



International scanning of **research programmes** that focus on societal challenges

National research programmes that focus on grand societal challenges are a relatively new phenomenon in Sweden. Based on an international case study, this report provides experiences and conclusions about factors to consider in the design of such programmes.

Dnr: 2017/121

Myndigheten för tillväxtpolitiska utvärderingar och analyser
Studentplan 3, 831 40 Östersund
Telefon: 010 447 44 00
Fax: 010 447 44 01
E-post: info@tillvaxtanalys.se
www.tillvaxtanalys.se

För ytterligare information kontakta: Irene Ek
Telefon: 010 447 44 79
E-post: irene.ek@tillvaxtanalys.se

Förord

Regeringen har under 2017 inrättat sju nationella forskningsprogram som ska bidra till att lösa ett antal prioriterade samhällsutmaningar. Tillväxtanalys gör här en omvärldsanalys av fem olika internationella forskningsprogram med liknande samhällsutmaningar som de svenska. Förhoppningen är att fallen ska fungera som inspiration och utgöra en grund för diskussioner kring ledning, styrning och organisation av de nya nationella programmen i Sverige.

De studerade programmen är satsningar som ska bidra till att lösa prioriterade samhällsutmaningar och stärka samverkan mellan forskningsutförare, forskningsfinansiärer och samhällsaktörer. Tillväxtanalys studie kartlägger och analyserar erfarenheter och problem under etablerings- och implementeringsfasen. I rapporten ingår en syntes av några viktiga observationer av omvärldsanalysen och en kort översikt av den internationella forskningen kring dessa nya och komplexa forskningsprogram som ofta har multipla mål och utfall.

Uppdraget har utförts i dialog med Formas som ansvarar för tre program inom klimat, hållbart samhällsbyggande och livsmedel. Forte och Vetenskapsrådet som ansvarar för de övriga fyra programmen har intervjuats och fått möjlighet att kommentera de olika fallstudierna.

Omvärldsanalysen har skrivits av Faugert & Co Utvärdering. Tillväxtanalys har bidragit med en syntes på svenska av fallen (kapitel 1) och en kortare forskningsöversikt (kapitel 2). På Tillväxtanalys har Irene Ek varit projektledare och har, tillsammans med utredningsassistenten Ida Knudsen och avdelningschef Enrico Deiacco, skrivit de svenska delarna.

Stockholm, december 2017

Enrico Deiacco
Avdelningschef, Innovation och grön omställning
Tillväxtanalys

Table of Contents

Sammanfattning	7
Summary	9
1 Samhällsutmaningar – några organisatoriska implikationer	10
2 Vad säger internationell forskning om samhällsutmaningar	17
2.1 Aktörer.....	17
2.2 Aktörernas roll	18
2.3 Statens roll	19
2.4 Utvärdering av projekt som adresserar samhällsutmaningar	20
2.5 Sammanfattning	20
3 International experiences: summary and analysis	21
3.1 A brief introduction	21
3.2 Similarities and differences	21
3.3 Discussion.....	23
3.4 Different notions of “grand” or “societal” challenges.....	26
4 Case study 1: United Kingdom, Prime Minister's 2020 Challenge on Dementia.....	27
4.1 Description of the challenge-driven research programme	27
4.2 The programme's process and associated research agendas	27
4.3 The programme's form and accompanying agenda	30
4.4 Implementation and monitoring	32
4.5 Conclusions and lessons learned.....	33
5 Case study 2: Denmark, Innovation Fund Denmark's Grand Solutions	36
5.1 Description of the challenge-driven research programