research	3b-1
Stavanger University Hospital	Stavanger University Hospital	NCMD	3b Clinical research	3b-1
Stavanger University Hospital	Stavanger University Hospital	Nursing and Health care	4 Public health	4d

Stavanger University Hospital	Stavanger University Hospital	SAFER Births - Forskningsgruppe for simulering	4 Public health	4d
Stavanger University Hospital	Stavanger University Hospital	SESAM	5 Psychology	5a
Stavanger University Hospital	Stavanger University Hospital	TIPS	5 Psychology	5a
SunnaasRehabilitation Hospital	Department of Research	Department of Research	3b Clinical research	3b-1
UiA	Faculty of Health and Sport Sciences	Centre for e-health	4 Public health	4a
UiA	Faculty of Health and Sport Sciences	Health and Quality of life in a family perspective	4 Public health	4a
UiA	Faculty of Health and Sport Sciences	Physical activity and Health across the LifeSpan	4 Public health	4b
UiA	Faculty of Health and Sport Sciences	Priority Research Centre for Lifecourse Nutrition	4 Public health	4a
UiB	Department of Biomedicine	Basic and Translational Neuroscience	1 Physiology	1b
UiB	Department of Biomedicine	Cardiovaskular research	1 Physiology	1a
UiB	Department of Biomedicine	Metabolism and Cancer Unit	2 Molecular Biology	2c
UiB	Department of Biomedicine	Structural biology and drug discovery	2 Molecular Biology	2b
UiB	Department of Biomedicine	Systems Biology and Translational Cell Signaling	2 Molecular Biology	2c
UiB	Department of Biomedicine	Translational Cancer Research	2 Molecular Biology	2c
UiB	Department of Clinical Science I	Bergen Multiple Sclerosis Research Group	3b Clinical research	3b-1
UiB	Department of Clinical Science I	Centre for Cancer Biomarkers	3a Clinical research	3a-2
UiB	Department of Clinical Science I	DECODE-PD	3b Clinical research	3b-1
UiB	Department of Clinical Science I	Renal research group	3b Clinical research	3b-2
UiB	Department of Clinical Science I	Section of Nutrition	4 Public health	4b

UiB	Department of Clinical Science II	Research group for infection and microbiology	3b Clinical research	3b-3
UiB	Department of Clinical Science II	Bergen respiratory research group	3b Clinical research	3b-2
UiB	Department of Clinical Science II	Broegelmann Research Laboratory	3b Clinical research	3b-3
UiB	Department of Clinical Science II	Centre for pharmacy	1 Physiology	1b
UiB	Department of Clinical Science II	Mohn Center for diabetes precision medicine	3b Clinical research	3b-2
UiB	Department of Clinical Science II	Oncology	3a-Clinical research	3a-2
UiB	Department of Clinical Science II	Paediatric Follow-up Group	3a Clinical research	3a-1
UiB	Department of Clinical Science II	Precision Oncology	3a Clinical research	3a-2
UiB	Department of Clinical Science II	TOR	1 Physiology	1a
UiB	Department of Global Public Health and Primary Care	BCEPS	4 Public health	4c
UiB	Department of Global Public Health and Primary Care	Centre for international health	4 Public health	4f
UiB	Department of Global Public Health and Primary Care	Section for general practice	4 Public health	4f
UiB	Department of Global Public Health and Primary Care	Section for epidemiology and medical statistics	4 Public health	4e
UiB	Faculty of Psychology	Addiction Research Group	4 Public health	4a
UiB	Faculty of Psychology	Bergen Bullying Research Group	4 Public health	4f
UiB	Faculty of Psychology	Bergen fMRI-group	5 Psychology	5a
UiB	Faculty of Psychology	Bergen sleep and chronobiology network	4 Public health	4f
UiB	Faculty of Psychology	DICE	5 Psychology	5b
UiB	Faculty of Psychology	Grief, Trauma and Seroius somatic illness	4 Public health	4c

UiB	Faculty of Psychology	Operational psychology research group	4 Public health	4f
UiB	Faculty of Psychology	Public mental Health	4 Public health	4a
UiB	Faculty of Psychology	Research Group for Clinical Psychology	5 Psychology	5a
UiB	Faculty of Psychology	Social Influence Processes on Adolescent Health	4 Public health	4a
UiB	Faculty of Psychology	Society and Workplace Diversity group	4 Public health	4a
UiO	Department of Pharmacy	Medicinal Chemistry	1 Physiology	1b
UiO	Department of Pharmacy	Pharmaceutical Analytical Chemistry	1 Physiology	1b
UiO	Department of Pharmacy	Pharmaceutical micobiology and immunity	2 Molecular Biology	2a
UiO	Department of Pharmacy	Pharmaceutics	1 Physiology	1b
UiO	Department of Pharmacy	Pharmacognosi	1 Physiology	1b
UiO	Department of Pharmacy	Pharmacology	1 Physiology	1a
UiO	Department of Pharmacy	PharmaSafe - PharmacoEpidemiology & Drug Safety research group	4 Public health	4e
UiO	Department of Psychology	Centre for Lifespan Changes in Brain and Cognition	5 Psychology	5a
UiO	Department of Psychology	Clinical Psychology	5 Psychology	5a
UiO	Department of Psychology	Cognitive and Clinical Neuroscience	5 Psychology	5a
UiO	Department of Psychology	HUP	5 Psychology	5b
UiO	Department of Psychology	MAKS	5 Psychology	5b
UiO	Department of Psychology	PROMENTA	5 Psychology	5b
UiO	Faculty of Dentistry	Biomat	1 Physiology	1a

UiO	Faculty of Dentistry	Oral physiology and cancer research group	1 Physiology	1a
UiO	Faculty of dentistry	Understanding salivary gland function	3a Clinical research	3a-1
UiO	Institute of Basic Medical Sciences	Cardiovascular physiology	1 Physiology	1a
UiO	Institute of Basic Medical Sciences	Chromatin biology	2 Molecular Biology	2b
UiO	Institute of Basic Medical Sciences	Clinical Nutrition	3b Clinical research	3b-2
UiO	Institute of Basic Medical Sciences	Department of Behavioural Medicine	4 Public health	4f
UiO	Institute of Basic Medical Sciences	Hybrid Technology Hub Centre of Excellence	2 Molecular Biology	2b
UiO	Institute of Basic Medical Sciences	Immunobiology	2 Molecular Biology	2b
UiO	Institute of Basic Medical Sciences	Membrane dynamics	2 Molecular Biology	2b
UiO	Institute of Basic Medical Sciences	Molecular Nutrition	2 Molecular Biology	2b
UiO	Institute of Basic Medical Sciences	Neuroanatomy	1 Physiology	1b
UiO	Institute of Basic Medical Sciences	Neurophysiology	1 Physiology	1b
UiO	Institute of Basic Medical Sciences	Nutritional epidemiology	4 Public health	4b
UiO	Institute of Basic Medical Sciences	Oslo Centre for Biostatistics and Epidemiology	4 Public health	4e
UiO	Institute of Health and Society	Centre for Medical Ethics	4 Public health	4c
UiO	Institute of Health and Society	Department for Interdisciplinary Health Sciences	4 Public health	4a
UiO	Institute of Health and Society	Department of Community Medicine and Global Health	4 Public health	4f
UiO	Institute of Health and Society	Department of General Practice	4 Public health	4f

UiO	Institute of Health and Society	Department of Health Management and Health Economics	4 Public health	4c
UiO	Institute of Health and Society	Department of Public Health Science	4 Public health	4f
UiO	NCMM	NCMM	2 Molecular Biology	2b
UiS	Faculty of Health Sciences	Centre for Resilence in Health Care	4 Public health	4c
UiS	Faculty of Health Sciences	Health promotion and innovative approaches for sistainable health services	4 Public health	4a
UiS	Faculty of Health Sciences	Life Phenomena and Caring	4 Public health	4f
UiS	Faculty of Health Sciences	Participation in school, working life and treatment	4 Public health	4f
UiS	Faculty of Health Sciences	Professional relations in health and welfare	4 Public health	4f
UiT	Department of clinical dentistry	Oral health research group	3a Clinical research	3a-1
UiT	Department of Clinical Medicine	Brain and Circulation Research Group	3b Clinical research	3b-1
UiT	Department of Clinical Medicine	Cardiovascular research group, clinical	3b Clinical research	3b-2
UiT	Department of Clinical Medicine	Psychiatry Research Group	5 Psychology	5a
UiT	Department of Clinical medicine	Research group for child and adolescent health	3a Clinical research	3a-1
UiT	Department of Clinical Medicine	Thrombosis Research Group	3b Clinical research	3b-2
UiT	Department of Community Medicine	Epidemiology of Chronic disease	4 Public health	4e
UiT	Department of Community Medicine	Health Services Research	4 Public health	4c
UiT	Department of Community Medicine	System Epidemiology	4 Public health	4c
UiT	Department of Health and Care Sciences	Centre for Care research North	4 Public health	4c

UiT	Department of Health and Care Sciences	Healthcare Professional Practice	4 Public health	4d
UiT	Department of Health and Care Sciences	Public Health and Rehabilitation	4 Public health	4f
UiT	Department of Health and Care Sciences	Research group for health and professional education	4 Public health	4f
UiT	Department of Health and Care Sciences	Rural and Remote Nursing and Healthcare in Arctic and North-Sàmi Area	4 Public health	4d
UiT	Department of Medical Biology	Autophagy Research Group	2 Molecular Biology	2b
UiT	Department of Medical Biology	Cardiovascular Research Group	1 Physiology	1a
UiT	Department of Medical Biology	Centre for Forensic Genetics	2 Molecular Biology	2a
UiT	Department of Medical Biology	Host-Microbe Interaction	2 Molecular Biology	2a
UiT	Department of Medical Biology	Immunology Research Group	2 Molecular Biology	2b
UiT	Department of Medical Biology	Pharmacology and Toxicology	2 Molecular Biology	2b
UiT	Department of Medical Biology	RNA and Molecular Pathology	2 Molecular Biology	2c
UiT	Department of Medical Biology	Translational Cancer Research Group	2 Molecular Biology	2c
UiT	Department of Medical Biology	Tumor Biology Research Group	2 Molecular Biology	2c
UiT	Department of Medical Biology	Vascular Biology Research Group	1 Physiology	1a
UiT	Department of Pharmacy	Cell Signalling and Targeted Therapy	2 Molecular Biology	2b
UiT	Department of Pharmacy	Drug Transport and Delivery	1 Physiology	1b
UiT	Department of Pharmacy	Identification and prevention of suboptimal medicine use	4 Public health	4e

UiT	Department of Pharmacy	MicroPop-Microbial Pharmacology and Population Biology	2 Molecular Biology	2a
UiT	Department of Pharmacy	Natural products and medicinal chemistry	1 Physiology	1b
UiT	Department of Psychology	Behavioral and Translational Neuroscience	1 Physiology	1b
UiT	Department of Psychology	Behavioral, aging and dementia	5 Psychology	5a
UiT	Department of Psychology	Clinical Psychology	5 Psychology	5a
UiT	Department of Psychology	Cognitive neuroscience	5 Psychology	5a
UiT	Department of Psychology	Cognitive neuroscience	5 Psychology	5b
UiT	Department of Psychology	Health psychology	5 Psychology	5b
UiT	Department of Psychology	Human factors in high risk environments CARE	5 Psychology	5b
UiT	Department of Psychology	Social Psychology	5 Psychology	5b
UiT	Department of Social Education	The Artic Centre for Welfare and Disability Research	4 Public health	4f
UiT	Institute of Clinical Medicine (ICM) and Institute of medical biology (IMB)	Translational Cancer Research Group	3a Clinical research	3a-2
UiT	Regional Centre for Child and Youth Mental Health and Child Welfare	Evidence-Based Practice	5 Psychology	5b
UiT	Regional Centre for Child and Youth Mental Health and Child Welfare	Preventive and health promoting interventions	5 Psychology	5b
UiT	School of Sport Sciences	School of Sport Sciences	4 Public health	4b
UiT	Department of Health and Care Sciences	Life courage and life promoting phenomena	4 Public health	4a

Western Norway University of Applied Sciences	Faculty of Health and Social Sciences	Comparative Services Research	4 Public health	4c
Western Norway University of Applied Sciences	Faculty of Health and Social Sciences	DiaBEST	4 Public health	4c
Western Norway University of Applied Sciences	Faculty of Health and Social Sciences	Mental health and substance buse	4 Public health	4a
Western Norway University of Applied Sciences	Faculty of Health and Social Sciences	Personlised health services	4 Public health	4d

Scales for research group assessment

Organisational dimension

Score	Organisational environment
5	An organisational environment that is outstanding for supporting the production of excellent research.
4	An organisational environment that is very strong for supporting the production of excellent research.
3	An organisational environment that is adequate for supporting the production of excellent research.
2	An organisational environment that is modest for supporting the production of excellent research.
1	An organisational environment that is not supportive for the production of excellent research.

Quality dimension

Score	Research and publication quality	Score	Research group's contribution Groups were invited to refer to the Contributor Roles Taxonomy in their description https://credit.niso.org/
5	Quality that is outstanding in terms of originality, significance and rigour.	5	The group has played an outstanding role in the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication.
4	Quality that is internationally excellent in terms of originality, significance and rigour but which falls short of the highest standards of excellence.	4	The group has played a very considerable role in the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication.
3	Quality that is recognised internationally in terms of originality, significance and rigour.	3	The group has a considerable role in the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication.
2	Quality that meets the published definition of research for the purposes of this assessment.	2	The group has modest contributions to the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication.
1	Quality that falls below the published definition of research for the purposes of this assessment.	1	The group or a group member is credited in the publication, but there is little or no evidence of contributions to the research process from the formulation of overarching research goals and aims via research activities to the preparation of the publication.

Societal impact dimension

Score	Research group's societal contribution, taking into consideration the resources available to the group	Score	User involvement
5	The group has contributed extensively to economic, societal and/or cultural development in Norway and/or internationally.	5	Societal partner involvement is outstanding – partners have had an important role in all parts of the research process, from problem formulation to the publication and/or process or product innovation.
4	The group's contribution to economic, societal and/or cultural development in Norway and/or internationally is very considerable given what is expected from groups in the same research field.	4	Societal partners have very considerable involvement in all parts of the research process, from problem formulation to the publication and/or process or product innovation.
3	The group's contribution to economic, societal and/or cultural development in Norway and/or internationally is on par with what is expected from groups in the same research field.	3	Societal partners have considerable involvement in the research process, from problem formulation to the publication and/or process or product innovation.
2	The group's contribution to economic, societal and/or cultural development in Norway and/or internationally is modest given what is expected from groups in the same research field.	2	Societal partners have a modest part in the research process, from problem formulation to the publication and/or process or product innovation.
1	There is little documentation of contributions from the group to economic, societal and/or cultural development in Norway and/or internationally.	1	There is little documentation of societal partners' participation in the research process, from problem formulation to the publication and/or process or product innovation.

Panel group	**Description**	**Panel number**
Panel group 1 PHYSIOLOGY Physiology-related Disciplines (human physiology), including corresponding translational research	Anatomy, physiology, neurobiology, toxicology, pharmacology, embryology, nutritional physiology, pathology, basic odontological research	Panel 1a Panel 1b
Panel group 2 MOLECULAR BIOLOGY including corresponding translational research	Microbiology, immunology, cell biology, biochemistry, molecular biology, genetics, genomics, biotechnology including bioinformatics	Panel 2a Panel 2b Panel 2c
Panel group 3a CLINICAL RESEARCH	All surgery, anaesthesiology, oncology, physical medicine and rehabilitation, gynaecology, paediatrics, dermatology and venereology, ophthalmology, otolaryngology and all clinical odontology	Panel 3a_1 Panel 3b_2
Panel group 3b CLINICAL RESEARCH	All internal medicine (cardiology, nephrology/urology, gastroenterology, endocrinology, haematology, infectious diseases, respiratory tract diseases, geriatric medicine), neurology, rheumatology, radiology and medical imaging and other clinical medical disciplines	Panel 3b_1 Panel 3b_2
Panel group 4 PUBLIC HEALTH Public Health and Health-related Research	Public health, community dentistry and community nutrition. Epidemiology and medical statistics. Health services research, preventive medicine, nursing research, physiotherapy, professional research, occupational medicine, behavioral research and ethics, other health-related research	Panel 4a Panel 4b Panel 4c Panel 4d Panel 4e Panel 4f
Panel group 5 PSYCHOLOGY Psychology and Psychiatry	Clinical psychology, social-, community- and workplace psychology, organizational psychology, personality psychology, developmental psychology, cognitive psychology, biological psychology and forensic psychology. Psychiatry, including geriatric psychiatry, child and adolescent psychiatry, biological psychiatry, and forensic psychiatry	Panel 5a Panel 5b

Norges forskningsråd
Besøksadresse: Drammensveien 288
Postboks 564
1327 Lysaker

Telefon: 22 03 70 00
Telefaks: 22 03 70 01

post@forskningsradet.no
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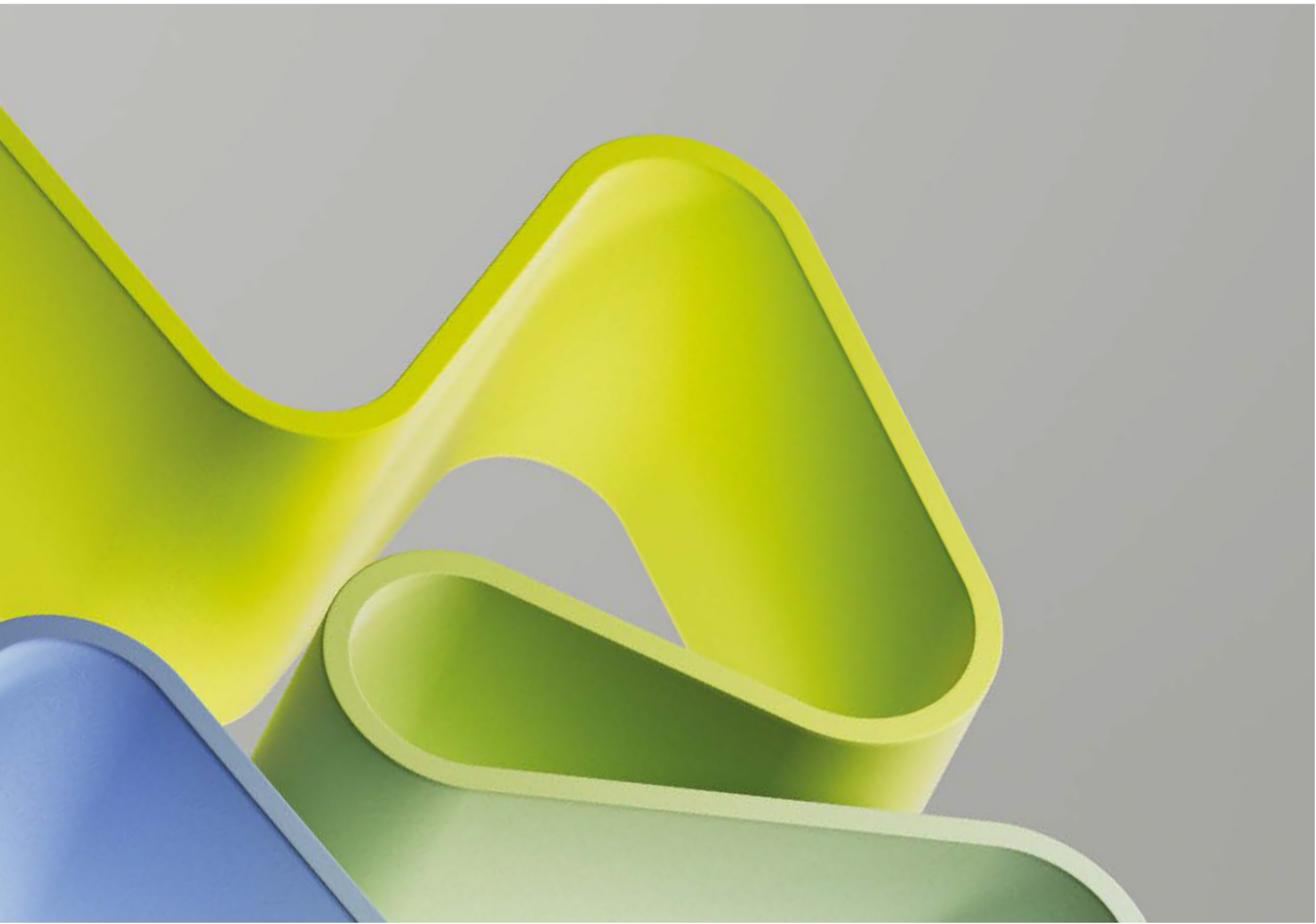
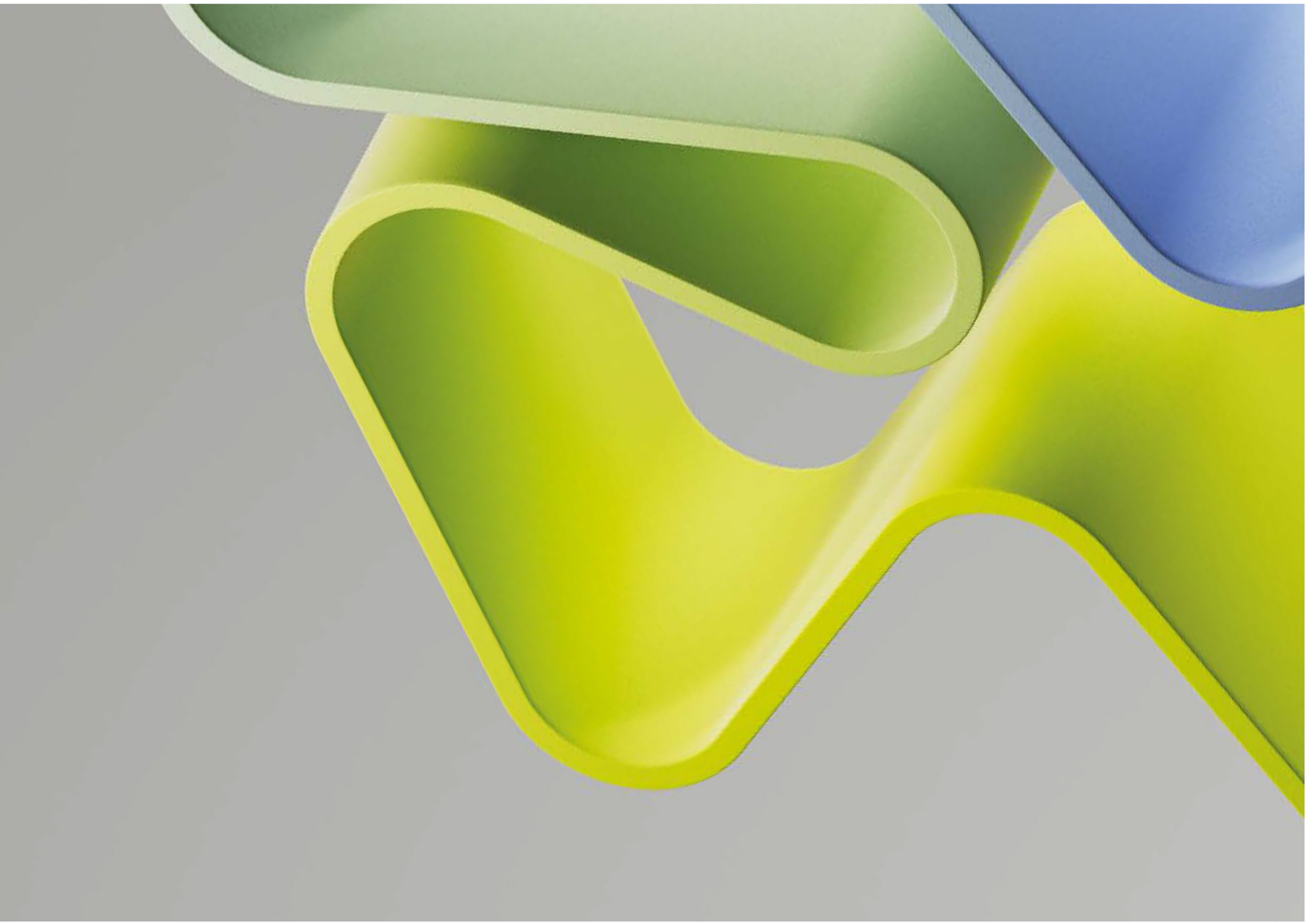


The Research Council of Norway

National report

Evaluation of Mathematics, ICT and Technology in Norway 2023-2024

March 2025



Contents

Preface by the Research Council of Norway

The Research Council of Norway (RCN) has been commissioned by the Ministry of Education and Research to perform subject-specific evaluations of all scientific disciplines every ten years. In the period 2022-2025 two evaluations have been carried out: one in natural sciences (EVALNAT) and one in mathematics, ICT and technology (EVALMIT).

The primary aim of the evaluations is to identify and confirm the quality and the relevance of research performed at Norwegian Higher Education Institutions (HEIs) and across the Research Institute Sector. The reports offer an overall assessment of the state of the research in the ten-year period 2012-2022 as well as providing recommendations for future development of the research disciplines.

The evaluations were carried out by international peers with reference to an evaluation protocol describing the evaluation process and the assessment criteria (Appendix 3). The national report for the evaluation of Norwegian research in Natural Sciences 2022 – 2024 was published in March 2024 (https://www.forskningsradet.no/siteassets/publikasjoner/2024/evalnat/justert-evalnat-national-report-final-march-2025.pdf).

Each evaluation has been done at three levels; research groups, administrative units and national level. In the evaluation of Mathematics, ICT and Technology, 248 research groups were evaluated by 15 expert panels divided by subjects and disciplines within the research fields across sectors. Thereafter, five evaluation committees were established to evaluate the 56 participating administrative units (faculty/institute/department/centre). The assessments and recommendations from the evaluation committees are compiled in 56 reports. These reports give important input to the individual administrative units. Each administrative unit has a responsibility to follow up on the recommendations provided in their evaluation unit report. Seven international experts including the chairs of the five evaluation committees constitute the National Evaluation Committee which was requested to compile a report based on the assessments and recommendations from the 56 independent evaluation unit reports. The national report will be used by the Research Council in developing national funding schemes in dialogue with the ministries and the evaluated institutions/units

The national reports pay specific attention to:

• Strengths and weaknesses of the research area in the international context

• The general resource situation regarding funding, personnel, and infrastructure

• Ph.D. training, recruitment, mobility, and diversity

• Research cooperation nationally and internationally

• Societal impact and the role of research in society, including Open Science

Oslo March 2025

Composition of the National Committee for evaluation of Mathematics, ICT and Technology research

This report offers an overall assessment of the state of mathematics, ICT and technology research in Norway and presents recommendations for future development of the research disciplines. All committee members support the conclusions and recommendations in the report.

Professor **Krikor B Ozanyan** (chair)
University of Manchester

Professor **Deborah Greaves**
University of Plymouth

Professor **Claudio Mazzotti**
University of Bologna

Professor **Jan S Hesthaven**
Karlsruhe Institute of Technology

Professor **PM Sarro**
Delft University of Technology

Professor **Rebecka Jörnsten**
University of Gothenburg

Professor **Bo Wahlberg**
KTH Royal Institute of Technology, Sweden

Dr **Erik Arnold**, Senior Partner, Technopolis Group, was the secretary to the committee.

Summary

This report, authored by an international committee of scientific experts, reports the national-level results of the 2023-25 evaluation of Mathematics, ICT and Technology (engineering) research in Norway (EVALMIT) and makes recommendations for its future development. It builds on 15 panel evaluations of 248 research groups, which in turn contributed to 56 evaluations in administrative units such as university departments and research institutes. EVALMIT is one of four large field evaluations carried out in Norway in 2023-2025. The other three covered Natural Sciences (EVALNAT), Life Sciences (EVALBIOVIT) and Medicine and Health (EVALMEDHELSE).

The MIT fields (Mathematics, ICT and Technology) receive the biggest part of Norwegian state investment in research. RCN invested just under NOK 4bn in the fields of Mathematics, ICT and Technology (MIT) in 2022. Norwegian business R&D focuses in 5 branches – computing and electronics, machine-building, the petroleum, coal and chemical industries, metal products, food and drink. The first three branches are significantly dependent on the predominantly applied research in scope to EVALMIT. The research is needed not only to support Norway's competitiveness, but also the green and digital transitions and to maintain important scientific and industrial capabilities and security in an increasingly fraught global context.

The MIT fields are very broad. Norwegian research is solid overall, and tends to be specialised in nationally-important niches, where there is strong interaction with industry and where the quality of the research is generally high. In Mathematics, the older universities tend to have the strongest pure mathematics and statistics research groups, while institutes are more important in driving societal impact in applied mathematics. ICT comprises many sub-fields, with SINTEF and NTNU often taking leading roles in research, but there are also strong groups in the colleges and newer universities. The traditional universities tend to focus more on natural sciences than technology, but nonetheless have some strong ICT groups. 'Technology' covers a range of sub-fields at least as broad as ICT, but its specialisations are more clearly defined by their high relevance to longer-standing branches of industry, notably marine, energy, oil and construction. As in ICT, the development of this newer industry has provided more opportunities for newer colleges and universities. The combination of strong research and close industrial contact that is co-produced, for example, by NTNU and SINTEF is powerful in many parts of MIT.

Successful research groups tend to be larger than less successful ones, do high-quality applied research, have close interaction with industry and focus their research on identified industrial needs. They are members of international networks, especially through participation in the EU Framework Programme. Successful approaches are often interdisciplinary.

There is a good level of external funding across MIT, primarily from RCN. The EU Framework Programme is the second-biggest source, and enhancing this would both make funding more sustainable and help more Norwegian research groups to enter international networks, learn, develop and grow.

While the applied industrial focus of MIT research is key to societal impact, it needs to build on a greater amount of fundamental research to maintain competence and the capacity to innovate. The mathematical sciences provide one of the intellectual cornerstones for all three MIT fields and need to be part of this fundamental research effort.

A generation of senior researchers is approaching retirement age, presenting an opportunity to evolve research agendas in response to new needs and reduce the risks of lock-in to the needs of an established industry structure. Seizing this opportunity requires increased capacity to design and deploy strategies at research-group level that address change and renewal. More new blood is needed also among early- and mid-career researchers to increase research and PhD production.

The amount and quality of research infrastructure available to Norwegian MIT researchers is very good, providing a sound basis not only for implementing current research ambitions but also being attractive partners in international collaborative research.

Gender inequality is slowly reducing. The implications of ethnic and cultural diversity in a research community with a strong and increasing proportion of people with non-Norwegian origins requires more exploration.

A short summary of the committee recommendations:

- Increase the ability of Norwegian MIT research to react to and initiate change in a timely way, in response to changes in technology and needs; create new research capacity at significant scale where needed, for example in catching up in the field of AI
- Safeguard the foundations of MIT by increasing support to fundamental research, especially in Mathematics, without reducing the effort in applied work
- Review national aims with respect to increasing the research-intensiveness of newer parts of the higher education system, and establish mechanisms such as ‘pairings’ between new and established institutions and research groups to strengthen capacity
- Continue and strengthen the policy aim to increase participation in the EU Framework Programme
- Review the effectiveness of policies to reduce gender inequality in research to date and reduce gender inequality through career support to female researchers; investigate the policy implications of increasing recruitment into the research community from abroad

Sammendrag

Denne rapporten, som er utarbeidet av en internasjonal komité av vitenskapelige eksperter, gir en evaluering av matematikk, IKT og teknologi (ingeniør) forskning i Norge (EVALMIT) på nasjonalt nivå og gir anbefalinger for fagenes fremtidige utvikling. Den bygger på 15 panelevalueringer av 248 forskningsgrupper, som igjen bidro til 56 evalueringer av administrative enheter ved universiteter, høyskoler og forskningsinstitutter. EVALMIT er en av fire store fagvalueringer utført i Norge i 2023-2025. De tre andre dekket Naturvitenskap (EVALNAT), Biovitenskap (EVALBIOVIT) og Medisin og helse (EVALMEDHELSE)

MIT-feltet (matematikk, IKT og teknologi) mottar den største delen av norske statlige investeringer i forskning. Forskningsrådet investerte i underkant av 4 milliarder kroner i fagene matematikk, IKT og teknologi (MIT) i 2022. Norsk næringslivs FoU fokuserer på 5 grener – databehandling og elektronikk, maskinbygging, petroleums-, kull- og kjemisk industri, metallprodukter, mat og drikke. De tre første grenene er betydelig avhengig av den overveiende anvendte forskningen i omfang til EVALMIT. Forskningen trengs ikke bare for å støtte Norges konkurranseevne, men også for de grønne og digitale omstillingene,og for å opprettholde viktige vitenskapelige og industrielle muligheter og bidra til sikkerhet i en stadig mer belastet global kontekst.

MIT-feltene er veldig brede. Norsk forskning er samlet sett solid, og har en tendens til å være spesialisert i nasjonalt viktige områder der det er et sterkt samspill med industrien og hvor kvaliteten på forskningen generelt er høy. I matematikk har de eldre universitetene en tendens til å ha de sterkeste forskningsgruppene innenfor ren matematikk og statistikk, mens institutter er viktigere for å drive samfunnspåvirkning innenfor anvendt matematikk. IKT omfatter mange delfelt, hvor SINTEF og NTNU ofte har ledende roller innenfor forskning, men det er også sterke grupper på høyskolene og nyere universiteter. De tradisjonelle universitetene har en tendens til å fokusere mer på naturvitenskap enn teknologi, men har likevel noen sterke IKT-grupper. "Teknologi" dekker en rekke underområder som er minst like brede som IKT, men spesialiseringene er tydeligere definert av deres høye relevans for langvarige industrigrener, spesielt marin, energi, olje og bygg. Som i IKT har utviklingen av denne nyere næringen gitt flere muligheter for nyere høyskoler og universiteter. Kombinasjonen av sterk forskning og nær industriell kontakt som er samprodusert av for eksempel NTNU og SINTEF er sterk i mange deler av MIT.

Vellykkede forskningsgrupper har en tendens til å være større enn mindre vellykkede, utfører høykvalitets anvendt forskning, har tett samspill med industrien og fokuserer sin forskning på identifiserte industrielle behov. De er medlemmer av internasjonale nettverk, spesielt gjennom deltakelse i EUs rammeprogram. Vellykkede tilnærminger er ofte tverrfaglige.

Det er et godt nivå av ekstern finansiering på tvers av MIT, primært fra Forskningsrådet. EUs rammeprogram er den nest største kilden, og å styrke dette vil både gjøre finansieringen mer bærekraftig og hjelpe flere norske forskningsmiljøer til å gå inn i internasjonale nettverk, lære, utvikle seg og vokse.

Mens det anvendte industrielle fokuset til MIT-forskning er nøkkelen til samfunnspåvirkning, må det bygge på en større mengde grunnleggende forskning for å opprettholde kompetanse og kapasitet til innovasjon. De matematiske vitenskapene er en av de intellektuelle hjørnesteinene for alle tre MIT-feltene og må være en del av denne grunnleggende forskningsinnsatsen.

En generasjon seniorforskere nærmer seg pensjonsalder, og gir en mulighet til å utvikle forskningsagendaer som svar på nye behov og redusere risikoen for å låse seg inn til behovene til en etablert industristruktur. Å gripe denne muligheten krever økt kapasitet til å utforme og implementere strategier på forskningsgruppenivå som adresserer endring og fornyelse. Det er viktig med god rekruttering også blant forskere tidlig og midt i karrieren for å øke forskning og doktorgradsproduksjon.

Mengden og kvaliteten på forskningsinfrastruktur som er tilgjengelig for norske MIT-forskere er meget god, og gir et godt grunnlag ikke bare for å implementere dagens forskningsambisjoner, men også være attraktive partnere i internasjonalt forskningssamarbeid.

Ulikheten mellom kjønnene reduseres sakte. Implikasjonene av etnisk og kulturelt mangfold et forskningsmiljø med en sterk og økende andel personer som ikke har norsk opprinnelse vil kreve mer utforskning.

En kort oppsummering av komiteens anbefalinger:

- Øk norsk MIT-forsknings evne til å reagere på og sette i gang endringer i tide, som svar på endringer i teknologi og behov; skap ny forskningskapasitet i betydelig skala der det trengs, for eksempel når det gjelder å ta igjen AI-feltet
- Ivareta grunnlaget for MIT ved å øke støtten til grunnleggende forskning, spesielt innenfor matematikk, uten å redusere innsatsen i anvendt arbeid
- Gjennomgå nasjonale mål med hensyn til å øke forskningsintensiteten i nyere deler av høyere utdanningssystemet, og etabler mekanismer som kobler sammen nye og etablerte institusjoner og forskningsgrupper for å styrke kapasiteten
- Videreför og styrk det politiske målet om å øke deltakelsen i EUs rammeprogram
- Gjennomgå effekten av policyer for å redusere kjønnsulikhet i forskning til dags dato og reduser kjønnsulikhet gjennom karrierestøtte til kvinnelige forskere; undersøk policy-konsekvensene av å øke rekrutteringen til forskningsmiljøet fra utlandet

Det er det engelske sammendraget som er det gjeldende.

1. Norwegian research in Mathematics, ICT and Technology in context

Introduction

This evaluation of Norwegian research (EVALMIT) covers Mathematics, Information Technology (ICT) and Technology (engineering). It is one of four large field evaluations carried out in Norway in 2023-2025. The other three evaluations covered Natural Sciences (EVALNAT), Life Sciences (EVALBIOVIT) and medicine and Health (EVALMEDHELSE). All four form part of RCN's rolling programme of field evaluations, which are normally conducted at approximately ten-year intervals.

As with the other field evaluations, participation in EVALMIT was voluntary, but most research organisations active in the field asked that their relevant research groups and administrative units (AUs) should be included. In total, 248 research groups[1] from 56 administrative units (faculties, institutes or departments) participated (see Appendix 5), involving about 5,580 researchers – some 3,700 from the higher education sector and about 1,900 from research institutes.

EVALMIT has been carried out entirely by scientific peer reviewers. The research groups were evaluated by expert panels, based on their self-assessments. The administrative units were evaluated by expert committees, informed primarily by self-assessment reports from the units but supplemented by video interviews with several representatives of each unit. This national report has been prepared by an expert committee, comprising chairs and other members of the committees that had evaluated the administrative units on the basis of the research group and administrative unit reports. Supporting information, statistical data and bibliometric indicators have also been made available to the panels and committees as important context for EVALMIT. These quantitative metrics were largely consistent with the committees' qualitative judgments derived from the informed peer review process. The assessments made here are the responsibility of the national evaluation committee, whose members are described in Appendix 5.

This introductory chapter describes the context within which mathematics, IT and technology (referred to in this report as 'MIT') research is done in Norway. It discusses policy, the development of the economy and the research sector in Norway before summarising previous evaluations of the same fields in Norway done about a decade ago.

Norwegian policy context

Like other countries in NW Europe, Norway has seen a multiplication of higher education institutions (HEIs) in recent decades. Despite a number of state-promoted mergers (the 'structure reform' of 2016), in 2024, the public HEI system still comprised 11 public universities and 15 state colleges (*høyskoler*). The government has decided to maintain the concentration of research capacity in the larger traditional universities, arguing that this is necessary to avoid fragmentation and maintain excellence. While successive governments have increased institutional funding[2] to the smaller and newer organisations in the last five years or so, there are still big variations in the proportion of institutional funding provided to different organisations. HEIs are free themselves to decide how to use their institutional funding (which is not formally divided by the government among education, research and knowledge exchange). Correspondingly, the proportion of academics' time allocated to research as opposed to other activities varies among HEIs.

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[1] In order to make best use of panel members' expertise, one research group was evaluated by an EVALMEDHELSE panel and 17 by EVALNAT panels.
[2] Institutional (or 'core' or 'basic' or 'block grant') funding is the money paid to the university or institute to cover its normal running costs. Traditionally, this has been a 'lump sum' and the university has itself decided how to spend it. Increasingly, however, it is earmarked to specific purposes. This is distinct from 'external' funding, which is normally intended to be spent on specific projects or tasks.

HEI policy is periodically updated in 'long-term plans'[3] announcing the government's priorities. The most recent plan for 2023–2032 has overall objectives of enhancing competitiveness and innovation capacity, environmental, social and economic sustainability, high quality and accessibility in research and higher education, and the following thematic priorities:

- Oceans and coastal areas
- Health
- Climate, the environment and energy
- Enabling and industrial technologies
- Societal security and civil preparedness
- Trust and community

Norway is strongly affected by the geopolitical changes of recent years. Its position as NATO's North-East flank during the Cold War influenced both higher education and development policies, and, following the accession of Sweden and Finland, Norway is planning to scale up the defence sector[4].

Norway's position as an Associated State of the EU means that its concerns and policies are mostly aligned with those of the Union. The EU's list of 10 'critical technologies' – many of them in MIT fields – is highly relevant also to Norway[5]. The recent communication from the European Commission[6] on competitiveness summarises its view on Europe's relative position, arguing that Europe is losing the productivity race internationally, and losing the technology race with the USA and especially China. The EU needs large-scale investment to modernise the economy while also rearming to meet new geopolitical challenges and still facing the wider societal challenges identified in recent years. The agenda of the Draghi Report (Draghi, 2024) sets three priorities:

- Closing the innovation gap
- Establishing a joint roadmap for decarbonising and competitiveness
- Reducing excessive dependencies and increasing security, in particular by
    - Catching up in AI
    - Digitalisation and diffusion of advanced technologies to increase productivity
    - Decarbonisation and competitiveness through energy innovation
    - Reducing dependencies to increase security

The EU's research and innovation priorities generally tend to be important for Norway. Because of its industrial structure, the marine area that has more policy priority for Norway than the continent.

Development of the economy and the research sector research in Norway

Norway is a late-industrialising, resource-based country that 100 years ago was among the poorest in Europe and is today among the richest. The structure of the research and higher education sector has peculiarities that reflect this history.

The higher education sector is dominated by the University in Oslo (UiO – see list of institutional abbreviations overleaf), founded in 1811 when Norway was under Danish rule. Formally, the University in Bergen (UiB) founded in 1949 was the second university, but the national technical college (NTH) in Trondheim has dominated technological education in various forms since it was set up in 1910, and was merged with other local organisations in 1996 to form the Norwegian University of Science and Technology (NTNU). The national agricultural college set up in 1911 became the Norwegian University of Life Sciences in 2014. The University in Tromsø (UiT), the 'Arctic' university, opened in 1972 to provide higher education, and especially medical training, to support economic

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[3] The most recent is the Long-term plan for research and education 2023-2032, Meld St 5(2022-2023)
[4] Forsvarsdepartementet, Forsvarsløftet – for Norges trygghet. Langtidsplan for forsvarssektoren 2025-2036, updated 2024
[5] The EVALMIT Committee's views on Norway's strengths and weaknesses in these technologies have been communicated to RCN in a separate note
[6] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, A Competitiveness Compass for the EU, Brussels 29.1.2025 COM(2025) 30 final (Draghi, 2024)

development and combat depopulation in the High North. The so-called BOTT (Bergen, Oslo, Tromsø, Trondheim) universities, which are cooperating to build common digital platforms, are regarded as the 'old' universities. Oslo and Bergen are traditional broad-spectrum continental-style universities; Tromsø has continental-style governance but a much narrower range of disciplines; and NTNU is recognisable as a university of technology. (Forskningsrådet, 2023)

FFI	Norwegian Defence Research Establishment
HVL	Western Norway University of Applied Sciences
IFE	Institute for Energy Technology
Kristiania	Kristiania University College
NGI	Norwegian Geotechnical Institute
NHH	Norwegian School of Economics
NMBU	Norwegian University of Life Sciences
NR	Norwegian Computing Centre
NTNU	Norwegian University of Science and Technology
OsloMet	Oslo Metropolitan University
Østfold	Østfold University College
Simula	Simula Research Laboratory
UiA	University of Agder
UiB	University of Bergen
UiO	University of Oslo
UiS	University of Stavanger
UiT	University of Tromsø, The Arctic University of Norway
UNIS	University Centre in Svalbard
USN	University of South-Eastern Norway
TØI	Norwegian Institute of Transport Economics

Table 1 Institutional abbreviations used in this report

The last 30 years or so have seen rationalisation among the many regional colleges, some of which have been given university status. The so-called 'Quality Reform' in 2003/4 brought the binary system of colleges and universities together into a single higher education system with a single set of funding rules based on those of the university sector, but leaving the colleges and new universities with a legacy of teaching-style funding structures and a need to develop research skills and scale while competing with the universities for external research funding. The process of remaking the UAS and colleges as universities is not complete, leaving open the question whether completing it is either economically affordable or wise.

As a resource-based economy (forests, minerals, oil and gas, fish and the mechanical and process industries to exploit them), Norway's knowledge needs have been for applied research and engineering more than for basic science. Thus, Norway set up a chain of technical research institutes owned by the NTNF science and technology council in 1946, but established a traditional (basic) research council (NAVF) only in 1949. The professors at NTH established SINTEF in 1950 as a research and technology organisation to provide an outlet for their research, supporting technological development and innovation in industry. It is now the dominant force in the Norwegian institute sector, especially in the parts of industry to which engineering and ICT are central. Unlike continental equivalents such as TNO, Fraunhofer and VTT, which tend to receive 30% or more of their research income as institutional funding, SINTEF and the other Norwegian RTOs such as NORCE get about 10%. Their economic basis is therefore very different from that of the universities, which explains their greater focus on contract research and lesser volume of academic publication.

While Norway in the 20th Century was following a conventional path of industrialisation by entering higher value-added branches (for example, diversifying from bulk into fine chemicals), this was rudely interrupted by the discovery and exploitation of oil and gas in the 1960s, in which NTH and SINTEF were key. Prudent management of the resulting revenues helped mitigate the classic resource curse where resource exploitation crowds out other industries and turns the terms of trade against them. Nonetheless, the rising value of the krone and a successful effort to master the technologies needed for oil and gas have kept Norway largely locked into resource exploitation. In the absence of a perceived crisis, the research and higher education system and the economy more generally have only recently begun to adapt to the needs and opportunities of the post-petroleum age. [Reve 2001, RCN evaluations, EVALNAT. Evidence from EVALMIT?]

Its history means that the Norwegian industrial structure is focused on low R&D-intensity branches, and even if comparisons between these branches in Norway and internationally tend to put Norway at the R&D-intensive end of the spectrum in each branch (OECD, 2008), the overall effect is that business' share of gross expenditure on R&D is small: 47% of the total in 2021, compared with 33% in higher education and 20% in the institute sector (Forskningsrådet, 2023).

This pattern represents a radical change during industrialisation. The higher education sector's share of national R&D investment has been growing since the 1940s, and overtook the share of the institute sector after 1997 (Arnold, et al., 2001). Correspondingly, the institute sector's real-terms R&D expenditure and employment have more or less flat-lined during the last decade, while the figures for the higher education sector have continued to grow (Aksnes & Fossum, 2023). This changing balance results partly from policies that favour higher education research over that of the institutes, partly from slow industrial dynamics with Norwegian industry lagging global patterns of restructuring and the institute sector remaining faithful to its traditional technologies, and partly from the growing importance of new industries more able to use knowledge produced in the higher education system.

Current state of research in Norway

Norway's gross **expenditure on R&D overall** was some NOK 81.6bn or 1.89% of GDP in 2021 – down from its all-time peak of 2.24% the previous year[7]. Business spent approximately NOK 38.3bn (47%) of this, the higher education sector NOK 26.9bn (33%) and the institutes NOK 16.4 (20%) (Forskningsrådet, 2023). The GERD figure of 1.89% of GDP is well below the Barcelona Goal of 3% to which the EU aspires, below the 2.15% level actually achieved by the EU in 2021, and the OECD average of 2.72%. This apparently poor showing partly reflects the 'inflation' of Norway's GDP by its large oil and gas revenues. In absolute terms, Norwegian gross spending on R&D per capita has been rising year on year for several decades.

The university sector accounts for 70% of research expenditure in the **higher education** sector (HERD). The regional health authorities account for a further 15% of HERD, with a large number of smaller universities and colleges for the remaining 15%. Within the university sector, research spending is very concentrated. NTNU alone expends 18% of HERD and UiO 17%. Together with UiB and UiT, the four established traditional universities alone account for over 50% of HERD.

Four of the five **research institutes** included in EVALMIT belong to the 'techno-industrial institute' group – one of four groups into which RCN places the research institutes when allocating their institutional finding. (These are research and technology organisations, or RTOs in international terminology). Institutional funding accounts for only 11% of this institute group's income, or a quarter to a third of the proportion provided in continental RTO systems such as TNO, VTT or Fraunhofer. Research in the techno-industrial institute sector is even more concentrated than that in the universities. SINTEF is the dominant force. The techno-industrial institutes had a combined turnover of NOK 6,688m in 2023, of which SINTEF accounted for 59%, IFE 17%, NORCE 8% and NR 2%. The other institute evaluated in EVALMIT is Simula, whose institutional funding is provided by the Ministry of Education and Research directly, rather than via RCN. Its NOK 296m income in 2023 corresponds to about 4% of the combined income of the techno-industrial institutes.

Business sector R&D is focused in 5 branches – computing and electronics, machine-building, the petroleum, coal and chemical industries, metal products, food and drink – together spending in excess of NOK 8bn on R&D in-house. The first three branches are significantly dependent on research in scope to EVALMIT. Business expenditure on R&D in ICT has risen over 80% in real terms

[7] OECD, Main Science and Technology Indicators

between 2011 and 2021, while real expenditure in other areas of technology has been more or less flat during the period.

Using GDP to normalise R&D statistics gives a false impression of Norway's research because the GDP denominator is 'inflated' by Norway's big oil & gas sector. The OECD's Main Science and Technology Indicators for 2021 show that Norway has the ninth-highest number of researchers per 1000 of population, with 18.4, well above the OECD as a whole (15.1) and the EU (14.7). Only Austria, Belgium, S Korea, Taiwan and the other Nordic countries are ahead of Norway on this dimension. In terms of 2022 publications in the Web of Science per inhabitant, Norway ranks third in the World, with 3.18 per 1,000 inhabitants after Switzerland (3.47) and Denmark (3.35). this compares with 2.09 in the UK, 1.47 in the USA and 0.55 in China (Forskningsrådet, 2021; Forskningsrådet, 2023).

Analysis of Norwegian publishing in the Web of Science suggests that, compared with the global average, Norway has a relative specialisation in the social sciences, health, biology, and geoscience. It is specialised away from materials science, physics and chemistry, while its specialisation in mathematics and the information sciences is only a little below the global average (Forskningsrådet, 2021).

Norwegian research is well cited. High rates of citation are normally taken to indicate high scientific quality. Different research communities are of different sizes and have different publishing and citation traditions, so it is rarely meaningful directly to compare numbers of citations across disciplines. Comparisons can, however, be made using mean normalised citation scores (MNCS), calculating where individual articles sit on the distribution of citations in their specific discipline and normalising this around 100 (or sometime 1), which represents the mean number of citations per article in the discipline. NIFU's calculations for all articles published in 2021-23 by authors with an institutional affiliation in Norway show a mean normalised citation score (MNCS) of 115 – so Norwegian publications in the period are 15% more frequently cited than the global average. The corresponding scores for the most highly performing countries – such as the UK, Switzerland and The Netherlands – are generally in the range 129-131. The scores for the USA and China are 116 and 111, respectively (Karlstrøm, et al., 2024:5)

Previous evaluations

Earlier evaluations of the fields covered by EVALMIT point to research that is strong and often very good, but – perhaps unsurprisingly, given the size of the country – rarely world-leading. The evaluations stress the fields' industrial importance, but tend to miss the point that while links with traditional engineering-based branches are strong and have traditionally been supported by RCN research and innovation programmes, neither ICT nor mathematics can easily be identified with specific branches or government ministries. As a result, there is less impetus to devise national strategies or funding programmes for them, and there is a risk of being reactive rather than leading in tackling new areas or fields.

In line with the structure of the economy, which is engineering- rather than science-based, Norway did better in the applied aspects of the three fields than in the fundamental or theoretical. In human resources, there were issues involving succession and the future supply of (especially native Norwegian) faculty. Mobility during the academic career was too low. Women were significantly under-represented.

Norwegian engineering and the national university of technology (NTH/NTNU) have consistently been criticised by international evaluation panels as being overly applied. The engineering sciences were last evaluated in 2015, in an evaluation that focused on basic and long-term research (Rauch, et al., 2015). The committee found that "engineering science in Norway is slightly above [world] average for scientific quality and clearly above average with respect to impact and relevance [but] there is a lack of groups conducting excellent research with little (current) practical use." Publications were generally in medium-level journals and conferences, supporting communication with practitioners, but there were few in high impact-factor journals orientated to basic research. Research strategies were seen as “relaxed”, and research topics responded to opportunities and researchers’ interests rather than to a scientific strategy.

Consistent with national needs, the areas with highest quality were marine technology and climate, and fossil fuel research, while almost all engineering research was closely linked to established industry and its needs. Petroleum research was fragmented, and good but not excellent. Materials science within engineering involved worthwhile work supporting existing industry, but was not keeping up with the latest developments at the forefront of materials science. Some new areas, such as 3D microprinting and laser processing, were not covered at all. The only group in the area of road and transport engineering was at NTNU and was rated as ‘underperforming’.

More generally

- The gender balance was improving, but still poor
- Recruitment of PhD students and faculty were impeded by low wages in Norwegian academia compared with industry, leading to a large inflow of non-Norwegians
- International cooperation was patchy and person-led, rather than strategic
- Too little fundamental research was being done in engineering science
- While links to established industry were strong, TTO services and links to new companies were inadequate
- Research at colleges and the new universities was generally weak and its systemic role was unclear

ICT was last evaluated in 2012 (Hesthaven et al, 2012). The committee found that the quality of Norwegian ICT research was broadly good and higher than would be expected from a country of Norway’s size. While it is impossible to excel in all areas, the work was often sufficiently good that – given more investment – it could be ranked among the best. (Unfortunately, the evaluation was not specific about which areas were strong and which were weak.) The gender balance in ICT was poor.

Demand for higher education in ICT was strong and growing, but this meant that university recruitment prioritised the needs of teaching, making it hard to devise and implement research strategy in the universities. Nor was there any national strategy for ICT research, so the lack of strategy at national and university levels limited the quality and impact of research, and this problem was exacerbated by the modest progress being made towards setting up larger research groups and centres that could bring Norwegian research to the forefront in selected parts of ICT. The lack of strategy often extended also to hiring and succession planning. Productivity was also impeded by a lack of postdocs. International mobility was impeded by the variable provision of sabbaticals. The community made too little use of European programme, which generate value for research and help train less experienced researchers,

Mathematics was evaluated in 2012 (Tillmann, 2012). The report pointed to Norway’s long tradition of excellence in mathematics, which is celebrated inter alia in the Abel Prize, and the importance of mathematics to the high-tech and engineering industries in Norway, as elsewhere. However, while applied mathematics and statistics had become stronger, there were signs of decline in more fundamental and theoretical areas. The evaluation identified areas of strength in analysis, algebra and algebraic geometry, topology and geometry, mechanics and stochastics. Research on partial differential equations was seen as outstanding, and the report referred to the early and successful development of computational mathematics as a Norwegian success story. However, number theory, mathematical physics and probability were seen as particularly under-represented. While some groups were aware of the potential industrial importance of their work, others appeared to be unaware or disdainful of the benefits of closer links to society.

Many senior professors were approaching retirement age, and some research groups were likely to disappear once their core members retired. There were too few internal candidates to replace them and a lack of postdoc positions that created a gap in career progression opportunities. Levels of faculty mobility were too low. No progress was being made on correcting the acute gender imbalance in mathematics. There was no specific funding available from RCN for mathematics, creating a need for funding and capacity-building in the field, both to keep it viable within the academic community and to maintain the needed research support to industry and society.

2. Strengths and weakness of Norwegian Mathematics, ICT and Technology research in an international context

2.1. The evaluation committee's perspective

This section presents the committee's assessment of mathematics, IT and technology research across the whole of EVALMIT. It is based on a reading of the research group reports for each of the 15, supplemented with information from the administrative unit level as well as background statistical sources. This section provides the committee's reflections on Norwegian performance on MIT research as a whole, then discusses mathematics, ICT and technology in turn. It builds on a more granular analysis of sub-fields, which is presented in Appendix 1.

The Committee's perspective on MIT as a whole

The scope of the fields evaluated here – mathematics, ICT, and technology – is very broad. The industrial context means that Norwegian research in these fields is mostly very applied. Given their central role in supporting industry, NTNU and SINTEF loom very large in all three fields. There are many successful Norwegian research groups and organisations in these fields, doing research with high quality and relevance to the Norwegian context. However, not all the groups are this successful.

Pure mathematics has a long tradition in Norway, with the strongest groups being in the older universities, notably UiO, NTNU and to a lesser degree UiB. Mission-orientated organisations including SINTEF and Simula are more important and drive societal impact in applied mathematics, though UiO, NTNU and UiB also play important roles. In statistics, too, the leading research groups are at UiO, NTNU and UiB.

ICT research comprises many sub-fields and affects many different parts of industry, with SINTEF and NTNU often taking leading roles in research. Given its traditional focus on natural science more than technology, UiO does little research in ICT by comparison, but its informatics research is very strong. There are many strong research groups, some in the newer and smaller universities that have grown up in the last few decades during which ICT has built up to its current social and economic importance. These groups tend to be rather scattered about the ICT landscape since – while it is very important in the Norwegian economy – there is not a strong cluster of ICT companies in Norway whose influence would encourage the formation of academic clusters of related topics.

'Technology' covers a range of sub-fields at least as broad as ICT, but its specialisations are more clearly defined by their high relevance to longer-standing branches of industry, notably marine, energy, oil and construction. NTNU and SINTEF are the leading research performers in most parts of technology, though this is true to a lesser degree in oil technology. As in ICT, the development of this newer industry has provided more opportunities for newer colleges and universities.

<u>Success factors</u>

Differences in research group performance appear to be more driven by context and behaviour than by field or discipline. Successful groups are generally larger than unsuccessful ones; they have critical mass and benefit from spreading overheads across more people. The quality of their research is high, or at least adequate to their context. Unsurprisingly, since Norwegian MIT research is very applied, successful groups have close contacts with industry and other users of their knowledge in society. Hence, knowledge about needs helps shape their research agendas, focusing their efforts on providing solutions to problems that have a good probability of being adopted and therefore creating societal impact.

The successful groups have strategies based on a combination of this demand-side understanding and wider knowledge about advances in research and the technological frontier. Relevant demand may be situated at the regional level – it is not always necessary to connect to a national set of users. Strategies need to be formed at the research group level, where the understanding of the demand side is located. Departmental or organisational strategies tend to be too high-level to be effective, trying to span multiple research areas and societal needs, failing to be specific enough to be useful. Given the applied nature of Norwegian research in MIT, successful approaches are often interdisciplinary. Interdisciplinary work opens the door to new fields of research.

Good research is correlated with research groups' membership of international networks, bringing them into contact with global rather than only national research communities and developments. This requires a degree of short- as well as longer-term researcher mobility, and can often be supported by participating in the EU Framework Programmes. Contact with international research communities is crucial, because *de facto* research quality standards are set at the global level. Correspondingly, successful research groups have ambitious publication strategies, aiming to be visible in high-status journals and conferences, advertising their ideas and making it clear to the wider community that they would make promising research partners. The internal structure of research groups is also a key to success. There need to be enough junior researchers – especially PhD candidates – to 'leverage' the expertise of the professors, making the research efficient and making it easier to enter new and expanding research fields. Many of the more successful research groups have higher-than-average ratios of PhD candidates to professors.

Less successful research groups tend to lack these characteristics. There are individually successful groups in some of the newer and smaller colleges and universities, but in general groups that are struggling tend to be in such places (or in a few cases to have been brought into UiT or NTNU in recent mergers). They lack the scale advantages of the bigger groups. Their interactions with the demand side are often weak – sometimes because they have been unable to build networks; sometimes because they are in geographies where there are few or no local users for their knowledge. Less successful groups have vague strategies, rely on departmental or university strategies that in practice cannot guide action, or have no strategies at all. This in turn makes it hard for them to enter national and international research networks.

It can be hard for those in newer and smaller organisations to build internal organisations with the capacity to succeed. Those in colleges and newer universities have higher teaching loads than the established universities, so they lack the time needed to run and participate in successful research groups. They lack the 'pyramid' hierarchies needed for efficient research and often struggle to recruit and support PhD candidates, so their ratio of candidates to professors tend to stay low.

Some of the less successful groups are in the traditional universities. Their difficulties tend to be driven by a lack of interest in achieving societal impact, inability to develop strategy, lock-ins to established user groups with a reluctance to address new classes of problem (for example, retaining an oil focus while not preparing to tackle challenges posed by the energy transition). There were rare examples of research organisations' own governance and routines impeding change.

<u>Common issues</u>

A number of issues – both negative and positive – are common to more and less successful groups alike. One of the most obvious is the poor gender balance, from which the MIT disciplines suffer in most countries. While it seems to be neither worse nor better than in other countries, it is only slowly reducing. Student recruitment and retention (at both first-degree and PhD levels) is difficult, especially institutions outside the main cities.

The overall level of capacity to develop and deploy effective research strategies is variable, but inadequate in many places. The ability to change the content of research strategies is also limited by the established structure of Norwegian industry. Unless groups maintain strong international research networks, they risk being isolated from new fields and from current and future industries not well represented in Norway. Notwithstanding the involvement of some of the groups in the EU Framework Programme, greater participation in that and other international research networking arrangements is a need in almost all the groups evaluated in EVALMIT. Most researchers have opportunities to benefit from mobility support of various kinds, but these are under-prioritised compared with needs.

Some large changes in direction benefit from national strategies. The current, glaringly obvious example is AI, with leading countries investing in the billions in AI. The committee understands that Norway is also rolling out a capacity-building programme in AI. This comes a little late compared with elsewhere, and the intention to fragment the effort over eight or so centres undermines its likely effectiveness. The success-factors discussed above would suggest that a single centre would be more likely to bring critical mass in research. Wider efforts to build the capacity to **use** AI will also be needed, in both research and higher education.

Last but not least, while the committee recognises the inherently applied focus of the MIT fields in general and the particular importance of that applied focus in Norway to serve the needs of the economy and society, it believes the proportion of more fundamental research carried out in the Norwegian research sector is too small and that more funding for basic research is therefore needed. Fundamental research is important not only in its own right but because it builds capacity, connects the Norwegian research community with global advances and provides new knowledge on which future applied research and innovation can be built.

Mathematics

While bibliometric analysis points to a downward trend, overall, mathematics in Norway is doing well. Larger and older institutions produce high-impact research and maintain strong international networks and collaborate with industry and in interdisciplinary projects. Research groups that maintain a good balance between established areas of strength while also expanding in new emerging topics do well. Successful research environments maintain a high PhD-to-faculty ratio. In contrast, smaller research groups and groups at smaller or newer institutions struggle. Often, this can be linked to a lack of strong international or national collaborations, a static and narrow research agenda and/or a lack of cohesive research strategy and unclear research profile. The evaluation reports identify increased internal collaboration, focused research strategies and increased national collaboration (and ultimately international) as ways to mitigate the situation.

All groups expressed concern regarding the funding landscape or anticipated changes thereof. A drop in funding to fundamental research in mathematics can have rapid and long-term consequences for maintaining the competence needed nationally and risks spilling over to impact research quality in related fields. The decreasing trend in the number of students in mathematics further exacerbates this risk.

Many groups struggle with long-term recruitment strategies, especially recruiting female faculty but also retaining talent in academia after a masters or PhD, and preparing for generational turnover while also responding to new research trends and needs. Utilising mobility programs, working actively to foster junior researchers and career development are essential to meet this challenge. Smaller groups are especially vulnerable to staff turnover and need to establish long-term and focused research strategies.

Strengths	Weaknesses
• High-performing groups maintain active international research networks • Balancing traditional and emerging topics in research agenda • Strong and active interdisciplinary collaboration with academic, government and industry partners result in research with high societal impact • Dynamic research environments with a healthy balance between senior, junior faculty, PhDs and postdocs	• Underperforming groups tend to lack a cohesive research strategy and have limited internal collaboration • Groups lacking national/international networks and with unclear research profile have low visibility, lower productivity/impact • Gender imbalance • Several groups have an under-sized PhD programs which limits productivity, knowledge transfer and impact
Opportunities	**Threats**
• Active use of mobility grants, including MSCA and NRC, and internally funded research visits to expand international collaboration and funding. Link to long-term recruitment plans, fostering of junior faculty, and to address gender imbalance. • National initiative to increase the number of students in mathematics • Active collaboration with regional stakeholders to increase societal impact • Smaller groups should work strategically to identify areas of strength and develop a clear research profile. • Consider re-organisation of smaller groups, exploring synergies within and between groups to consolidate resources • Publication strategies that target high-visibility outlets, including conference venues for AI/ML	• Drop in student numbers • Drop in funding to fundamental research, lack of small/mid-size grants for career development • Fluctuating funding levels that lead to an over-establishment of topics that cannot be maintained long-term • Lack of long-term recruitment strategies in the face of generational turn-over, gender imbalance, lack of agile research agenda leads to drop in productivity/quality and impact • Static, narrow research agenda risks missing opportunities with global impact • Lack of clear benchmarking risks leading to poor strategic planning

Table 2 SWOT on Mathematics

ICT Overall

This section assesses research groups in ICT key areas, including virtual reality (VR) and human-computer interaction (HCI), control systems and robotics, software engineering, and AI and data science. Top performers, such as UiB's Visualisation group and UiO's Digital Signal Processing and Image Analysis group, excel due to strong collaborations, particularly with industry partners, which demonstrates significant societal impact and high-quality publications in top-tier conferences.

Norway has a strong tradition in ICT and software, and some strong research groups in parts of the rather disparate ICT field. Simula has particular strengths in cryptography, communications and software engineering. SINTEF is very strong in several fields including IoT, software, maritime ICT and several parts of AI. UiO is strong in DSP and visualisation, robotics and intelligent systems, reliable systems and AI-based digital innovation. NTNU has particular strength in control, robotics, autonomous systems, engineering cybernetics, software engineering, nanotechnology, photonics and DSP. Narrower points of strength were at NORCE in earth and space observation, and its E&T Measurement Science group. UiB has a particular strength in visualisation and UiA in IoT and mobile communications. By and large, the quality of the university research is higher than that of the institutes, which tend to have greater socio-economic impact than the universities, but as indicated there are also some fields where institute research is also excellent. In all cases, high-quality research is associated with close networking and cooperation with industry.

ICT publication output is dominated by NTNU and UiO, but some of the newer universities (together with UiB and UiT) are medium-sized contributors. The published output is mainly in electrical and electronic engineering and in computer science.

The mean normalised citation score for the whole of ICT averaged 118 over the last decade but was generally below this level in 2013-2017, and above it in subsequent years. MNCS for the various ICT sub-fields suggest Norway does better in applied and interdisciplinary research than in fundamental work.

There are, however, also weak points in both large and small organisations, Challenges faced by these research groups are multifaceted. Funding limitations, especially for fundamental research, are a recurring issue and appears to be of increasing concern. Many groups struggle to secure sufficient external funding which impacts staff retention and competitiveness. The reports also point to deficiencies in industrial partnerships, particularly in areas of industrial robotics, which often hinder the translation of research findings into practical applications. Methodological gaps and concerns about gender diversity are also highlighted.

Many of the weaker AUs often also lack specific strategies and in a number of cases struggle to produce much research because they lack critical mass, over-fragmenting their small manpower resources across too many areas. These cases tend to be in smaller universities as teaching pressures mean research time is limited and where the need to focus for the purpose of doing good research is counteracted by the need to provide a broad curriculum. These AUs suffer from challenges in recruitment, retention, and diversity, as well as inconsistent self-assessments and missed opportunities to align with evolving scientific and societal needs.

Strengths	**Weaknesses**
• Several strong groups, some at international level • Strong industry links in these cases • Tackling both fundamental and applied research • Strong groups had bigger PhD student cadres and successful programs	• Weaker groups lacked scale, focus, clear strategies and industry connections • They generally lack industrial and international networks, and are often hindered by being inward-looking • Weaker groups did less dissemination, eg through conferences • Low institutional funding for institutes limits ability to do more path-breaking research
Opportunities	**Threats**
• Increasing EU networking and funding • Improve dissemination • More rapid take-up of newer technologies • Opportunities to leverage AI in engineering and other applied fields • Increase industry interaction to raise quality and impact • Stronger mentoring relationships between old and new institutions.	• Lack of resources to increase strategic focus and scale • Too strong emphasis on applied work at the expense of smaller scale fundamental work • Insufficient local support • Lack of gender diversity

Table 3 SWOT on ICT as a whole

Engineering overall

Engineering research in Norway is of high quality, with international excellence in some areas and strong societal relevance and impact at a national level in others. The research excellence and organisation is generally more evident than the societal impact and the transition to emerging sectors and new opportunities is disparate, variable in impetus, and would benefit from stronger strategy and coordination.

Norwegian engineering research is generally strong in marine engineering. A significant level of funding is available which results in a lot of high-quality work, as reflected in the high-quality research carried out at NTNU and SINTEF. Research is very strong in oil and gas (O&G) related areas, ship related research areas like sustainability and optimisation of vessel performance are also well covered, and emerging areas, including storage and transport of new fuels and offshore renewable energy are explored by some research units (SINTEF, NTNU). Newer research groups at HVL and USN generally have less strong research activity, but they are seeking support for research from their local industries in their niche areas. Research in oil technology is variable, with some groups from SINTEF leading in terms of research quality and organisation, while others perform less well. In construction, there is a combination of significant international impact (NTNU and SINTEF) and good national quality (IuT, UiA and OsloMet) of research. Engineering technology research groups are very broad and their size, characteristics, challenges and potentials vary substantially, with civil engineering accounting for the biggest share of publication output. NTNU and SINTEF lead in terms of organisation and research quality, where some groups are active at an international level attracting competitive grants for European cutting-edge research. NTNU is by far the biggest contributor in Norway of scientific publications in energy technology, and the greatest proportion of the publications produced relate to energy and fuels.

Green energy research is internationally excellent in some areas with a strong correlation between research excellence and societal impact and strong impact. Overall the topics addressed by the research groups are well aligned with international trends and with societal needs and research is creating societal impact. However, there is a tendency to cover too broad a scope without a clear research strategy. This leads to loss of critical mass and undermines the group's international competitiveness. The Norwegian research in industrial technology is, in general, of very good international quality, with NTNU and SINTEF excelling at the international level and UiS and UiT performing well within their national networks.

Although the topics covered across engineering are critical for Norwegian society, expressing the societal impact of the research is generally underplayed.

Strengths	Weaknesses
• Thriving sub-disciplines in Information Engineering and Power Engineering due to their global relevance and strong infrastructure. • Research groups at NTNU and SINTEF in general stand out with respect to research quality, with several groups being internationally excellent level • Strong societal impact by SINTEF in areas of Thin film and membrane technology, Battery and hydrogen technology, Offshore energy systems, Active distribution system and Bioenergy, and by NTNU in Sustainable Energy systems with strong involvement of partners. • All research groups are covering research fields of strategic relevance and importance for the development of Norway, incorporating the specific Norwegian environmental conditions and requirements. • The infrastructure and equipment are generally modern and build a good research basis. • Strong industry collaboration in general enabling industrial grant funding. • Marine technology/ocean engineering research is very strong in Norway, including maritime systems, robotics and automatic systems. • SINTEF, NTNU, UIT and USN have strong societal impact due to their excellent research collaboration and/or knowledge transfer partnership with industry.	• Weak strategic planning in many units limits focus and measurable impact. • Less societal impact is generally found for research groups at some of the smaller universities • Lack of succession planning and over-reliance on individual research leaders • Lack of gender balance • The number of PhD students is rather low compared to scientific staff number and to some international standards. • Some groups show a moderate social impact or sub-optimal communication skills, even though the topics of this area can have a fundamental impact. • Relatively little international collaboration is noted in the research groups evaluated. • Groups are fairly reliant on RCN funding. • National grants and industrial collaboration can limit the number of high-quality publications and the international comparison.

Opportunities	Threats
• Leveraging global challenges like green energy and automation to enhance visibility and funding. • Expanding collaborations with international and industrial partners for research excellence and impact. • There is opportunity for some of the research groups at smaller universities to increase research, knowledge transfer and capacity to interact and create significant impact since the topics are of importance for society. • Digitalisation and sustainability are critical emerging topics of this panel, which perfectly align with the global issues of digital and green transitions. There are still plenty of opportunities to excel at international level. • Individual competences can be systemised through increased interdisciplinary collaboration and more intense use of shared national research infrastructures. • Future success of less strong new research groups (HVL and USN) could be supported by the institutions and the Research Council in terms of 'ring fenced' funding for a limited period. • Research groups could consider longer-term diversification in emerging areas like: marine and offshore related research in the areas of artificial intelligence and machine learning. • O&G companies provide a significant support for these RGs, this should be directed towards supporting new and emerging research areas, eg low carbon shipping and sustainability, offshore renewables. • Availability of a large number of oil & gas infrastructures with and for which new, more sustainable and efficient decommissioning and recovery technologies can be developed.	• Some structural inefficiencies and high teaching loads. • Limited societal impact in some groups which may hinder broader relevance and funding opportunities. • Lack of strategic planning for research, without specific and measurable goals and objectives means that current research is unlikely to reach and sustain a high international level. • The trend for funding to be increasingly for interdisciplinary work can reduce the funding available for low TRL-level (basic) research, draining the pipeline for future innovations. • Retention: international academics and industrial experts returning to 'home' countries due to changes in the governmental policies. • In some areas it is difficult to attract and retain academic staff since industry offers competitive salaries. • The continued strong demand for oil & gas engineers risks weakening or preventing the development of long-term strategic thinking, including in terms of training and demand for new skills and talent. • Lack of strategic planning for research, without specific and measurable goals and objectives means that current research is unlikely to reach and sustain a high international level. • Research activity for some of the smaller universities, e.g. Electrical power systems and Energy and Environmental Technology at (USN) and Renewable energy (UiA) is threatened by the stronger focus on education compared to research and lack of coherent and articulated strategy for the research groups.

Table 4 SWOT on Technology

2.2. Analysis from the research group level

EVALMIT's hierarchical design (Appendix 3) means that disaggregated information from the research group level evaluations is fed up to the administrative unit evaluations and on to the national report. This brief section reports two results from cross-analysis of the research group evaluations.

The panels reviewing the research groups in EVALMIT used a 5-point scoring system (see Table 23 at the Appendix) to make judgements about aspects of group performance. These scores were reported to the research groups and administrative units but are not made more generally available.

Figure 1 averages publication quality and societal impact scores by sub-field. It confirms the national committee's finding that there is a positive relationship between quality and relevance. Bibliometric indicators for Norwegian mathematics at the aggregate level are close to the world average (Section 2.3), but the panels evaluating research groups found high quality and relevance in many of the specific groups assessed in EVALMIT. While mathematics and ICT tend to cluster in the top-right quarter of the figure, the more traditional technology fields are scattered. It is clearly important to move green energy upwards and rightwards because the area is key to sustainability while also providing huge commercial possibilities. Marine technology is not a field where the amount of publication is rising much, but it remains crucial to Norwegian industry. The other technologies are faster-growing, suggesting they have high potential relevance that could be realised.

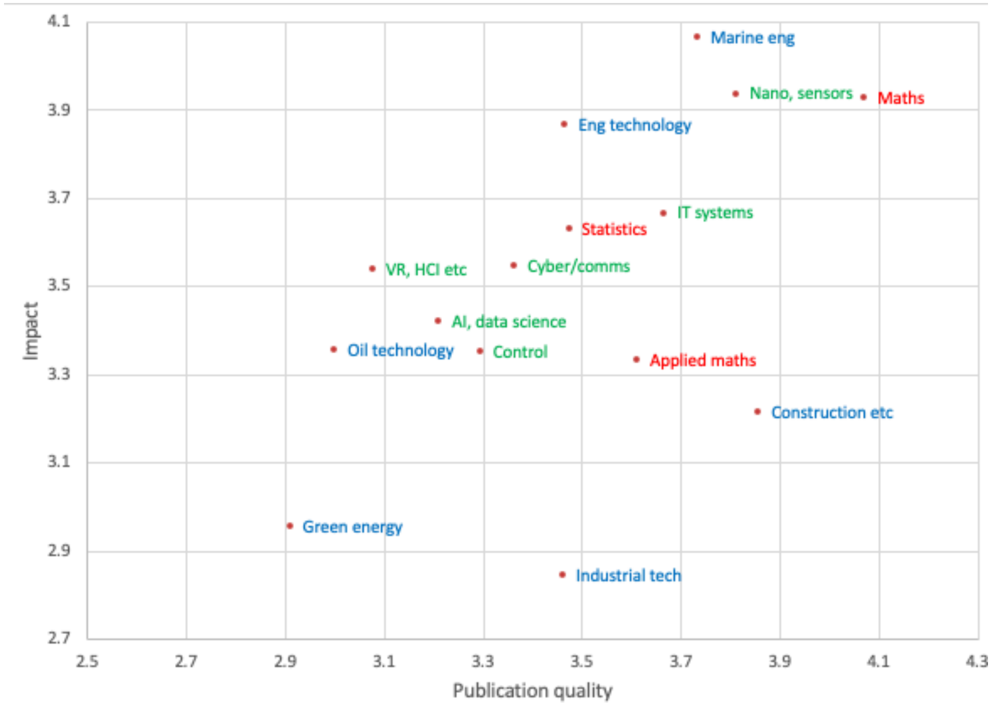

Figure 1 Publication quality and societal impact scores for EVALMIT sub-disciplines
Source: Mean scores per discipline, calculated from EVALMIT research group scores
Mathematics in red; IT in green; technology in blue

Figure 2 clusters the publication quality and impact scores by organisation. Simula's impressive position is driven by its strong academic funding combined with a relatively narrow specialisation in software, so it is an outlier. Leaving Simula aside, the established universities cluster at the top-right, while the new and smaller ones tend to be at the bottom-left. The institutes and the more mature among the new universities and colleges occupy the middle ground.

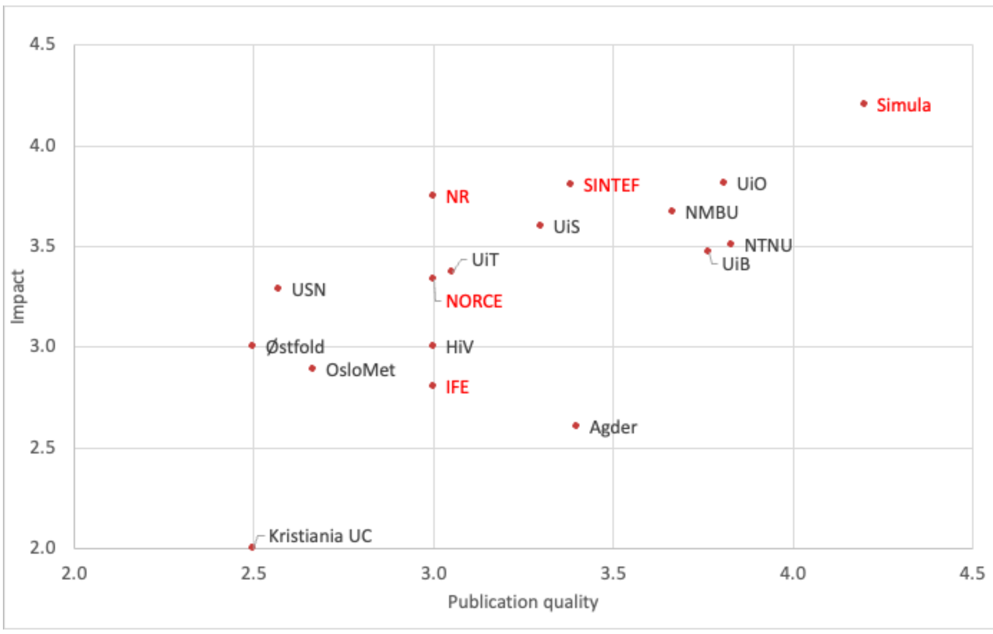

Figure 2 Publication quality and societal impact scores for EVALMIT institutions
Source: Mean scores per institution, calculated from EVALMIT research group scores. HEIs in black; institutes in red

The scores allocated to the research groups by EVALMIT panels support the national committee's finding that quality and impact are correlated, so research groups and policymakers alike should pursue both these goals together. Old-fashioned academic aloofness from societal needs does not pay off in MIT fields, at least.

The scores also confirm that the established universities and the institutes in scope have distinct roles in knowledge generation and use. It underscores that many smaller units, especially in smaller and newer colleges and universities, are disadvantaged and often underperform. This raises a policy question about whether and how to support their research ambitions, as against their important role in providing higher education across the whole country.

2.3. Supporting analysis based on bibliometric and statistical data

The MIT fields within Norway's overall science, technology, engineering and mathematics (STEM) output

Figure 3 shows numbers of publications in Norwegian STEM sub-fields in the past decade and an index of Norway's specialisation in these fields. Consistent with the longer-term pattern of economic and research system development in Norway, the Figure tends to show low specialisation and production of publications in basic fields and high specialisation in applied ones. Despite their economic importance, overall Norwegian specialisation in the three MIT fields varies around the world average of "1". At a more granular level, I is clear that the effort is more focused on industries and disciplines of national importance.

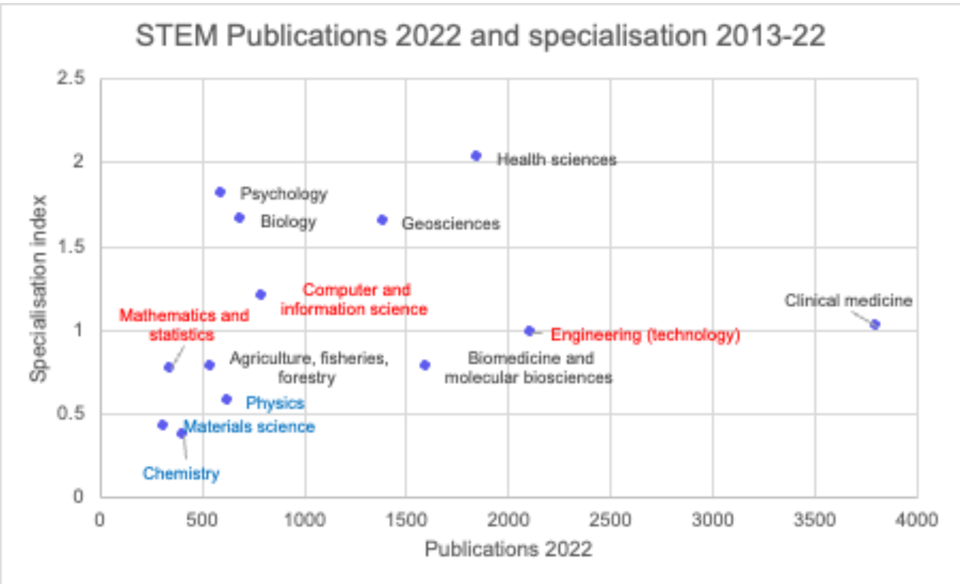

Figure 3 Norwegian STEM publications and specialisation indices for STEM subjects
MIT fields shown in red, Physical sciences in blue   Data from Karlstrøm et al (2024:5)

Figure 4 compares the mean normalised citation scores (MNCS) in Norway for each STEM sub-field with its specialisation index. An MNCS of "100" indicates that on average the number of citations obtained by articles in Norway is the same as that of all world publications in the field. Mathematics, Materials science and Chemistry are below average on both dimensions. While Norwegian publications tend to have higher MNCS in fields in which Norway specialises, the extent to which Norwegian publications in MIT subjects are cited is rather average. The Committee's evaluation in Section 2.1 indicates that at a more granular level there is more variation in performance,

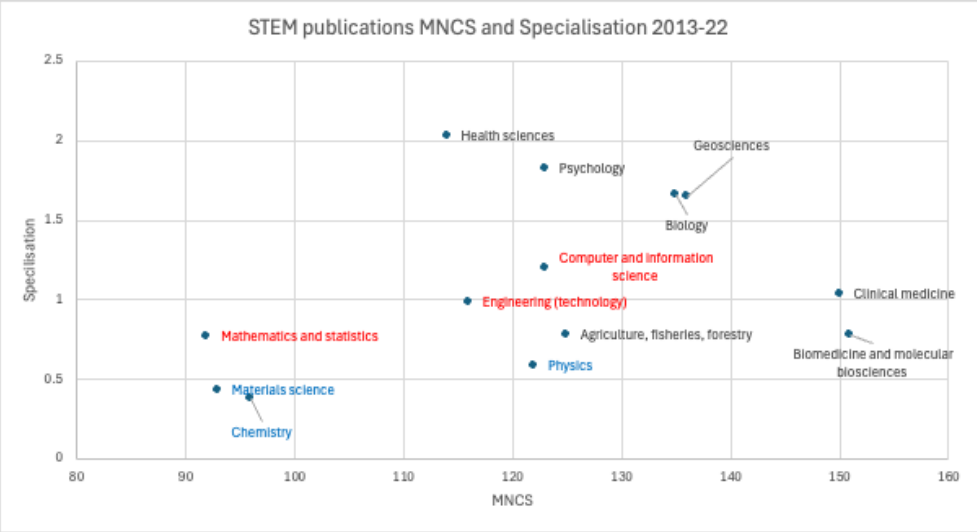

Figure 4 Mean normalised citation scores and specialisation indices for Norwegian STEM research
MIT fields shown in red, Physical sciences in blue Data from Karlstrøm et al (2024:5)

Mathematics, IT and Technology

Bibliometric evidence made available to the committee covers all Norwegian publications in MIT fields, not only those produced by researchers in scope to EVALMIT. This views research performance through the narrow lens of citation, but makes it possible to analyse Norwegian MIT at both field and sub-field levels and make systematic international performance comparisons.

Most of the bibliometric evidence refers to all publications with at least one author from a Norwegian institutional address, so in principle people in groups evaluated by EVALMIT will tend to be a sub-set of those considered in the bibliometric analyses. There may also be some inconsistencies between EVALMIT's field classifications and those of the Web of Science (WoS), on which the bibliometrics are based. Nonetheless, the bibliometric data provide an indication of how performance compares with international standards.

While MIT fields are important to the Norwegian economy, the proportion of Norwegian publications in 2013-2022 respectively in mathematics, ICT and Technology is close to the average for all countries considered in the WoS.

The numbers of Norwegian publications in 2022 in these fields differs widely among them. Table 5 shows the number published in each field in 2013 and 2022, and the growth across this period.

	2013	2022	Growth
Mathematics	560	650	16%
ICT	1460	1980	36%
Energy technology	410	530	29%
Marine Technology	230	330	43%
Other technology	600	990	65%

Table 5 Numbers of Norwegian papers published in MIT fields, 2013-2022
Source: Karlstrøm et al (2024:5)

Across the 2013-2021 period, the MNCS for MIT as a whole varied around 125, with no clear up- or downwards trend (Aksnes & Karlstrøm, 2025).

In the mathematics field as a whole, Norwegian the MNC has averaged 111, but has gently declined over the decade. Within mathematics sub-fields, Norway is specialised in pure and applied mathematics, but receives fewer than the world average number of citations. Citation performance is highly variable in other sub-fields that involve mathematics applications, with Norway doing a little better than average in interdisciplinary fields involving engineering and production, but below average in more abstract fields and in statistics.

In ICT, citation performance has risen during the last decade, with the MNCS averaging 118 across the 2013-2021 period. Norway is to a modest degree specialised in electrical and electronic engineering but spreads its research efforts across quite a range of fields. Citation performance in most sub-fields is well above the world average, especially in more applied rather than theoretical fields.

The available bibliometrics for Technology are presented in three sub-categories:

- The Norwegian MNCS in energy research fell sharply in the mid-2010's to around 110-115, but this is thought to be due to the publication of some exceptionally highly-cited work in the first half of the decade. Norway is very specialised in Energy and Fuels, obtaining above-average citation rates. In some other sub-fields, especially those orientated to engineering, Norwegian research is highly cited, but in other sub-fields more orientated to applied science (and Chemical Engineering) the citation rates are poorer
- In Marine Technology overall, Norwegian citation performance has hovered just above the world average for the last decade. Disaggregating the statistics, Norway is specialised in Marine, Ocean and Civil Engineering and in Oceanography with MNCS approximately in the range 110-125
- In Other Technology & Engineering, citation performance has fluctuated around an average of 118 during the past decade. Among the sub-fields, Norway is somewhat specialised in Civil Engineering, where the citation performance is just a little above the world average. The other sub-fields are rather disparate, with citation performance substantially better than average, especially in Mechanical Engineering

A more recent snapshot is provided by the 2019-2021 figures, when the MNCS for the major MIT fields were (Aksnes & Karlstrøm, 2025):

- Mathematics 96
- ICT 129
- Energy technology 116
- Marine Technology 102
- Other Technology and Engineering 113

Institutional performance

Karlstrøm & Aksnes (2024) provide a simple overview of the extent to which AUs' journal publications have been cited. Citation performance was diverse among the HEIs:

- NTNU submitted 15 AUs, 5 of which had 12.5% of their publications among the Top-10% most cited papers in their field; 4 had below 7.5% and the other 6 were around the mean
- UiT's Department of Electrical Engineering had 24.6% of its publications among the Top-10%, while the 8 other AUs were below (and in 4 cases far below) the average.
- Oslomet's 3 AUs were just below average
- UiB's 2 AUs a little further below
- While 4 of USN's AUs were a little further below average, the 5th one – Business and IT – had 31.7% of its publications among the top-10%
- Some individual AUs at new and small universities (Østfold, Western Norway, Agder) were strong, presumably reflecting success in building capability in a small number of specialisations.

Given their economics and applied focus, the institutes would be expected to have lower shares of highly-cited publications than the universities, and that is clearly the case for IFE, NORCE and NR. SINTEF's 6 AUs are distributed around the average. Simula's high citation rate stands out, but it is important to note that Simula has different economics to the other institutes and is very academically orientated.

AUs cited 50% or more above average were: NTNU's Departments of Computer Science and Natural Science, Simula, UiT Electrical Engineering, Agder Information Systems, UiO Informatics, USN Business and IT, and Østfold's Faculty of Computer Science, Engineering and Economics.

Emerging conclusions from the bibliometric analyses

Disaggregating the bibliometric data suggests that Norway tends to specialise in nationally and industrially relevant sub-fields of MIT, and to perform better than average at that level in terms of citations. This means that the industrial context encourages applied rather than more fundamental research, and this tends to translate to poorer levels of citation performance in fundamental and theory-based fields, adding credibility to the committee's assertion that fundamental research is under-supported in both funding and research group strategies.

There appears to be a particular issue in mathematics, where citation indicators suggest a modest performance. The committee's judgements about groups' performance suggest that there are some very good groups but that the 'tail' of modest performers is rather longer than in ICT or Technology. The committee points to a particular lack of funding support in pure mathematics, while citation performance is particularly disappointing in statistics and probability.

The bibliometric analyses also suggest there may be sub-fields – especially in technology – such as oil and green energy that need strengthening in order to support the green transition better. Such support would be important both to protect existing industry and to build the technological strength to make good use of the economic opportunities provided by the transition.

2.5. Open science

Administrative Units pretty universally claim to have adopted FAIR (Findable, Accessible, Interoperable, Re-usable) principles for curating research data so that they can be re-used. Some also mention that they also follow CARE (Collective benefit, Authority to control, Responsibility, Ethics) principles for sharing data on indigenous people's terms. However, there are no systematically-collected data about FAIR or CARE compliance for MIT as a whole.

Open access publication has been rising in Norway in recent years, as it has in other countries. NIFU (Karlstrøm & Aksnes, 2024) has analysed the extent to which the AUs represented in EVALMIT published their work in open access channels in 2022, based on publications listed in the Web of Science. The average unit archived 41.3% of its papers, so that pre-print versions can openly be obtained. It published a further 24.3% using 'gold' open access, so that the papers can be downloaded free of charge from the journal's web site. The remaining 34.4% of the output was not openly accessible. Since they are based on the Web of Science, these numbers exclude internal publications such as working papers, which are normally available free, as well as contract research (which is normally confidential when done for private customers, but free when done for government organisations).

Most of the AUs considered in EVALMIT are at major universities (Karlstrøm & Aksnes, 2024). Individual AU behaviour may deviate significantly from the averages given above, but there is no obvious pattern in the behaviour of the universities themselves. However, the newer and smaller universities tend to make less use of open access than the majors. Two of the more established new universities – Stavanger and Agder – tend to lie in between the two groups. OsloMet is hard to position, as its three AUs behave very differently to each other – though they all make heavy use of archiving.

Among the institutes included in EVALMIT[8], the Institute for Energy Technology and NORCE publish just over half their output in open access. SINTEF publishes over 75% of its output via open access – but makes heavy use of archiving to do this. However, the Norwegian Computing Centre behaves much like the average AU. These patterns suggest, first, that the traditional universities have better routines and possibly more money to pay article processing charges than the new universities and institutes and, second, that there is a learning curve among the universities that is driving up the share of open access publication over time.

[8] Simula was not included in the dataset analysed here

3. The general resource situation

3.1. Funding

Institutional funding

The higher education sector and the regional health authorities (which are not in scope to EVALMIT) are respectively governed by the Ministry of Education and Research and the Ministry of Health and Care Services. In contrast, the institutes are owned and governed by a wide range of ministries and foundations.

As in most Western countries, the public universities in Norway receive institutional funding from their parent ministry. Formally, this is allocated annually because the state budgets one year at a time. The annual letters of allocation from the ministry to the universities set broad goals for them in line with government research and higher education policy (especially the Long-Term Plan) and specify numbers of student places to be provided in various disciplines. The Ministry does not specify how much of universities' institutional funding is to be spent on research. However, NIFU calculates that in practice about 80% of the universities overall costs for research are covered by institutional funding. The remainder has to be won in competition from external funders such as RCN and the EU Framework Programme.

Different countries work with differing ratios of institutional to external funding. The exact ratios vary somewhat among years. However, at about 80%, Norway tends to be towards the upper end of the range together with, for example, Denmark and Switzerland. Other countries such as Finland, Sweden and the UK are more competitive, with institutional funding for research tending to cover about 50% of universities' research costs. As in most systems, the proportion of institutional funding for research provided varies among the universities in Norway, with the older traditional research universities getting a higher proportion than the newer universities and the colleges, which are more teaching-intensive.

Public research organisations or institutes often have multiple roles. Many function as 'government laboratories', and are typically owned and institutionally funded by a sector ministry. For example, the Marine Research Institute is owned the Ministry of Trade, Industry and Fisheries. It does some research, but most of its work is data collection and regulation on behalf of the ministry, for which it is paid directly. Other more research-orientated Institutes such as SINTEF and NORCE are among 33 institutes that satisfy RCN's criteria to be classed as 'research institutes'. Their institutional funding is channelled through RCN, which has also is responsible for evaluating them periodically. Norwegian research institutes typically get between 7% and 20% of their income as institutional funding, which is very low compared with equivalents in other countries such as the Fraunhofer institutes in Germany, TNO in the Netherlands or VTT in Finland, which typically get 30-40% institutional funding. Since they are more dependent on external market-based funding than their equivalents abroad, Norwegian research institutes tend to do more applied research and work at higher TRLs.

Different parts of the institute system are funded in different ways. The 'techno-industrial institutes' (research and technology organisations – RTOs – in international terminology) are the most relevant to EVALMIT.

Table 6 shows their economics in 2023. Institutional funding accounts on average for only 11% of their income, compared with the 30-40% provided in continental RTO systems such as TNO, VTT or Fraunhofer.

As the Table indicates, research in the techno-industrial institute sector is even more concentrated than that in the universities. SINTEF is the dominant force, and was originally set up in the 1950s as the industrial extension arm of the Norwegian Technological University (NTH, predecessor of NTNU).

	SINTEF	IFE	NGI	NORCE	NR	NORSAR	RISE:PFI	Sum	FFI	Total
Operating income	3954.6	1134.4	773.6	512.7	158.4	101.4	52.7	6,687.8	1,335.6	8,023.4
Institutional funding	507.5	91.0	62.3	52.0	18.1	9.6	3.7	744.2	1,315.2	2,059.4
Grant income	1,213.0	255.5	48.4	197.4	47.5	31.5	20.5	1,813.8	39.6	1,853.4
Contract income	1,095.1	156.1	363.7	164.7	62.4	31.9	24.9	1,898.8	894.0	2,792.8
International income	783.2	141.0	271.1	60.8	14.0	23.5	1.8	1,295.3	48.7	1,344.0
Government administration		404.1						404.1	19.0	423.1
Other operating income	225.5	65.8	8.5	14.6	3.2	1.0	1.3	319.9	27.8	347.7
Financial income	130.2	20.8	19.7	23.2	13.3	4.1	0.5	211.8	19.8	231.6
International share of operating income	*20%*	*12%*	*35%*	*12%*	*9%*	*23%*	*3%*	*19%*	*4%*	*17%*
Institutional share of operating income	*13%*	*8%*	*8%*	*10%*	*11%*	*9%*	*7%*	*11%*	*98%*	*26%*
RCN share of operating income	*32%*	*30%*	*14%*	*42%*	*32%*	*42%*	*41%*	*30%*	*0%*	*25%*

Table 6 Key figures, Norwegian Techno-Industrial Institutes, 2023 (NOK 1,000s)
Source: RCN Annual Report 2023, Techno-Industrial Institutes. Shaded institutes have not participated in EVALMIT. For historical reasons, Simula's institutional funding is provided directly by the Ministry of Education and Research

External funding

Norway merged its innovation agency and research councils to create the Research Council of Norway (RCN) in 1993. While RCN is an agency of the Ministry of Education and Research, it also acts as a research and funding agency for innovation and research for all the other ministries except defence. These other ministries themselves decide how much of their spending on research and innovation is devolved to RCN and how much they do for themselves. Almost all external funding in Norway comes either from RCN or the ministries. Unlike some other countries such as Sweden, Denmark, the USA and UK, there are few research funding foundations. Exceptions include the Cancer Foundation and the Trond Mohn Foundation, which mainly funds research at the University of Bergen and the associated university hospital (Haukeland), but these are very small by international standards.

In 2022, the ministries elected to spend NOK 11.4bn through RCN, of which

- NOK 7.3bn (51%) was spent on external competitive research and innovation funding, split
    1. NOK 4.1bn (56%) to the higher education sector
    2. NOK 2.9 bn (40%) to the research institutes
    3. NOK 0.3 bn (4%) to the regional health authorities
- NOK 1.1 bn was used for institutional or 'core' funding for the institutes overseen by RCN

In current money, RCN invested just under NOK 4bn in MIT fields in 2022.

Table 7 shows RCN's project funding of the major disciplines in real (2015) terms. The largest grouping is Technology (38%), followed by Mathematics and Natural Sciences (22%), which rose respectively by 31% and 48% in real terms in 2012-2022.

Disciplines	Cumulated real (2015) MNOK	Shares	Growth 2012-2022
Humanities	2,936	4%	40%
Agriculture and fisheries science	5,874	7%	-29%
Mathematics and natural sciences	17,335	22%	48%
Medicine and health	9,893	13%	36%
Social sciences	11,987	15%	65%
Technology	29,750	38%	31%
Other	1,283	2%	204%

Table 7 RCN Real-Terms Project Funding, Major Disciplines, 2012-2022 (Millions of 2015 NOK)
Source: RCN

Table 8 shows the proportion of different funding instruments in MIT funding and total RCN grant funding. Bottom-up, researcher-initiated projects tend to lie in the “Independent projects” category, or in some cases in centres of excellence funded under “institutional measures”. The Table is therefore consistent with the applied focus of MIT research.

Funding instruments	MIT	All fields
Independent projects	8%	16%
Infrastructure and institutional measures	23%	21%
Networking measures	10%	7%
Programmes	57%	54%
Other	2%	2%
Total	100%	100%

Table 8 Share of funding instruments in RCB grants, 2012-2022 (real prices) for MIT fields and all grants
Source: RCN

Funding acknowledgements from articles published in 2020-2022 confirm that RCN is the dominant funder in EVALMIT fields, acknowledged in 78% of articles[9]. The EU is acknowledged in 21%. Two companies (Aker BP and Hydro) are cited in about 1% each. The remaining funding is from various parts of the Norwegian state, except for 2% acknowledging the Trond Mohn Foundation in Bergen.

There is no comprehensive statistical source showing all the sources of funding used in Norwegian MIT research. NIFU’s analysis of funding sources for Norwegian publications in the MIT fields found that RCN is acknowledged in about 60-70% of publications in each of the five EVALMIT fields. The EU funds close to 20% in most of these fields, but only about quarter as much in marine technology, which tends not to be an EU priority. Mathematics and ICT articles acknowledge industrial funding much less than the other MIT fields.

[9] Source: NIFU Insight 2025-2. NB that some articles acknowledge more than one funding source

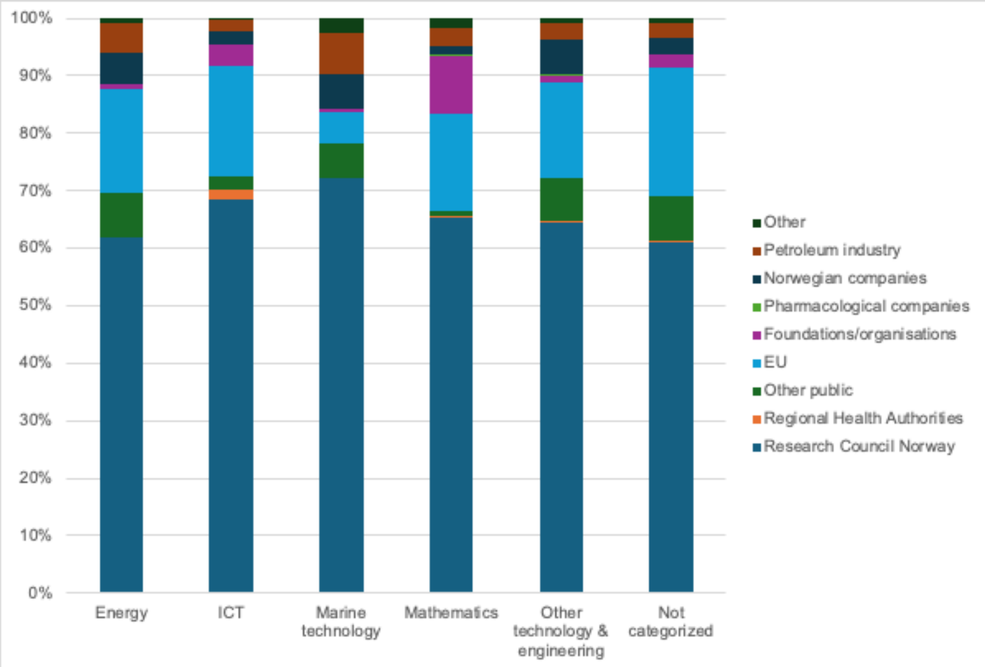

Figure 5 Proportion of Norwegian publications in 2020-2022 acknowledging various funding sources in mathematics, ICT and technology
Source: NIFU Insight 2025-2

EU Framework Programme funding

In 2022, RCN and the EU Framework Programme together provided a total of NOK 14.2 bn to research in Norway, with 80% of the funding coming from RCN and 20% from the FP.

Figure 6 differentiates between funding in MIT fields received by Norwegian research-performing institutions in the Excellent Science programmes and the innovation and societally-orientated programmes within the Framework in 2020 to 2022. Norway's funding is mostly in the second category. The Figure also shows that funding from the Framework Programme for Norwegian MIT fields is very skewed, with SINTEF, NTNU and UiO winning around €220m in the period, suggesting that there is substantial headroom for other organisations to win more money from the Framework Programme.

The EVALMIT research group and administrative unit reports echo this message. Especially for groups outside NTNU, SINTEF and UiO, the reports emphasise the need to diversify funding sources beyond RCN by making better use of the opportunities provided by the Framework Programme. One of the reasons given for this is to reduce the risk associated with high dependence on a single funder. The committee feels this risk is exaggerated to the extent that RCN has a range of funding instruments for fundamental and applied research and innovation – in effect, RCN contains different sorts of money. However, the more important reasons given for seeking Framework Programme funding are to participate more in international research and innovation networks and to build scale. As was indicated in Section 2.1, these ambitions align with success-factors in MIT research. While the evaluation reports rarely go into more detail about the benefits of Framework Programme participation, this not only brings opportunities to learn from and demonstrate capabilities to international researchers but also to industry. Framework Programme participation is dominated by established networks that evolve slowly over time and that win projects through a combination of capacity and track records. There are strong barriers to entry, but once one becomes a trusted network member the likelihood of participating in successful proposals rises dramatically (Arnold, 2012).

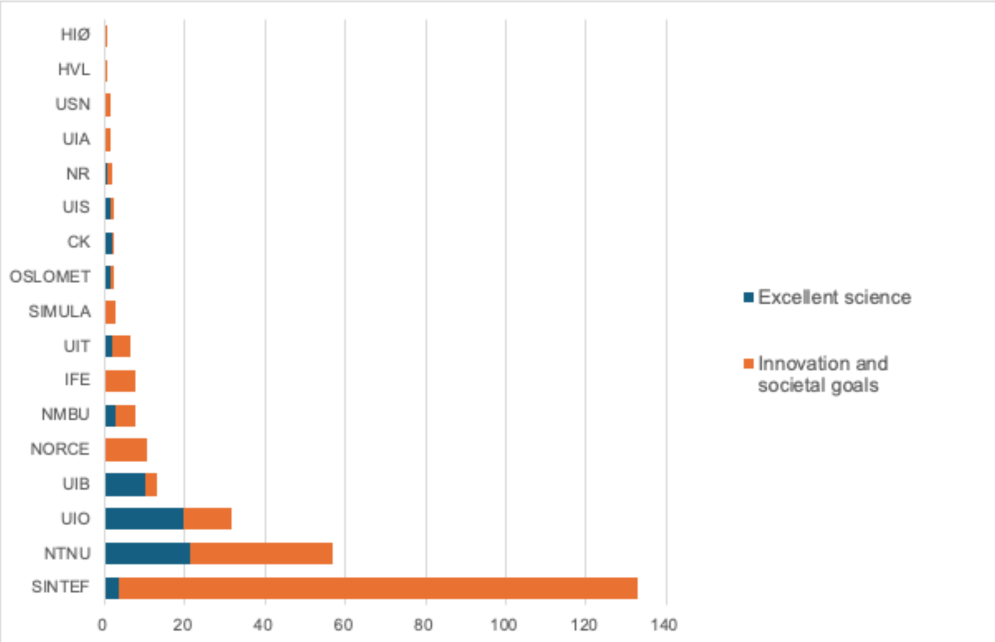

Figure 6 EU Framework Programme funding granted to Norwegian organisations by programme goals, 2020-2022
Source: RCN

3.2. Personnel

The Administrative Units included in EVALMIT employed a total of about 5,580 researchers in 2021 (the latest year for which the national statistical office SSB publishes a consistent set of data). Two thirds (3,700) of these researchers were in the higher education sector and the other third (1,900) in the institutes. Consistent with a longer-term trend for the higher education sector to grow faster than the institute sector, the growth among higher education researchers in units in scope to EVALMIT between 2013 and 2021 was 60% (1,430) while the number of institute researchers grew by only 25% (380 people).

The higher education researchers in scope to EVALMIT were younger (average 39 years) than those in higher education as a whole (average 45). The average age of the (full) professors in AUs submitted to EVALMIT was 54, with a range from 45 to 61. Some 26% of professors in the EVALMIT units were 62 or more years old and therefor eligible for retirement (though the official retirement age is 67). In thirteen[10] AUs, the share of professors aged 62 or more was one third or above, underlining the need for deliberate succession planning as a component in unit strategy. This signals a generation shift, which is on the one hand a threat because of the need to replace retirees, though surprisingly little is said in the AU and research group reports about succession planning. On the other hand, it is an opportunity to set new research directions by replacing retiring professors with other people specialising in new areas. These would not necessarily be professors – there is a case for recruiting some people at lower levels to enable organic growth. This opportunity is especially relevant in relation to the green transition – shifting research foci from fossil fuels to renewables and new materials – and new technologies in ICT such as AI, quantum computing and communications,

[10] NTNU Departments of Electronic Systems, Energy and Process Engineering, Geoscience and Petroleum, and Structural Engineering; UiA Faculty of Engineering and Science; UiS Department of Petroleum Engineering; UiT Department of Building Energy and Materials Technology, Computer Science and Computational Engineering, and Mathematics and Statistics; USN Department of Business and IT; and all 3 AUs from USN.

and digitalisation more broadly. This strategic opportunity was also little discussed in the self-evaluations presented to EVALMIT.

The growth in the research workforce at the university units in scope to EVALMIT has been strongly supported by people who took their PhDs outside Norway. The proportion of research staff who took their PhD abroad has risen from 28% in 2013 to 40% in 2021. The proportion is highest (48%) among postdocs and researchers, lowest among associate professors (33%), and very close to the average among full professors (41%). There is no obvious connection among subjects and having an above-average proportion of PhD-holders except among units with ‘Mathematics’ in their title which all did so in 2021.

	Researchers	Percentage
Total	3,704	100%
Full professors	746	20%
Associate professors	768	21%
Researchers and postdocs	595	16%
PhD students	1,595	43%

Table 9 Shape of the HE academic hierarchy in EVALMIT units, 2021
Source: Rørstad & Wendt (2024/15)

3.3. Research infrastructure

Norwegian MIT research benefits from extensive and high-quality national research infrastructure and access to EU infrastructures and the ESFRI system, as well as older multilateral facilities such as EMBL and CERN. Access to infrastructure is not only important to carrying out research but also can be a key factor in making Norwegian researchers attractive partners in international research collaborations, such as the EU Framework Programme.

Table 10 shows how many EVALMIT administrative units use the main infrastructures available. There are many more facilities in addition which, as the table indicates, are only used by one or two units.

Many of the national infrastructures reflect specific Norwegian research foci.

- There are extensive and high-quality marine engineering facilities for hydrodynamic and strength and fatigue assessment of ships, O&G platforms and offshore renewable energy structures. Many of these are in and around Trondheim, where a Norwegian Ocean Technology Centre is being built at a cost of about NOK 10bn, and is to be run by NTNU and SINTEF
- SINTEF Ocean is the host institution for three national infrastructures: PLANKTONLAB (The Norwegian Centre for Plankton Technology) for bio marine production/biomass production and harvesting of plankton from the sea; The Marine Technology Centre for research and development in shipping, marine equipment, ocean energy, petroleum and other ocean industries; OceanLab (Ocean Space Field Laboratory) for technological developments and digitalisation of the ocean, including an ecotoxicology laboratory, environmental and biochemical analysis, and oil laboratory
- The NORCE E&T Division hosts two national infrastructures: OpenLab Drilling for research and technology development within drilling and well operations, and Ullrigg Test Centre, which is a full-scale test and piloting centre for technology, systems, methods, and solutions in drilling and well activities. It is a partner in four infrastructures: the Norwegian P&A Laboratories, a national Plugging and Abandonment (P&A) infrastructure being established at NORCE, SINTEF, UiS and NTNU

National infrastructures	No of user AUs	International infrastructures	No of user AUs
Sigma2	11	ESA	12
NorFab	8	CERN	11
eX3	7	ELIXIR EMBL	6
Manulab	5	ECCSEL	7
NorPALabs	5	European Synchrotron Radiation Facility	4
ELIXIR.NO	4	ESS	3
Norwegian Advanced Battery Laboratory Infrastructure (NABLA)	4	LUMI Supercomputer	3
Norwegian Artificial Intelligence Cloud (NAIC)	4	SIOS Svalbard	3
NcNeotron/ESS	4	EuroHPC-JU EuroHPC Joint Undertaking,	2
OceanLab	4	Europ Bio-imaging ERIC	2
Norwegian Biorefinery Laboratory (NorBioLab)	4	ESRF-EBS	2
HydroCen	4	39 others	1 each
SmartGrid	3		
ZEBLab	3		
CCSEL Norway CCS RI	3		
HighEFFLab	3		
Smart Building Hub (SBHUB)	3		
14 other infrastructures	2 each		
64 other infrastructures	1 each		

Table 10 Numbers of administrative Units using national and international infrastructures
Source: EVALMIT Administrative Unit reports

- NorFab, the Norwegian infrastructure for micro and nano fabrication, provides a wide variety of micro- and nanotechnology (MNT) fabrication and characterisation services, as well as education and training, vital to both basic and applied research. The State-of-the-art laboratories are of great importance for various research activities in MNT, promoting collaboration on a national level, fostering a robust national competence, enhancing international project collaborations. Groups at NTNU, USN, UiO and at SINTEF make use of the facilities and contribute to building competence in this field
- Norway's geography makes it an excellent base for environmental, climate and geological observation. IOS Infranor, which is an international infrastructure on Svalbard to monitor impacts of climate change and understanding of how the change affects the arctic environment and its ecosystems; TONe, Troll Observing Network, to enable environmental research and understanding of the role of eastern Antarctica in the climate system, and how climate change will impact fauna and primary production; EPOS-N, a web-based software to visualise, sort and analyse different types of geoscientific data, volcanic eruptions, slope instabilities, tsunamis, tectonics and Earth surface dynamics. NORCE E&T also make use of the ECCSEL Infrastructure, Svelvik CO2 Field Lab, for testing digital acoustic sensing for monitoring CO2 injection and storage; and NIRD both for access to High-Performance Computing and large-scale data storage
- Within international infrastructures, NORCE has a long track record in radar satellite remote sensing and are an ESA Expert Support Laboratory for the Envisat and Sentinel-1 missions, part of the Copernicus satellite infrastructure. Norwegian membership in the Copernicus program is at the core of the satellite remote sensing activities at NORCE, and a critical infrastructure for the satellite research activities and service development. It also uses the ESFRI: European Next Generation Incoherent Scatter radar infrastructure to develop a space debris tracking system; the European Multidisciplinary Seafloor and water column Observatory; and is responsible for developing and maintaining parts of the core services for the e-Infrastructure of the European Plate Observing System; and the Aircraft infrastructure, and SAR satellite snow products for the Svalbard Integrated Arctic Earth Observing System
- Currently, research consumes rapidly-growing high-performance computing (HPC) power. Norway has created a single national HPC centre – Sigma2 – which is co-managed by leading

Norwegian universities and is currently testing a new supercomputer in former mine workings outside Trondheim. This is an important example of the power of building a single national centre in a technology where scale is very important

Research infrastructure is cost-heavy, and parts of the infrastructure constantly need renewal, so infrastructure projects need appropriate business models to cover their costs. As the Ocean Technology Centre illustrates, these costs can be very large. A clear strategy will be needed for facilities maintenance, use and development to ensure funding covers future overheads. It also needs to be clear about how it is positioned in the context of national and international roadmaps to ensure alignment with wider national and international needs, raise the profile of the facilities to support continued use, and raise awareness of the Centre and its partners more widely.

4. PhD training, recruitment, mobility and diversity

4.1 PhD training

EVALMIT submissions at research group and AU level described numbers of PhDs being trained, but understandably it was difficult for committees directly to form a view of the quality of PhD education at individual AUs. Unsurprisingly, the larger institutions tended to have more formal arrangements for mentoring and training PhD candidates, and had the numbers of PhD candidates allowing sustainable provision of doctoral training classes in addition to individual supervision. Many groups had enough capacity available to train more PhDs, but were not always able to recruit them. Ten of the AUs had numbers of PhDs in single figures, and are likely to be sub-critical.

The ratio of PhD students to full professors across the EVALMIT HEI AUs in 2021 was 2.1 (Table 11). The ratio of PhD students to full and associate professors was 1.1, suggesting that research productivity in terms of both research and PhD production was low. There was a wide variation in these ratios at the individual AU level, however. The ratios also need to be understood in the context of differences in the importance of teaching versus research. Low ratios of PhD candidates to professors at smaller institutions will be strongly influenced by high teaching loads, with some of the professors focusing on teaching rather than research.

Organisations	No of AUs submitted by the institution	PhD students per full professor	PhD students per full or associate professor
Kristiania	1	0.6	0.2
NMBU	1	1.9	0.7
NTNU	15	2.8	1.6
Oslomet	3	1.0	0.4
UiA	2	1.5	0.7
UiB	3	2.9	1.2
UiO	2	2.2	1.4
UiS	3	2.2	1.1
UiT	9	2.5	1.0
USN	5	0.9	0.4
HiV	1	1.2	0.4
All	43	2.1	1.1

Table 11 Ratios of PhD students to professors, 2021
Source: Calculated from Table 3.4 in Rørstad & Wendt (2024/15), which shows the full data set at the individual AU level

4.2 Recruitment

Many of the AU reports describe difficulties in recruiting faculty members and students at all levels. These are especially important where alternative, better-paid posts exist in industry. Mobility of researchers in Norway is impeded in many cases by the ‘two-body problem’ where both partners in a family have professional or academic jobs, so that changing location can only be done if two suitable positions can be found simultaneously.

As Section 3.2 points out, growing numbers of faculty members are not of Norwegian origin, and the same is true of students, especially at PhD level, reflecting changes in Norwegian demographics and employment preferences. Recruitment is especially difficult outside the major cities.

4.3 Mobility

EVALMIT self-evaluations rarely contain any numbers, but committees and panels frequently comment on the (long-established) problem that Norwegian researchers tend to be reluctant to take up mobility opportunities. This is often attributed to the high level of welfare in Norway and the family issues raised by mobility, such as the need for spouses to have an income and the loss of benefits such as childcare. There are no opportunities to take sabbaticals in the institutes, and few in the higher education sector outside the traditional universities. Low levels of mobility seem therefore to be supported by a combination of low demand and low supply in a high-income country where the short-term benefits of mobility are felt to be limited. This runs counter to the more general belief in global research communities that mobility is career-enhancing because it builds reputations and new networks, prevents in-breeding in research groups, and supports the transport of new thinking between research communities. Complexities in tax regimes, including the Norwegian one, have also been mentioned as barriers to mobility, so it could be useful for the institutions and RCN to explore this question and potentially to offer advice alongside the mobility schemes in operation.

4.4 Gender equality and diversity

Women’s positions are slowly improving in the universities, but they remain poorly represented in the EVALMIT units, with those in higher education in 2021 making up 25% of the researcher workforce, compared with 51% in the higher education sector as a whole.

	Professors	Associate professors	Researchers & postdocs	PhD students	Total
2021	15%	26%	24%	29%	25%
2017	12%	27%	26%	28%	24%
2013	10%	24%	23%	27%	22%

Table 12 Share of women in EVALMIT higher education units at different career stages
Source: Rørstad & Wendt (2024/15),

The slow growth in female participation is consistent with international trends in large-scale surveys of authorship of journal articles. Jemieniak and Wilamowski (2024).calculate that the convergence between female and male shares of authorship is reducing over time, making it unlikely that equality will be achieved without additional policy measures Female participation varies both by country and by field. The female share in mathematics is about 21-27%, engineering about 24-28%, and computer science about 26-29% (Jemielniak & Wilamowski, 2024; Elsevier, 2024).

Research group and AU reports university point to the problem of gender imbalance, especially in ICT and mathematics. Groups and AUs universally have policies aimed at reducing the imbalance, though few were able to describe specific actions through which they are reducing it.

The share of women among EVALMIT institute researchers was 29%, up from 26% in 2013. Some 68% of RI researchers have a PhD, compared with 93% in the HE sector. Only 20% of institute researchers had a foreign PhD in 2021. The institute researchers’ average age has been stable at about 43 during the 2013-2021 period, while the proportion aged 62 or above is only 7%, suggesting there are fewer succession planning issues than in the HE sector.

Data on wider diversity, other than shares of people in various positions born outside Norway to non-Norwegian parents, are hard to find. The reports contain nothing to suggest that this change raises issues. This is surprising, since such demographic changes tend to raise questions of brain drain and gain, culture, language and research group sustainability, among others. Unless such issues are monitored, it will not be possible to address questions about them using a factual basis.

5. Research cooperation nationally and internationally

5.1 Administrative units' cooperation within and between sectors

Norwegian research cooperation patterns in MIT appear consistent with the geography and history of the research-performing organisations. **Error! Reference source not found.**[11] maps co-publication among these organisations in 2020-2022, with the diameter of the nodes being proportional to the number of articles published and the width of the lines being proportional to the number of joint publications between the institutions at the end of the lines.

At this overall level (and in most of the sub-fields), the NTNU and SINTEF are the dominant actors, reflecting NTNU's historic role as the national university of technology. SINTEF was originally conceived as the industrial extension department of NTNU, but has grown over time almost to become the national research and technology organisation, rather like TNO in The Netherlands or VTT in Finland. One reason SINTEF can operate with much lower institutional funding than TNO or VTT is its symbiotic relation with NTNU, which is most visible in the large number of (primarily) NTNU PhD candidates co-supervised, or in practice working in the labs, at SINTEF.

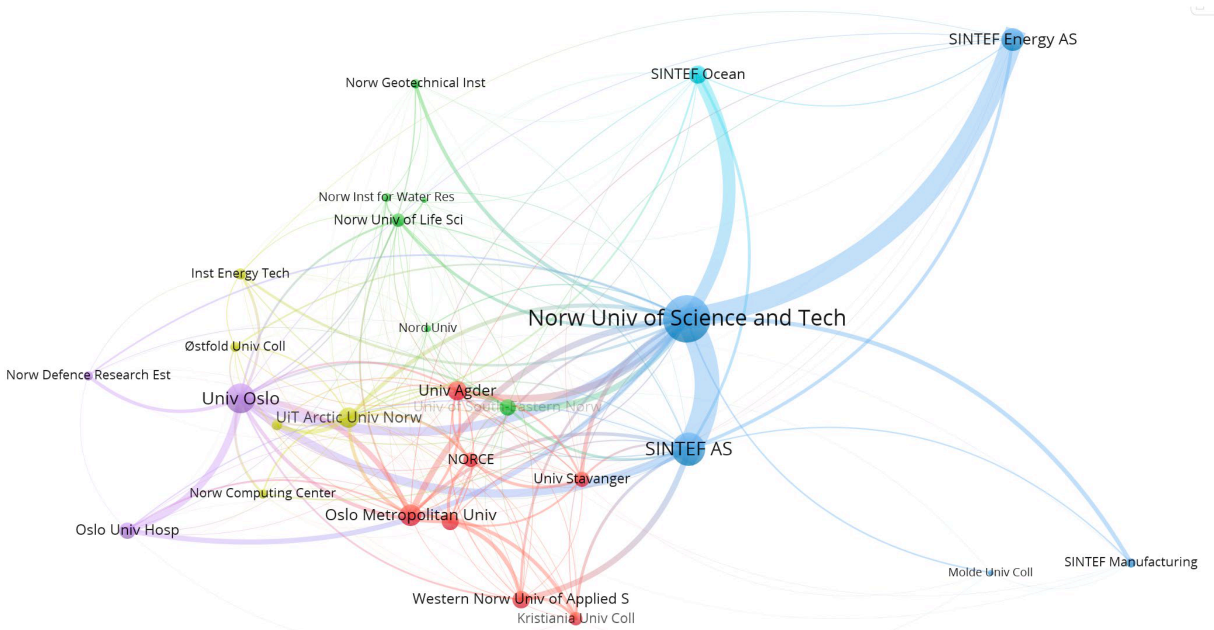

Figure 7 NTNU as the spider in the web of Norwegian MIT co-authorships, 2020-2022
Source: Aksnes & Karlstrøm (2025)

Figure 7 shows a second, smaller cluster around UiO, whose partners are more likely than those of SINTEF to be universities rather than institutes. The shape of these two clusters is partly driven by UiO's greater orientation towards natural sciences, mathematics and software while NTNU has focused more on 'hard' industrial technologies. It also reflects the fact that Norway's original national institute of technology (*Sentralinstituttet for industriell forskning*) was absorbed by SINTEF in 1993. UiO's links to SINTEF are sometimes to the parts that were absorbed by SINTEF and which tend to remain located close to UiO. (Norway also has a third natural university-institute network with about

[11] Most of this section summarises information from the same source, at both MIT level and at the level of the five fields into which the authors divide MIT. The reader should note that this and the other network analyses treat SINTEF AS and the industrial divisions (Industry, Digital, Marine, etc) as separate entities

800 employees, which is developing around UiB through the merger of ten mostly West-coast institutes into NORCE. This is thematically diverse and therefore not visible in analyses of MIT.)

Aksnes and Karlstrøm (2025) additionally describe the different characteristics of individual fields within Norwegian MIT:

- The national co-publication pattern in mathematics is dominated by two clusters: a marginally bigger one centred on UiO, and another on NTNU. The pair with the largest number of joint publications, however, is UiO and NTNU, reinforcing the extent to which the Norwegian mathematics community forms a single network. This network is dominated by universities – there are only a few institute nodes, of which SINTEF Ocean is the biggest
- The ICT network is more heterogeneous, with overlapping networks centred on NTNU and UiO. SINTEF also appears as a major node, with connections not only to NTNU and UiO but also to a list of other universities
- The Energy network is heavily dominated by NTNU, which is strongly linked to various parts of SINTEF. UiO is at the centre of a much smaller network with a different set of institutes – notably the Institute for Energy Technology (IFE), the Norwegian Defence Research Establishment and CICERO, all in the vicinity of Oslo
- Marine technology is similarly dominated by the NTNU-SINTEF pair, with UiO at the centre of a much smaller sub-network
- Reflecting its heterogeneity, the ‘Other technology’ network has many members but they are nonetheless overshadowed by the scale of the NTNU-SINTEF pair

5.2 Administrative units’ international research cooperation

Table 13 shows Norway’s pattern of international co-publication in MIT. Unsurprisingly, given their size, China and the USA are the biggest cooperation partners, followed by Germany and the UK, which have traditionally had the major relevant research communities in Europe. The other Nordics (Sweden, Denmark, Finland) together make up 17%. The top-9 countries account for just over half the co-publications, so while these are important partners none is big enough to overshadow the collaboration pattern.

Country	No collab pub	Percent	Country	No collab pub	Prop all pub
China	1529	10 %	**Canada**	477	3 %
USA	1281	8 %	**Switzerland**	310	2 %
UK	981	7 %	**Australia**	292	2 %
Germany	970	6 %	**Finland**	256	2 %
Italy	785	5 %	**Austria**	255	2 %
Sweden	724	5 %	**Brazil**	239	2 %
India	638	4 %	**Iran**	229	2 %
Netherlands	537	4 %	**South Korea**	214	1 %
France	527	3 %	**Russia**	206	1 %
Denmark	501	3 %			
Spain	492	3 %	**Total**	8671	58%

Table 13 International co-publication in MIT fields, 2020-2022
Source: Aksnes & Karlstrøm (2025)

The major MIT fields have different international collaboration patterns. Based on 2020-2022 publications, the following proportions of Norwegian publications have international co-authors

- Mathematics 63%
- ICT 56%
- Energy 61%
- Other technology and engineering 61%
- Marine technology 43% (Karlstrøm & Aksnes, 2024)

Table 14 shows Norway's top-5 co-publication partner countries for each of the main MIT fields, the proportion of co-publication that is with China and the USA, and similarly for the Nordic countries as a group and individually. Despite their proximity, the other Nordic countries are not especially frequent partners. In research terms, these patterns appear healthy. However, the importance of China is an issue in terms of knowledge export controls. In the current geopolitical climate, it is unclear whether co-operation with US researchers will become more complex.

	Mathematics		ICT		Energy		Marine		Other technologies	
No. articles		1123		3252		1145		289		1853
Top-5	US	12%	CN	9%	CN	11%	CN	13%	CN	13%
	DE	10%	US	8%	IN	7%	US	8%	US	8%
	UK	9%	DE	7%	US	7%	DK	5%	UK	7%
	IT	6%	UK	6%	DE	7%	UK	5%	IT	7%
	FR	6%	IN	5%	DK	6%	NL	3%	SE	6%
CN		5%		9%		11%		13%		13%
US		12%		8%		7%		8%		8%
Nordics		7%		9%		11%		5%		13%
Of which, SE		5%		5%		5%				6%
DK		2%		2%		6%		5%		5%
FI				2%						2%

Table 14 Top co-publication partners per MIT field, 2020-2022

Data from Karlstrøm & Aksnes (2024) NB these data are taken from longer lists of top co-publication partner countries, so small percentages from other Nordic countries will have been omitted

In 2022, 31.7% of Norwegian scientific publications involved international co-authors, placing Norway in a group with other small countries like Finland and Estonia with a very high propensity to international co-authorship[12]. The proportion of European authors co-publishing internationally has risen during the life of the EU Framework programme. For obvious arithmetical reasons, country indicators of international collaboration tend to be inversely related to population. In Luxembourg, international co-publication is nearly inevitable; in China it is less so, and the recent decline in the overall proportion of articles with foreign co-authors is likely to be driven by the dramatic growth in Chinese publications during recent years.

In aggregate, 21.9% of the articles published by AUs submitting to EVALMIT involved national co-authors, and 53.8% international co-authors. Individual AU behaviours are rather variable, depending to some degree on their discipline. For example, about half the NTNU and UiT AUs co-publish with other Norwegian organisations only to a rather small degree. In contrast, UiS, Western Norway and Østfold publish little with domestic partners but much more than average with foreign ones. SINTEF AUs tend to publish more than average with national partners and a little less than average internationally. The other institutes show a similar pattern, though Simula stands out for publishing

[12] OECD Bibliometric indicators 2024 edition, based on SCOPUS

75% of its articles with Norwegian authors but at the same time more than average with foreign institutions (Data from Karlstrøm & Aksnes (2024) Table 4).

EVALMIT AU reports imply that the more successful research groups and administrative units are already well integrated into international networks, but that all groups would benefit from greater participation in the EU Framework Programme. This may become especially important if current tensions among international trading blocs continue to increase, leading to restrictions on cooperation.

6. Societal impact and the role of research in society

As indicated in Section 2.1, successful applied MIT research requires understanding of the industries in which research results are likely to be applied and therefore contact with users.

The committee's impression was that the authors of the administrative units' impact cases were not very familiar with researching and writing such things. About a fifth of the self-assessments did not include any cases. Many of the cases were at an early stage, where little impact had yet occurred. Most of the cases submitted discussed the research involved and asserted there was societal impact, but provided few or no indicators to support the claim – even if in many cases the claims were credible. Future evaluations could provide more guidance on how to evidence impact claims, though it should be noted that producing evidenced impact statements can involve a substantial amount of work.

The committee selected 35 examples where significant and specific effects had been identified to analyse more closely. The impact statements from research institutes tended to be more concrete and better evidenced than those from universities. This is unsurprising, as the institutes generally work at higher TRLs and to a greater extent co-produce innovations with their customers, so they are better positioned to understand short-term impacts. Some university groups have similar relationships, but by no means all do so.

The set of impact cases shows some other distinct patterns:

- Impacts easily cross disciplines, so mathematics can create impacts on health, ICT on energy technology, and so on. In many cases, impacts resulted from different departments working together
- Few cases involve the creation, packaging and transfer of intellectual property
- Where spin-offs take place (which is in a small minority of cases), they tend to appear in clusters over a period, reflecting the research groups' strong understanding of the demand side. They therefore tend to address established industry, rather than being the more speculative, 'technology push' kinds of firm normally associated with Silicon Valley, Cambridge, UK and so on
- An exception is Simula, which spins off software firms
- It was possible to identify only one clear case of AI-related impact (Tsetlin machines – see below)

These trends appear consistent with the structure of Norwegian research and industry in EVALMIT-related sectors, with a tendency towards incremental innovation in established industries. This underlines the question whether the research and innovation system is sufficiently able to support the more disruptive changes likely to be needed in talking the societal challenges and the challenges increasingly arising from the changing global context.

The following case summaries are intended to illustrate the variety of impact that is possible, They are all, to varying degrees successful examples (unsuccessful ones have no impact, by definition). Their scope ranges from the very local example of reducing the damaging effects of ship wakes in coastal waters to global influence on the design and implementation of offshore wind turbines.

NORCE – Automated drilling

This case builds on research at NORSE and its predecessors in Stavanger going back to the 1980s on how to optimise drilling in the oil and gas industry. Like many of the institute sector's impacts, it is based not on a single project but a longer research agenda conducted in interaction with industry over many years. The research has aimed to understand what is happening underground during drilling, to optimise its efficiency and increase its range of applications, using mathematical models, laboratory-scale experiments and full-scale trials at the Ullrig drilling infrastructure at NORCE. From 2000, the work has focused on real-time control of drilling, increasing efficiency and making it possible to drill from unstable platforms, especially floating platforms. NORCE's predecessor institute span off a service company, Sekal, in 2011 through which the researchers have been able to deliver a stream of commercial software to the company and the market, supporting drilling at over 1,000 wells, and in 2021 demonstrating AI-based autonomous control of drilling in a joint industry project supported by RCN. Sekal is now among the market leaders in drilling automation. Independent analysis by Rustad has identified large potential for productivity improvements as well as reducing the carbon footprint of the drilling process itself.

SINTEF Energy Research – Grøft Design (Trench Design)

This case is based on work by SINTEF on two RCN industrial innovation (IPN) projects between 2014 and 2022. This developed a tool to support the design of high-voltage underground transmission cable installations needed to address increasing electricity demand caused by decarbonisation. The projects were initiated in response to a request from power distribution companies. The resulting computer-aided design tool – Grøft Design – allows designers to explore alternative cable and trench designs as well as alternative materials for filling trenches, all of which affect the magnetic and thermal properties and the carrying capacity of the installed cables. Grøft Design claims that it increases electricity throughput by 5-20% compared with traditiomal design methods. The first version of the software was launched on the market in 2019, and is promoted by REN, which is a company jointly owned by the electricity distributors that sets standards and promotes good practice in electricity distribution. At this stage, the claimed performance improvements appear not to have been independently verified.

Norwegian Computing Centre (NR) Covid-19 modelling

As in many other countries, Norway recruited the help of a research group at the start of the Covid pandemic at the end of 2019 to model the transmission and effects of the disease. NR played this role in Norway, using researchers from the RCN-funded BigInsight research centre to provide real-time data for policy planning, monitoring the spread of the disease, calculating reproduction numbers at national and local levels, predicting numbers of hospitalisations and providing scenarios to allow the development of vaccination strategies. To do this, NR mainly built on models that were in place before the pandemic. A PhD project that used mobile phone data to help predict the spread of 'flu in Bangladesh already being done by an NR researcher provided a novel way to predict the spread of the disease without waiting to collect additional data from the field. NR was also able to feed models run by the Norwegian Institute for Public Health, and provided data allowing the health service to develop differentiated vaccination strategies for different parts of Norway. The subsequent inquiry into the pandemic (*Koronautvalget*) has confirmed the importance of NR's activities in combating the pandemic. The group has also contributed to the Norwegian Directorate of Health's account of the socio-economic effects of intervention.

UiO Department of Mathematics Sequential Monte Carlo methods for Covid-19 analysis

This research was done by the UiO Department of Mathematics under the umbrella of the BigInsight research centre. Together with the preceding Norwegian Computing Centre case, this forms part of the national COVID effort, coordinated by the Norwegian Institute for Public Health (NIHP). A key part of understanding the epidemiology of the pandemic was to monitor the 'reproduction number', which is the number of additional people who would be infected by a new person falling victim to the disease. Once the reproduction number can be driven below "1", the pandemic will subside. Achieving that depends on many variables such as vaccination, natural immunity in the population, isolations and distancing measures, demographics and so on, so there is a need to understand almost in real time how and where the reproduction number changes in order to plan interventions. The research used Monte Carlo simulation methods to estimate these values in collaboration with the Norwegian Computing Centre and use them in modelling by NIHP and the UiO Institute of Medical Sciences.

These projects, and the overall coordination work at NIPH, provide powerful examples of the ability of the research system quickly to mobilise against a new threat, reducing illness and death and hastening he resumption of normal social and economic life.

UiB Informatics New person-identifier to replace person-number

Since the 1960s, Norwegian citizens and residents have been allocated a unique personal identifier (PID) at birth, that is used to identify them in relation to all interactions with the state. Increases in population, the amount of electronic information held by the state on citizens and the need to keep such information secure meant that a new design was needed for the PID after 2011. Two professors from UiB developed, costed and presented four alternative designs, intended to be robust for use in state information systems up to 2150. Their proposal for which one to adopt was accepted by the government and will be operational from 2032, affecting every resident of Norway.

UiA Engineering and Technology Tsetlin machines

This case provides an alternative approach to AI-based machine learning that is said to avoid the use of the massive amounts of energy needed to run current US AI models. Based on ideas on learning automata and game theory articulated by the Soviet mathematician Mikhail Tsetlin in the 1960s, Tsetlin machines replace energy-intensive deep learning techniques with logic-based machine learning. They are hardware-near, with very low energy and memory requirements. Ole-Christoffer Granmo at UiA introduced the idea of Tsetlin machines in 2018, which are now seen as suitable for addressing a long list of functions in AI, including keyword-spotting, sentiment analysis, novelty detection, game playing, battery-less sensing, and legal analysis. They have triggered the development of energy-harvesting machine-learning solutions at Georgia Tech, and the development of a new generation of AI chips at Newcastle University, offering several orders of magnitude increases in throughput at the same time as several orders of magnitude reduction in energy consumption. A growing number of R&D projects are exploring implementation. At this stage, there is no evidence of societal impact, but the scope for changing the development pathway of learning-based AI appears to be extremely large, with potentially global effects.

UiO Mathematics Ship-driven mini-tsunamis

This case was triggered by a journalist from the Norwegian Broadcasting Corporation, NRK, who was receiving complaints from residents that two particular 30,000-ton ferries were causing ‘mini-tsunamis’ when passing through a narrow sound on their way through the Oslo Fjord, despite proceeding slowly and in line with the relevant navigation regulations. There was damage to boathouses and beaches in the area. A specialist from UiO was initially unable to explain the waves, which appeared ahead of the bow and after the stern. Conventional formulae suggested that the ships were steaming well below the speed that would be needed to cause such waves. After observing and measuring the effect, the researcher further developed his past work on wave production, and discovered that the waves were produced when the ships passed over a shoal, effectively ‘squeezing’ the water out ahead of it as the bow passed over the shoal and the ships rode up, then producing a second wave as the stern passed from the shoal to deeper water. Thus the incident led both to a discovery important to navigation in shallow and narrow waters and to the ships’ captains taking a different course to avoid the shoal. After this, there were no more mini-tsunamis.

HVL Ballast water treatment

This case also involved UiB, NORCE and the Norwegian Institute for Water Research (NIVA)

Steel ships use ballast water to gain stability and trim the vessel so it can manoeuvre when it is carrying little or no cargo. This can involve taking on water (and sea life) in one part of the world and then discharging it in another – along with sometimes toxic or invasive species such as zebra mussels, sea lampreys, caulerpa taxifolia (a toxic seaweed), and various phytoplankton and zooplankton. The International Maritime Organisation established a convention in 2014 requiring all ships in international waters to have ballast water treatment systems by 2017, to prevent the transport of sea life in ballast water. The Norwegian Knutsen shipping group developed a ballast water treatment system (KBAL) based on irradiating the water with UV light, which it has installed in its own fleet and sells to other shipowners and shipbuilders. HVL has done several projects on ballast water analysis and treatment, some of them in collaboration with Knutsen, since 2011, establishing a *de facto* standard organism for testing treatment systems, improving measurement techniques, testing the efficacy of UV treatment, this supporting the type-approval of KBAL by the International Maritime Organisation and the US Coast Guard (which uses different standards for the effectiveness of ballast water treatment). HVL has thus contributed to mitigating the worldwide threats posed by ballast water and supported an important innovation by a Norwegian firm that is now sold worldwide.

NTNU Electronic Systems Autonomous ferries

This case also involves NTNU Departments of Engineering Cybernetics, Marine Technology, and Design.

NTNU hosted a Centre for Autonomous Marine Operations and Systems from 2013-2023. An initial project was a 5-metre autonomous ferry “Milliampere 1” launched in 2017, which served as a development and test platform for masters students and PhD candidates working with autonomous systems. It was followed in 2019 by “Milliampere 2”, an 8-metre autonomous passenger ferry certified for transporting 12 passengers. With the help of the FORNY technology transfer programme, the Zeabus company was then spun off, which employed 28 people at the time the EVALMIT self-assessment report was written, turning over $3.1m in 2023. A 25-passenger, solar-powered autonomous ferry “Estelle” using the Zeabuz software entered Summer service in Stockholm in 2023. At this early stage, the commercial activities are experimental, but there seems to be considerable potential for future growth, especially if more mainstream business interests are attracted.

SINTEF Ocean Offshore wind

SINTEF has a long history of working with offshore structures, from ships through oil and gas exploration and exploitation to, more recently, offshore wind. SINTEF Ocean has over the years built tools for simulating and testing offshore structures in a variety of joint projects, industry projects and as part of the NOWITECH research consortium on sub-sea structures. It has developed a software package called SIMA, which is able to handle both fixed and floating structures, which are subject to complex interacting forces. Since 2013, SIMA has been distributed by DNV and been applied in about 70 companies worldwide, generating about NOK 8-10m per year in licence fees to SINTEF. Users include: Equinor (formerly Statoil), which is a leading player in offshore wind and part-financed the development of SMA: COWI, a Danish engineering company heavily involved in designing foundations for offshore wind; Taisei, which has used SIMA and Sesam in floating offshore wind designs; and Saltec Offshore Technologies designing floating wind foundations. Floating offshore wind is likely to be especially important for Norway, which largely lacks a shallow continental shelf. SINTEF Ocean has therefore played a role in enabling offshore fixed and floating wind farms to be built in many parts of the world.

7. Conclusions and recommendations

The evidence presented in this report suggests that Norwegian research in MIT fields is broadly healthy and very relevant to current national needs. This Chapter identifies five areas for improvement and recommends actions at the levels of the research-performing organisations, RCN and the Ministry needed in order to address them.

7.1. Conclusions

Norway has a strong research system, given its small population, which has co-evolved over a long period with industry and society. The system reflects the need for applied research to support national industries, many of which are not R&D intensive but whose performance nonetheless depends on understanding and exploiting the technological state of the art. The system has to generate and communicate new industry-relevant knowledge in specific areas of need, support industry's ability to absorb and exploit technological opportunities, proactively enter and build capacity in new fields needed to maintain competitiveness, and support industrial restructuring and renewal. The MIT fields are central to this. They comprise a large part of the Norwegian research effort, accounting for over 40% of RCN funding for research and the greater part of Norway's research income from the EU Framework Programme.

On average, university research expenditure is about 80% paid for from institutional funding for research, giving some freedom to change research directions in response to advances in science and changes in society. The institutes' low level of institutional funding (11%) forces them to keep their applied work very close to customer needs. The extraordinary concentration of research effort at NTNU and SINTEF demonstrates the power of close relations between universities and institutes.

MIT research in Norway

The three major field of research considered in EVALMIT are Mathematics, ICT and Technology.

Pure mathematics has a long tradition in Norway, with the strongest groups being in the older universities, notably UiO, NTNU and to a lesser degree UiB. Mission-orientated organisations including SINTEF and Simula are more important and drive societal impact in applied mathematics, though UiO, NTNU and UiB also play important roles. In statistics, too, the leading research groups are at UiO, NTNU and UiB.

ICT comprises many sub-fields and is important to many different parts of industry, with SINTEF and NTNU often taking leading roles in research. UiO does little research in ICT by comparison, given its traditional focus on natural science more than technology, but its informatics research is very large and of high quality. There are many strong research groups, some in the newer and smaller universities that have grown up in the last few decades during which ICT has built up to its current social and economic importance. These groups tend to be rather scattered across the ICT sub-fields – while ICT is very important across the Norwegian economy – partly because there is not a strong cluster of ICT companies in Norway whose influence would encourage the formation of academic clusters in related topics.

'Technology' covers a range of sub-fields at least as broad as ICT, but its specialisations are more clearly defined by their high relevance to longer-standing branches of industry, notably marine, energy, oil & gas and construction. NTNU and SINTEF are the leading research performers in most parts of technology, though this is true to a lesser degree in oil technology. As in ICT, the development of newer industry has provided more opportunities for newer colleges and universities.

Comparative bibliometric indicators for scientific articles that include Norwegian authors at the level of broad fields of MIT suggest that citation of research papers in Mathematics is marginally below the world average, Marine Technology is just above the world average, while ICT, Energy Technology and Other Technologies are comfortably some 15-20% above average. A lot of the effort and publications in Norwegian research are clustered in in nationally relevant sub-fields, where citation rates are substantially higher than in sub-fields in which Norway does not specialise. More generally, Norwegian MIT citation rates tend to be higher in applied sub-fields than in more fundamental or theoretical ones. The bibliometric analyses also suggest there are some sub-fields such as pure mathematics, statistics and probability, and technology fields important to the green transition such as decarbonisation of oil & gas and green energy, where publication citation levels are low in international comparison and might therefore need to be strengthened to meet scientific and national needs.

Characteristics of research in MIT

The EVALMIT national committee has identified several characteristics of successful MIT research, which are consistent across all the MIT fields, presumably because of their applied, industrial nature.

Differences in research group performance appear to be more driven by context and behaviour than by field or discipline. Successful groups are generally larger than unsuccessful ones, have critical mass and do research whose quality is high or at least adequate to their context. Unsurprisingly, since Norwegian MIT research is generally applied, successful groups have close contacts with industry and other societal users of their competence. Hence, knowledge about needs helps shape their research agendas, focusing their efforts on providing solutions to problems that have a good probability of being adopted and therefore creating societal impact.

Successful groups have strategies based on a combination of demand-side understanding and wider knowledge about advances in research and the technological frontier. Relevant demand may be situated at the regional level – it is not always necessary to connect to a national set of users. Strategies need to be formed at the research group level, where the understanding of the demand side is located. Some departmental or organisational strategies are too high-level to be effective, trying to span multiple research areas and societal needs but failing to be specific enough to be useful. Given the applied nature of Norwegian research in MIT, successful approaches are often interdisciplinary, opening the door to new fields of research.

Successful research groups tend to be members of international networks, bringing them into contact with global rather than only national research communities and developments. This requires a degree of short- as well as longer-term researcher mobility, and can often be supported by participating in the EU Framework Programmes. Contact with international research communities is crucial because *de facto* research quality standards are set at the global level. The successful research groups also tend to have ambitious publication strategies, aiming to be visible in high-status journals and conferences, disseminating their ideas and implying to the wider community that they would make promising research partners. The internal structure of research groups is also a key to success. They often need to have more junior researchers – especially PhD candidates – than at present to 'leverage' the expertise of the professors, making research efficient and making it easier to enter new and expanding research fields. Many of the more successful research groups have higher-than-average ratios of PhD candidates to professors.

Much of the very successful research is done at traditional universities and SINTEF. Less successful research tends to lack some of the characteristics listed above. Often this is done by smaller groups and in smaller institutions, or in departments that had been absorbed into larger universities in recent years and not yet fully integrated. Their small scale and comparatively limited resources prevent them from overcoming the entry barriers created by the success of other groups. One important problem (which, in fairness, is also shared by some of the bigger groups) is weak capacity for designing and deploying research strategies. These strategies are often vague or overly bottom-up, sometimes reflecting what individual researchers want to do but lacking a clear direction for the research group and therefore failing to define specific research foci and marshalling research resources against them. This in turn makes it difficult to change research direction, for example to address directly problems relating to the societal challenges. A frequent problem for these weaker research performers is that they have not yet been able to integrate into global or European research networks, which would let them access both leading ideas and issues in science and extend their relationships with industry.

An issue the Committee identified across almost the whole of MIT research was a lack of sufficient fundamental research, presumably as a result of short-term pressures to produce deployable results. This was especially an issue in Mathematics, where researchers found it particularly difficult to fund small theoretical research projects, owing to the low success rate for bottom-up proposals at RCN. This threatened in the longer term to undermine the ability of research groups to support industrial development and renewal, as well as to continue to do dynamic work. Similar to Mathematics, ICT and Technology clearly would benefit from enhancing fundamental research as required in their individual themes. However, it is worth noting that Applied Mathematics, ICT and Technology all depend heavily on applying ideas from pure mathematics, and so the Norwegian MIT community as a whole would benefit from strengthening fundamental research in mathematics.

Societal impact

The administrative units submitted to EVALMIT assembled an impressive set of impact case studies, though the clarity of communication was variable and in some cases there was only limited concrete evidence offered of impact. Some of the most powerful cases came from the institutes, building on long-term relationships with industry that equip them with a deep understanding of the industrial context and its needs. Some university groups have similar relationships, but by no means all do. Many of the impacts documented took place across disciplinary and industry boundaries. Where spin-offs took place (which is in a small minority of cases), they tended to appear in clusters over a period, reflecting the research groups' strong understanding of the demand side. They therefore tend to address established industry, rather than getting involved in new branches.

The wider research context in Norwegian MIT

The context for MIT research in Norway contains both challenges and opportunities.

Researchers in Norwegian MIT generally enjoy good working conditions and benefit from a high level of research infrastructure. The strength of the infrastructure makes Norwegian researchers attractive collaboration partners in the EU Framework Programme and other international collaborations. PhD candidates appear to be well served in larger research groups and administrative units with the scale to organise shared doctoral education and to maintain a group of several candidates. Some of the smaller administrative units in newer universities were too small for this, leaving PhD students isolated.

The great majority of publications are now available in open access. While all the administrative units have data curation policies based on FAIR principles, there are no statistics available that can confirm the extent to which these principles have been implemented.

Large numbers of senior professors will be retiring in the next few years, presenting not only promotion opportunities but also options to change research direction by hiring professors with different specialisations or reallocating resources to building new capacity among mid-career people.

Student and faculty recruitment is generally difficult in Norwegian STEM subjects, including MIT. As a result, the proportion of foreign-born students and faculty members is rising,

The Norwegian system carefully monitors researchers' gender. The gender gap in Norwegian MIT research continues to close at a slow rate, but does not appear to be worse than in other countries generally. However, other kinds of diversity – notably race, national origin – appear not to be monitored.

While the close relationship between research and industry in many MIT fields strongly supports industrial competitiveness in periods of incremental technical change, it also encourages path dependency by reducing incentives for change in research. This has been identified as an issue in RCN research programmes in the past (Narula, 2000) and also at the level of the emergence of new fields such as 'omics' in the 1990s and ICT in the 2000s (Arnold, et al., 2001; Arnold & Mahieu, 2012), new developments in materials, 3D microprinting and laser processing in the evaluations of Technology research (Rauch, et al., 2015). Currently, there may be similar issues in relation to AI and quantum computing. Such inflexibility needs to be addressed at both the micro level of improving research groups' horizon-scanning and strategy processes and at the macro level of creating funding programmes and other policies that can exert clear directionality.

The committee notes that the current geopolitical and security situation involves challenges for both scientific and industrial cooperation, both of which have in recent years been regarded as normal and desirable, but regards any recommendations on this subject to beyond its scope.

Results in the light of the previous evaluations

Compared with the evaluations of the MIT fields some ten years ago, the committee finds that

- As might be expected of a small country, MIT research is often internationally excellent in terms of originality significance and rigour but is still only in rare cases world-leading
- The research institutes – notably SINTEF, but also others – continue to play pivotal roles in supporting industry and development
- Research strategies are often still 'looser' than might be optimal, and among weaker research groups would benefit from being more closely coupled to industrial needs
- While the research system continues to support existing industrial needs, it remains insufficiently proactive and slow to get into new areas – currently, such as aspects of the green transition, AI, and quantum computing
- Tight coupling to current industrial needs means research is insufficiently coupled to the needs of 'unborn industry'
- The systemic role and value of fostering newer and smaller research-performing universities and colleges remains insufficiently clear

7.2. Recommendations

The conclusion that the MIT research system in Norway does well at supporting current needs has the corollary that action should be taken to improve its ability to cope with and exploit change. The needed actions are in five areas, some of which need tackling at more than one level.

First, whether the focus is on the societal challenges identified in the EU Framework Programme some years ago or on the newer 'multi-crisis' of rapidly-changing geopolitical, security and defence, resilience, and climate change adaptation, it is clear that the research and innovation system needs to move beyond slowly and comfortably adapting to incremental changes as it has done in the last few decades and towards more flexibly and rapidly tackling more radical change needs.

- Research performers need to consider how to develop more dynamic and flexible ways to modify their thematic priorities and capabilities, developing strategies that encompass their research agendas, industrial links, partnerships, and human resource requirements in ways that are sustainable over time. This will involve delicate judgements, for example about how much resource to reallocate from traditional to new themes, whether to replace retiring professors with specialists in the same or other areas, or to recruit more junior and mid-level researchers better able to build strong research positions in new fields or sub-fields
- Decide whether to use instruments such as funding programmes to support more traditional fields whose research performance falls below par. Based on the analysis in this report, such fields could include pure mathematics, statistics, oil & gas, and green energy engineering
- The research and innovation systems will also need clearer signals and incentives for change from the national policy level through more change- or transition-orientated national programmes for funding and infrastructure development that provide increased directionality, tending to coordinate the national effort

Second, ensure that the foundations in fundamental research of the applied fields discussed in this volume are sufficiently solid. Fundamental research is not only a source of knowledge to be used in applications but also a way to retain national membership in the global 'invisible colleges' (Price, 1963) of researchers that define and address key disciplinary problems, a way to identify medium-and longer-term research priorities, and an important training school for researchers. MIT research performers in Norway therefore need to prioritise fundamental research to a greater extent, without losing sight of the importance of applied research in serving their societal mission. This implies:

- At the level of the research performers, seeking more funding for fundamental research through both national (FRIPRO) and EU (ERC) funding. These bottom-up programmes are among the most competitive schemes available. Norwegian universities have high institutional funding and should also exploit the freedom this brings to do internally funded basic research
- RCN should consider whether its portfolio contains sufficient funding for fundamental and other low-TRL research specifically for applied fields

Third, EVALMIT provides evidence that highlights differences in performance among different groups of research performers. While bigger groups in established organisations often perform well, history, funding, scale and sometimes location stack the odds against researchers in smaller and newer organisations, notwithstanding the fact that some research groups in such organisations nonetheless perform strongly. This resurfaces the question asked (but not answered) by the MIT evaluations of a decade ago about the expected role of such research groups and organisations in the research and innovation system. An effect of the Quality Reform with a unitary set of funding and assessment rules for the higher education system, together with the restructuring of that system in Norway in recent decades, has been to give all institutions incentives to try to become nationally-orientated research universities. It is not clear that this is desirable in terms of either national or regional policy, or that enough resources could be available to make it feasible. While these questions are beyond the scope of a field evaluation such as EVALMIT, there seem to be at least two ways to address the inequalities of resources, scale and performance identified here:

- Ring-fence research funding for the smaller and newer institutions to support further capacity-building. RCN's earlier programme of such funding was abandoned about 20 years ago. It is noteworthy that Sweden's Knowledge Foundation (KK-stiftelsen) has had considerable success using ring-fenced but competitive funding to build research capacity in the equivalent Swedish organisations, and also that this took 30 years
- Establish field-specific research 'pairings' between established and newer organisations to provide mentorship and some shared scale. Swedish experience is that this can be productive, for example linking KTH with Mid-Sweden University in pulp and paper technology and Lund with Blekinge in digital signal processing

Fourth, in the new geopolitical context, it is increasingly important for research groups and organisations to establish and maintain presence in international networks. This provides access to and participation in scientific advance, broadens access to industry from a national to an international level, allows researchers to operate within the circles that define R&D agendas, standards, and norms, and creates alliances to access funding. Norway has privileged access to the EU Framework Programme. Policy measures that support that participation – especially among the research groups that at present have little presence there – would further strengthen MIT research in Norway.

Further action is required on gender balance and on diversity. The findings of EVALMIT here are more or less identical to those of EVALNAT a year earlier, and appear likely to apply across much if not all of the Norwegian landscape

- The MIT fields are well-known internationally for having a particularly strong gender imbalance. While EVALMIT administrative units universally have policy commitments to reducing this imbalance, and clearly aim to use individual appointments to try to reduce it, there are few systematic measures in place, or measures intended to make research a less family-unfriendly place to work
- Wider aspects of diversity appear largely to be unmapped in Norway except at the level of counting the numbers of non-Norwegians employed in research. Other successful research systems – for example, Switzerland and Luxembourg – are heavily reliant on foreigners. Norway should find out more about both the welfare and the research policy implications of the rather sudden shift in the composition of the research community in recent years

Table 15 summarises the committee's recommendations and suggests actions at the level of the research-performing organisations, RCN and the Ministry of Education and Research.

Area	Research-performing organisations	RCN	Ministry
Adopting and adapting to needed changes in research agendas	Launch internal education programmes to increase the capacity of research groups and higher management levels to design and deploy wide-ranging research strategies, spanning both research themes and the associated physical and human resource needed to implement them When professors retire from fields needing change, consider hiring people at earlier career stages and building capacity rather than only making change at the top. There is also scope to use the fact that many academics are passionate about continuing their work after retirement age by creating new post-retirement roles that make use of their expertise without consuming as much budget as full-time academic roles	Investigate on a case-by-case basis needs to support MIT research fields that appear to be underperforming, based on the national importance of the fields to science and industry and the prospects of improving performance	Review with RCN's help and proactively intervene to establish programmes to enable the research system to tackle major changes in science and transition-orientated research needs, aiming to respond to these in a more timely fashion Consider the need for scale when establishing new capacity in highly competitive fields such as AI. Concentrate resources in single centres, where appropriate
Safeguarding the fundamental research foundations of MIT	Modify internal planning and budgeting procedures to create formal ways to allocate institutional budget to fundamental research and incentivise principal investigators to apply to relevant external funding schemes	Explore mechanisms for taking a holistic view of the ratio of fundamental to applied research in relevant portfolios, strengthening opportunities and incentives to apply where necessary Consider increasing the number of small- and mid-sized grants for fundamental research in MIT-related fields, especially theoretical mathematics	
Tackling unequal research performance between old and new institutions in higher education	Identify and implement 'pairings' in specific fields or sub-fields where better-established research-performing institutions mentor newer ones and increase joint scale		Review the implications of current higher education policy for research in the newer and smaller institutions. If appropriate, consider establishing a policy for 'pairings' in higher education research – and potentially more broadly
Increase participation in the EU Framework Programme	Set increased objectives for participation in the Framework programme	Review the effectiveness and efficiency of current measures for stimulating Framework Programme participation. Consider modifications to support smaller and less experienced potential participants from Norwegian research in MIT	
Gender balance and diversity	Mentor and plan career for strong female candidates, starting at the PhD level, international postdoc and possible recruitment. Introduce procedures to tackle 'two-body' problems		Review the effectiveness of policies to reduce gender inequality in MIT research; establish improved monitoring of wider diversity and investigate policy implications of the increased share of non-Norwegians in the MIT and other research communities in Norway

Table 15 Recommendations by area

Appendix 1: The committee’s perspectives on sub-fields of MIT

Mathematics

Mathematics: Algebra and algebraic geometry; Geometry and topology; Operator algebra; Cryptography; Mathematic analysis; Logics; Mathematical physics; Mathematics/ICT didactics

Overall, mathematics in Norway is doing very well. Research groups publish in high quality journals, collaborate nationally and internationally and participate in national and international networks. 4 research groups stand out especially: sections 5 (Algebra, Geometry and Topology) and 6 (Several Complex Variable, Logic and Operator Algebras) UiO, and Algebra and Analysis at NTNU. These research groups, located in larger and established institutions, are generally well supported by the institution and administrative units. They publish in top outlets, attract external funding, and work strategically to maintain an agile research agenda (e.g., interdisciplinary research efforts in cryptography at NTNU). Three groups are doing less well. The Functional Analysis group at UiA publishes high quality research but struggles to attract significant external funding. To remedy this, the group review panel recommended that the group broaden its research focus. The analysis group at UiB also struggles with external funding. The ESE group at NTNU received lower scores across all evaluation dimensions. This is a relatively new group that has been given informal research group status. This, in addition to the group’s focus on engineering education, which has a different publication culture than the other groups, has resulted in an unfocused strategy and unbalanced publication rate and quality within the group. Common to all 3 groups is their relatively small size which limits their ability to address challenges that the self-assessment and/or group panel reports identified.

All groups pursue activities with strong societal impact, with three notable exceptions. On the positive side, the Algebra group at NTNU excels in view of the listed user-oriented publications and products which are fundamental in several aspects of computer security. Two groups are lagging a bit behind the others in terms of societal impact, pursuing standard activities, but the impression can also be due to some shortcomings of the self-assessment.

Overall, all groups express a concern regarding the support to mathematics research in Norway. Sources for funding for “pure mathematics” is more limited than for more applied or interdisciplinary research groups. Some groups have been able to expand to interdisciplinary research projects, but it is important that top researchers in foundational research are given the resources to maintain top international level and not forced to dilute their research time to out-of-expertise areas. Therefore, foundational research in mathematics depends on the availability of small to medium size grants more than large centre grants.

All groups struggle to attract female researchers, a common problem for research groups in other panels as well. Unclear career paths and difficulty to provide internationally competitive starting packages is a problem.

In addition, most research groups express a concern regarding the drop in student numbers. This is a national problem and all research groups together with schools, municipalities and government agencies must work together to ensure that the pool of mathematical students grows in order to meet the national need for this competence.

Many groups note that students leave academia after their master or PhD. To remedy this loss of talent, it is recommended to work actively with mobility programs for young researchers. International research visits and postdoctoral programs, nationally or international, are key instruments here. All groups need to develop long-term strategies for recruitment.

All groups are recommended to develop strategies for increasing the level of funding, especially international funding, perhaps through more strategic use of mobility programs and increased international and interdisciplinary collaborations.

Groups that maintain static or narrow research agendas miss opportunities to meet societal needs and to obtain external funding. Increased national collaborations between large research groups at the older institutions and smaller/younger groups is recommended.

Applied Mathematics: Applied mathematics; Computational and numerical mathematics; Applied mathematical analysis; PDEs; Optimisation theory; Mathematical modelling; Industrial mathematics; Fluid mechanics; Biomathematics; Scientific computing: HPC

The group evaluation reports highlight the superior performance of mission-driven organisations like SINTEF and SIMULA as compared to universities in research quality and quantity. This is attributed to their focused research mandate and more generous funding. Some university groups (Oslo, Bergen, and NTNU) also perform very well. Several of these groups are performing at a high international level. Smaller institutions generally struggle with funding, attracting talent, and international visibility. Smaller institutions (NORCE, OsloMet, Tromsø) struggle to meet obligations while maintaining high-quality research, indicated by difficulty attracting external funding and limited international visibility.

The large mission-driven organisations (SINTEF and SIMULA) demonstrate strong societal impact due to their resources and focus. Similar observations can be made of the large institutions, i.e., Oslo, NTNU and Bergen. Tromsø is a notable exception among the smaller universities. The challenges among smaller institutions to maintain a timely research profile and visibility, often hinders their societal impact.

Mission-driven organisations and large institutions show strong national and international collaborations and attracts some, sometimes very substantial, external funding. However, even for the established institutions, this is an increasing challenge.

The reports highlight a significant disparity between mission-driven research organisations and many smaller universities. There are concerns raised about resource limitations, competition, and a potential decline in resources for fundamental research at universities. This has the potential negatively to impact research in applied mathematics in the long term. The reports also emphasise the need to address resource constraints, improve internal institutional support, and carefully consider the balance between different research types to ensure the long-term health of the Norwegian research system.

It is suggested to consider a national re-assessment of the balance between fundamental and mission-driven research as a question of particular importance of a domain like applied mathematics which has its own fundamental knowledge core.

Statistics: Statistics and data analysis; Stochastic analysis and risk analysis; Insurance mathematics; Machine learning/Artificial intelligence; Data Science; Data Mining/Big data; Language technology

The research groups within this panel are quite diverse, ranging from basic research in statistics and foundations of AI to bioinformatics and contract research with industry. Most research groups perform quite well across all evaluation dimensions while some struggle in all, or a subset of these.

Four research groups stand out as doing very well. UiO Statistics and Data Science has made a conscientious effort to strengthen its research profile in machine learning and the foundations of AI, building on the competence in the group and growing their research education program. The group has historically been very successful in obtaining large grants from RCN. UiO RAS is a nationally and internationally highly visible research group and has, similarly to UiO Statistics and Data Science, made decisions to expand in new research directions (in sustainability) to meet national and regional needs for competence. UiB Algo produces excellent research and achieves a high level of funding, including ERC. NTNU Statistics has implemented a long-term recruitment strategy to maintain strength in its internationally recognised areas of expertise while also recruiting in areas of growth. Common to all these groups is their agile research agenda and strategic expansion. All groups have been able to maintain a balance between applications, including industry partnerships, and theory, and maintain a good PhD-to-faculty ratio.

Six research groups performed less well in the evaluations. NR-SAND is a research group that depends heavily on funding from the petroleum industry. There is limited opportunity for open academic research. The panel recognised this difficulty and recommended that the group tries to strengthen its ties to academic partners. UiS IMF, UiB I2S, UIB LAI, UiT ASR and UiB ML scored poorly in terms of societal contribution and/or organisation. A common factor for most of these groups was their small size. For small groups, a lack of cohesive research strategy means that resources are spread too thin. Several groups were recommended to develop a more focused research strategy, explore synergies within the research group and with related groups within the same academic unit to consolidate resources better. It is also important that newly established research groups and groups working in interdisciplinary projects develop a clear identity/research profile. If possible, groups should prioritise industry and interdisciplinary collaborations projects where members' contributions match level of recognition/visibility and co-funding.

The size of the groups evaluated in this panel varied widely. The organisational overhead for small groups is considerable and there is also an inbuilt vulnerability when research/teaching/outreach depends on 1-2 individuals. Some groups could benefit from being merged, which might also help identify potential synergies within the administrative units.

All groups maintain activities to generate societal impact. Groups that work closely with regional stakeholders and have been very successful in this regard. Having an active interdisciplinary and international research network is, for the most part, associated with both high quality academic performance and high societal impact. By contrast, some groups are missing an opportunity to work with regional stakeholders on topics of regional interest.

Many groups could benefit from increasing their research education program. This would be especially valuable in AI/ML where you need a large PhD education program to be internationally competitive. Expanding international and interdisciplinary collaboration, including with non-academic partners, may help identify new funding sources and/or increase the probability of obtaining EU funding. Groups could use mobility programs, including MSCA, more strategically to build partnerships with international research groups.

Some groups need to move away from publishing in less visible outlets as this leads to a downward spiral in terms of international recognition. A lack of cohesion, or a lack of focused research agenda, within a research group, risks leading to poor long-term strategies for recruitment and poor use of limited resources. Small groups are vulnerable to staff turnover and drop in funding levels. Increased national collaboration to form strong partnerships between research groups is recommended.

ICT

<u>Cyber/Communications: Cybersecurity; Cryptography; Communication systems; Multimedia and speech processing; Networks; Distributed systems; Internet of things (IoT)</u>

Norwegian research in cybersecurity, Internet-of-Things (IoT), and communications shows notable strengths and areas requiring improvement. SIMULA excels in cryptography research and international collaboration. UiA demonstrates strengths in IoT and mobile communications, while the research at SINTEF in trustworthy green IoT and software benefits from strong infrastructure. Cryptography, cybersecurity, IoT, and mobile communications are strategically important fields of research, driven by significant security challenges in society.

However, several units underperform. The research at UiA in communication and system security lacks clear strategies and evidence of progress. The research at NTNU in smart wireless systems struggles with weak publications and low funding, and the research at UiT faces modest scientific outputs and few PhD students. Middleware research is losing its relevance and impact. Societal impact is uneven, with high-impact units at SIMULA, UiA, and SINTEF contrasted by relatively low-impact units at UiA and OsloMet. There are problems of sparse administrative support, the need for proactive diversity recruitment, and low numbers of PhD students.

Recommendations include enhancing international collaborations, targeting prestigious publication venues, improving dissemination strategies for societal impact, and focusing on emerging technologies like 6G.

<u>VR, image processing, HCI, EO" Virtual reality: Visualization; Visual computing; Image processing/analysis; Human computer interaction; Earth observation</u>

This panel assesses Norwegian research groups in the areas of VR and HCI, highlighting UiB's Visualisation group and UiO's Digital Signal Processing and Image Analysis (DSB) as high performers, particularly in applied research areas like geomatics and HCI. They show excellent publication records and impactful applied research (patents and spinouts). Geomatics, visualisation, and HCI sub-disciplines perform well, particularly in applications rather than methodological research. Less successful groups include NTNU Colourlab and UiT's Centre for Artificial Intelligence (CAI) which underperform in funding and research quality. CAI also faces issues with recruitment, retention, and gender diversity. Several groups lack submissions to top conferences, hindering impact. Methodological research in vision and machine learning struggles, potentially due to publishing in less impactful venues. OsloMet's Universal Design of ICT (UD-ICT) needs support to advance at the university level.

Groups with a high impact include UiO's DSB (medical patents and software), SINTEF's Computer Vision (industry connections), NORCE's DARWIN (marine sector contributions), OsloMet's UD-ICT (public education and events), NTNU's Geomatics, and NR's BAMJO (high societal relevance projects). Groups with low or limited societal impact often lack clear strategies for stakeholder engagement. The report highlights that the split of CAI at UiT's into two groups may negatively impact research quality.

NTNU's Colourlab, SINTEF's HCI group, and UiO's DSB group demonstrate strong collaborations, often linked to successful European funding applications and collaborations. The report flags methodological weakness in certain industrially focused groups, suggesting a need for stronger university collaboration. Groups need to improve self-assessment reporting on societal impact.

The low gender diversity across research groups needs attention, with measurable goals to promote a more inclusive environment. More focused strategies and increased stakeholder engagement are needed to improve societal impact for many research groups. This requires better self-assessment in reporting. Some industrially oriented groups could benefit from stronger collaboration with universities to improve their methodological approach.

<u>Control: Control theory and robotics; Autonomous systems</u>

Norwegian research in control, robotics, autonomous systems, and engineering cybernetics is internationally very strong, with standout contributions from NTNU, which excels in cutting-edge research, advanced facilities, impactful collaborations, and societal contributions in maritime systems and life sciences. Other well-performing areas include the research at SINTEF in maritime ICT and cybernetics, the research at NORCE in air and space observing systems, and the research at UiO in robotics and intelligent systems.

Key challenges include focus, funding, and recognition issues faced by units from former university colleges, including OsloMet and UiA. These units also struggle with recruitment and balancing applied and basic research. Additionally, relatively low external funding and low PhD-to-professor ratios limit competitiveness. Research in industrial robotics lacks Norwegian industrial backing. Research institutes face difficulties maintaining staff and competing for funding due to relatively low basic funding. Norway's recent investments in AI highlight the need for a strategic focus on applied AI to strengthen research efforts and societal impact. The recommendations are to develop a national strategy to leverage investments and Norway's strengths in applied AI and autonomous systems research.

IT systems: Digitalisation; Software engineering; Information systems; Programming technology; Reliable systems; Digital systems and organisation; Formal Methods; eLearning

Norwegian research in software engineering, information systems, and programming is very good, with several units achieving excellence in research quality, collaboration, and societal impact. NTNU stands out in software engineering for its focus on empirical research and learning technologies, supported by strong academic and industry networks. SIMULA also stands out in software engineering, benefiting from good funding, and impactful research projects. NTNU excels in information systems through interdisciplinary research, while the research at UiO in information systems has a global impact on health informatics. The research at UiO in reliable systems demonstrates strong international engagement and a clear, strategic focus across fields like engineering, health, and biology.

There are challenges within the underperforming units. The research at UiB in programming theory is too inward-focused, with low research output and societal impact. The research at UiA in integrated emergency management struggles with a lack of strategic direction and adequate funding. The research at USN in digital information systems faces organisational issues across campuses, unclear strategies, and limited publication ambitions.

The top-performing groups demonstrate that strong collaborations and networks are crucial for success, while weaker groups lack these elements. Broader trends reveal challenges in recruitment, retention, and diversity, as well as inconsistent self-assessments and missed opportunities to align with evolving scientific and societal needs.

Micro and nanotechnology, sensors et.al.: Micro and nanotechnology; Materials technology (incl. solar); Sensor technology, Medical ICT; Signal processing

The ICT research topics reviewed in sub-field 8 are quite diverse, in that although their individual origins are clearly at the forefront of science and engineering, their commonalities are not straightforward to identify and use for characterisation of the sub-field, incl. comparisons with global standards. This may prompt alternative approaches to taxonomy in future RCN research assessment exercises.

Across the three Dimensions, The Organisational Dimension yields weaker results, but not substantially so, as the spread between the three is small.

The groups in the academic sector are performing overall better than those in institutes. This is most prominent in the Quality Dimension, combining publications quality and group's contribution. At the same time, in the Societal Impact Dimension (contribution and user involvement), groups in Institutes are doing marginally better than academic groups. This can be interpreted with a reference to the criteria used: academic groups typically have better publication records, while the funding model in institutes results in higher societal impact through industrial pull. This does not appear as a substantial discrepancy though, given that typically good ties and collaborations exist between Universities and Institutes, particularly where they are co-located.

By large, the research strategy of the individual research groups is clearly in line with the organisation. Overall, for most of the groups evaluated in sub-field 8, work on adopting measurable milestones to be used for judging success more precisely, will help to improve the quality of strategic planning.

AI and data science: Applied AI and data science; Industrial applications; Information technology; Innovation; Entrepreneurship; Digital transformation

The evaluation of research groups in the domains of AI and Data Science reveals that the University of Oslo's Digital Innovation group (DIN) is a top performer, excelling in research quality and societal impact due to its strong structure and diverse contributions. Several SINTEF groups (Smart Data, Software Product Innovation, Digital Process Innovation, and Digital Production) also demonstrated high quality, characterized by strong funding, diverse projects, and focus on relevant research issues. The University of Oslo's Entrepreneurship (ENT) group also showed high publication quality despite limited external funding.

Weaker groups, often from smaller universities such as Kristiania University College (IDEAS Lab and BT Lab) and the University of South-Eastern Norway (ACSAD), received low scores due to a heavy focus on teaching, an ongoing struggle to attract external funding, and weak organisational support. This leads to lower research output and societal impact.

Top-performing groups demonstrated significant societal impact largely due to strong collaborations with industry and public organisations. Impact varies from direct contributions (patents, software) to indirect contributions (policy guidelines, process improvements). Groups with low societal impact typically lacks collaborations with external partners and a detailed strategies for engagement.

High-performing groups shows strong organisational structures, a diversified project portfolio, and robust collaborations (industry, public, international) while groups with limited impact are characterised by a lack of organisational support, external funding, and effective collaboration strategies.

Overall, the weaker institutions will require stronger support, both at the local administrative level as through collaborations, be it with national or international partners. While a problem-solving focus is valuable, some groups should consider a more ambitious publication strategy to increase visibility and funding opportunities. Vague or inconsistently used benchmarks in self-assessments require improvement for more effective evaluation.

There are concerns about gender balance across the general domain.

Technology

Green Energy : Renewable energy production (hydropower, wind power, solar energy and bioenergy); Energy system; Energy efficiency; Energy transition, Thermal energy storage; Batteries and hydrogen production

Research is internationally excellent in areas such as Power systems and Energy systems, Offshore energy systems, Thin film and membrane technology and Hydrogen technology. There is a strong correlation between research excellence and societal impact and strong impact also in these areas. Overall the topics addressed by the research groups are well aligned with international trends and with societal needs and research is creating societal impact. However, there are several examples where the research groups try to cover too broad scope leading to loss of critical mass to really be internationally competitive. This is also reflected in the lack of clear research strategy to reach a high international level, and for collaborations and impact, and rather reflects that the groups do not have specific goals and objectives. As a result most groups are doing rather well but are not internationally excellent. However, in many cases there is potential for taking the next step, but this requires focusing and strategic cohesion within the research group and might be something that needs to be better imposed by the host institution.

Marine Engineering: Marine and ocean technology; Ship design; Hydrodynamics; Marin structural design and production technology; Ship machinery and propulsion; System engineering

Norwegian research is generally strong in marine technology/ocean engineering. A significant level of funding is available which results in a lot of high-quality work, as reflected in the high-quality research carried out at NTNU and SINTEF. Research is very strong in oil and gas (O&G) related areas, with many research projects and publications. Ship-related research areas like sustainability and optimisation of vessel performance are also well covered, and emerging areas, including new technologies to enhance the storage and transport of new fuels (e.g. hydrogen, ammonia and CO2) as well as the use of offshore renewable energy in producing sustainable oil and gas are explored by some research units (SINTEF, NTNU). Designing oil and gas platforms, offshore renewable energy structures, and ships for harsh environments; hydrodynamic and reliability-based strength and fatigue analysis are the main areas of expertise of the research groups evaluated. Newer research groups at HVL and USN generally have less strong research activity, but they are seeking support for research from their local industries in their niche areas. Research groups could consider longer-term diversification in emerging areas, such as marine and offshore related research in the areas of artificial intelligence and machine learning. O&G companies provide significant support for these RGs, this should be directed towards supporting new and emerging research areas, eg low carbon shipping and sustainability, offshore renewables.

Industrial Technology: Industrial technologies; Circuit design; Acoustics; Electro-technical subjects; Industry, product, and component design; Cyber-physical Systems

The Norwegian research in information engineering, power engineering, and production engineering is, in general, of very good international quality. NTNU generally leads in terms of research quality, with significant international impact, while SINTEF excels in more applied research. UiS and UiT perform well within their national networks. NTNU's research in acoustics and electrical power engineering, along with SINTEF's research in electrical systems, stand out due to their high expertise and unique shared infrastructures. The research in information engineering and power engineering thrives, driven by global challenges like green energy. Units with strong industrial collaborations excel through partnerships with industries like oil, gas, and transportation.

There are some structural inefficiencies, such as overlapping activities and high teaching loads. Strategic planning is overall weak, though SINTEF and UiT demonstrate effective organisation. Addressing these challenges through better resource use and clear strategies could further enhance research quality and impact.

Engineering technology: ngineering technology; Technical geosciences and engineering geology; Applied mechanics; Heat and energy transport; Energy storage; Energy and process technology

Within the panel 11, the thematic fields of the research groups are very broad and their size, characteristics, challenges and potentials vary substantially. For this reason, it is difficult to perform a direct comparison between the groups or to draw a general and unique funding scheme able to optimise the behaviour of all the research groups. Some groups from NTNU lead in terms of organisation and research quality, followed by other groups from SINTEF. Some of them are active at an international level attracting competitive grants for European cutting-edge research.

All research groups are covering research field of strategic relevance and importance for the development of Norway, incorporating the specific Norwegian environmental conditions and requirements. Within these respective field of research, they have performed well and on a high international level. The infrastructure and equipment are generally modern and build a good research basis. Recently significant relevant collaborative research infrastructure has been built up. On the other hand, international collaboration with industry and academia is pursued only to a limited extent and the number of PhD students is rather low, compared to scientific staff number and to some international standards. On the organisational side, several research groups were lacking a clear and cohesive strategy as well as mechanisms for strategic development and quantitative benchmarks. When strategy is derived from the departmental level, it is usually too broad and unfocused.

Since the Panel's components have a very good social impact, this could be exploited to better communicate the main scientific issues and challenges, to attract more students and women, actually lacking. All research groups have established substantial collaborations with national partners from both academia and industry; this expertise and know-how can be used to extend the same activity internationally.

In a global research framework continuously evolving, adaptation to the new and emerging themes requires re-evaluation of the organisation, structure and governance of the research groups, together with time and resources. The current trend towards interdisciplinarity and applied research can reduce the funding schemes available for low TRL-level (basic) research, draining the pipeline for future innovations. A robust strategy addressing this issue is necessary.

Construction: Structural engineering; Building and construction engineering; Building materials; Construction processes and digitalization; Building physics; Concrete; Water and wastewater systems engineering; Energy efficiency in buildings and areas; Climate adaptation of buildings and infrastructure

The groups of panel 12 are, overall, of good international quality. NTNU and SINTEF generally lead in terms of research quality, with significant international impact. IuT, UiA and OsloMet follow with a good national quality, since they are either regional or relatively young, with comparably lower research funding. All research groups are generally stronger in the organisational and research quality dimensions than in the societal impact dimension, or they are not able to clearly express their societal impact.

The best-performing groups most with high publication quality have critical mass in term of staff and research funding, and conduct research in relatively focused fields. Overall, there is a good link between the groups and external industrial partners, allowing the activation of a number of industrial grants, though the latter is not homogeneous among the groups.

Most of the groups show a moderate social impact or sub-optimal communication skills, even though the topics of this area can have a fundamental impact. Groups coming from younger or regional institutions conduct research with a primarily national focus which generally makes research excellence harder to reach, especially at the international level. The number of PhD students of is rather low in international comparison. The strategy of most of the groups could be defined as "mainly reactive" to the external inputs coming from administrative entities of higher level and from the scientific community. A pro-active evolution could be beneficial.

The research groups from younger Universities are more flexible and they could quickly embrace the emerging trends and topics without the constraints of more consolidated groups. Digitalisation and sustainability are critical emerging topics of this panel, which perfectly align with the global issues of digital and green transitions. There are still plenty of opportunities to excel at international level. Individual competences can be systemised through increased interdisciplinary collaboration and the a more intense use of shared national research infrastructures.

In order to understand and exploit the global trend to move towards new themes such as digitalisation, circularity and sustainability and how they can be applied in each specific field (including teaching), the groups should work more at international level and with an international perspective. National policies have changed the funding schemes for Universities, introducing potential problems to groups without a strong link with external national or international funding. A proper strategy can help address this issue. The staff reduction could increase the teaching burden, leaving the researchers with too little time and energy for research; a reorganisation could help in this respect.

Oil Technology: Petroleum technology; Drilling and well technology; Reservoir technology; Basin geology; Multiphase separation and -transport (oil/gas); Processing; CO2 capture, transport and storage (CCS); Geothermal energy

The groups of panel 14 are, overall, of medium international quality. The researchers' tendency is to undersell their research, with more focus on technical publications. Some groups from SINTEF lead in terms of research quality and organisation, while others perform less well. UiS is the worst performing group, probably because it is deeply involved in teaching. Even though the topics covered by this panel are critical for the Norwegian society, on average, the impact is only medium or they are not able to clearly express their societal impact.

Since there is an actual strong research need in this area at a national level, due to the presence of important oil and gas resources still to be exploited, many opportunities can be found. To date, important funding is available for the groups of this panel coming mainly from national industries.

Availability of plenty of National grants and industrial collaboration limit the number of high-quality publications and the international comparison. For the same reason, international grants have low attractivity and few groups only seem to have an internationalisation strategy, almost incidentally. Most of the RGs lacks a strategy that goes beyond the exclusive theme of oil and gas to include other, more topical, future-oriented themes, always linked to the world of energy. As in many other panels, the number of PhD students of is rather low in international comparison. Most of the groups show limited succession planning, together with a gender imbalance.

The presence of a large number of oil & gas infrastructures with and for which new, more sustainable and efficient decommissioning and recovery technologies can be developed constitute an opportunity the could be exploited. At the same time, the actual availability of good level of funds and stakeholders could allow to start developing the technologies for the energy transition. The International arena is an available source for finding useful and effective benchmarks to improve the quality and future-proof the groups of the panel.

It is not clear how well set up the RGs are to cope with diversifying funding sources for future financial stability. The presence of strong national funding perhaps are not incentivising this as much. The continued strong demand for oil & gas engineers risks weakening or preventing the development of long-term strategic thinking, including in terms of training and demand for new skills and talent.

Appendix 2: Additional bibliometric and statistical information

The data in this Appendix come from Aksnes & Karlstrøm, (2025).

MIT overall

NTNU and UiO dominate publication numbers in MIT from the university sector, while SINTEF does so in the institute sector. Overall, the NTNU-SINTEF dyad accounts for 40% of the publication activity on which Table 16 is based.

Sector	Institution/institute	Number of publications	Modified author shares	Share mod. author shares
Higher education sector	**NTNU**	2121	1476.2	35.1%
	UiO	557	352.2	8.4%
	UiA	372	257.1	6.1%
	UiS	300	203.9	4.9%
	UiT	288	188.6	4.5%
	UiB	287	187.3	4.5%
	HVL	251	153.4	3.6%
	USN	200	152.7	3.6%
	OsloMet	205	128.9	3.1%
	NMBU	147	90.9	2.2%
	Østfold	88	57.4	1.4%
	Other units	264	161.0	3.8%
Research Institutes	**SINTEF**	314	199.8	4.8%
	SINTEF Energy	178	112.7	2.7%
	SINTEF Ocean	92	56.3	1.3%
	NORCE	90	53.2	1.3%
	Other units	496	297.0	7.1%

Table 16 Norwegian organisations with the largest MIT publication output in 2022

Mathematics

Norwegian publication output in mathematics is dominated by NTNU, UiO, and to a lesser degree UiB Table 17). As would be expected of organisations focusing on applied research, the institute sector produces a smaller share of the publications in mathematics than it does in other fields. Pure and applied mathematics, statistics and probability, and mechanics provide more than half the publications with the balance coming from other fields to which mathematics contributes.

Mathematicians' publication behaviour tends to some extent to differ from the kind of behaviour seen in the natural and applied sciences. Peer review in mathematics can be very onerous and time-consuming, so some mathematicians prefer alternative publication mechanisms, sometimes including social media. Applied mathematics plays an important role in science and the economy more widely, so mathematicians often publish in non-mathematical journals (as

implies). Hence, comparing raw publication numbers for mathematics and other disciplines can be misleading, However, **within** mathematics, we can expect publication behaviour to be fairly homogeneous (since it reflects the norms and behaviour of the mathematical community).

While the MNCS for the whole of Norwegian mathematics averages 111 over the evaluation period, 2013-2021, there is a clear declining trend between 2013, when the MNCS was almost 120, to 2020, when it had fallen to the low 90s (i.e. below the world mean of 100).

NIFU's analysis of mathematics publications in 2019-2022 shows that Norway is most specialised in pure and applied mathematics and that their citation scores are just below the world average, while statistics and probability scores low. Publications in some of the applications of mathematics (bottom-right in the Figure) are better cited, though those in others are not. Such averaged citation statistics do not capture individual points of research excellence, but give an impression that mathematics is mainly used instrumentally in Norway rather than mathematical excellence driving advances in other fields.

Sector	Institution/institute	Number of publications	Modified author shares	Share mod. author shares
Higher education sector	NTNU	206	145.4	28.2%
	UiO	149	104.9	20.4%
	UiB	75	50.0	9.7%
	UiA	45	33.5	6.5%
	UiT	45	31.3	6.1%
	UiS	28	19.0	3.7%
	OsloMet	22	17.7	3.4%
	HVL	23	17.0	3.3%
	NMBU	22	16.0	3.1%
	Østfold	14	11.8	2.3%
	NHH	10	6.3	1.2%
	Nord University	10	6.0	1.2%
	Other units	23	17.7	3.5%
Research Institutes	NORCE	12	7.4	1.4%
	SINTEF	10	7.2	1.4%
	Other units	36	22.0	4.3%

Table 17 Mathematics: Institutions/Institutes with the largest publication outputs, by sector, 2022

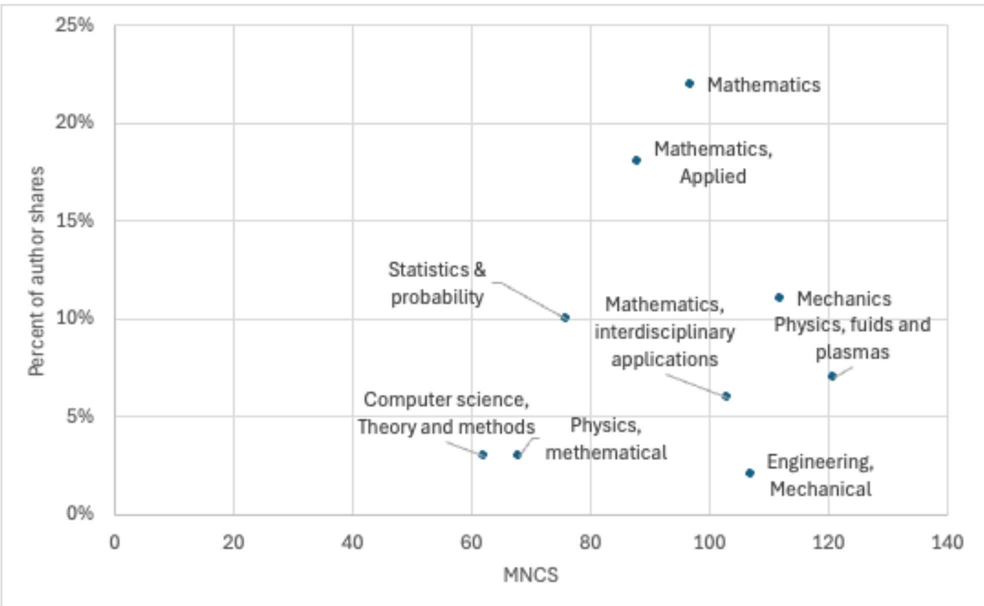

Figure 8 Proportions of article production and MNCS, Norwegian Mathematics publications, 2019-2022

ICT

ICT publication output is dominated by NTNU and UiO, but some of the newer universities (together with UiB and UiT) are medium-sized contributors (Table 18). Published output is mainly in electrical and electronic engineering and in computer science.

Like mathematicians, ICT researchers' publication behaviour also differs from practice in natural sciences, placing heavy reliance on conferences. This has for a long time been recognised by the bibliographic databases such as the Web of Science and Scopus, which these days have a good coverage of international, peer-reviewed conference series such as those of the IEEE. ICT researchers also increasingly publish in software, which is not captured in the databases. Given reasonably homogeneous publication behaviour among ICT researchers and subject to the usual disclaimers, bibliometric indicators can be used to compare citation performance within ICT.

The MNCS for the whole of Norwegian ICT averaged 118 over the period 2013-2022, but was generally below this level in 2013-2017, and above it in subsequent years. MNCS for the various ICT sub-fields suggest Norway does much better in applied and interdisciplinary research than in fundamental work but also that there is a fairly broad set of expertise available within the research and innovation system (**Error! Reference source not found.**).

Sector	Institution/institute	Number of publications	Modified author shares	Share mod. author shares
Higher education sector	**NTNU**	683	498.8	30.6%
	UiO	270	171.5	10.5%
	UiA	193	132.2	8.1%
	UiB	159	105.5	6.5%
	HVL	154	92.1	5.7%
	UiT	112	75.5	4.6%
	OsloMet	106	61.8	3.8%
	USN	75	56.0	3.4%
	UiS	76	52.5	3.2%
	Østfold	52	33.8	2.1%
	Kristiania	47	29.1	1.8%
	NMBU	29	19.8	1.2%
	Other units	78	46.6	2.9%
Research Institutes	**SINTEF**	134	87.8	5.4%
	NR	34	25.2	1.5%
	Other units	158	94.3	5.8%

Table 18 ICT: Institutions/Institutes with the largest publication outputs, by sector, 2022

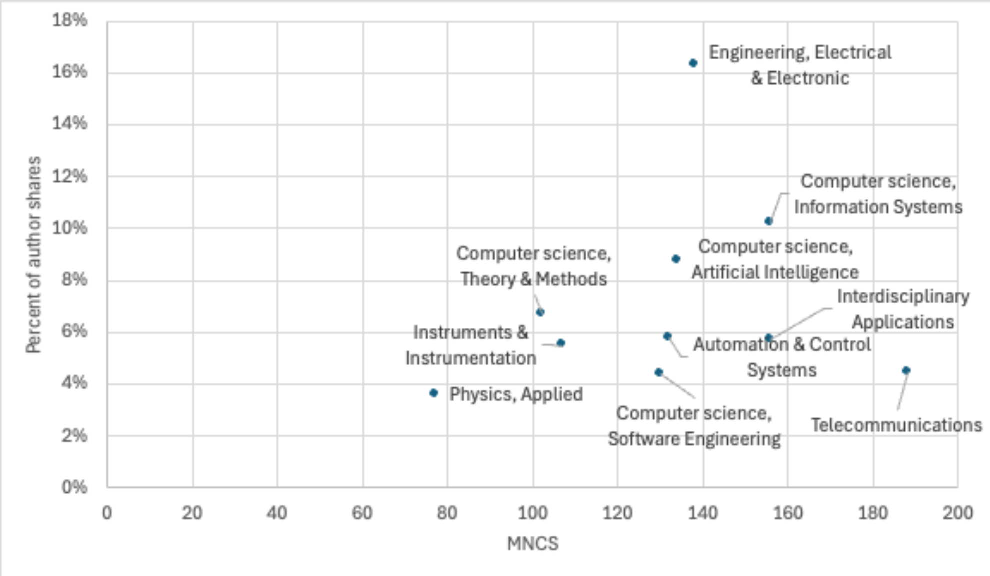

Figure 9 Proportions of article production and MNCS, Norwegian ICT publications, 2019-2022

Technology – Energy

NTNU is by far the biggest producer of scientific publications in energy technology. The NTNU-SINTEF dyad produces almost two thirds (65%) of Norwegian author shares in the area.

By far the greatest proportion of the publications produced relate to energy and fuels (Figure 7). The MNCS for energy technology publications averaged 158 over the period 2013-21. On an annual basis, the MNCS dropped abruptly from above 150 in 2013-17 to around 110-115 in 2018-2021. NIFU suggests the earlier high NCS values were caused by the publication of a set of very strong and highly cited papers in the first half of the decade, with the implication that an MNCS in the range 110-115 is more typical of the community's current performance than the higher level seen in the first half of the period. Nonetheless, Norwegian research is present and well-cited in many energy sub-disciplines.

Sector	NTNU	Number of publications	Modified author shares	Share mod. author shares
Higher education sector	NTNU	247	166.8	40.1%
	UiS	40	27.4	6.6%
	UiAr	35	22.9	5.5%
	UiT	23	14.5	3.5%
	HVL	27	12.5	3.0%
	NMBU	16	10.7	2.6%
	UiO	20	10.0	2.4%
	UiB	12	8.0	1.9%
	USN	12	6.0	1.4%
	Other units	14	6.7	1.6%
Research Institutes	SINTEF Energy	99	63.4	15.2%
	SINTEF	49	29.3	7.0%
	IFE	22	10.9	2.6%
	SINTEF Ocean	16	9.7	2.3%
	NORCE	14	8.4	2.0%
	Other units	15	8.4	2.0%

Table 19 Norwegian organisations with the largest Energy Technology publication output in 2022

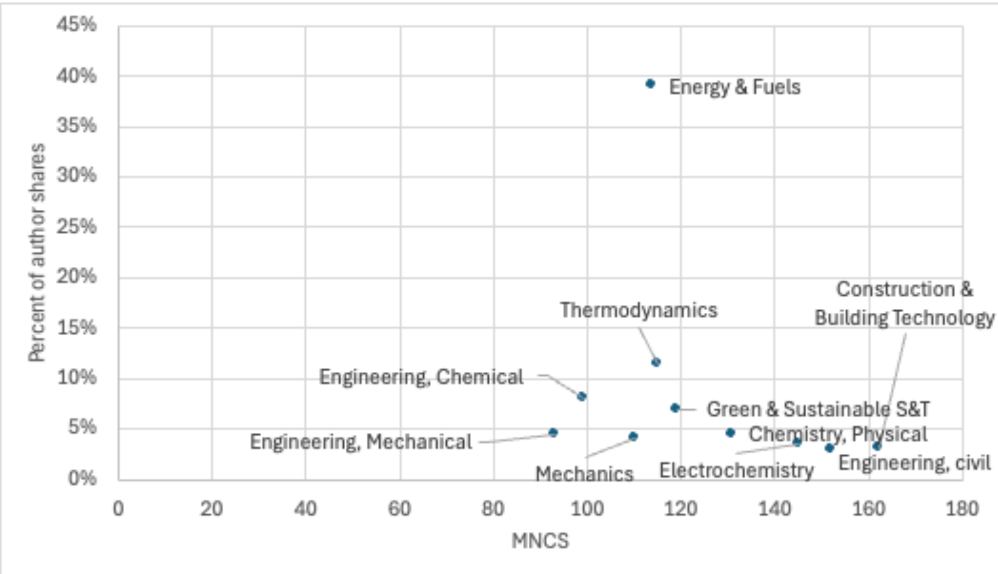

Figure 10 Proportion of article production and MNCS, Norwegian Energy publications, 2019-2022

Technology: Marine Engineering

Marine engineering is an area of traditional strength in Norwegian industry and research. As in energy research, NTNU-SINTEF dyad is the main producer of marine technology publications, producing almost two thirds (65%) of the authorship shares.

Marine engineering publications are mostly in marine, ocean and civil engineering or in oceanography. The MNCS of Norway's marine engineering publications has hovered around a mean of 104 in the period 2013-2021.

Figure 11 shows the MNCS of the sub-fields for 2019-2022, with most fields performing above the world average, but mechanical engineering lagging substantially behind. Norwegian marine engineering research is thus both specialised in, and good at, relevant applied engineering sub-fields.

Sector	NTNU	Number of publications	Modified author shares	Share mod. author shares
`Higher education sector	NTNU	184	142.4	48.9%
	UiS	46	35.8	12.3%
	UiT	16	11.2	3.8%
	UNIS	21	10.2	3.5%
	UiO	12	7.3	2.5%
	OsloMet	10	6.0	2.1%
	USN	7	5.2	1.8%
	Other units	14	8.6	3.0%
Research Institutes	SINTEF Ocean	59	38.7	13.3%
	SINTEF	9	6.9	2.4%
	NORCE	6	4.3	1.5%
	NGI	6	3.5	1.2%
	FFI	7	3.3	1.1%
	Other units	15	7.8	2.7%

Table 20 Norwegian organisations with the largest Marine Technology publication output in 2022

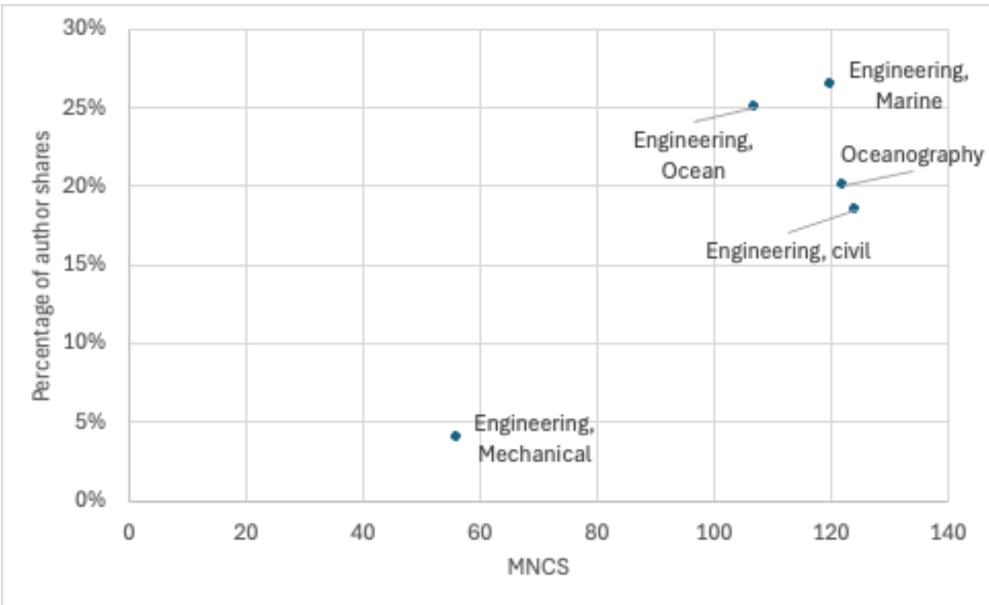

Figure 11 Proportion of article production and MNCS, Norwegian Marine Technology publications, 2019-2022

Technology: Other technologies

NTNU is the dominant producer of publications in 'other technologies'. Many (62%) are produced within the NTNU-SINTEF sphere, but there are also a good many other national partners. Civil engineering accounts for the biggest share of publication output, but a broad range of other fields is also involved (Table 21). The mean MNCS across the 2013-2021 period is 118, but there are also fairly big annual fluctuations. Most of the sub-fields are at or above the world average level of citations Figure 12).

Sector	Institution/institute	Number of publications	Modified author shares	Share mod. author shares
Higher education sector	NTNU	605	415.4	51.9%
	UiS	74	50.5	6.3%
	UiA	47	34.9	4.4%
	UiO	40	23.1	2.9%
	OsloMet	36	21.9	2.7%
	UiT	29	18.9	2.4%
	NMB	25	15.1	1.9%
	USN	23	14.5	1.8%
	HVL	20	13.4	1.7%
	Other units	42	26.4	3.3%
Research Institutes	SINTEF	54	33.1	4.1%
	SINTEF Energy	49	32.1	4.0%
	NGI	42	27.9	3.5%
	SINTEF Ocean	31	19.0	2.4%
	TØI	16	13.0	1.6%
	NORCE	11	7.0	0.9%
	Other units	58	32.0	4.0%

Table 21 Norwegian organisations with the largest publication output in 'Other Technologies' 2022

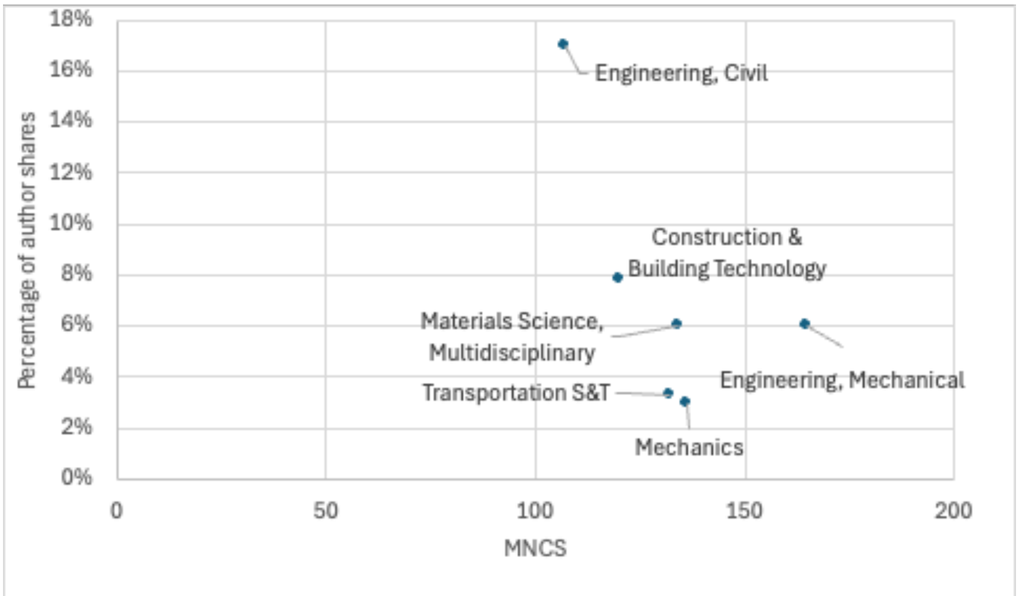

Figure 12 Proportion of article production and MNCS, Norwegian Other Technology & Engineering publications, 2019-2022, selected large fields

Appendix 3. Description of the evaluation process

Evaluation process and methods

The evaluation of mathematics, ICT and technology was conducted between the autumn of 2023 to the spring of 2025. It was carried out by international peers, using an Evaluation protocol developed by RCN (Appendix 3), *Evaluation of mathematics, ICT and technology in Norway 2023-2025.* The evaluation protocol is the same as used in the evaluation of Natural sciences and was approved by the portfolio board of Natural sciences and technology April 2022.

Institutions that were relevant for the evaluation of mathematics, ICT and technology were invited to participate. The evaluation included 56 administrative units (such as faculty, department, institution) which were submitted for evaluation by the host institution. The administrative units submitted their research groups, 248 in total. The institutions have been allowed to submit and adapt the evaluation mandate (Terms of Reference) to their own strategic goals. This is to ensure that the results of the evaluation will be useful for the institution's strategic development. The administrative unit together with the research group(s) selected appropriate benchmarks for each of the research group(s).

The evaluation reports will give important input to the individual administrative units, and provide important inputs to the Research Council, to relevant ministries and to any other bodies involved in the development of Norwegian research. Each institution/administrative unit is responsible for following up the recommendations that apply to their own institution. The Research Council will use the evaluation reports in the development of funding instruments and as basis for advice to the Government.

Organisation of the evaluation

The research evaluation has been evaluated at three levels:

- *National committee*

The National Evaluation Committee consisted of the four chairs of the evaluation committees plus additional two members to cover chemistry, physics and geosciences. The National Evaluation Committee was requested to produce a report based on the assessments and recommendations from the 56 independent administrative unit reports, and the national-level assessments produced by the expert panels and additional documents provided by RCN.

- *Evaluation committees*

The administrative units were assessed by evaluation committees according to sectorial affiliation and/or other relevant similarities between the units. The evaluation committee has expertise in the main disciplines of the natural sciences and various aspects of the organisation and management of research and higher education. The committees consisted of 6-8 international evaluation members per evaluation committee.

- *Expert panels*

The administrative units enrolled their research groups to be assessed by expert panels organised by research subjects or themes. The expert panels assessed 248 research groups across institutions and sectors and provided one evaluation report for each research group. The expert panels consisted of 4-7 international experts per panel.

The Research Council has established an external academic secretariat for the evaluation. The external evaluation secretariat is responsible for the implementation of the evaluation.

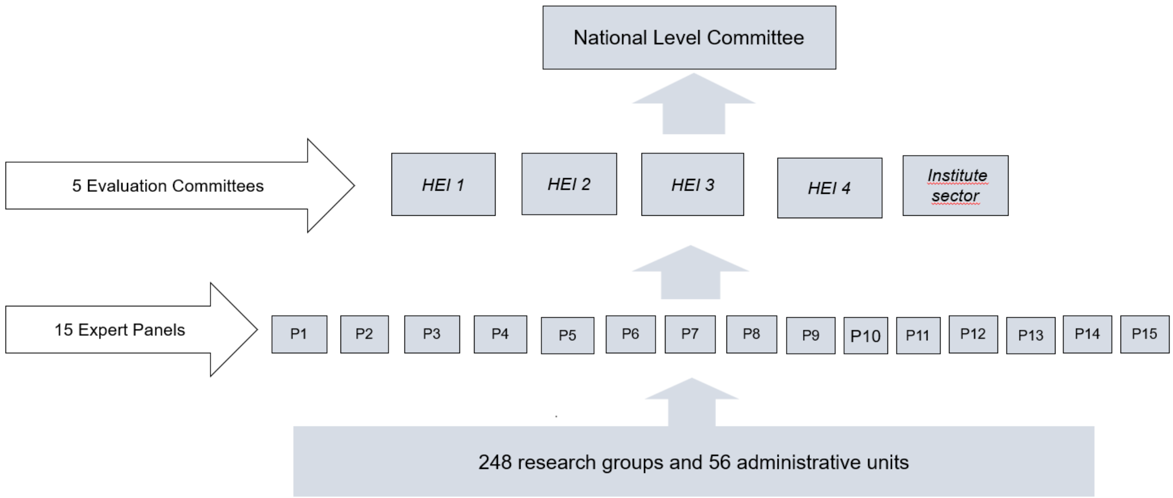

Figure 1. Organisation of the evaluation of mathematics, ICT and technology in three levels; expert panels, evaluation committees and national committee.

Data available

The documentary inputs to the evaluation were:

- Evaluation Protocol Evaluation of mathematics, ICT and technology in Norway 2022-2023
- Administrative Unit´s Terms of Reference
- Administrative Unit's self-assessment report
- Administrative Unit's impact cases
- Administrative Unit's research groups evaluation reports
- Panel reports from the Expert panels
- Bibliometric data (NIFU Nordic Institute for Studies of innovation, research and education)
- Personnel data (Statistics Norway (SSB))
- Funding data – The Research Council´s contribution to natural sciences research (RCN)
- Extract from the Survey for academic staff and the Student Survey (Norwegian Agency for Quality Assurance in Education (NOKUT))

Evaluation Criteria

The administrative units were evaluated on all five evaluation criteria cf. the evaluation protocol:

2.1 Strategy, resources and organisation
2.2 Research production, quality, and integrity
2.3 Diversity and equality
2.4 Relevance to institutional and sectoral purposes
2.5 Relevance to society

Panel no.	Description
1	Algebra and algebraic geometry; Geometry and topology; Operator algebra; Cryptography; Mathematic analysis; Logics; Mathematical physics; Mathematics/ICT didactics
2	Applied mathematics; Computational and numerical mathematics; Applied mathematical analysis; PDEs; Optimisation theory; Mathematical modelling; Industrial mathematics; Fluid mechanics; Biomathematics; Scientific computing: HPC
3	Statistics and data analysis; Stochastic analysis and risk analysis; Insurance mathematics; Machine learning/Artificial intelligence; Data Science; Data Mining/Big data; Language technology
4	Cybersecurity; Cryptography; Communication systems; Multimedia and speech processing; Networks; Distributed systems; Internet of things (IoT)
5	Virtual reality: Visualization; Visual computing; Image processing/analysis; Human computer interaction; Earth observation
6	Control theory and robotics; Autonomous systems;
7	Digitalization; Software engineering; Information systems; Programming technology; Reliable systems; Digital systems and organization; Formal Methods; eLearning
8	Micro and nanotechnology; Materials technology (incl. solar); Sensor technology, Medical ICT; Signal processing
9	Industrial technologies; Circuit design; Acoustics; Electro-technical subjects; Industry, product, and component design; Cyber-physical Systems;
10	Renewable energy production (hydropower, wind power, solar energy and bioenergy); Energy system; Energy efficiency; Energy transition, Thermal energy storage; Batteries and hydrogen production
11	Engineering technology; Technical geosciences and engineering geology; Applied mechanics; Heat and energy transport; Energy storage; Energy and process technology;
12	Structural engineering; Building and construction engineering; Building materials; Construction processes and digitalization; Building physics; Concrete; Water and wastewater systems engineering; Energy efficiency in buildings and areas; Climate adaptation of buildings and infrastructure
13	Marine and ocean technology; Ship design; Hydrodynamics; Marin structural design and production technology; Ship machinery and propulsion; System engineering
14	Petroleum technology; Drilling and well technology; Reservoir technology; Basin geology; Multiphase separation and -transport (oil/gas); Processing; CO2 capture, transport and storage (CCS); Geothermal energy
15	Applied AI and data science; Industrial applications; Information technology; Innovation; Entrepreneurship; Digital transformation

Table 22 Panel descriptions; Evaluation of mathematics, ICT and technology EVALMIT (2023-2024)

The research groups were evaluated on the evaluation criteria 2.1 Strategy, resources, and organisation and 2.2 Research production, quality and integrity. The research groups got five scores based on the three dimensions: Organisational dimension, two scores for Quality dimension and two scores for Societal impact dimension.

Table 23 shows the criteria used for judging publication quality and societal impact dimensions, referred to in Figure 1 and Figure 2.

Score	Research and publication quality	Research group’s societal contribution, taking into consideration the resources available to the group
5	Quality that is outstanding in terms of originality, significance, and rigour.	The group has contributed extensively to economic, societal and/or cultural development in Norway and/or internationally.
4	Quality that is internationally excellent in terms of originality, significance and rigour but which falls short of the highest standards of excellence.	The group's contribution to economic, societal and/or cultural development in Norway and/or internationally is very considerable given what is expected from groups in the same research field.
3	Quality that is recognised internationally in terms of originality, significance and rigour.	The group's contribution to economic, societal and/or cultural development in Norway and/or internationally is on par with what is expected from groups in the same research field.
2	Quality that meets the published definition of research for the purposes of this assessment.	The group's contribution to economic, societal and/or cultural development in Norway and/or internationally is modest given what is expected from groups in the same research field.
1	Quality that falls below the published definition of research for the purposes of this assessment.	There is little documentation of contributions from the group to economic, societal and/or cultural development in Norway and/or internationally.

Table 23 Criteria for scoring publication quality and societal impact at research group level

Limitations

This national report of the evaluation of Mathematics, ICT and Technology research in Norway 2023-2025 is based on an extensive process of peer review at three levels: research groups; administrative units (faculty/institute/centre/institution); and the national level.

In most cases, the research groups and administrative units involved invested a great deal of time and thought in preparing their self-assessments. In some cases it would have been useful if the research groups had given more attention to their societal impact, because this aspect is important not only at the policymaking and political levels but also to the wider public. In many impact case studies there was a welcome focus on the research done but too little account was taken of the need to evidence societal impact. This limited the ability of the evaluation to demonstrate the societal importance of the research.

In the ideal case, evaluations like this one would be done through site visits. Unfortunately, that would not only be unreasonably expensive but also make it impossible to find experts able to devote the large amounts of time it would require. The process used here appears to be a useful compromise that has worked well.

Opportunities for improvement include:

- More precise instructions for writing and evidencing impact case studies. It should, however, be recognised that this would increase the self-evaluation workload on the groups and administrative units
- Considering how to create a more direct link from the research group evaluations, which are focused on research, to the national report. The architecture used in EVALMIT means there is a loss of information between the research group and national levels as information passes through the administrative unit level

Appendix 4. Evaluation protocol including Terms of Reference

This protocol contains in Appendix A an unfilled form with instructions, as seen by the organisations participating in EVALMIT.

The Research Council of Norway

Evaluation of mathematics, ICT and

technology in Norway 2022-2024

EVALMIT protocol version 1.0

By decision of the Portfolio board for Natural sciences and Technology April 5, 2022

The Research Council of Norway
Visiting address: Drammensveien 288
P.O. Box 564
NO-1327 Lysaker

Telephone: +47 22 03 70 00
Telefax: +47 22 03 70 01
post@rcn.no
www.rcn.no

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Introduction

Research assessments based on this protocol serve different aims and have different target groups. The primary aim of the evaluation of mathematics, ICT and technology is to reveal and confirm the quality and the relevance of research performed at Norwegian Higher Education Institutions (HEIs), and by the institute sector. These institutions will hereafter be collectively referred to as Research Performing Organisations (RPOs). The assessments should serve a formative purpose by contributing to the development of research quality and relevance at these institutions and at the national level.

Evaluation units

The assessment will comprise a number of *administrative units* submitted for evaluation by the host institution. By assessing these administrative units in light of the goals and strategies set for them by their host institution, it will be possible to learn more about how public funding is used at the institution(s) to facilitate high-quality research and how this research contributes to society. The administrative units will be assessed by evaluation committees according to sectoral affiliation and/or other relevant similarities between the units.

The administrative units will be invited to submit data on their *research groups* to be assessed by expert panels organised by research subject or theme. See Chapter 3 for details on organisation.

Administrative unit	An administrative unit is any part of an RPO that is recognised as a formal (administrative) unit of that RPO, with a designated budget, strategic goals and dedicated management. It may, for instance, be a university faculty or department, a department of an independent research institute or a hospital.
Research group	Designates groups of researchers within the administrative units that fulfil the minimum requirements set out in section 1.2. Research groups are identified and submitted for evaluation by the administrative unit, which may decide to consider itself a single research group.

Minimum requirements for research groups

1) The research group must be sufficiently large in size, i.e. at least five persons in full-time positions with research obligations. This merely indicates the minimum number, and larger units are preferable. In exceptional cases, the minimum number may include PhD students, postdoctoral fellows and/or non-tenured researchers. *In all cases, a research group must include at least three full-time tenured staff*. Adjunct professors, technical staff and other relevant personnel may be listed as group members but may not be included in the minimum number.
2) The research group subject to assessment must have been established for at least three years. Groups of more recent date may be accepted if they have come into existence as a consequence of major organisational changes within their host institution.
3) The research group should be known as such both within and outside the institution (e.g. have a separate website). It should be able to document common activities and results in the form of co-publications, research databases and infrastructure, software, or shared

responsibilities for delivering education, health services or research-based solutions to designated markets.
4) In its self-assessment, the administrative unit should propose a suitable benchmark for the research group. The benchmark will be considered by the expert panels as a reference in their assessment of the performance of the group. The benchmark can be grounded in both academic and extra-academic standards and targets, depending on the purpose of the group and its host institution.

The evaluation in a nutshell

The assessment concerns:

- research that the administrative unit and its research groups have conducted in the previous 10 years
- the research strategy that the administrative units under evaluation intend to pursue going forward
- the capacity and quality of research in mathematics, ICT and technology at the national level

The Research Council of Norway (RCN) will:

- provide a template for the Terms of Reference[13] for the assessment of RPOs and a national-level assessment in mathematics, ICT and technology appoint members to evaluation committees and expert panels
- provide secretarial services
- commission reports on research personnel and publications based on data in national registries
- take responsibility for following up assessments and recommendations at the national level.

RPOs conducting research in mathematics, ICT and technology are expected to take part in the evaluation. The board of each RPO under evaluation is responsible for tailoring the assessment to its own strategies and specific needs and for following them up within their own institution. Each participating RPO will carry out the following steps:

1) Identify the administrative unit(s) to be included as the main unit(s) of assessment
2) Specify the Terms of Reference by including information on specific tasks and/or strategic goals of relevance to the administrative unit(s)
3) The administrative unit will, in turn, be invited to register a set of research groups that fulfil the minimum criteria specified above (see section 1.2). The administrative unit may decide to consider itself a single research group.
4) For each research group, the administrative unit should select an appropriate benchmark in consultation with the group in question. This benchmark can be a reference to an academic level of performance or to the group's contributions to other institutional or sectoral purposes (see section 2.4). The benchmark will be used as a reference in the assessment of the unit by the expert panel.
5) The administrative units subject to assessment must provide information about each of their research groups, and about the administrative unit as a whole, by preparing self-assessments and by providing additional documentation in support of the self-assessment.

13 The terms of reference (ToR) document defines all aspects of how the evaluation committees and expert panels will conduct the [research area] evaluation. It defines the objectives and the scope of the evaluation, outlines the responsibilities of the involved parties, and provides a description of the resources available to carry out the evaluation.

Target groups

- Administrative units represented by institutional management and boards
- Research groups represented by researchers and research group leaders
- Research funders
- Government

The evaluation will result in recommendations to the institutions, the RCN and the ministries. The results of the evaluation will also be disseminated for the benefit of potential students, users of research and society at large.

This protocol is intended for all participants in the evaluation. It provides the information required to organise and carry out the research assessments. Questions about the interpretation or implementation of the protocol should be addressed to the RCN.

Assessment criteria

The administrative units are to be assessed on the basis of five assessment criteria. The five criteria are applied in accordance with international standards. Finally, the evaluation committee passes judgement on the administrative units as a whole in qualitative terms. In this overall assessment, the committee should relate the assessment of the specific tasks to the strategic goals that the administrative unit has set for itself in the Terms of Reference.

When assessing administrative units, the committees will build on a separate assessment by expert panels of the research groups within the administrative units. See Chapter 3 'Evaluation process and organisation' for a description of the division of tasks.

Strategy, resources and organisation

The evaluation committee assesses the framework conditions for research in terms of funding, personnel, recruitment and research infrastructure in relation to the strategic aims set for the administrative unit. The administrative unit should address at least the following five specific aspects in its self-assessment: 1) funding sources, 2) national and international cooperation, 3) cross-sector and interdisciplinary cooperation, 4) research careers and mobility, and 5) Open Science. These five aspects relate to how the unit organises and actually performs its research, its composition in terms of leadership and personnel, and how the unit is run on a day-to-day basis.

To contribute to understanding what the administrative unit can or should change to improve its ability to perform, the evaluation committee is invited to focus on factors that may affect performance.

Further, the evaluation committee assesses the extent to which the administrative unit's goals for the future remain scientifically and societally relevant. It is also assessed whether its aims and strategy, as well as the foresight of its leadership and its overall management, are optimal in relation to attaining these goals. Finally, it is assessed whether the plans and resources are adequate to implement this strategy.

Research production, quality and integrity

The evaluation committee assesses the profile and quality of the administrative unit's research and the contribution the research makes to the body of scholarly knowledge and the knowledge base for other relevant sectors of society. The committee also assesses the scale of the unit's research results (scholarly publications, research infrastructure developed by the unit, and other contributions to the field) and its contribution to Open Science (early knowledge and sharing of data and other relevant digital objects, as well as science communication and collaboration with societal partners, where appropriate).

The evaluation committee considers the administrative unit's policy for research integrity and how violations of such integrity are prevented. It is interested in how the unit deals with research data, data management, confidentiality (GDPR) and integrity, and the extent to which independent and critical pursuit of research is made possible within the unit. Research integrity relates to both the scientific integrity of conducted research and the professional integrity of researchers.

Diversity and equality

The evaluation committee considers the diversity of the administrative unit, including gender equality. The presence of differences can be a powerful incentive for creativity and talent development in a diverse administrative unit. Diversity is not an end in itself in that regard, but a tool for bringing together different perspectives and opinions.

The evaluation committee considers the strategy and practices of the administrative unit to prevent discrimination on the grounds of gender, age, disability, ethnicity, religion, sexual orientation or other personal characteristics.

Relevance to institutional and sectoral purposes

The evaluation committee compares the relevance of the administrative unit's activities and results to the specific aspects detailed in the Terms of Reference for each institution and to the relevant sectoral goals (see below).

Higher Education Institutions

There are 36 Higher Education Institutions in Norway that receive public funding from the Ministry for Education and Research. Twenty-one of the 36 institutions are owned by the ministry, whereas the last 15 are privately owned. The HEIs are regulated under the Act relating to universities and university colleges of 1 August 2005.

The purposes of Norwegian HEIs are defined as follows in the Act relating to universities and university colleges[14]

- provide higher education at a high international level;
- conduct research and academic and artistic development work at a high international level;
- disseminate knowledge of the institution's activities and promote an understanding of the principle of academic freedom and application of scientific and artistic methods and results in the teaching of students, in the institution's own general activity as well as in public administration, in cultural life and in business and industry.

In line with these purposes, the Ministry for Research and Education has defined four overall goals for HEIs that receive public funding. These goals have been applied since 2015:

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[14] https://lovdata.no/dokument/NLE/lov/2005-04-01-15?q=universities

1) High quality in research and education
2) Research and education for welfare, value creation and innovation
3) Access to education (esp. capacity in health and teacher education)
4) Efficiency, diversity and solidity of the higher education sector and research system

The committee is invited to assess to what extent the research activities and results of each administrative unit have contributed to sectoral purposes as defined above. In particular, the committee is invited to take the share of resources spent on education at the administrative units into account and to assess the relevance and contributions of research to education, focusing on the master's and PhD levels. This assessment should be distinguished from an assessment of the quality of education in itself, and it is limited to the role of research in fostering high-quality education.

Research institutes (the institute sector)

Norway's large institute sector reflects a practical orientation of state R&D funding that has long historical roots. The Government's strategy for the institute sector[15] applies to the 33 independent research institutes that receive public basic funding through the RCN, in addition to 12 institutes outside the public basic funding system.

The institute sector plays an important and specific role in attaining the overall goal of the national research system, i.e. to increase competitiveness and innovation power to address major societal challenges. The research institutes' contributions to achieving these objectives should therefore form the basis for the evaluation. The main purpose of the sector is to conduct independent applied research for present and future use in the private and public sector. However, some institutes primarily focus on developing a research platform for public policy decisions, others on fulfilling their public responsibilities.

The institutes should:

- maintain a sound academic level, documented through scientific publications in recognised journals
- obtain competitive national and/or international research funding grants
- conduct contract research for private and/or public clients
- demonstrate robustness by having a reasonable number of researchers allocated to each research field

The committee is invited to assess the extent to which the research activities and results of each administrative unit contribute to sectoral purposes and overall goals as defined above. In particular, the committee is invited to assess the level of collaboration between the administrative unit(s) and partners in their own or other sectors.

The hospital sector (only relevant for evaluation of medicine and health research)

There are four regional health authorities (RHFs) in Norway. They are responsible for the specialist health service in their respective regions. The RHFs are regulated through the Health Enterprises Act of 15 June 2001 and are bound by requirements that apply to specialist and other health services, the Health Personnel Act and the Patient Rights Act. Under each of the regional health authorities, there are several health trusts (HFs), which can consist of one or more hospitals. A health trust (HF) is wholly owned by an RHF.

Research is one of the four main tasks of hospital trusts.[16] The three other mains tasks are to ensure good treatment, education and training of patients and relatives. Research is important if the health

[15] Strategy for a holistic institute policy (Kunnskapsdepartementet 2020)
[16] Cf. the Specialist Health Services Act § 3-8 and the Health Enterprises Act §§ 1 and 2

service is to keep abreast of stay up-to-date with medical developments and carry out critical assessments of established and new diagnostic methods, treatment options and technology, and work on quality development and patient safety while caring for and guiding patients.

The committee is invited to assess the extent to which the research activities and results of each administrative unit have contributed to sectoral purposes as described above. The assessment does not include an evaluation of the health services performed by the services.

Relevance to society

The committee assesses the quality, scale and relevance of contributions targeting specific economic, social or cultural target groups, of advisory reports on policy, of contributions to public debates, and so on. The documentation provided as the basis for the assessment of societal relevance should make it possible to assess relevance to various sectors of society (i.e. business, the public sector, non-governmental organisations and civil society).

When relevant, the administrative units will be asked to link their contributions to national and international goals set for research, including the Norwegian Long-term Plan for Research and Higher Education and the UN Sustainable Development Goals. Sector-specific objectives, e.g. those described in the Development Agreements for the HEIs and other national guidelines for the different sectors, will be assessed as part of criterion 2.4.

The committee is also invited to assess the societal impact of research based on case studies submitted by the administrative units and/or other relevant data presented to the committee. Academic impact will be assessed as part of criterion 2.2.

Evaluation process and organisation

The RCN will organise the assessment process as follows:

- Commission a professional secretariat to support the assessment process in the committees and panels, as well as the production of self-assessments within each RPO
- Commission reports on research personnel and publications within mathematics, ICT and technology based on data in national registries
- Appoint one or more evaluation committees for the assessment of administrative units.
- Divide the administrative units between the appointed evaluation committees according to sectoral affiliation and/or other relevant similarities between the units.
- Appoint a number of expert panels for the assessment of research groups submitted by the administrative units.
- Divide research groups between expert panels according to similarity of research subjects or themes.
- Task the chairs of the evaluation committees with producing a national-level report building on the assessments of administrative units and a national-level assessments produced by the expert panels.

Committee members and members of the expert panels will be international, have sufficient competence and be able, as a body, to pass judgement based on all relevant assessment criteria. The RCN will facilitate the connection between the assessment levels of panels and committees by appointing committee members as panel chairs.

Division of tasks between the committee and panel levels

The expert panels will assess research groups across institutions and sectors, focusing on the first two criteria specified in Chapter 2: 'Strategy, resources and organisation' and 'Research production and quality' The assessments from the expert panels will also be used as part of the evidence base for a report on Norwegian research within mathematics, ICT and technology (see section 3.3).

The evaluation committees will assess the administrative units based on all the criteria specified in Chapter 2. The assessment of research groups delivered by the expert panels will be a part of the evidence base for the committees' assessments of administrative units. See figure 1 below.

The evaluation committee has sole responsibility for the assessments and any recommendations in the report. The evaluation committee reaches a judgement on the research based on the administrative units and research groups' self-assessments provided by the RPOs, any additional documents provided by the RCN, and interviews with representatives of the administrative units. The additional documents will include a standardised analysis of research personnel and publications provided by the RCN.

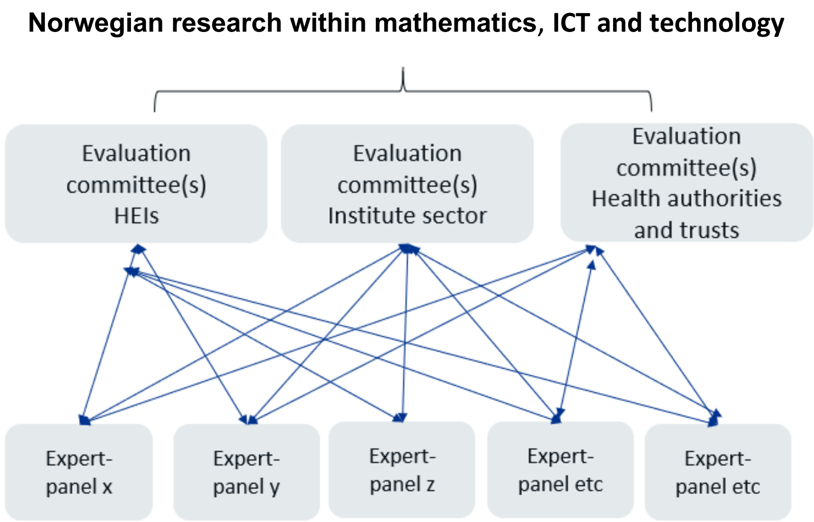

Figure 1. Evaluation committees and expert panels (Health authorities and trusts are only relevant for evaluation of medicine and health)

The evaluation committee takes international trends and developments in science and society into account when forming its judgement. When judging the quality and relevance of the research, the committees shall bear in mind the specific tasks and/or strategic goals that the administrative unit has set for itself including sectoral purposes (see section 2.4 above).

Accuracy of factual information

The administrative unit under evaluation should be consulted to check the factual information before the final report is delivered to the RCN and the board of the institution hosting the administrative unit.

National level report

Finally, the RCN will ask the chairs of the evaluation committees to produce a national-level report that builds on the assessments of administrative units and the national-level assessments produced by the expert panels. The committee chairs will present their assessment of Norwegian research in mathematics, ICT and technology at the national level in a separate report that pays specific attention to:

- Strengths and weaknesses of the research area in the international context
- The general resource situation regarding funding, personnel and infrastructure
- PhD training, recruitment, mobility and diversity
- Research cooperation nationally and internationally
- Societal impact and the role of research in society, including Open Science

This national-level assessment should be presented to the RCN.

Appendix A: Terms of References (ToR)

[Text in red to be filled in by the Research-performing organisations (RPOs)]

The board of [RPO] mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess [administrative unit] based on the following Terms of Reference.

Assessment
You are asked to assess the organisation, quality and diversity of research conducted by [administrative unit] as well as its relevance to institutional and sectoral purposes, and to society at large. You should do so by judging the unit's performance based on the following five assessment criteria (a. to e.). Be sure to take current international trends and developments in science and society into account in your analysis.

a) Strategy, resources and organisation
b) Research production, quality and integrity
c) Diversity and equality
d) Relevance to institutional and sectoral purposes
e) Relevance to society

For a description of these criteria, see Chapter 2 of the mathematics, ICT and technology evaluation protocol. Please provide a written assessment for each of the five criteria. Please also provide recommendations for improvement. We ask you to pay special attention to the following [n] aspects in your assessment:

1. …
2. …
3. …
4. …
…

[To be completed by the board: specific aspects that the evaluation committee should focus on – they may be related to a) strategic issues, or b) an administrative unit's specific tasks.]

In addition, we would like your report to provide a qualitative assessment of [administrative unit] as a whole in relation to its strategic targets. The committee assesses the strategy that the administrative unit intends to pursue in the years ahead and the extent to which it will be capable of meeting its targets for research and society during this period based on available resources and competence. The committee is also invited to make recommendations concerning these two subjects.

Documentation
The necessary documentation will be made available by the mathematics, ICT and technology secretariat at Technopolis Group.

The documents will include the following:

- a report on research personnel and publications within mathematics, ICT and technology commissioned by RCN

- a self-assessment based on a template provided by the mathematics, ICT and technology secretariat
- [to be completed by the board]

Interviews with representatives from the evaluated units
Interviews with the [administrative unit] will be organised by the evaluation secretariat. Such interviews can be organised as a site visit, in another specified location in Norway or as a video conference.

Statement on impartiality and confidence
The assessment should be carried out in accordance with the *Regulations on Impartiality and Confidence in the Research Council of Norway*. A statement on the impartiality of the committee members has been recorded by the RCN as a part of the appointment process. The impartiality and confidence of committee and panel members should be confirmed when evaluation data from [the administrative unit] are made available to the committee and the panels, and before any assessments are made based on these data. The RCN should be notified if questions concerning impartiality and confidence are raised by committee members during the evaluation process.

Assessment report
We ask you to report your findings in an assessment report drawn up in accordance with a format specified by the mathematics, ICT and technology secretariat. The committee may suggest adjustments to this format at its first meeting. A draft report should be sent to the [administrative unit] and RCN]. The [administrative unit] should be allowed to check the report for factual inaccuracies; if such inaccuracies are found, they should be reported to the mathematics, ICT and technology secretariat within the deadline given by the secretariat. After the committee has made the amendments judged necessary, a corrected version of the assessment report should be sent to the board of [the RPO] and the RCN after all feedback on inaccuracies has been received from [administrative unit].

Appendix B: Data sources

The lists below show the most relevant data providers and types of data to be included in the evaluation. Data are categorised in two broad categories according to the data source: National registers and self-assessments prepared by the RFOs. The RCN will commission an analysis of data in national registers (R&D-expenditure, personnel, publications etc.) to be used as support for the committees' assessment of administrative units. The analysis will include a set of indicators related to research personnel and publications.

Data providers

- Norwegian Agency for Quality Assurance in Education (NOKUT)
- Research Council of Norway (RCN)
- Statistics Norway (SSB)
- Nordic institute for studies of innovation, research and education (NIFU)

Available data material

1) **Administrative unit**
    a. **Data from administrative units:**
        i. *Self-assessment covering all assessment criteria*
        ii. *Administrative data on funding sources*
        iii. *Administrative data on personnel*
        iv. *Administrative data on research infrastructure and other support structures*
        v. *SWOT analysis*
        vi. *Impact cases*
        vii. *Any supplementary data needed to assess performance related to the Terms of Reference, strategic goals and specific tasks of the unit*
    b. **Data from expert panels**
        i. *Panel report for each expert panel in the evaluation*
        ii. *Assessment reports per participating research group*
    c. **Data from National data providers**
        i. *Publication and citation analysis (NIFU)*
        ii. *Statistics for use in the evaluations (SSB)*
        iii. *The Norwegian Research System (NIFU)*
        iv. *Bibliometrics Higher Education Sector (NIFU)*
        v. *Bibliometrics Institute Sector (NIFU)*
    d. **Data from the Research Council of Norway**
        i. *Research Council of Norway contribution to the evaluation (RCN)*
        ii. *Extract from the Survey of academic staff (NOKUT)*
        iii. *Extract of the Student Survey (NOKUT)*

2) **Research groups**

    b. Data from the research groups
        i. *Self-assessment covering the first two assessment criteria (see Table 1)*
        ii. *Research group data on funding sources*
        iii. *Research group data on personnel*
        iv. *Publication profiles*
        v. *Example publications and other research results (databases, software etc.) The examples should be accompanied by an explanation of the groups' specific contributions to the result*

vi. *Any supplementary data needed to assess performance related to the benchmark defined by the administrative unit*

c. Data from National data providers

i. *Publication and citation analysis (NIFU)*

The table below shows how different types of evaluation data may be relevant to different evaluation criteria. Please note that the self-assessment produced by the administrative units in the form of a written account of management, activities, results etc. should cover all criteria. A template for the self-assessment of research groups and administrative units will be commissioned by the RCN from the mathematics, ICT and technology secretariat for the evaluation.

Table 1. Types of evaluation data per criterion (changes may occur)

Evaluation units / **Criteria**	**Research groups**	**Administrative units**
Strategy, resources and organisation	Self-assessment Data from National data providers	Self-assessment Terms of Reference Research groups assessment reports Data from National data providers and RCN
Research production and quality	Self-assessment Example publications (and other research results)	Self-assessment Research groups assessment reports Data from National data providers and RCN
Diversity, equality and integrity		Self-assessment Research groups assessment reports Data from National data providers and RCN
Relevance to institutional and sectoral purposes		Self-assessment Impact cases Data from National data providers and RCN
Relevance to society		Self-assessment Impact cases Data from National data providers and RCN
Overall assessment	*Data related to:* *Benchmark defined by administrative unit*	*Data related to:* *Strategic goals and specific tasks of the admin. unit*

Appendix 5. List of participating administrative units

Institution	Administrative Unit	Research Group
University of Oslo	Department of Informatics	Analytical Solutions and Reasoning (ASR)
		Design of information systems (DESIGN)
		Digital Innovation (DIN)
		Digital Signal Processing and Image Analysis (DSB)
		Entrepreneurship group (ENT)
		Information Systems (IS)
		Language Technology Group (LTG)
		Nanoelectronics research group (NANO)
		Networks and Distributed Systems (ND)
		Reliable Systems (PSY)
		Programming Technology (PT)
		Robotics and Intelligent Systems (ROBIN)
		Scientific Computing and Machine Learning (SCML)
		Software Engineering (SE)
		Digital Security (SEC)
University of Oslo	Department of Mathematics	Mechanics - MEK
		Statistics and Data Science - Section 2
		Risk and Stochastics - RaS
		Partial differential equations and computational mathematics – section 4
		Algebra, Geometry and Topology - Section 5
		Several Complex Variables, Logic and Operator algebras – section 6
University of Bergen	Department of Informatics	Algorithms (Algo)
		Machine Learning (ML)
		Optimization (OPT)
		Programming Theory (PUT)
		Selmer Centre in Secure Communication (SC)
		Visualization Research Group (VisGroup)
University of Bergen	Department of Mathematics	Algebra, algebraic geometry and topology (AGATA)
		Analysis and PDE (AnPDE)
		Fluid Mechanics (FM)
		Porous Media Research Group (PMG)
		Statistics and data science
University of Bergen	Department of Physics and Technology (IFT)	Reservoir Physics – Energy Technology and CO2 storage (CCUS)
		Energy and Process Technology (EPT)
University of Bergen	Department of Information Science and Media Studies (InfoMedia)	The HCI research group (HCI)
		Intelligent Information Systems (I2S)

Institution	Administrative Unit	Research Group
		Logic and Artificial Intelligence (LAI)
		Behavioural Data Analytics & Recommender Systems Research Group (DARS)
UiT the Arctic University of Norway	Department of Automation and Process Engineering (IAP)	IR, Spectroscopy and Numerical Modelling Research Group (IRSNM)
UiT the Arctic University of Norway	Department of Building, Energy and Material Technology	Building, Energy and Materials (BEaM)
UiT The Arctic University of Norway	Department of Computer Science (IFI)	Arctic Green Computing Group (AGC)
		Computational Analytics and Intelligence (CAI)
		Cyber-Physical and IoT Systems (CPS)
		Cyber Security Group (CSG)
		Health Data Lab (HDL)
		Health Informatics and -Technology (HIT)
		Open Distributed Systems (ODS)
UiT The Arctic University of Norway	Department of Computer Technology and Computational Engineering (IDBI)	Simulations
UiT The Arctic University of Norway	Department of electrical engineering (IET)	Electromechanical systems (ElMech)
UiT The Arctic University of Norway	Department of Industrial Technology	Arctic Technology & Icing Research Group (arcICE)
		Intelligent Manufacturing and Logistics (IMaLog)
UiT The Arctic University of Norway	Department for Mathematics and Statistics (IMS)	Applied and Computational Algebra, ACAG
		Complex Systems Modelling (CoSMo)
		Geometry and Mathematical Physics
UiT The Arctic University of Norway	Department of Physics and Technology (IFT)[1]	Machine Learning Group (MLG)
UiT The Arctic University of Norway	Department of technology and Safety (ITS)	Sustainable Technology and Safety (STS
		Advanced maritime ship operations (AMSO)
University of Stavanger (UiS	Department of Electrical Engineering and Computer Science (IDE)	Cybernetics and Biomedical Engineering (CBE)
		Computer Science
		Data Science and Artificial Intelligence
University of Stavanger (UiS	Department of Energy and Petroleum Engineering – IEP	Drilling and Well Technology – DWT
		Energy Technology - ET
University of Stavanger (UiS	Department of Mechanical and Structural Engineering and Material Science (IMBM)	Structural engineering Research group (BYGG)
		Marine and Offshore Technology, Marin (M&O)
		Mechanical Engineering and Industrial Asset Management, Maskin og IAM (MEIAM)
University of Stavanger (UiS	Department of Mathematics and Physics, IMF	Geometry and Analysis, GeoAna
		Statistics
		Theoretical Subatomic Physics and Cosmology (TSPC)
		Materials Physics (MP)

Institution	Administrative Unit	Research Group
Norwegian University of Science and Technology - NTNU	Department of Architecture and Technology – IAT	Energy and Environment Group
Norwegian University of Science and Technology - NTNU	Department of Civil and Environmental Engineering (DCEE)	Building Technology - BT
		Building Process (BP)
		Geomatics
		Geotechnical Engineering, Geotech
		Marine Civil Engineering (MB)
		Water and Wastewater (VA)
		Road, Railway and Transport Engineering (VJT)
		Hydraulic Engineering group (VT)
Norwegian University of Science and Technology - NTNU	Department of Computer Science (IDI)	Artificial Intelligence Foundations (AIFO)
		Algorithms, HPC and Systems
		Applied Artificial Intelligence
		Computer Architecture Lab (CAL)
		Computing Education Research Group
		Colourlab (Colourlab)
		Information Systems (IS)
		Intelligent Systems and Analytics (ISA)
		Software Engineering and Learning Technology (SE-LT)
		Visual Computing Group
Norwegian University of Science and Technology - NTNU	Department of Electric Energy (IEL)	Electrical Machines and Electromagnetics (EME)
		Electricity Markets and Energy System Planning (EMESP)
		High Voltage Technology (HVT)
		Power Electronics Systems and Components (PESC)
		Power System Operation and Analysis-PSOA
Norwegian University of Science and Technology - NTNU	Department of Electronic Systems (IES)	Acoustics group (AK)
		Electronic Systems Education (ESE)
		Circuit and Radio Systems group (KR)
		Nanoelectronics and Photonics (NF)
		Signal Processing Group (SI)
		Smart Wireless Systems (SWS)
Norwegian University of Science and Technology - NTNU	Department of Energy and Process Engineering (EPT)	Industrial Ecology Programme (IndEcol)
		Process and Power (PP)
		Sustainable Energy Systems (SES)
		Thermo-fluid (TF)
Norwegian University of Science and Technology - NTNU	Department of Engineering Cybernetics – DeptCybernetic	Cybernetics in Life Sciences-Biocybernetics
		Control and AI for Cyber-Physical Systems
		Robotics and Autonomous Systems – RAS

Institution	Administrative Unit	Research Group
Norwegian University of Science and Technology - NTNU	Department of Geoscience and Petroleum (IGP)	Engineering Geology and Rock Mechanics (EG&RM)
		Mineral Production and HSE
		Well and Reservoir (originally registered as Subsurface Technology)
		Research Group Geology
		Research Group Geophysics
Norwegian University of Science and Technology - NTNU	Department of ICT and Natural Sciences	Cyber-Physical Systems Lab
		Sustainable Digital Transformation Research and Development Group (SDT)
Norwegian University of Science and Technology - NTNU	Department of Information Security and Communication Technology, NTNU – IIK	Communication Technology, NTNU-IIK-COM (COM)
		the Discipline of Human, Organizational, and Societal Aspects (NTNU-IIK-HOS, HOS)
		Information Security Discipline (NTNU-IIK-INF)
		Discipline of Cryptology (NTNU-IIK-KRY, KRY)
Norwegian University of Science and Technology - NTNU	Department of Manufacturing and Civil Engineering (IVB)	Manufacturing Materials and Energy
		Civil engineering and geomatics group
Norwegian University of Science and Technology - NTNU	Department of Marine Technology (IMT)	Marine Energy Systems and Automatics (MESA)
		Marine Structures (MS)
		Marine Systems Design (MSD)
Norwegian University of Science and Technology - NTNU	Department of mathematical sciences (IMF)	Algebra
		Analysis
		Differential Equations and Numerical analysis (DNA)
		Geometry and Topology
		Statistics
Norwegian University of Science and Technology - NTNU	Department of Mechanical and Industrial Engineering (MTP)	Design, Analysis, Materials & Manufacturing (DAM)
		Production Management (PM)
		Project and Quality Management, PQL
		Robotics and Automation, RA
		Reliability, Availability, Maintainability and Safety, RAMS
Norwegian University of Science and Technology - NTNU	Structural Engineering (KT)	Concrete Group
		Nano and Biomechanics
		Structural Impact Laboratory (SIMLab)
		Structural Mechanics Group (KMEK)
University of Agder, UiA	Department of Information Systems (IIS)	Centre for Digital Transformation (CeDiT)
		Centre for Integrated Emergency Management (CIEM)
University of Agder, UiA	Faculty of Engineering and Science (TekReal)	Centre for Artificial Intelligent Research (CAIR)
		Civil and Structural research group (CSG)
		Electronics, IoT, and Mobile Communications
		Functional Analysis (FA)

Institution	Administrative Unit	Research Group
		Mathematics Education Research Group Agder (MERGA)
		Renewable Energy (REN)
		Cyber security, systems engineering, modelling (SYSEC)
		Mechatronics Section/Top Research Centre Mechatronics (TRCM)
Oslo Metropolitan University - OsloMet	Department of Built Environment (BE)	Structural Engineering Research Group (SERG)
		Sustainable Built Environment (SustainaBuilt)
Oslo Metropolitan University - OsloMet	Department of Computer Science	Applied AI research group (AI2)
		Autonomous Systems and Networks (ASN)
		Mathematical modelling research group (MatMod)
		Universal Design of Information and Communication Technologies (UD-ICT)
Oslo Metropolitan University - OsloMet	Department of Mechanical, Electronic and Chemical Engineering	ADEPT (Advanced Health Intelligence and Brain-inspired Technologies)
		Automation, Robotics, and Intelligent Systems (ARIS)
		Mechanics, Mechatronics and Material Technology (M3T
Norwegian University of Life Sciences (NMBU)	Faculty of Science and Technology (REALTEK)	Biospectroscopy and Data Modeling (BioSpec
		Material Theory and Informatics (MatInf)
		Robotics Group
University of South-Eastern Norway (USN)	Department of Electrical Engineering (IT) and Cybernetics (EIK)	Applied Modeling and Control (AMOC RG)
		Electrical Power Systems (EPS RG)
University of South-Eastern Norway (USN)	Department of Microsystems (IMS)	Biological Micro Electronic Mechanical Systems (BioMems)
		Materials and Micro-integration (matMicro)
University of South-Eastern Norway (USN)	Department of Process, Energy and Environmental Technology (PEM)	USN Research Group of Energy and Environmental Technology (URGENT)
University of South-Eastern Norway (USN)	Department of Science and Industry Systems (IRI)	Advanced Cognitive systems and Data Science (ACSAD)
		Norwegian Industrial Systems Engineering (NISE)
		Quantum Technology (QTECH)
University of South-Eastern Norway (USN)	USN School of Business	Management Information Systems (MIS)
Kristiania University College	School of Economics, Innovation and Technology/SEIT	The Behavior & Technology Lab/BTLab
		The Innovation and Digitalization for Enterprises And Society research laboratory (IDEAS Lab)
Western Norway University of Applied Sciences (HVL)	Faculty of Engineering and Natural Sciences (FIN) / Faculty of Technology, Environmental and Social Sciences (FTMS), from 1.1.2024	Nanofluids for energy and process technology (Nanofluids
		Software Engineering (SE)
		Wind, Water and Waves (W3)
		Glaciers Research Group (BRE)
		Landslides Research Group (SKRED)
Østfold University College (ØUC)	Faculty of Computer Science, Engineering and Economics (IIØ)	Green Energy Hub (GEH)
		Department of Computer Science and Communication (ITK)

Institution	Administrative Unit	Research Group
Institution	Administrative Unit	Research Group
NORCE Norwegian Research Centre (NORCE)	NORCE Energy and Technology	Subsurface Flow Laboratory (SFL)
	NORCE Teknologi	Air and Space
		Computational Geosciences and Modeling (CGM)
		Coastal and Ocean Systems (COS)
		Data, AI, Robotics, Vision, Visualization, Immersion (DARWIN)
		Data Assimilation and Optimization (DAO)
		Digital Systems (DS)
		Energy Modelling and Automation
		Autonomous Systems and IoT (IoT)
		Measurement Science
		Modelling and Simulation (ModSim)
		Well Operations and Risk Management (WORM)
SINTEF Community	SINTEF Community	Climate adaptation of the built environment (CLIMADAPT)
		Energy efficiency and flexibility in buildings and neighbourhoods (ENERFLEX)
SINTEF Digital	SINTEF Digital	Communication Systems (CS)
		Human Computer Interaction (HCI)
		Robotics and Control (RobCon)
		Acoustics / ACOU
		Computational Geosciences (COMG)
		Computational Science and Engineering (CSE)
		Computer Vision (CV)
		Cyber Security / CyberSec
		Digital Process Innovation (DPI)
		Geometry / GEO
		Trustworthy Green IoT Software / GIoT
		Optimization (OPT)
		Reliable automation (RA)
		Smart Data / SD
		Software Product Innovation / SPIN
		Analytics and AI / AAI
		Health Services Research / HSR*
		Applied Optics (AO)
		Medical Technology
		Micro-optics
		Silicon Sensor Technology
SINTEF Industry	SINTEF Industry	Applied Geoscience (AG)
		Formation Physics / FF
		Material- and Structural Mechanics (MSM)
		Batteries and Hydrogen Technologies (BHT)

Institution	Administrative Unit	Research Group
		Solar Energy and Materials
		Operations Research and Economics (IØO)
		New Energy Solutions (NES)
		Thin Film and Membrane Technology (TFMT)
		Casting, forming and recycling - SFR
		Polymer and composite materials — PKM
		Materials Integrity and Welding, MIW
		Corrosion and Tribology (CT)
		Drilling & well/DW
		Flow Technology (ST)
		Industrial Process design (IPD)
		Chemical and Environmental Process Engineering
		Multiphase Flow (FFS)
		Material Physics Oslo (MPO)
		Material Physics Trondheim (MPT)
		Electrolysis and High Temperature Materials (EHTM)
		Material Modelling and Processing
		Process Chemistry and Functional Materials (PCFM)
		Process Metallurgy and Raw Materials
SINTEF Energy	SINTEF Energy	Active Distribution Systems (ADS)
		Bioenergy (BIO)
		Energy Processes (EP)
		Insulation systems
		Offshore energy systems (OES)
		Thermodynamics (Thermo)
SINTEF Ocean	SINTEF Ocean	Aquaculture Robotics and Automation
		Experimental Hydrodynamics
		Marine CFD
		Marine Operations
		Marine Structures (MS)
		Maritime Energy Systems
		Maritime ICT and Cybernetics
		Ship Hydrodynamics
		Structural Mechanics (KT)
SINTEF Manufacturing	SINTEF Manufacturing	Digital Production / DP
		Industrial Robotics and Automation / RobAuto
Norwegian Computing Centre (NR)	Norwegian Computing Centre (NR)	Image analysis, Machine Learning and Earth observation s BAMJO
		Department of Applied Research in ICT (DART
		Statistical Analysis and Machine Learning for user motivated applications (SAMBA)
		Statistical Analysis of Natural Resource Data (SAND)

Institution	Administrative Unit	Research Group
Institute for Energy Technology (IFE)	Human and organisational factors (HOF)	Human and organisational factors (HOF)
	Energy and Energy Technology (ENET)	Solar Energy Materials and Technology
		Energy Materials, ENMAT/Battery Technology Department
		Department for Hydrogen Technology
		Department for Environmental Industrial Processes
		Department for Reservoir Technology
Simula Research Laboratory (SIMULA)	Simula Research Laboratory (SIMULA)	Communication Systems
		Cryptography (SUiB)
		Data Science
		Scientific Computing
		Software Engineering (SE)

1 research group from EVALMEDHELSE and 17 research groups from EVALNAT

Explanation color code:

	17 Research groups that are evaluated in EVALNAT, will be included in the Adm unit assessment in EVALMIT
	7 Research groups will not be included in any Adm Unit report in EVALMIT (only research group reports)
	1 Research group will be evaluated in EVALMEDHELSE but will be included in Adm unit report for EVALMIT.

Appendix 6. Members of the EVALMIT national committee

Krikor B Ozanyan (Chair)

Krikor B Ozanyan (FInstP, FIET, FHEArp, LifeSMIEEE) is Professor of Photonic Sensors and Systems in the School of Engineering, The University of Manchester, UK. His research interests span semiconductor materials, devices and technology, sensors and sensing systems for indirect imaging, as well as machine learning for sensor data processing. He has held research and academic appointments at several European Universities and has led the Publications and Education portfolios of the IEEE Sensors Council. He served as Expert Panel member in EVALNAT (2023-2024) and chaired one of the ICT Expert Panels, the Research Institutes Evaluation Committee and the National Evaluation Committee in EVALMIT (2024-2025).

Deborah Greaves

Deborah Greaves is a Professor of Ocean Engineering, Director of the Interdisciplinary Research Centre for Decarbonisation and ORE, Director of the COAST Laboratory and was Head of the School of Engineering, Computing and Mathematics (2016 -2022) at the University of Plymouth with previous appointments at the University of Oxford, UCL and the University of Bath. In 2020, she was elected to be a Fellow of the Royal Academy of Engineering and was appointed as a Member of EPSRC Council in 2022. She has led many national and international research projects concerning offshore renewable energy (ORE) in collaboration with industrial and academic partners, is Director of the EPSRC Supergen Offshore Renewable Energy (ORE) Hub. In the Queen's Birthday Honours List, 2018, she was awarded an OBE for services to Marine Renewable Energy, Equalities, and Higher Education.

Jan S Hesthaven

Since 2024, Jan S Hesthaven is the President of Karlsruhe Institute of Technology, Germany where he is also Professor of Computational Science and Engineering. Following his graduation from the Technical University of Denmark in 1995, he joined Brown University, USA where he became Professor of Applied Mathematics in 2005. In 2013 he joined EPFL, CH as Professor of Mathematics and, most recently, served as Vice-President of Academic Affairs until 2024. He is a recognised expert in the analysis and application of modern computational models for solving partial differential equations, including data driven methods. He is a member of the Royal Danish Academy of Sciences and Letters and was awarded an honorary doctorate from DTU in 2024 for his contributions to science and science leadership

Rebecka Jörnsten

Rebecka Jörnsten has been a Professor of Biostatistics and Applied Statistics at the University of Gothenburg since 2016. She obtained her Ph.D. in mathematical statistics from the University of California at Berkeley in 2001. She held an assistant and associate professorship at Rutgers University from 2002 to 2008, before joining the Department of Mathematical Sciences, University of Gothenburg in 2009. She has been vice-dean for research and research infrastructures at the Faculty of Science and Technology since 2018. Her research centres on model selection, neural network regularization, and developing new machine learning methods with applications to systems biology.

Claudio Mazzotti

Claudio Mazzotti is full Professor of Structural Engineering at the University of Bologna (Italy). He was the head of the Building & Construction Centre of Applied Research (CIRI-EC) of the University of Bologna. In 2024 he is member of the Board for the National Scientific Qualification within the Structural Engineering national group; he acted as international reviewer for a number of research projects funded by Italian and international bodies; he is author of more than 200 publications.

PM (Lina) Sarro

Lina Sarro, IEEE Fellow, is Professor in Microsystems Technology at the Delft University of Technology (TUD), the Netherlands. She received the Laurea degree in Physics from the University of Naples, Italy, in 1980 and a PhD degree in Electronic Engineering from the TUD in 1987. From 1981 to 1983, she was a post-doctoral fellow in the Photovoltaic Research Group of the Division of Engineering, Brown University, Rhode Island, U.S.A. Since 1987 she is associated with TUD where she became full professor in 2001. She is internationally recognized for her work on integrated silicon sensors and micro/nano-electro-mechanical (MEMS/NEMS) technology, for applications in health, environment, automotive and scientific instrumentation.

Bo Wahlberg

Bo Wahlberg has been the Professor of Automatic Control at KTH Royal Institute of Technology, Sweden, since 1991. He is an IEEE Fellow, an IFAC Fellow, and a Fellow of the Royal Swedish Academy of Engineering Sciences. His research focuses on decision and control systems with applications in industry and transportation.

References

Aksnes, D. W. & Fossum, L. W., 2023. *The Norwegian research system – structure and main characteristics,* Oslo: NIFU.

Aksnes, D. W. & Karlstrøm, H., 2025. *Evaluation of mathematics, ICT and technology in Norway (EVALMIT) Publication and citation analysis – a national profile,* Oslo: NIFU.

Arnold, E., 2012. Understanding the long-term impacts of R&D funding: The EU framework programme. *Research Evaluation,* 21(5), pp. 332-343.

Arnold, E., Kuhlmann, S. & van der Meulen, B., 2001. *A Singular Council: Evaluation of the Research Council of Norway,* Oslo: Royal Norwegian Ministry of Education, Research and Church Affairs.

Arnold, E. & Mahieu, B., 2012. *A Good Council? Evaluation of the Research Council of Norway,* Oslo: Royal Norwegian Ministry of Education and Research.

Draghi, M., 2024. *The Future of European Competitiveness,* Brussels: European Commission.

Elsevier, 2024. *Progress towards gender equality in research and innovation – 2024 review,* Amsterdam: Elsevier.

Forskningsrådet, 2021. *Science & Technology Indicators for Norway 2021,* Oslo: Forskningsrådet.

Forskningsrådet, 2023. *Indiktorrapporten Det norske forsknings- og innovasjonssystemet – statistikk og indikatorer,* Oslo: Forskningsrådet.

Hesthaven et al, J. S., 2012. *Research in Information and Communication Technology in Norwegian Universities and Selected Research Institutes: An Evaluation,* Oslo: RCN.

Jemielniak, D. & Wilamowski, M., 2024. Gender gap in all academic fields over time. *Social Science Computer Review,* 0(0), p. doi: 10.1177/08944393241270633.

Karlstrøm, H. & Aksnes, D. W., 2024. *Compilation report EVALMIT Bibliometric statistics and analyses for administrative units included in the evaluation of mathematics, ICT and technology research in Norway,* Oslo: NIFU.

Karlstrøm, H., Piro, F. N. & AAksnes, D. W., 2024:5. *A bibliometric analysis of Norwegian sciences Trends and international comparisons,* Oslo: NIFU.

Narula, R., 2000. *Explaining 'Inertia' in R&D internationalisation: Norwegian firms and the role of home country effects,* Oslo: University of Oslo/STEP.

OECD, 2008. *OECD Reviews of Innovation Policy: Norway,* Paris: OECD.

Price, D. d. S., 1963. *Little Science, Big Science.* New York(New York): Columbia University Press.

Rørstad, K. & Wendt, K., 2024/15. *Statistics for use in the evaluation of mathematics, informatics and technology Analysis of research personnel in 2013, 2017 and 2021,* Oslo: SSB.

Rauch, W., Fray, D. J. & Preu, R., 2015. *Basic and long-term research within engineering scienc e in Norway,* Oslo: RCN Science Division.

RCN, 2024. *Funding of mathematics, ICT and technology,* Oslo: RCN.

Tillmann, U., 2012. *Research in Mathematics at Norwegian Universities: An evaluation,* Oslo: RCN.

Norges forskningsråd

Besøksadresse: Drammensveien 288

Postboks 564

1327 Lysaker

Telefon: 22 03 70 00

Telefaks: 22 03 70 01

post@forskningsradet.no

www.forskningsradet.no

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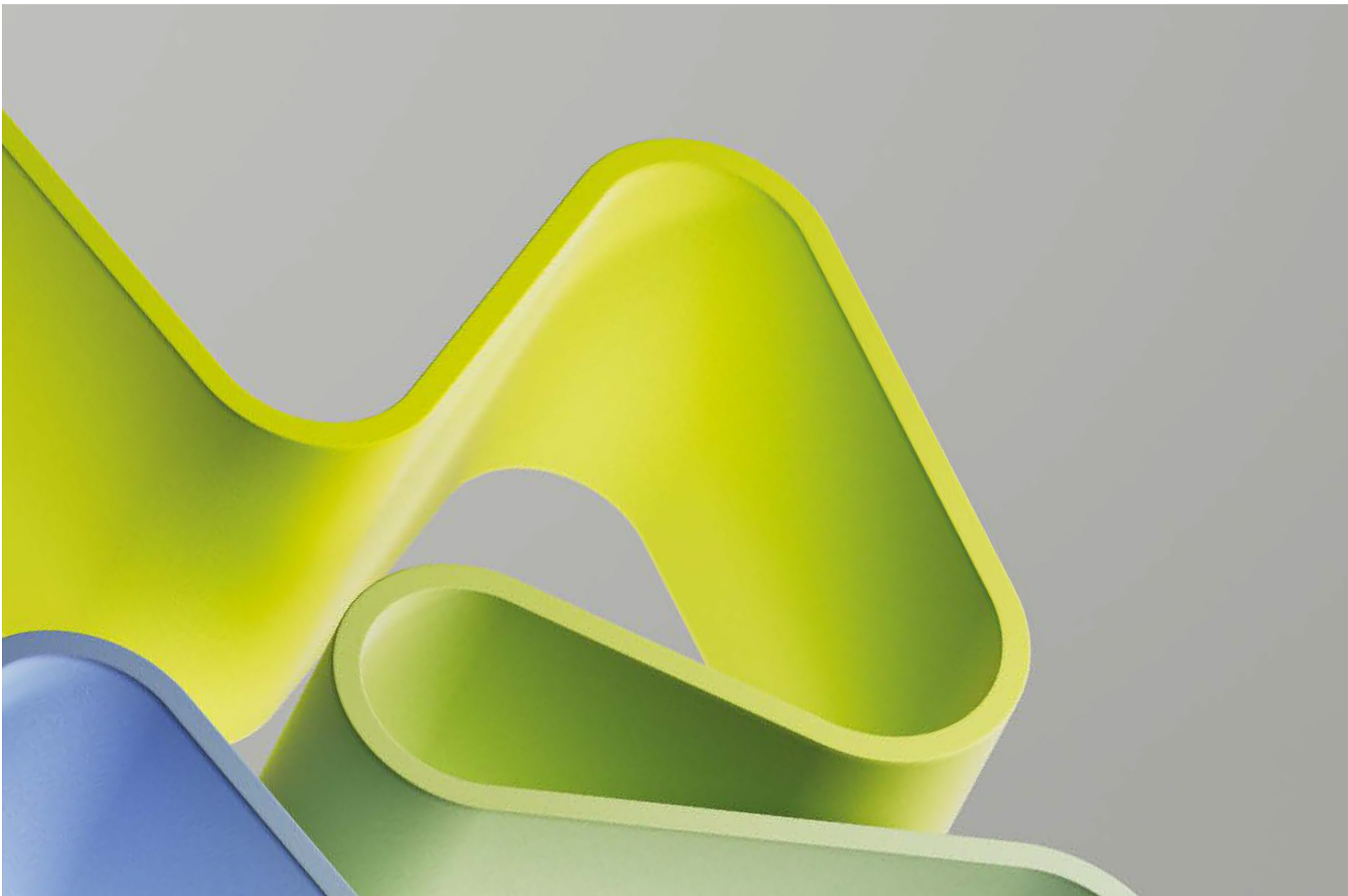


Saksfremlegg

Sak PS-BF 33/25
Strategiske veivalg for utvikling av porteføljen

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret for Banebrytende forskning	Petter Helgesen	Harald H. Simonsen	1. Mål, prioriteringer og tiltak porteføljeplanen

Fra

Områdedirektør

Benedicte Løseth

BESLUTNINGSSAK

Forslag til vedtak

Porteføljestyret for Banebrytende forskning prioriterer å videreføre og styrke de eksisterende satsinger i regi av porteføljestyret. Eventuelle nye satsinger bør kobles til tiltak for oppfølgning av fagevalueringer samt håndtering av konsekvenser av situasjonen for forskning i USA.

Kort bakgrunn

Som et ledd i det årlige arbeidet med porteføljeanalysen og investeringsplanen skal det legges fram en sak for porteføljestyret om hvilke strategiske veivalg porteføljestyret skal ta for videre utvikling av porteføljen. Saken vil være et innspill til den årlige investeringsplanen (på kort sikt) og til Forskningsrådets satsings- og budsjettforslag (på lengre sikt).

Hvorfor saken fremmes til dette møtet

Saken legges fram på dette møtet slik at innspill fra porteføljestyret kan legges til grunn for arbeidet med investeringsplanen og inngå som underlag for Forskningsrådets arbeid med budsjettforslag 2027.

Hovedpunkter

I diskusjonen om strategiske veivalg for porteføljen bes porteføljestyret om å ta stilling til følgende spørsmål:

1. Hva er nødvendige aktiviteter for å tette gapet mellom porteføljeplanens målsetninger og dagens status?
2. Hvordan bør porteføljestyret disponere sitt økonomiske handlingsrom i neste investeringsplan?
3. Hva bør være satsingsområdene? Begrunn både nye satsinger og videreføringer av eksisterende.
4. Hvilke deler av porteføljestyrets ansvarsområder bør skjermes dersom det blir budsjettkutt?

I behandlingen av den reviderte investeringsplanen for 2025 ble det besluttet å komplementere utlysningene i FRIPRO og SFF med 7 nye utlysninger (se møte 1/25, sak 10/25). Disse utlysningene representerer prioriteringer og tiltak porteføljestyret har definert i porteføljeplanen. Utlysningene i regi av porteføljestyret for 2025 er gitt under. Hvilke prioriteringer og tiltak utlysningen understøtter, er vist i parentes. (Eks. P1a refererer til porteføljeplanens prioritering 1, tiltak a.)

- SFF (P1a)
- Erfarne forskere (P1b)
- Toppforskere (P1f)
- Kvalifiserte ERC-søknader (P1h)
- Radikale forskningsideer (P2a)
- Tidlig karriere (P4a)
- Internasjonal mobilitet (P4b)
- Ta banebrytende forskning i bruk-Kommersialisering – Verifisering (P5d)

- Ta banebrytende forskning i bruk-Kommersialisering-Kvalifisering (P5d)
- Fellesutlysinger humaniora (P6b)
- Forskerskoler (kun 2025) (P6c, d)
- Nettverkssamarbeid (kun 2025) (P6c, d)
- HERA (Internasjonalt samarbeid) (P3a, P6b)
- EUI (Internasjonalt samarbeid) (P3a, P6b)

Med de nye utlysningene i 2025 har porteføljestyret satsinger knyttet til alle de økonomiske tiltakene i porteføljeplanen. Dette er viktig fordi porteføljeplanens prioriteringer og tiltak viser hvordan porteføljestyret ønsker å nå porteføljeplanens mål. Merk at porteføljeplanens mål er direkte knyttet til målene i Forskningsrådets strategi. Måloppnåelse i Forskningsrådets strategi er dermed direkte koblet til måloppnåelse av porteføljeplanens mål. Dette bør vektlegges i diskusjonens knyttet til spørsmålene over.

Administrasjonen har med utgangspunkt i porteføljeplanens prioriteringer og tiltak lagt vekt på at *dagens satsinger* bør opprettholdes eller styrkes før nye satsinger iverksettes. Spesielt kan det være aktuelt å styrke utlysingene av *toppforskere, radikale forskningsideer* og *å ta forskning i bruk*. Den økonomiske rammen for disse utlysningene er relativt liten og bør vurderes økt dersom porteføljestyret blir tildelt ekstra midler. Utlysingen knyttet til radikale forskningsideer er for trinn 1 i en to-trinns behandling. Søknader til trinn 2 vil være søknader til utlysningene av erfarne forskerprosjekter og tidlig karriere. For å håndtere trinn 2 kan det være aktuelt å styrke disse to utlysningene.

Eventuelle *nye satsinger* bør innrettes mot å følge opp de fire fagevalueringene som nettopp er gjennomført, samt å bidra til å håndtere konsekvenser som følge av situasjonen for forskning i USA.

Alle dagens utlysninger i regi av porteføljestyret representerer viktige tiltak for måloppnåelsen i porteføljeplanen (og derigjennom Forskningsrådets strategi). Et eventuelt budsjettkutt vil dermed gå direkte ut over måloppnåelsen i porteføljeplanen og igjen Forskningsrådets strategi.

Forberedelse / prosess

Saken er utviklet av administrasjonen.

Videre saksgang

Administrasjonen tar med seg porteføljestyrets kommentarer og innspill i arbeidet med investeringsplan og budsjettforslag 2027. En sak om investeringsplan for banebrytende forskning for perioden 2026-2028 vil legges fram for porteføljestyret på neste møte (12. september 2025).

Mål og prioriteringer i porteføljeplanen

Mål 1: Porteføljen skal bidra til flere verdensledende forskningsmiljøer

Mål 2: Forskningsmiljøene innenfor porteføljen utfører langsiktig, grunnleggende forskning som bidrar til å flytte forskningsfronten

Mål 3: Kunnskap, funn og resultater fra banebrytende forskning skal deles og tas i bruk

Prioritering 1: Porteføljestyret vil innrette porteføljen slik at den bidrar til flere verdensledende forskningsmiljøer

Prioritering 2: Porteføljestyret vil fremme spesielt nyskapende forskningsideer

Prioritering 3: Porteføljestyret vil stimulere til internasjonalt forskningssamarbeid

Prioritering 4: Porteføljestyret vil løfte fram lovende talenter

Prioritering 5: Porteføljestyret vil legge til rette for at forskning tas i bruk

Prioritering 6: Porteføljestyret vil stimulere til fagutvikling

20.05.2025

Prioriteringer og tiltak i porteføljeplanen

Prioritering 1: Porteføljestyret vil innrette porteføljen slik at den bidrar til flere verdensledende forskningsmiljøer

a) Finansiere nye sentre for fremragende forskning.
b) Finansiere nye banebrytende prosjekter gjennom FRIPRO-ordningen.
c) Bidra til å etablere og ta i bruk felles mekanismer for å sikre god balanse og kobling mellom nasjonal og internasjonal finansiering innenfor porteføljen.
d) Bruke fagevalueringer som grunnlag for å utvikle virkemidlene for banebrytende forskning.
e) Styrke ordningen med sentre for fremragende forskning.
f) Styrke porteføljen gjennom et nytt virkemiddel for store forskerprosjekter/mindre forskningssentre.
g) Styrke FRIPRO-ordningen som virkemiddel for banebrytende forskning bl.a. gjennom en ekstern evaluering.
h) Stimulere til å øke antall søknader til ERC og til høyere kvalitet på søknadene.

Prioritering 4: Porteføljestyret vil løfte fram lovende talenter

a) Finansiere nye forskerprosjekter for tidlig karriere.
b) Finansiere nye treårige forskerprosjekter med internasjonal mobilitet.
c) Videreutvikle ordningen med Forskerprosjekt for tidlig karriere.
d) Vurdere ordningen med Treåring forskerprosjekt for internasjonal mobilitet.

Prioritering 2: Porteføljestyret vil fremme spesielt nyskapende forskningsideer

a) Vurdere bruk av et virkemiddel for finansiering av radikale og banebrytende forskningsideer.
b) Videreutvikle porteføljen av tverrfaglige prosjekter innenfor banebrytende forskning.

Prioritering 5: Porteføljestyret vil legge til rette for at forskning tas i bruk

a) Fremme betydningen av grunnleggende og banebrytende forskning i samfunnet.
b) Fremme betydningen av grunnforskning for innovasjon.
c) Stimulere til større forskermobilitet mellom grunnleggende forskning, anvendt forskning og innovasjon.
d) Bidra til at ideer, skapt i SFF eller andre sentre, tas videre til anvendelse og innovasjon.
e) Stimulere forskere som har FRIPRO og SFF prosjekter, til å etablere møteplasser med forskere fra andre fagområder og med brukere (f.eks. gjennom KOS).

Prioritering 3: Porteføljestyret vil stimulere til internasjonalt forskningssamarbeid

a) Stimulere til internasjonal mobilitet og kunnskapsutveksling.
b) Utnytte potensialet til forskningssamarbeid knyttet til internasjonale partnerskap og forskningsinfrastrukturer.
c) Vurdere innhold og tidspunkt i utlysninger i lys av internasjonale utlysninger, spesielt Horisont Europa og EØS-midlene.

Prioritering 6: Porteføljestyret vil stimulere til fagutvikling

a) Vurdere hensikt med og betydning av fagevalueringer.
b) Videreføre satsingen på humaniora i Forskningsrådet for perioden 2024-2028 bl.a. gjennom samfinansiering av prosjekter med andre porteføljestyrer.
c) Følge opp fagevalueringene for naturvitenskap og teknologi (EVALNAT og EVALMIT).
d) Følge opp fagevalueringene for livsvitenskap (EVALBIOVIT og EVALMEDHELSE).
e) Iverksette fagevalueringer av humaniora og samfunnsvitenskap

10

Tiltakene i grønn skrift er tiltak med eksisterende utlysninger fra tidligere år. Tiltak i blå skrift er tiltak dekket av nye utlysninger i 2025.

Saksfremlegg
Porteføljestyremøte 3/25

Sak PS-BF 34/25
Norsk veikart for forskningsinfrastruktur

Til	Ansvarlig Direktør	Saksbehandler	Vedlegg
Porteføljestyret for Banebrytende forskning	Solveig Flock	Ingerid Fossum og Kirsti Solberg Landsverk	1. Utkast til Norsk veikart for forskningsinfrastruktur 2025

Fra

Områdedirektør

Benedicte Løseth

DRØFTINGSSAK

Forslag til vedtak

Administrasjonen har utarbeidet et forslag til Norsk veikart for forskningsinfrastruktur 2025. Veikartet skal vedtas av porteføljestyret for forskningssystemet 17. september 2025.

Porteføljestyret for Banebrytende forskning gir sin tilslutning til hovedtrekkene i utkastet til veikart.

Veikartet bearbeides videre i tråd med kommentarene som kom frem i møtet.

Kort bakgrunn

Forskningsrådet oppdaterer nå Norsk veikart for forskningsinfrastruktur. Veikartet blir oppdatert mellom hver utlysning gjennom ordningen Nasjonal satsing på forskningsinfrastruktur (INFRASTRUKTUR), og skal blant annet synliggjøre behovet for nye forskningsinfrastrukturer fremover og eksisterende infrastrukturer på veikartet (som mottar/har mottatt støtte fra Forskningsrådet.) Norske forskere samarbeider i stor grad med internasjonale aktører og deltar i en rekke europeiske forskningsinfrastrukturer. Veikartet synligjør derfor både nasjonale infrastrukturer og internasjonale forskningsinfrastrukturer med norsk deltakelse.

Ved utarbeidelse av forrige veikart (Norsk veikart for forskningsinfrastruktur 2023) ble det gjennomført en bred innspillsrunde, med både skriftlige innspill og innspill i workshoper. I tillegg ble det nedsatt et eksternt utvalg som bisto Forskningsrådet i utarbeidelsen av veikartet. Alt dette har vært viktig grunnlagsmateriale også i årets oppdatering av veikart.

Langtidsplan for forskning og høyere utdanning 2023-2032 adresserer tydelig behovet for forskningsinfrastruktur innenfor regjeringens seks prioriterte områder for forskning. Forskningsrådets strategi understreker dette gjennom å fastslå at vi skal arbeide for en prioritering av forskningsinfrastruktur, deling og tilgjengeliggjøring av data, ved å investere i nasjonal forskningsinfrastruktur og norsk deltakelse i internasjonale infrastruktursamarbeid som støtter opp under norske prioriteringer. Forskningsrådet har delt arbeidet med investeringer inn i 11 porteføljer. Gjennom flere av porteføljeplanene, som er det overordnede strategiske styringsdokumentet for hver portefølje, pekes det på at forskningsinfrastrukturer er svært viktig for forskningen på feltet.

Hvorfor saken fremmes til dette møtet

Saken fremmes for at porteføljestyret kan diskutere og gi tilbakemeldinger på utkastet til veikart.

Hovedpunkter

Prosess

Administrasjonen har utarbeidet et første utkast til oppdatert Norsk veikart for forskningsinfrastruktur i løpet av første halvår 2025. Det har vært en bred prosess internt, der fagrådgivere fra 12 ulike avdelinger i Forskningsrådet har deltatt. For å sørge for at våre investeringer i forskningsinfrastruktur spiller godt sammen med våre investeringer i forskning, vil vi besøke de ulike porteføljestyrene og innhente innspill i løpet av juni. Videre vil vi arrangere åpne digitale møter slik at institusjonene får mulighet til å gi innspill spesielt på del 2 i veikartet som omhandler Forskningsrådets prioriteringer for forskningsinfrastruktur innenfor ulike tematiske områder. Veikartet vil bli vedtatt av Porteføljestyret for Forskningssystemet på deres møte 17. september 2025.

Veikartets utforming

Veikartet vil bestå av tre deler. Del 1 presenterer retningslinjene for hvordan Forskningsrådet finansierer forskningsinfrastruktur, og det gis anbefalinger til departementene og FoU-institusjonene. Del 2 gir en oversikt over Forskningsrådets prioriteringer omkring forskningsinfrastruktur for ulike tematiske områder og del 3 vil vise dagens landskap av forskningsinfrastrukturer i Norge.

Et viktig prinsipp er at investering i forskningsinfrastruktur skal forankres i forskningens behov i dag og fremover. Del 2 er derfor delt inn i tematiske områder med utgangspunkt i porteføljene, med noen tilpasninger for å ivareta en helhetlig tilnærming. Den tematiske inndelingen er som følger:

- Energi og transport
- Helse
- Klima og miljø
- Mat og bioressurser
- Muliggjørende og industrielle teknologier
- Humaniora og samfunnsfag
- Grunnleggende naturvitenskap
- Generiske datainfrastrukturer

Administrasjonen ber om innspill fra porteføljestyret på innholdet i veikartet sett i lys av porteføljestyrets ansvarsområde. Vi ber om forståelse for at veldig omfattende endringer ikke vil være mulig med tanke på den tiden vi har til rådighet.

Spørsmål til diskusjon i porteføljestyret

Beskrives porteføljens behov for forskningsinfrastrukturer tydelig nok?

Er det viktige hull i landskapet av infrastrukturer som ikke er fanget opp?

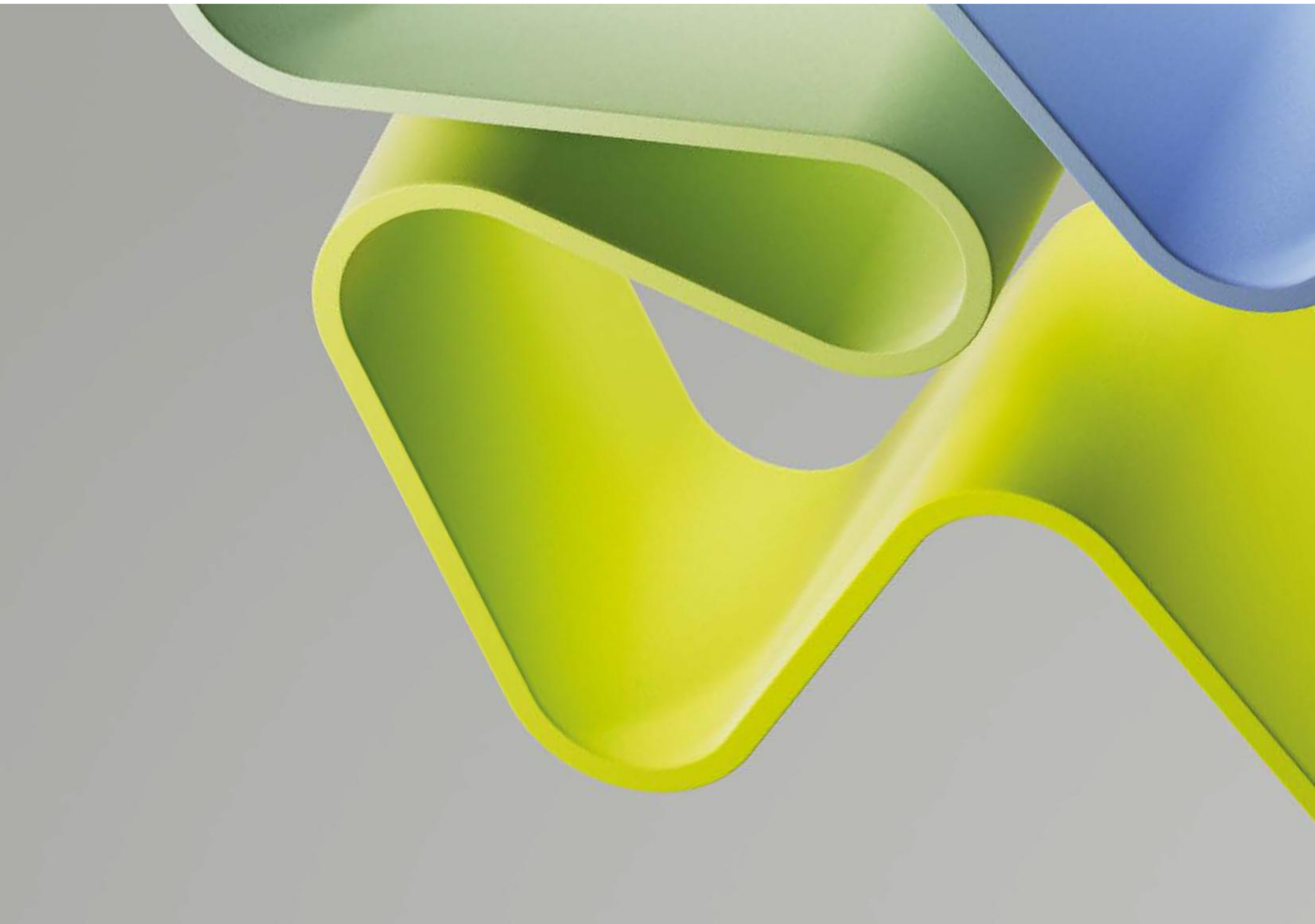
Bør porteføljens behov for forskningsinfrastrukturer også beskrives under andre tematiske områder? Evt. hvilke?

Forberedelse / prosess	Saken er forberedt av administrasjonen som del av underlaget til møtet.
Videre saksgang	Det avholdes digitale innspillsmøter i juni. Disse vil innarbeides i veikartet sammen med innspillene fra porteføljestyremøtene, før veikartet vedtas endelig av porteføljestyret for forskningssystemet 17. september.

Forskningsrådet

Utkast

Norsk veikart for forskningsinfrastruktur 2025



Innholdsfortegnelse

Forord

Dette er en foreløpig versjon av veikartet som legges ut som grunnlag for innspillsmøter.

Dokumentet inneholder bare Del 2: Strategisk grunnlag, som er den delen av veikartet vi ønsker innspill på.

Forskningsrådet vil jobbe videre med veikartet basert på innspillene før endelige godkjenning av veikartet av Porteføljestyret for forskningssystemet i september 2025.

Del 2: Strategisk grunnlag

Denne delen av veikartet har fokus på fremtidige behov for forskningsinfrastruktur innenfor ulike temaområder, og det strategiske grunnlaget for disse prioriteringene. Disse beskrivelsene er en viktig del av beslutningsgrunnlaget for bevilgninger til forskningsinfrastruktur over Forskningsrådets budsjett og planlegging av framtidige utlysninger for forskningsinfrastruktur.

Del 2 og del 3 skal gi en oversikt over dagens forskningsinfrastrukturer og fremtidige behov. Dette vil hjelpe med å koordinere infrastrukturer på tvers av fag og teknologi. Når man vurderer å etablere nye forskningsinfrastrukturer, må man også se på hva de eksisterende infrastrukturer allerede tilbyr.

Inndeling

Investering i forskningsinfrastruktur skal skje innenfor fagområder og -disipliner hvor man finansierer forskning. I inndelingen i temaområder har vi derfor tatt utgangspunkt i porteføljene, med noen tilpasninger for å ivareta en helhetlig tilnærming. Den tematiske inndelingen er som følger:

- Generiske datainfrastrukturer
- Muliggjørende og industrielle teknologier
- Energi og transport
- Klima og miljø
- Mat og bioressurser
- Helse
- Humaniora og samfunnsfag
- Grunnleggende naturvitenskap

Fordi infrastrukturbehovet innenfor ulike områder er svært forskjellig både hva gjelder typer/kategorier infrastruktur, investerings- og driftskostnader og antall og typer brukere, vil beskrivelsene variere noe i lengde og detaljeringsgrad. Det vil være en viss overlapp mellom noen av underområdene, og inndelingen skal ikke representere hindringer for samarbeid om forskningsinfrastruktur på tvers av områdene. Tverrfaglig tilnærming er en forutsetning for å løse mange av samfunnsutfordringene og for å lykkes med utvikling og utnyttelse av ny teknologi og næringer.

Langtidsplan for forskning og høyere utdanning 2023-2032

Langtidsplanen har vært, og vil fortsatt være, en viktig del av beslutningsgrunnlaget for Forskningsrådets tildelinger til forskningsinfrastruktur. I Langtidsplanen fremmes tre overordnede mål som gjelder alle fagområder, inkludert seks tematiske prioriteringer. De seks tematiske prioriteringene er utvalgte områder hvor regjeringen mener det er særlig viktig at Norge satser strategisk på forskning og høyere utdanning i årene som kommer.

Langtidsplan for forskning og høyere utdanning 2023 - 2032					
Styrket konkurransekraft og innovasjonsevne					
Miljømessig, sosial og økonomisk bærekraft					
Høy kvalitet og tilgjengelighet i forskning og høyere utdanning					
Hav og kyst	Helse	Klima, miljø og energi	Mulig-gjørende og industrielle teknologier	Samfunns-sikkerhet og beredskap	Tillit og felleskap

Figur 1: Oversikt over langtidsplanens overordnede mål og tematiske prioriteringer.

Langtidsplanen favner en stor bredde av temaer, fag- og teknologiområder, og gir samtidig noen føringer for områder som skal gis særlig oppmerksomhet. Behov for investeringer i forskningsinfrastruktur innenfor alle de prioriterte områdene er tydelig adressert, og spesielt behovet for infrastruktur for håndtering av data.

Sikker kunnskap i en usikker verden

De forskningspolitiske målene og tematiske prioriteringene som ble bestemt i langtidsplanen for forskning og høyere utdanning, ligger fast i arbeidet med forskningssystemet (Meld. St. 14 (2024-2025)).

I dagens samfunn gjør storpolitiske spenninger og nye trusselbilder at forskningssystemet må rustes til å håndtere stadig mer komplekse etiske og sikkerhetsmessige utfordringer. Samtidig vil regjeringen verne om viktige prinsipper som åpenhet og etterprøvbarhet. Vi trenger derfor infrastrukturer og regelverk som sikrer åpenhet og tilgjengelighet der det er mulig, men også beskyttelse og skjerming der det er nødvendig.

I systemmeldinga fokuserer regjeringen på behovet for en oppdatert digital forskningsinfrastruktur og for å sikre tilstrekkelig regnekraft. Regjeringen har også utarbeidet en oversikt over tiltak med relevans for forskningen innenfor kunstig intelligens og fremtidens databehandling. Oversikten gir et bilde av departementenes totale innsats på området og skal oppdateres årlig. De er også opptatt av samarbeid mellom sektorer og beskriver at deler av den digitale forskningsinfrastrukturen må videreutvikles for å tjene bredere samfunnsformål enn forskning.

Forskningsrådets porteføljeplaner

Forskningsrådet delte i 2024 arbeidet med investeringer inn i 11 nye porteføljer. Det skal etableres en 12. portefølje i 2026 med fokus på forsvar, nasjonal sikkerhet og beredskap. Forskningsrådet skal gjennom porteføljestyring utvikle en strategisk og helhetlig portefølje. Porteføljeplanen er det overordnede styringsdokumentet for hver portefølje og skal legge til rette for en styring av porteføljen hvor mål, prioriteringer, investeringer og resultater sees i sammenheng, og legges til grunn for årlige tiltak og investeringer. For å sikre at det er god sammenheng mellom investeringer i infrastruktur og forskningens behov, er det derfor viktig å legge prioriteringene i porteføljeplanene til grunn ved utarbeidelsen av veikartet.

Generiske datainfrastrukturer

Vitenskapene som helhet blir stadig mer data-intensive. Disipliner som er tradisjonelt data-intensive – som jordobservasjon, partikkelfysikk og bioinformatikk – har lenge økt både produksjon og bruk av data ved hjelp av fremskritt innen måleinstrumenter, analysemetoder og regneteknologi. Samtidig tar disipliner med tradisjonelt lavere data-intensivitet – som lingvistikk, sosiologi og arkeologi – i bruk nye metoder som lar dem samle og benytte seg av stadig større mengder data. Dette genererer økt behov for infrastrukturer for datahåndtering, og det trengs kapasitet for lagring, tungregning, transport av data og kuratering.

Infrastrukturlandskapet fremover

I regjeringens systemmelding legges det til grunn at Norge har opplevd og vil oppleve en økt vekt på datainfrastruktur i årene fremover. De fleste av disse vil være disiplinspesifikke datainfrastrukturer. Generiske datainfrastrukturer vil i mange tilfeller ikke brukes direkte av forskerne, men understøtte de mer disiplinspesifikke infrastrukturene. I så måte utgjør de en viktig grunnmur som andre infrastrukturer og tjenester kan bygges på. Økte behov i spesifikke områder i forskningen vil derfor kunne føre til direkte økning i behov for generiske datainfrastrukturer.

En sentral generisk datainfrastruktur er Sigma2 som tilbyr tungregnekapasitet og -kompetanse til de norske forskningsmiljøene. Sigma2s tungregnekapasitet inkluderer nasjonale regnemaskiner og europeiske regnemaskiner gjennom EuroHPC samarbeidet. Sigma2 tilbyr sine ressurser direkte eller i samarbeid med andre nasjonale infrastrukturer. Sigma2 tilbyr tjenester og veiledning for tungregnebrukere gjennom Norwegian Research Infrastructure Services (NRIS) i samarbeid med UiO, UiB, NTNU og UiT og de koordinerer Nasjonalt kompetansesenter for tungregning (NCC) for brukere i næringsliv og offentligsektor i samarbeid med SINTEF og NORCE. Sigma2 har også betydelig lagringskapasitet for forskningsdata, og de leverer tjenester for bruk av sensitive data gjennom Tjenester for Sensitive Data (TSD) og NORTRE samarbeidet.

Per i dag finansieres investeringer i Sigma2 med konkurranseutsatte midler gjennom Forskningsrådets INFRASTRUKTUR-ordning. Forskningsrådet leverte i 2024 en rapport om tungregning til Kunnskapsdepartementet der de anbefalte at Sigma2 tas ut av INFRASTRUKTUR-ordningen og finansieres gjennom en mer stabil og forutsigbar grunnbevilgning. Dette er i tråd med de tidligere anbefalingene i evalueringen av infrastrukturordningen og rapporten fra datainfrastrukturutvalget. Det forventes et raskt økende behov for regnekapasitet framover og en oppgradering er nødvendig i årene som kommer.

Samtidig opplever de norske forskningsmiljøene utfordringer med å realisere nasjonal strategi for tilgjengeliggjøring og deling av forskningsdata, særlig med hensyn til å gjøre forskningsdata gjenfinnbar, tilgjengelig, samhandlende og gjenbrukbar i henhold til FAIR-prinsippene. Rapportene fra datainfrastrukturutvalget og FAIR-utredningen viser til manglende kunnskap og tjenester for datadeling som en sentral barriere.

Stortinget har på bakgrunn av dette lagt til grunn i Langtidsplanen for forskning og høyere utdanning 2023-2032 at det skal arbeides for at alle fagområder i norsk forskning skal tilbys kompetanse, veiledning og kuratering av forskningsdata innen 2030, også med sikte på bruk av data på tvers av forskning og forvaltning. Dette er i tråd med Forskningsrådets strategi og porteføljeplan for forskningssystemet.

I Europeisk sammenheng er det initiativer underveis for å etablere sentre for kuratering og røkt av data gjennom den Europeiske Skyen for Åpen Forskning (EOSC). Eksempler på dette er EDEN- og FIDELIS-prosjektene som skal henholdsvis kartlegge beste praksis for datahåndtering, og bygge et felles nettverk for kuraterte og kvalitetssikrede datalagre for å muliggjøre forskningsdata av høy kvalitet og gjenbrukbarhet. Norge er med i prosjektene gjennom Universitetet i Tromsø, Sikt og CESSDA. Prosjektene

Muliggjørende og industrielle teknologier

Infrastrukturer innenfor muliggjørende teknologier skal bidra til å drive frem radikale innovasjoner, nye grensesprengende teknologier, store samfunnsendringer og internasjonal konkurransekraft. Muliggjørende teknologier betegner brede teknologiområder med et vidt spekter av kjente og ukjente anvendelsesområder. I Langtidsplanen for forskning og høyere utdanning 2023-2032 omtales **muliggjørende teknologier** som følgende temaområder:

1. Bioteknologi er generisk og bidrar til å modernisere flere sektorer, inkludert industri, landbruk, havbruk og helsenæring. Den spiller en avgjørende rolle i å møte samfunns- og miljøutfordringer som klimaendringer, ressursforvaltning og matsikkerhet.
2. Nanoteknologi og avanserte materialer omfatter bruk av nano-, mikro- og materialteknologi for å utvikle og fremstille avanserte materialer og systemer med spesifikke og kontrollerbare egenskaper.
3. Informasjon og kommunikasjonsteknologi (IKT) omfatter teknologier som muliggjør innsamling, lagring, behandling, deling, kommunikasjon, visualisering, bruk og samarbeid om data og informasjon i elektronisk form.

I Langtidsplanens omtale av muliggjørende teknologier, fremheves betydningen av kunstig intelligens, kvanteteknologi og nevroteknologi som særlig prioriterte områder. I veikartet er nevroteknologi nærmere omtalt under Helse.

Industrielle teknologier omtales som generiske, avanserte teknologiplattformer som utnytter og bygger på de muliggjørende teknologiene. Det vises til sårbare verdikjeder som synliggjør behov for avanserte produksjonsprosesser som også kan bidra til reduserte utslipp og økt gjenbruk. Industrielle teknologier kan deles inn tematisk, sortert etter verdikjeder; råmaterialer, prosess og metallindustri, vareproduksjon.

Porteføljeplan for muliggjørende teknologier fra 2025 peker på at det er viktig at forskningen har tilgang til nasjonale og internasjonale avanserte laboratorier samt annen fysisk og digital infrastruktur. Når forskningen blir stadig mer datadrevet, krever dette data med kvalitet og transparens, regnekapasitet, lagringskapasitet og avanserte verktøy for dataanalyser.

Infrastrukturlandskapet fremover

For alle teknologiområdene må forholdene legges til rette for radikal innovasjon og samarbeid med næringsliv. Her vil god og koordinert utvikling av teknologisk relevante forskingsinfrastrukturer nasjonalt og EUs nye arbeid med teknologi-infrastrukturer bli sentrale og gi viktige videreutviklings- og samarbeidsmuligheter.

For bio- og nanoteknologi og avanserte materialer bør fremtidige investeringer prioritere generiske infrastrukturer som støtter forskning på tvers av de relevante fagområdene, og som har mange brukere. Det er viktig å oppgradere og videreutvikle eksisterende, velfungerende infrastrukturer og å sikre god utnyttelse av dem. Samtidig må det åpnes for finansiering av nye infrastrukturer med høy strategisk betydning.

Det er generelt et økende behov for datadrevne metoder, maskinlæring og kunstig intelligens i teknologisk forskning, og det er nødvendig med kapasitet til å håndtere store datamengder.

I ESFRIs landskapsanalyse fra 2024 innenfor analytisk fysikk påpekes det at teknologiutvikling i forskningsinfrastrukturer overlapper med muliggjørende teknologier (Key Enabling Technologies, KETs) som fotonikk, avanserte materialer, nanoteknologi, mikro- og nanoelektronikk, og avanserte produksjonsteknologier. Mange forskningsinfrastrukturer er teknologisk ledende, og for å opprettholde dette må de aktivt utvikle nye teknologier.

Bioteknologi

Bioteknologi-relaterte forskningsinfrastrukturer er essensielle for grønn omstilling og er fremhevet i LTP som spesielt viktig innen mat, helse, havbruk, landbruk og miljø. De er også sentrale for sikkerhet og beredskap, inkludert matsikkerhet, medisin- og vaksineutvikling. Vi har i dag viktige infrastrukturer innen bioinformatikk, gensekvensering, proteinanalyser, strukturbiologi, og bildedannende teknologier. Noen av disse er del av europeiske samarbeidsprosjekter under ESFRI (Veikart Del 3).

Bioteknologiske metoder er viktig for alle deler av medisin og helseforskning - fra forebyggende medisin, til utvikling av nye behandlinger og legemiddelproduksjon (biofarma). Det er behov for infrastrukturer som støtter persontilpasset medisin og helsenæring, og som legger til rette for samspillet mellom helseregistre og biobanker. Det vil være et økende behov for bedre integrering av medisinske, digitale og eHelse-teknologier.

Bioteknologisk forskningsinfrastruktur er viktig for matproduksjon og bioressurser. Bioteknologi bidrar til effektivitet og sikrer sunn mat med lav klima- og naturpåvirkning. I marine næringer, landbruk og prosessindustri trengs det bedre utnyttelse av biomasse og utvikling av nye fôrråvarer. Bioteknologi er også avgjørende for forskning på avl, plantehelse, dyrehelse og jordhelse.

For å lykkes med Samfunnsoppdraget for bærekraftig fôr, og for å løse utfordringer innen Én-helse-forskning, er bioteknologisk forskningsinfrastruktur sentral.

Nanoteknologi og avanserte materialer
Nanoteknologi og avanserte materialer er stadig viktigere for innovasjon og nasjonal sikkerhet. Halvparten av EUs 10 kritiske teknologier for økonomisk sikkerhet forutsetter infrastruktur som faller inn under nanoteknologi og avanserte materialer. Langtidsplan for forsvarssektoren 2025-2036 prioriterer også disse områdene for norsk forsvarsindustri.

Norge har allerede gode generiske renromsfasiliteter for nano-, kvante- og materialteknologi. Det er viktig å oppgradere disse med banebrytende utstyr slik at de kan være i forskningsfronten, samtidig som bruk av det nye utstyret krever forprosesser og analyser som forutsetter godt vedlikeholdte eksisterende laboratorier. Det er også gode laboratorier for generell og spesialisert materialkarakterisering. For å kunne utnytte European Spallation Source (ESS) når den åpnes, er det behov for nasjonal kompetanse og infrastruktur for nøytronforskning.

Moderne, avansert utstyr for materialkarakterisering vil være viktig for ressursutnyttelse, bærekraft og sikkerhet, og er relevant for mange fag- og teknologiområder. Offentlige FoU-miljøer samarbeider ofte tett med bedrifter, og avanserte materialer er viktige for chiper, sensorer, solcelleteknologi og batterier. Mange forskningsresultater tas videre i start-ups og etablert industri, og kan bidra til norsk konkurransekraft.

I Europa og i Norge bygges det opp eksperimentelle pilotlinjer for forskning og utvikling innen halvlederteknologi (en del av Chips Act) og disse er tilgjengelige for norske bedrifter og forskningsmiljøer, eventuelt med assistanse av «Chips Competence Centre".

Framover bør vi satse på forskningsinfrastrukturer som styrker Norges suverenitet og sikkerhet, og videreutvikler av vår styrke innen halvleder- og sensorteknologi, inkludert kvantesensorer. Det bør satses på utvikling av infrastrukturer for kvanteteknologi og digital infrastruktur som bruker kunstig intelligens (KI). Biomaterialer spiller en nøkkelrolle i utviklingen av medisinske produkter og bærekraftig løsninger. Metodikken Safe and Sustainable by Dessign (SSbD) har blitt viktig for nanoteknologi, avanserte materialer, helse, sikkerhet, miljø og bærekraft.

IKT
Fremover vil vi trenge mer spesialisert infrastruktur, særlig for kunstig intelligens, kvanteteknologi og testfasiliteter for avansert IKT-utstyr. Samtidig må vi ivareta bærekraft ved å legge til rette for energieffektiv databehandling og kommunikasjon. Globale partnerskap, samarbeid og kobling til internasjonale infrastrukturer innenfor de følgende prioriterte teknologiområdene vil være avgjørende for å akselerere norsk IKT-forskning og sikre tilgang til kritisk infrastruktur.

Vi trenger en nasjonal forskningsinfrastruktur til forskning og innovasjon innen fremtidige internett-teknologier, smarte nettverk og tjenester. Infrastrukturen må være fleksibel og støtte forskning på nettverk, databehandling og lagring – spesielt med sky- og edge-teknologi. Den skal gjøre det mulig å løse nye utfordringer og drive nyskapende forskning innen «Internet og Things» og distribuerte systemer.

Kunstig intelligens endrer IKT-feltet raskt, og får økende betydning for samfunnet. For å ivareta nasjonale interesser, personvern og sikkerhet må vi sikre tilgang til gode, standardiserte og representative data, robust nasjonal tungregningskapasitet tilpasset KI og kunne drifte store språkmodeller i Norge - samtidig som vi opprettholder tilgang til internasjonale løsninger. Forskningsinfrastrukturen må dekke hele verdikjeden – fra innsamling og -forvaltning til utvikling, testing og drift av KI-modeller.

Kvanteteknologi er et nytt, strategisk satsingsområde for regjeringen. Innen kvanteberegning er norske miljøer sterke på kvantesoftware, -middleware og -algoritmer. Internasjonale avtaler og samarbeid om tilgang til kvantemaskiner er svært viktig siden disse er for kostbare å utvikle og drifte for Norge alene. Parallelt må vi bygge opp nasjonal infrastruktur for kvantekommunikasjon – med noder, fibernettverk og sikker overføringskapasitet – for bygge nødvendig kompetanse, og for å legge til rette for at Norge kan delta aktivt i nordiske og europeiske samarbeid.

I forsvarssektorens langtidsplan for 2025–2036 framheves det at et teknologisk forsprang innen stordata, kunstig intelligens, autonome systemer, romteknologi og kvanteteknologi er avgjørende for norsk og alliert sikkerhet og forsvarsevne. Det er derfor viktig at vi har oppdatert forskningsinfrastruktur som dekker disse områdene.

Cybersikkerhet blir stadig viktigere i møte med avanserte trusler, inkludert KI-drevne angrep. Det er nødvendig å etablere realistiske testarenaer der vi kan utvikle, simulere, validere og verifisere sikre løsninger.

Industrielle teknologier - råmaterialer, prosess- og produksjonsteknologi
Forsvarssikkerhet er tett knyttet sammen med forsyningssikkerhet, og i dagens geopolitiske situasjon er dette viktigere enn på lenge. Tilgang på kritiske råmaterialer og evnen til å videreforedle disse gjennom en robust prosess- og produksjonsindustri er avgjørende. Regjeringen har foreslått tiltak gjennom Mineralstrategien, Prosess21, Grønt Industriløft 2.0 og Industrimeldingen for å styrke norsk industri og bidra til EUs grønne omstilling. For å støtte denne utviklingen er det viktig med god forskningsinfrastruktur langs hele verdikjeden fra utvinning av råmaterialer til produkter i bruk.

Norge har gode muligheter for å utvikle industri basert på landbaserte kritiske mineraler. Det er behov for forskning innenfor geologi, mineralutvinning, oppredningsteknologi og metallproduksjon for å sikre en vekst i norsk mineralindustri og skape nye verdikjeder. Eksisterende forskningsinfrastrukturer bør oppdateres, og det er behov for ny forskningsinfrastruktur for å støtte forskning rundt avansert leteteknologi, analysemuligheter og utvinningsteknologier. Havbunnsmineraler omtales under avsnittet Energi og transport.

Ifølge Grønt industriløft 2.0 skal Norge ha verdens reneste og mest energieffektive prosessindustri, basert på høyteknologiske løsninger. Forskningsinfrastruktur er viktig for å utvikle teknologi som reduserer utslipp og øker verdiskapingen. Prosessindustrien samarbeider tett med norske forskningsmiljø, og som det understrekes i regjeringens meldinger om forskningssystemet og konkurransekraft for industrien, bør dette samarbeidet styrkes. Forskningsinfrastruktur for prosessteknologi og materialkarakterisering bør plasseres i tilknytning til sterke forskningsmiljøer, som kan sikre optimal utnyttelse av utstyret. Digitalisering, inkludert utvikling av digitale tvillinger og simuleringsverktøy, er viktig for å gjøre industrien grønnere og mer effektiv.

Høsten 2024 leverte SIVA, Innovasjon Norge og Forskningsrådet en rapport til Nærings- og fiskeridepartementet som analyserer utfordringene i norsk produksjonsindustri. Konklusjonen er tydelig: Norsk material- og vareproduksjon har store utfordringer med å ta i bruk digital teknologi, spesielt kunstig intelligens og dataanalyser for å optimalisere produksjon. Norsk forskningsinfrastruktur for produksjonsteknologi bør støtte forskning på små, avanserte og automatiserte produksjoner. Den bør også legge til rette for forskning på materialbruk, gjenvinning og moderne produksjonsmetoder som «additive manufacturing».

Energi og transport

Infrastruktur innen energi og transport skal bidra til forskning for et bærekraftig og fremtidsrettet lavutslippssamfunn med nok fornybar energi på rett sted til rett tid, trygge og robuste land- og havbaserte transportløsninger, en bærekraftig utnyttelse av naturressurser og et konkurransedyktig næringsliv, og omfatter følgende temaområder:

1. *Energi og lavutslipp* omfatter produksjon, distribusjon og bruk av fornybar energi, samt lavutslippsløsninger og avkarbonisering av industriprosesser.
2. *Petroleum* omfatter olje- og gassvirksomhet i åpne områder på norsk sokkel.
3. *Maritim* omfatter alle typer skip og fartøy, inkludert fartøy og maritim teknologi knyttet til andre havnæringer.
4. *Transport* omfatter utvikling, testing eller pilotering av nye, smarte mobilitetsløsninger, og kan omfatte gods- og persontransport innenfor alle fire transportformer (vei, bane, sjø og luft).
5. *Havbunnsmineraler* omfatter en mulig framtidig utvinning av mineraler på havbunnen.

I henhold til porteføljeplan for energi og transport er tilgang til forskningsinfrastruktur i verdensklasse og data gjennom nasjonalt og internasjonalt samarbeid et avgjørende verktøy for forskningskvalitet.

Infrastrukturlandskapet fremover

Det er investert i en rekke nasjonale infrastrukturer innenfor de ovenfor nevnte forskningsfeltene. Igangsatte forskningssentre bidrar til å sikre en god samordning og utnyttelse av forskningsinfrastruktur og til god kopling mot næringslivet. Det er viktig å se på utviklingen av infrastrukturer i Norge i sammenheng med det som skjer av etablering av forskningsinfrastruktur i EU og internasjonalt forøvrig. EUs nye arbeid med teknologi-infrastrukturer kan også gi viktige videreutviklings- og samarbeidsmuligheter.

Energi og lavutslipp

Infrastrukturer på dette området skal bidra til forskning og innovasjon for et framtidig bærekraftig energisystem, fornybar energi produksjon, effektiv energibruk samt redusert utslipp av CO2 i industrien. Området omfatter også omstilling av transportsektoren til framtidige null eller lavutslipps løsninger og inkluderer både maritim-, land- og luftbasert transport.

Det er finansiert nasjonale infrastrukturer innen vindkraft, batteri-, hydrogen- og solcelleteknologi, bioenergi, energisystemer, energibruk i bygninger og industri, og CO2-håndtering. Det er behov for både oppgradering og ny infrastruktur innen flere av disse områdene.

Når det gjelder infrastrukturer for forskning på kraftnett og elektrisitetsoverføring er det nødvendig med nye investeringer og oppgradering av eksisterende infrastrukturer. Digitalisering, elektrifisering og sikkerhet blir stadig viktigere. For å sikre fleksibilitet ved integrasjon av uregulerbare energikilder i kraftsystemet, er det behov for videre forskning innen vannkraft og variabel drift av vannkraftanlegg.

Fremtidens bærekraftige energisystemer forutsetter utvikling av nye teknologier, som energilagring. Det er behov for forskningsinfrastrukturer som inkluderer testfasiliteter og tilrettelegger for forskning på gjenbruk og gjenvinning av materialer. Sirkularitet og resirkulering er avgjørende for utviklingen av nye energiteknologier.

Hydrogen er en energibærer og har potensiale for energilagring. For å realisere verdikjedene for hydrogen og relaterte energibærere er det behov for både oppgradering og ny forskningsinfrastruktur for å sikre at det gradvis finnes forskningsinfrastrukturer langs hele verdikjeden.

Innen havbasert kraftproduksjon er det behov for utvikling av marintekniske, elektrotekniske og materialtekniske laboratorier og testsentre. Det er i tillegg behov for utstyr, sensorikk og mer måledata for å kunne utforme enda bedre modeller som benyttes blant annet for å optimalisere vind- og solkraftfasiliteter.

Det finnes relevante ESFRI Landmarks for deler av den norske energisektoren, og de viktigste er innenfor solenergi, havvind og CO2-håndtering. Forskningsinfrastruktur for CO2-håndtering er i stor grad integrert i ESFRI-prosjektet The European Research Infrastructure for CO2 capture, utilisation, transport and storage (ECCSEL ERIC) hvor Norge er vertsnasjon. ECCSEL ERIC har fått finansiering fra Forskningsrådet i flere omganger.

Framover er det et økende behov for infrastrukturer for tungregning, datalagring og -deling, samt datasikkerhet og digitale teknologier. Ifølge Energi21 vil digitalisering gi et mer presist grunnlag for analyser ved beslutninger om investeringer og driftsstrategier. Nano- og materialteknologi benyttes innen store deler av energiforskningen, for eksempel innenfor solenergiforskning og forskning på batteri- og brenselceller. Det kan være behov for oppdatering og testfasiliteter for disse områdene. Infrastrukturer for bioressurser benyttes innen bioenergiforskning, biodrivstoff og andre biobaserte produkter. Infrastrukturer innen klima og miljø er viktige for bredden av energifeltet.

Petroleum

De pågående store forskningsinfrastrukturene/ testsentrene innen brønn, boring og flerfase, er fortsatt viktig å videreføre, både for forskningsmiljøene og næringslivet. Disse benyttes til verdensledende forskning og for å pilotere og verifisere ny teknologi.

Mange petroleumsfelter på norsk sokkel er i en moden fase. Derfor er det fortsatt behov for metoder som er kostnads- og energieffektive for utvinning og produksjon, samt for sikker og effektiv permanent plugging og forlating av brønner (P&A). Det er også behov for forskning og teknologiutvikling for å øke sikkerheten, inkludert fysisk- og cybersikkerhet, storulykker og oljevernberedskap, noe som også vil være verdifullt for maritim sektor.

Det er behov for infrastruktur som kan bidra til teknologisk forbedring og innovasjon for nøyaktig avbildning av undergrunn, og bedre forståelse av fluid-systemer i porøse medier. Infrastrukturene bør være en plattform for forskning på multifase strømninger i undergrunn og energireduserende løsninger. Behovet omfatter både eksperimentelt utstyr og IKT-relatert infrastruktur.

Energieffektivisering og utslippsreduksjoner på norsk sokkel har høy prioritet/er av meget høy viktighet / har høyt fokus. Teknologier som autonomi, automatisering, robotikk, droner (både over og under vann), subseateknologi og -kommunikasjon, og kunstig intelligens kan være viktige. Samtidig er det viktig med god arbeidsflyt og samarbeid mellom ulike fagområder, samt mer effektive prosesser og energigjenvinning.

Maritim og transport

Det er et mål at Norge skal fortsette å være en verdensledende havnasjon, og at norske havnæringer skal levere de mest innovative, bærekraftige og miljøvennlige løsningene for framtida. Hvis Norge skal fortsette å være ledende på hav, er det viktig at vi har laboratorier som sørger for at de involverte næringene kan utvikle seg videre. Byggingen av det nye havteknologilaboratoriet, Ocean Space Centre, finansieres direkte fra Stortinget og omfatter en rekke laboratorier og bassenger.

Maritim teknologi er viktig for sikker og bærekraftig verdiskaping i alle havnæringer. Langtidsplanen for forskning og høyere utdanning 2023-2032 har som mål å fremme klima- og miljøvennlig maritim transport, basert på anbefalingene fra Maritim21. For å lede an i det grønne skiftet, må maritim næring og forskningsmiljøer tidlig satse på forskning, utvikling, demonstrasjon og kommersialisering av nye teknologier og bærekraftige løsninger. I tråd med Maritim 4.0-strategien bør infrastrukturen støtte forskning innen digitalisering av maritim næring, grønn skipsfart og sikkerhet til havs.

Transport21 har tre hovedfokusområder for transportforskning: nullvisjonen, bevegelsesfrihet og verdiskaping og konkurransekraft. Nullvisjonen handler om å oppnå null utslipp, null dødsfall og null skader, støy og svevestøv fra transportsektoren. Bevegelsesfrihet betyr å gi alle tilgang til bærekraftig og effektiv transport, både i byer og på landsbygda, for både personer og varer. Verdiskaping og konkurransekraft fokuserer på å styrke næringslivets konkurranseevne med innovative transportløsninger. I tråd med Transport21 bør infrastrukturen støtte forskning innen bevegelsesfrihet, klima og miljø, transportsikkerhet og et robust transportsystem, samt verdiskaping og konkurransekraft.

Havbunnsmineraler

Infrastrukturer innen dette området bør være rettet mot forskning på ressurser på norsk sokkel som er relevant for mulig framtidig utvinning av havbunnsmineraler. Også infrastrukturer som bidrar til forskning på miljøeffekter og konsekvenser av mineralutvinning på havbunnen er viktig.

Klima og miljø

Området for klima og miljø omfatter forskningsinfrastruktur og observasjonssystemer som er viktig for norsk natur-, miljø-, klima- og ressursforvaltning på land, hav, kyst og i polare områder. Målet er å støtte forskning og teknologiutvikling som bidrar til bærekraftige løsninger, sirkulærøkonomi, tilpasninger til klimaendringer, redusert tap av natur og kulturmiljøer, og bedre samfunnssikkerhet og beredskap.

Klima- og miljøforskning inkluderer studier av tilstand, koblinger og endringer i terrestrisk og marint miljø, alle komponenter i det koblede klimasystemet, samfunnsfag og humaniora knyttet til miljø- og klimautfordringer, samt geopolitiske endringer i polare områder. Forskningen skal levere kunnskap for en grønn omstilling og sikre samfunnets motstandskraft mot uforutsette endringer ved å koble tverrfaglige og sektorovergripende perspektiver.

Porteføljeplanen for klima og miljø vektlegger at oppdatert og moderne forskningsinfrastruktur er svært viktig for forskningen og at Norge har et ansvar for å forvalte mange langsiktige tidsserier relevant for klima og miljø på norske land-, ferskvanns-, hav- og kystområder og i polare områder. Nasjonal og internasjonal forskningsinfrastruktur må utnyttes effektivt for å støtte forskning som gir kunnskap for en helhetlig forståelse av endringer i natur, klima, samfunn og internasjonale forhold, som grunnlag for en kunnskapsbasert forvaltning i norske land-, hav og polarområder. Spesielt viktig blir norske bidrag til internasjonale observasjonssystemer og sikring av kritiske datasett og databaser med norske og internasjonale bidrag og brukere.

Infrastrukturlandskapet framover

Det er investert betydelige ressurser i forskningsinfrastruktur innen klima og miljø, både nasjonalt og internasjonalt. Norge har godt utviklede landbaserte forskningsplattformer, ulike marine observasjonssystemer, og en avansert jordsystemmodell som leverer viktige bidrag til FNs klimapanels hovedrapporter. Norge har også forskningsinfrastruktur ved helårsstasjonen i Antarktis (Troll) og på Svalbard, samt god logistikk for innsamling av miljø-, klima- og biologiske data.

Fremover vil det være spesielt viktig å styrke forskningsinfrastruktur som støtter forskning på arealproblematikk og naturressurser, hav- og kystområder, samfunnssikkerhet og beredskap. Norge og Europa må nå ta et større ansvar for den globale infrastrukturen og kunnskapsutviklingen på klima- og naturområdet. I tråd med regjeringens systemmelding er det også behov for å vurdere nye anvendelser av kunstig intelligens, stordata og maskinlæring, samt jordobservasjonstjenester og digitale tvillinger. Dette vil gi bedre utnyttelse av databaser og observasjonssystemer, samt bidra til videreutvikling og anvendelse av ulike modellsystemer. Det vil være økende behov for regnekraft og lagringskapasitet framover, og tilgang til et moderne tungregneanlegg er svært viktig.

Nasjonal forskningsinfrastruktur må også støtte opp om grunnleggende systemforskning og lange tidsserier, samt forvaltningsrettet forskning og kunnskapsgrunnlag for politikkutforming og økonomisk utvikling. Store endringer, vippepunkter og tilbakekoblinger i jordsystemet har vesentlig betydning og vil gjøre det vanskeligere å nå nasjonale og internasjonale mål knyttet til klima, naturmangfold og samfunnssikkerhet. Nye samarbeidsformer der offentlige og private aktører deltar aktivt med datainnsamling, både som brukere og leverandører, blir viktigere. Regjeringens strategi med Næringsplan for norske havområder åpner nye muligheter for offentlig-privat samarbeid, der næringsaktører som får tilgang til arealer til havs skal bidra til å sikre innsamling og deling av relevante data.

Behovene for forskning og forvaltning i større grad er overlappende, og i tråd med regjeringens systemmelding, er det naturlig at disse to sektorene legger til rette for gjensidig deling og utnyttelse av infrastrukturer. Det er behov for å styrke og videreføre nasjonal koordinering og integrering, samt sikring av internasjonale medlemskap og observasjonssystemer. Blant annet med tanke på det norske bidraget til kunnskapsoppsummeringene under det internasjonale naturpanelet (IPBES Home page | IPBES secretariat), er det viktig å sikre flerbruk og datadeling på tvers av fagdisipliner, teknologiområder og sektorer. Det er et stort internasjonalt behov for utbygging og harmonisering av eksisterende observasjonssystemer. Det bør vurderes å styrke det nordiske og europeiske samarbeidet på relevante områder, særlig ut fra geopolitiske endringer.

Regjeringens klimamelding 2035 understreker at infrastruktur er særlig viktig med hensyn til behov for stor regnekapasitet, utvikling av kunstig intelligens, internasjonalt samarbeid og bærekraftig drift av forskningsinfrastruktur. Regjeringens melding om flom og skred legger også vekt på betydningen av ny infrastruktur for å redusere risiko og for å styrke av samordning mellom ulike aktører. Klima- og miljødepartementets kunnskapsstrategi 2025 - 2030 peker på betydningen av miljødata for å vurdere miljøtilstand og følge utviklingen over tid, samt for å vurdere behov for å evaluere virkninger av miljøtiltak. Regjeringens naturmelding vektlegger at forskningsinfrastruktur er særlig viktig for grønn og blågrønn forvaltning, der arealer og landskapselementer er viktige for naturmangfoldet. I 2025 lyses det for første gang ut penger til sentre for bærekraftig areal- og naturbruk. Denne forskningen er avhengig av tilgang på lange dataserier og infrastruktur av høy kvalitet.

Polarområdene endrer seg raskt og har stor innvirkning på globale politiske, økonomiske og naturlige prosesser. Raske endringer forutsetter godt utbygde og integrerte observasjonssystemer. Regjeringens Svalbardmelding understreker betydningen av avansert forskningsinfrastruktur for norsk og internasjonal forskning og at det er potensial for mer systematisk og forpliktende samarbeid med deling og gjensidig tilgang som kan gi felles merverdi.

Rene og ressursrike hav- og kystområder er en forutsetning for langsiktig bærekraftig utnyttelse av marine ressurser. Økende utfordringer som tap av naturmangfold, havforsuring, miljøgifter og plastforurensning påvirker økosystemenes dynamikk og funksjon. Norge legger vekt på en kunnskapsbasert, helhetlig og ansvarlig forvaltning, som bygger på kartlegging, forskning og miljøovervåking. Internasjonalt samarbeid, samarbeid på tvers av sektorer og bedre metoder for å overvåke endringer og vurdere den samlede belastningen på marine og terrestriske økosystemer er nødvendig.

For å sikre gode analyser av prøver finnes det flere laboratorier for miljøkjemiske, biologiske og fysisk/kjemiske analyser ved hjelp av kvalitetssikrede analyse- og kalibreringsverktøy. Det vil være behov for fornyelse av analyseverktøy, laboratorier og måleteknologi for å kunne oppdage nye miljøgifter og forurensninger og forstå de biologiske virkningene av disse.

Mat og bioressurser

Området for mat og bioressurser omfatter forskningsinfrastruktur og observasjonssystemer innenfor landbruk, fiskeri, havbruk, skogbruk og andre biobaserte næringer. Målet er å støtte forskning og teknologiutvikling som bidrar til bærekraftig omstilling i næringsliv og offentlig sektor, økt konkurranseevne og innovasjonsevne, og økt matsikkerhet og mattrygghet. Langtidsplanen for forskning og høyere utdanning 2023-2032 har tre overordnede mål og seks tematiske prioriteringer, som alle er relevante for området mat og bioressurser. Langtidsplanen vektlegger også betydningen av sirkulære løsninger, samt trygg bruk av bioressurser på tvers av næringer, sektorer og fagområder.

Forskning på mat og bioressurser inkluderer bærekraftig trygg og sunn matproduksjon, biobaserte produkter som dyre- og fiskefôr, skogbruk, biokjemikalier og biomaterialer. Forskning innenfor og på tvers av agronomi, veterinærmedisin og landbruksfag er viktig for å innfri målene for matproduksjon og utviklingen av bioøkonomien. Teknologi og digitalisering spiller en stor rolle i å utnytte råvarer bedre og ivareta biologisk mangfold. Regjeringen har lansert et nasjonalt samfunnsoppdrag med mål om at alt fôr til oppdrettsfisk og husdyr skal komme fra bærekraftige kilder og bidra til å redusere klimagassutslippene i matsystemene.

Området involverer utstrakt internasjonalt forskningssamarbeid og er en forutsetning for å finne gode løsninger på mat- og bioressursutfordringer. Porteføljeplanen for mat og bioressurser peker på viktigheten av internasjonalt samarbeid også i forbindelse med forskningsinfrastrukturer. Dette kan gi norske forskere tilgang til infrastrukturer de ellers ikke ville hatt tilgang til, og er positivt med tanke på ressursutnyttelse, samarbeid og nettverksbygging.

Infrastrukturlandskapet framover

I tråd med regjeringens melding om konkurransekraft for industrien kan Norge oppnå økt konkurransekraft, innovasjonsevne og bærekraft ved å styrke koblingen mellom næringsliv og forskning. Viktigheten av å se forskning og innovasjon i sammenheng trekkes også fram av Forskningsrådet, Innovasjon Norge og Siva i deres felles handlingsplanen for forskning og innovasjon på bioøkonomifeltet som bygger på regjeringens bioøkonomistrategi. Viktig grunnlag for prioriteringer er også stortingsmelding om dyrevelferd og Nasjonal én-helse strategi mot antimikrobiell resistens 2024–2033.

Å styrke koblingen mellom forskning og næringsliv innebærer blant annet å investere i forskningsinfrastrukturer som utnytter matavfall, marint råstoff, og prosessering av organismer fra lavere trofisk nivå i havet, samt utvikling av fôringredienser. Forskningsinfrastrukturer som bidrar med ny teknologi, økt bruk av digitalisering og effektivisering er viktige for et fremtidsrettet klima- og miljøvennlig landbruk. Disse tiltakene er viktige for å fremme en grønn bioøkonomi basert på norske bioressurser. Innen mat og bioressurser finnes det flere forskningsinfrastrukturer som spiller en viktig rolle i overgangen til grønn bioøkonomi, basert på norske bioressurser.

I en verden med miljø- og klimaendringer, migrasjonsbølger og raske teknologiskifter kreves det stor grad av tverrfaglig samarbeid, der alle fag og disipliner kan bidra i samarbeid med næringsliv. Det er behov for oppgradering av eksisterende forskningsinfrastruktur og kobling av eksisterende plattformer for bedre ressursutnyttelse. Norge deltar i europeisk infrastruktursamarbeid (ESFRI) for forskning på marine organismer og koordinering av dataressurser for livsvitenskapene. Vi bør øke vårt engasjement i internasjonale satsinger på forskningsinfrastruktur for mat og bioressurser og videreutvikle nordisk samarbeid.

Utvikling av forskningsinfrastruktur innenfor morgendagens bærekraftige matsystemer må ses i sammenheng med bioteknologi, nanoteknologi, energi, materialteknologi, bygningskonstruksjon, helse og medisin, klima og miljø, og e-infrastruktur. Prioriteringer inkluderer infrastruktur for styrking av forskning for det grønne skiftet, overvåking og forvaltning, bærekraftig fangst, prosessering og foredling av naturressurser, forskning på nye produksjons- og dyrkingssystemer, jordhelse og karbonlagring, planteforedling, oppdrett, og utvikling av nye produkter basert på bioråstoff.

Avansert teknologi som sensorer, automatisering, digitalisering og robotisering kan bidra til å utvikle matproduksjon, fiskerinæringer, jordbruk og skogbruk i en mer bærekraftig retning. Med en stadig økende mengde data, blir det viktig å utvikle systemer slik at data fra ulike kilder kan gjøres tilgjengelig, sammenlignes og analyseres.

Området Mat og bioressurser bør ses i sammenheng med områdene innovasjon, muliggjørende teknologier, klima og miljø, og transport og logistikk. Dette krever utvikling av tverrfaglig tilnærming med bidrag fra flere områder inkl. energi, klima og miljø, samfunnsvitenskap og humaniora, bioteknologi, nanoteknologi og andre muliggjørende teknologier.

Helse

Området for helse inkluderer hele fagområdet medisin og helsefag. Også fag og disipliner under andre fagområder er relevant innenfor området helse. Det gjelder særlig fagområdet teknologi, men også naturvitenskap og matematikk, samfunnsvitenskap og humaniora.

Målet er å støtte forskning som bidrar til ny kunnskap innenfor hele bredden fra helsefremmende tiltak og forebygging via diagnostikk, behandling av- og rehabilitering etter sykdom, til organisering og omstilling av helse- og omsorgstjenestene og helseovervåking og beredskap. I tillegg er fremragende forskning og forskningsresultater sentralt i utvikling av helsenæring.

Behovene for kunnskap innenfor helseområdet er tydelig beskrevet i Langtidsplanen for forskning og høyere utdanning der helse er en av hovedprioriteringene. Kunnskapsbehov som blir trukket frem er knyttet til folkehelseutfordringer, én helse-perspektiv, tjenestenes bærekraft, klinisk forskning og integrering i tjenestetilbudet, bedre bruk av helsedata, og livsvitenskap og verdiskaping av helseforskning.

Porteføljeplanen for helse vektlegger at helsedata i form av helseregistre, helseundersøkelser, biobanker med mer, er verdifulle og utgjør et unikt informasjons- og kunnskapsgrunnlag for helsesektoren. Dette understøttes også i regjeringens systemmelding som vektlegger at mengden og kvaliteten på dataene samlet gir et stort potensial for verdiskaping, både i form av forskning, næringsutvikling og utvikling av tjenestetilbud.

Infrastrukturlandskapet framover

Det er viktig at aktørene innen helsesektoren har tilgang til nasjonal- og internasjonal infrastruktur som fremmer forskning av høy kvalitet og relevans, bidrar til innovasjon og næringsutvikling og styrker internasjonalt samarbeid (Porteføljeplan helse 2025). Samordning og koordinering omkring etablering og bruk av forskningsinfrastrukturer i miljøene og på tvers av sektorene; universitets- og høyskolesektoren, instituttsektoren, næringslivet og helseforetakene, er av stor betydning. Dette stemmer overens med resultatene fra Fagevaluering av medisin og helsefag 2023-2024 som anbefaler bedre tilgang til og bruk av nasjonal forskningsinfrastruktur.

Betydelige ressurser er investert i forskningsinfrastrukturer innen helse. Dette inkluderer blant annet infrastrukturer for kliniske studier i primær- og spesialisthelsetjenesten, helseregistre og biobanker, samt teknologiplattformer for bioinformatikk og systembiologi. Det omfatter også gensekvensering og ulike 'omics'-teknikker, presisjonsmedisin, MR-analyser og andre billeddannende teknologier og strukturbestemmelser. Fagevalueringen trekker også frem at bedre nasjonal koordinering av f.eks. helseregistrene og nær sanntidsdata vil være enestående sett i et internasjonalt perspektiv.

For å løse FoU-utfordringene innenfor helse og medisin, er det behov for infrastruktur som dekker hele spekteret fra grunnleggende til klinisk forskning. Helseforskning er avhengig av tilgang til forskningsinfrastrukturer også innenfor andre disipliner som f.eks. materialvitenskap og nanoteknologi. Det blir særlig viktig å satse på forskning innenfor forebyggende helse og fremtidig terapiutvikling og bruk av nye teknologier for å muliggjøre effektiv forebygging og behandling av sykdommer (ESFRI landskapsanalyse 2024). Nevrovitenskap, immunologi, radiofarmasi og medisinsk teknologi er fagfelt hvor Norge er i forskningsfronten. Skal Norge opprettholde denne posisjonen, er det nødvendig med infrastrukturer som muliggjør eksperimentelle studier og klinisk forskning, gir forskere tilgang til ny teknologi og fremmer tverrfaglig samarbeid.

Med en rask teknologisk utvikling generelt og de siste årene, ytterligere akselerert ved bruk av kunstig intelligens og høye forventninger til hva helsetjenesten skal tilby, blir utvikling av infrastrukturer stadig viktigere. For at norsk forskning skal hevde seg internasjonalt og bidra til utvikling av f.eks. nye avanserte terapiformer og persontilpasset medisin, er det vesentlig at Norge investerer i infrastruktur som muliggjør systemmedisinsk forskning både innen forebygging, diagnostikk og behandling av sykdommer. Det dreier seg om pasienter og pasientgruppers genomer, biomolekyler, celler, vev og organer.

Fremtidig forskning innenfor medisin og helse kommer til å bli påvirket av økt generering av store datamengder, deriblant helsedata som registerdata, befolkningsundersøkelser og muligheter for kobling mellom disse i ulike deler av tjenestene (inkl. primærhelsetjenesten). Utfordringer knyttet til demografiske endringer og utenforskap vil øke behovet for forskning i kommunale helse- og omsorgstjenester, inkludert fastlegetjenesten. Data fra kommunale helse- og omsorgstjenester er svært nyttige for forskning, for oversikt over pasientpopulasjoner og for rekruttering til klinisk studier. Dette gjør at behovet for datainfrastrukturer og avansert databehandling både i spesialist- og primærhelsetjenesten er stort. For å nå målene som regjeringen har fastsatt i strategien Fremtidens digitale Norge, er det nødvendig med tilstrekkelig forskningsfinansiering, infrastruktur, data og kompetanse om avansert databehandling. Med avansert databehandling menes tungregning, høykapasitets dataanalyse, maskinlæring og kunstig intelligens. Det er behov for bedre tilgang til regnekraft og kvanteteknologi og muligheter for høykapasitets dataanalyse, kunstig intelligens og maskinlæring og infrastruktur for lagring og håndtering av personsensitive data. I tråd med regjeringens systemmelding bidrar bruken av superdatamaskiner til å løse komplekse problemstillinger og utvikle samfunnsnyttige tjenester, som for eksempel å utvikle ny diagnostikk og behandlinger basert på persontilpasset medisin eller å drive effektiv og god forvaltning for beredskap.

Håndtering av personsensitive data er et særskilt behov innenfor helsesektoren, og det er spesielt viktig med nasjonalt samarbeid for bedre utnyttelse av personsensitive data, spesielt for store 'omics'-data til persontilpasset medisin. Det er svært viktig at all infrastruktur for personsensitive data har innebygget personvern og at tillit og etiske aspekter håndteres etter de høyeste standarder. Spesifikt er det også viktig med nasjonal samkjøring av samtykkehåndtering og dialog med deltakere i undersøkelser og studier.

Det er også behov for infrastruktur for data om sykdomsfremkallende mikroorganismers genomer, spredning og smitteveier for forskning om antibiotikaresistens i et én-helseperspektiv. Her er det viktig å dele data på tvers av sektorer, som kan gi verdifull kunnskap tilknyttet f.eks. forbruksvaner og klimaendringer. Dette er også viktig i samfunnssikkerhetsperspektiv, hvor det kreves tverrfaglig tilnærming til samfunnsvitenskapelige og humanistiske perspektiver. Beredskap for og håndtering av kriser omtales i prioriteringen 'samfunnssikkerhet og beredskap' (Langtidsplanen for forskning og høyere utdanning 2023 – 2032), og er relatert til f.eks. håndtering av pandemier og antimikrobiell resistens (AMR).

Samhandling med europeiske forskningsinfrastrukturer er helt nødvendig, og norske infrastrukturer må tilpasses internasjonale standarder og tilrettelegge for internasjonalt samarbeid både ifm. nye innkjøp og oppgradering av nasjonal infrastruktur. I det europeiske helseinfrastrukturlandskapet er det fokus på standardisering, integrering med nasjonale infrastruktur, implementering av GDPR og skytjenester for å håndtere datalagring og analyse (ESFRI landskapsanalyse 2024). I et internasjonalt perspektiv medfører European Health Data Space behov for datahåndtering også på nasjonalt nivå.

Humaniora og samfunnsvitenskap

Området inkluderer både samfunnsvitenskap og humaniora, og omfatter forskningsinfrastrukturer som tilbyr ressurser, verktøy og tjenester som er nødvendige for å forstå og analysere menneskelige samfunn, kultur og historie.

Målet med forskningen innen samfunnsvitenskap og humaniora er å forstå og analysere menneskelige samfunn og kulturelle uttrykk. Dette innebærer å undersøke hvordan mennesker samhandler, hvordan samfunn er strukturert, og hvordan kulturelle og historiske faktorer påvirker dagens samfunn. Forskningen bidrar til å utvikle kunnskap som kan brukes til å fremme en ønsket samfunnsutvikling, og større kulturell forståelse. Langtidsplanen for forskning og høyere utdanning 2023-2032 fremhever den viktige rollen humaniora og samfunnsvitenskap spiller for å håndtere samfunnsmessige utfordringer. Området er relevant for mange porteføljer i Forskningsrådet, og kanskje spesielt for banebrytende forskning, velferd og utdanning, og demokrati og internasjonale relasjoner.

Infrastrukturlandskapet fremover

I en tid preget av økende kompleksitet, teknologi og globale utfordringer er det avgjørende å styrke humaniora og samfunnsvitenskap. Langtidsplanen for forskning og høyere utdanning 2023-2032 understreker behovet for innsikt i kulturelle og historiske kontekster, særlig med tanke på sikkerhet og konflikt i Europa. Det er også essensielt å forstå hvordan den raske teknologiske utviklingen påvirker kultur og samfunn. Forskning på demokrati, tillit, samfunnssikkerhet og beredskap krever forskningsinfrastruktur som tilrettelegger for longitudinelle studier og koordinert datainnhenting.

Digitaliseringen av forskningsprosesser innebærer en omfattende transformasjon av samfunnsfag og humaniora. Oppfølging av evaluering av humanistisk forskning i Norge anbefaler økt satsing på digitalisering og forskningsinfrastruktur for humaniora. Eksisterende forskningsinfrastrukturer må videreutvikles for standardisering, økt tilgang og gjenbruk. Fremveksten av kunstig intelligens utgjør en sentral del av det digitale skiftet og åpner for å utforske mer komplekse problemstillinger ved å koble og utnytte store datamengder på tvers av sektorer og fagfelt. Bruken av kunstig intelligens reiser problemstillinger knyttet til personvern, datakvalitet og etiske- og juridiske problemstillinger. Det er også et økende behov for langtidslagring av store datamengder og tungregningsfasiliteter.

Tverrfaglig samarbeid er nødvendig for å møte samfunnsutfordringer. Dette inkluderer samordning av infrastrukturer innenfor samfunnsvitenskap og humaniora med andre vitenskapsområder som helse, teknologi, klima og miljø. I kriser er rask tilgang til data på tvers av sektorer avgjørende, men reiser juridiske og etiske utfordringer. Tilgang til kommersielle data krever videreutvikling av IKT-løsninger som kryptering og anonymisering. Bruk av internasjonale standarder er viktig for samhandling og gjenbruk av data ("I" og "R" i FAIR-prinsippene).

Norge har omfattende forvaltningsdata for forskning og forskningsdata om hele befolkningen. I tråd med regjeringens systemmelding er det hensiktsmessig at infrastrukturer utviklet for henholdsvis forvaltnings- eller forskningsformål, kan dra gjensidig nytte av hverandre. Når datainfrastrukturer legger til rette for deling, kan forskere bruke dem til å utvikle nye tjenester og løsninger til glede for samfunnet. Forskning som gir kunnskap om problemstillinger knyttet til samfunnsdeltakelse, demokrati, velferds- og arbeidslivsmodellen, ulikhet, migrasjon, offentlig innovasjon, utdanning og beredskap er avgjørende for innsikt i samfunnsutvikling og for å utvikle kunnskapsbasert politikk.

For å styrke humanistisk forskning og kunnskapsdeling trengs tilgang til strukturerte og gjenbrukbare data innen språk, kulturarv, medier og historie. Med høy presisjon og felles standarder kan Norge bli en pioner i europeisk datainfrastruktur. Dette vil fremme datadrevet humaniora, styrke samarbeid mellom kunnskapsinstitusjoner og gjøre norske ressurser mer tilgjengelige internasjonalt.

Det er økende behov for tilgang til og analyse av ferske datakilder som språkdata, nettsider, nettaviser og innhold fra sosiale medier som kan høstes fortløpende. Også brukergenerert innhold fra læremidler og læringsplattformer representerer en viktig kilde til innsikt. Samtidig er det behov for bedre tilgjengeliggjøring og tverrfaglig bruk av eksisterende registerdata. Disse datatypene reiser nye etiske problemstillinger knyttet til personvern og ansvarlig bruk, som forskningsinfrastrukturen må ivareta.

Vi har i dag forskningsinfrastrukturer som støtter medborgervitenskap og brukerinvolvering som en måte å styrke forskningens relevans og forankring i samfunnet. Ved å åpne for bidrag fra innbyggere og brukergrupper – for eksempel i form av datainnsamling, annotering eller deling av lokal kunnskap – kan forskningen både berikes og gjøres mer tilgjengelig for allmennheten.

For å utføre forskning av høy kvalitet innen visse områder, er det nødvendig med tilgang til avansert og kostbart utstyr. Europeisk samarbeid om høyteknologisk forskningsutstyr viktig for å styrke forskningskapasiteten og sikre tilgang til de beste ressursene. Norge bør også delta i internasjonale forskningsprosjekter og initiativer som sammenligner data på tvers av land. ESFRIs veikart inneholder prioriterte forskningsinfrastrukturer som er viktige for å styrke Europas forskningskapasitet. Ved å delta i disse initiativene, kan norske forskere få tilgang til verdifulle data, kostbart utstyr og viktig samarbeid.

Grunnleggende naturvitenskap

Grunnleggende naturvitenskap omfatter infrastrukturbehovet innen de klassiske naturvitenskapelige disiplinene som ikke er omtalt under de tematiske porteføljeområdene. I det videre er det altså ikke en beskrivelse av behovet for forskningsinfrastruktur innenfor grunnleggende naturvitenskap generelt, men snarere en presentasjon av behovet innen enkelte disipliner som ikke allerede er beskrevet.

Tilgang til avansert forskingsinfrastruktur er en forutsetning for mange forskningsfelt. Både omfang og kostnader ved forskningsinfrastrukturene gjør at en betydelig del av dette arbeidet foregår internasjonalt. Disiplinene i seg selv, men også arbeidet med utvikling av relevant forskningsinfrastruktur, bidrar til utvikling av ny avansert teknologi, som igjen legger grunnlag for nye anvendelser og nye produksjonsmetoder. Langtidsplanen for forskning og høyere utdanning 2023-2032 fremhever betydningen av den langsiktige grunnforskningen for å bygge ny kunnskap vi trenger for å håndtere utfordringer og kriser.

I henhold til fagevalueringen av naturvitenskap 2022-2024 har de norske forskningsmiljøene god tilgang til nasjonal eller internasjonal forskningsinfrastruktur. Dette gjør de mer produktive og attraktive som partnere i EU prosjekter, siden Norge er i en særstilling når det gjelder tilgang på «state-of-the-art» forskningsutstyr. Porteføljeplanen for banebrytende forskning peker spesielt på viktigheten av internasjonalt samarbeid om forskningsinfrastrukturer.

Innenfor disse disiplinene, og særlig med bruk av avansert forskningsinfrastruktur, genereres det betydelige mengder data. Dette stiller store og ulike krav til både regnekapasitet og til lagringskapasitet.

Infrastrukturlandskapet framover

Geovitenskap

Geovitenskap omfatter jordens faste materiale, prosesser og historie (geologi) og studier av jordens fysiske struktur og prosesser (geofysikk), og spiller en avgjørende rolle i å øke forståelsen av geofysiske fenomener som jordskjelv, vulkanutbrudd, erosjon, sedimentasjon, og bevegelsene av jordskorpen.

Norges deltakelse i internasjonale vitenskapelige organisasjoner som den internasjonale unionen for geodesi og geofysikk (IUGG) og samarbeid med organisasjoner som EuroGeoSurveys (EGS) og andre europeiske geologiske samarbeidsorganer legger til rette for sterke fagmiljøer og internasjonalt samarbeid innenfor geovitenskapelig forskning og teknologiutvikling. Fagområdet benytter seg også av satellittbasert jordobservasjon som omtales under. Det er flere nasjonale forskningsinfrastrukturer på dette feltet (del 3 i veikartet).

Det er betydelig aktivitet innenfor anvendt geovitenskap som inkluderer petroleumsgeologi, hydrogeologi, og miljøgeologi. Behovet for kunnskap og kompetanse innenfor disse områdene er beskrevet blant annet i flom og skredmeldingen og OG21. Geovitenskap spiller en nøkkelrolle i forvaltningen av jordens ressurser, og etter at Norge har vært en betydelig olje- og gassindustri blir det nå viktig å bygge og videreutvikle kompetansen innenfor bærekraftig ressursforvaltning og miljøbeskyttelse.

Tilgrensende fagområder som meteorologi og oseanografi faller under klima og miljø. Vi har derfor valgt å ikke omtale dette spesifikt her, selv om dette er områder Norge har sterke forskningsmiljøer og mange forskningsinfrastrukturer knyttet til.

Romfysikk og jordobservasjon

Romteknologien har utviklet seg, og gir mange samfunnsnyttige tjenester. Norges deltakelse i ESA og EUs romprogram styrker fagmiljøer og internasjonalt samarbeid innenfor bredden av romrelatert forskning og teknologiutvikling. Norges posisjon langt nord gir unike fortrinn, både når det gjelder næringsvirksomhet og forskningsinfrastrukturer som EISCAT.

Romforskning foregår både på bakken og i verdensrommet, og omfatter studier av alt fra solsystemet til universets opprinnelse. Norge har sterke tradisjoner når det gjelder nordlys- og solforskning, blant annet gjennom bruk av EISCATs radarer i Sverige, Finland og Norge.

Rommet gir nye muligheter for jordforskning. Jordobservasjon har utviklet seg raskt og gir verdifull innsikt i klima, havstrømmer og jordskorpas bevegelser. De europeiske landene samarbeider om jordobservasjon, klimaforskning og samfunnssikkerhet i Copernicus-programmet. Ifølge Klima- og miljødepartementets kunnskapsstrategi vil satellitter i framtiden bli en stadig viktigere og mer kostnadseffektiv kilde til miljøinformasjon.

Partikkelfysikk, kjernefysikk og kjernekjemi
Grunnleggende forskning innenfor partikkelfysikk, kjernefysikk og kjernekjemi bidrar til å øke forståelsen av fenomener, krefter og bestanddeler i universet.

Norsk partikkelfysikk er tettknyttet til CERN, hvor naturens minste byggesteiner studeres i store akseleratorer med partikkelkollisjoner ved ekstremt høye energier. Forskningen er både innenfor teoretisk og eksperimentell fysikk samt innen teknologier som er relevante for partikkelfysikk, bl.a. utvikling av avanserte partikkel- og strålingsdetektorer. Dataene analyseres i stor grad i de enkelte land og nødvendiggjør lokal kapasitet for tungregning og lagring av store mengder data. Norge deltar i flere av eksperimentene med hovedvekt på ATLAS- og ALICE-samarbeidet. Landet bidrar også i den omfattende oppgraderingen av Large Hadron Collider.

Langtidsplanen for forskning og høyere utdanning 2023-2032 fremhever behovet for kompetanse i kjernefysikk og kjernekjemi for å sikre norsk ekspertise innen strålevern og atomsikkerhet. Fagområdet har også relevans for helse- og materialvitenskap. Et nasjonalt nukleært forskningssenter, støttet av Forskningsrådet, samler de viktigste miljøene og er knyttet til nasjonal og internasjonal infrastruktur.

Norge har ingen kjernekraftverk, men er omgitt av land med eksisterende og planlagte anlegg. Norske forskningsmiljøer deltar i initiativer for etablering av kjernekraft basert på små modulære reaktorer (SMR) og for reaktordrift av sivile skip. Reaktorene utvikles hovedsakelig i utlandet, og det er lite aktuelt å bygge forsøksanlegg i Norge. Behov for forskningsinfrastruktur gjelder særlig sikkerhet og avfallshåndtering.

Kjemi
Kjemi er et fag med stort behov for avansert instrumentering, og god tilgang er avgjørende for forskning på et høyt internasjonalt nivå. Behovet for infrastruktur for kjemi er i stor grad omfattet av de tematiske porteføljene. Evalueringen av naturvitenskapelig forskning i 2022–2024 konkluderte med at tilgang til både nasjonal og internasjonal infrastruktur er god, spesielt for de store universitetene. Evalueringen inkluderer infrastrukturer finansiert gjennom institusjonenes basisfinansiering og forskningsinfrastrukturer finansiert av Forskningsrådet.

Det kan være behov for å oppgradere eksisterende forskningsinfrastrukturer. Nye behov bør være forankret i nasjonale prioriteringer slik de framgår av Langtidsplanen for forskning og høyere utdanning 2023-2032.

Referanser

Datainfrastrukturutvalget (2022) *Investering i infrastrukturer for FAIR forskningsdata og særlig relevante forvaltningsdata for forskning.* Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2022/rapport-fra-datainfrastrukturutvalget-2022.pdf

Digitaliserings- og forvaltningsdepartementet (2024) *Fremtidens digitale Norge. Nasjonal digitaliseringsstrategi 2024–2030.* Tilgjengelig fra: https://www.regjeringen.no/contentassets/c499c3b6c93740bd989c43d886f65924/no/pdfs/nasjonal-digitaliseringsstrategi_ny.pdf

Energi21 (2022) Tilgjengelig fra: https://www.energi21.no/contentassets/2ec5d9578a134adc930a0d9ecea1bf64/energi21-strategy-2022/

European Commission (2023) *ANNEX to the Commission Recommendation on critical technology areas for the EU's economic security for further risk assessment with Member States*. Tilgjengelig fra: https://defence-industry-space.ec.europa.eu/document/download/d2649f7e-44c4-49a9-a59d-bffd298f8fa7_en?filename=C_2023_6689_1_EN_annexe_acte_autonome_part1_v9.pdf

European Commission (2024) *Chips competence centres to strengthen semiconductor expertise across.* Tilgjengelig fra: https://digital-strategy.ec.europa.eu/en/news/chips-competence-centres-strengthen-semiconductor-expertise-across-europe-about-kick (Hentet 06.05.2025)

European Commission (2025) *Safe and sustainable by design*. Tilgjengelig fra: https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/chemicals-and-advanced-materials/safe-and-sustainable-design_en?wt-search=yes (Hentet 06.05.2025)

European Commission (2025) *Technology Infrastructures*. Tilgjengelig fra: https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/technology-infrastructures_en (Hentet 06.05.2025)

Europena Strategy Forum on Research Infrastructures (2024) *ESFRI Landscape Analysis 2024* (ISBN PDF: 978-88-943243-6-5). Tilgjengelig fra: https://landscape2024.esfri.eu/

Forskningsrådet, Innovasjon Norge og Siva Bioøkonomi (2019) Bioøkonomi – felles handlingsplan for forskning og innovasjon. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2019/biookonomi_handlingsplan_endelig.pdf

Helse- og omsorgsdepartementet (2024) Nasjonal én-helse strategi mot antimikrobiell resistens 2024–2033. Tilgjengelig fra: Nasjonal én-helse strategi mot antimikrobiell resistens 2024–2033 - regjeringen.no

Klima og miljødepartementet (2025) *Klima og miljødepartementets kunnskapsstrategi 2025-2030.* Tilgjengelig fra: https://www.regjeringen.no/contentassets/fdfda78e6680403a931baa23468ce44c/no/pdfs/kld-kunnskapsstrategi.pdf

Kunnskapsdepartementet (2017*) Nasjonal strategi for tilgjengeliggjøring og deling av forskningsdata. Tilgjengelig fra: https://www.regjeringen.no/no/dokumenter/nasjonal-strategi-for-tilgjengeliggjoring-og-deling-av-forskningsdata/id2582412/*

Maritim21 (2022) Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2022/maritim21-strategi-januar-2022.pdf

Meld. St. 5 (2022-2023) (2022) *Langtidsplanen for forskning og høyere utdanning 2023-2032.* Kunnskapsdepartementet. Tilgjengelig fra: https://www.regjeringen.no/no/dokumenter/meld.-st.-5-20222023/id2931400/

Meld. St. 26 (2023-2024) (2024) *Svalbard*. Justis- og beredskapsdepartementet. Tilgjenglig fra: https://www.regjeringen.no/contentassets/f8407df1f6a641fbae2ca00f4509a64e/no/pdfs/stm202320240026000dddpdfs.pdf

Meld. St. 27 (2023-2024) (2024) *Tryggare framtid – førebudd på flaum og skred*. Energidepartementet. Tilgjengelig fra: https://www.regjeringen.no/contentassets/7a6bf454917444a18225bd8cdebfbff3/nn-no/pdfs/stm202320240027000dddpdfs.pdf

Meld. St. 35 (2023-2024) (2024) *Bærekraftig bruk og bevaring av natur. Norsk handlingsplan for naturmangfold.* Klima- og miljødepartementet. Tilgjengelig fra: https://www.regjeringen.no/contentassets/c8122f7641734da2b892738b796d4725/no/pdfs/stm202320240035000dddpdfs.pdf

Meld. St. 8 (2024-2025) (2024) Dyrevelferd. Landbruks- og matdepartementet. Tilgjengelig fra: https://www.regjeringen.no/contentassets/c7a5163695754c3b948139760dd14b59/no/pdfs/stm202420250008000dddpdfs.pdf

Meld. St. 14 (2024-2025) (2025) Sikker kunnskap i en usikker verden. Kunnskapsdepartementet. Tilgjengelig fra: https://www.regjeringen.no/no/dokumenter/meld.-st.-14-20242025/id3092418/?q=stortingsmelding%20forskningssystemet

Meld. St. 16 (2024–2025) (2025) *Industrien – konkurransekraft for en ny tid*. Nærings- og fiskeridepartementet. Tilgjengelig fra: https://www.regjeringen.no/no/dokumenter/meld.-st.-16-20242025/id3093608/

Meld. St. 25 (2024-2025) (2025) *Klimamelding 2035 – på vei mot lavutslippssamfunnet*. Klima- og miljødepartementet. Tilgjengelig fra: https://www.regjeringen.no/contentassets/d51d0e3cc153440b9611cdece49f4549/no/pdfs/stm202420250025000dddpdfs.pdf

Menon Economics (2023) *The semiconductor industry in Norway*. Tilgjengelig fra: https://menon.no/en/projects/the-semiconductor-industry-in-norway

Norges forskningsråd (2019) Oppfølging av evaluering av humanistisk forskning i Norge. Tilgjengelig fra: https://www.forskningsradet.no/contentassets/e2905367d91b4d5598f02ab80ad46df8/oppfolging_av_evaluering_av_humanistisk_forskning_i_norge.pdf

Norges forskningsråd (2021) *Evaluation of the INFRASTRUKTUR initiative as a funding instrument.* Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2021/infrastruktur-evalueringsrapport.pdf

Norges forskningsråd (2021) *OG21 – Norsk sammendrag*. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2022/og21-strategi_no.pdf

Norges forskningsråd (2024) *Evaluation of Natural Sciences in Norway 2022-2024.* Tilgjengelig fra: justert-evalnat-national-report-final-march-2025.pdf

Norges forskningsråd (2024) *Forskningsrådets strategi* (ISBN 978-82-12-04047-2) Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2024/forskningsradets-strategi.pdf

Norges Forskningsråd (2024). *Behov for tungregnekraft for forskning og kunstig intelligens*. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2024/rapport-med-vedlegg---behov-for-tungregnekraft-for-forskning-og-ki---versjon-3.pdf

Norges forskningsråd (2025) *Porteføljeplan for banebrytende forskning.* Tilgjengelig fra: https://www.forskningsradet.no/siteassets/portefoljer/banebrytende-forskning/portefoljeplan-for-banebrytende-forskning.pdf

Norges forskingsråd (2025) *Porteføljeplan for energi og transport*. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/portefoljer/energi-og-transport/portefoljeplan-energi-og-transport.pdf

Norges forskningsråd (2025) Porteføljeplan for forskningssystemet. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/portefoljer/forskningssystemet/portefoljeplan-forskningssystemet/

Norges forskningsråd (2024) Porteføljeplan for helse. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/portefoljer/helse/portefoljeplan-for-helse_2025.pdf

Norges forskingsråd (2025) *Porteføljeplan for klima og miljø*. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/portefoljer/klima-og-miljo/portefoljeplan-klima-og-miljo.pdf

Norges forskingsråd (2025) *Porteføljeplan for muliggjørende teknologier*. Tilgjengelig fra: https://www.forskningsradet.no/siteassets/portefoljer/portefoljesidene/muliggjorende-teknologier/2025-portefoljeplan-for-muliggjorende-teknologier.pdf

Norges forskningsråd (2025) *National report Evaluation of Medicine and Health in Norway 2023-2024.* Tilgjengelig fra: https://www.forskningsradet.no/siteassets/publikasjoner/2025/evalmedhelse/evalmedhelse_national-report_march-2025.pdf

Nærings- og fiskeridepartementet (2023) *Norges mineralstrategi*. Tilgjengelig fra: https://www.regjeringen.no/no/dokumenter/norges-mineralstrategi/id2986278/

Nærings- og fiskeridepartementet (2023) Veikart 2.0: Grønt industriløft. Tilgjengelig fra: https://www.regjeringen.no/no/dokumenter/veikart-2.0-gront-industriloft/id2996119/

Nærings- og fiskeridepartementet (2024) *Næringsplan for norske havområder*. Tilgjengelig fra: https://www.regjeringen.no/contentassets/876ba5f136704790886c22f6c32660d7/no/pdfs/naeringsplan-for-norske-havomrader.pdf

Prop.87 S (2023-2024) *Langtidsplan for forsvarssektoren 2025–2036*. Forsvarsdepartementet. Tilgjengelig fra: https://www.regjeringen.no/contentassets/27e00e5acc014c5ba741aacfff235d99/no/pdfs/prp202320240087000dddpdfs.pdf

Prosess21 (2023) Tilgjengelig fra: https://www.prosess21.no/ (Hentet 06.05.2025)

SIVA, Norges Forskningsråd og Innovasjon Norge (2024) *Vurdering av eksisterende tilbud til prosjekter innenfor automatisering og digitalisering av industrien (Industri 4.0)*

Sikt (2022) *Infrastruktur og tjenester for FAIR forskningsdata – Status og forslag til videre arbeid.* Tilgjengelig fra: https://www.openscience.no/media/3582/download?inline.

Transport21 (2019) Tilgjengelig fra: https://www.transport21.no/contentassets/5dfe5c6c588540298bd62b04c552b6db/transport21-strategi.pdf

Forskningsrådet

Norges forskningsråd
Besøksadresse: Drammensveien 288
Postboks 564
1327 Lysaker

Telefon: 22 03 70 00
Telefaks: 22 03 70 01

post@forskningsradet.no
www.forskningsradet.no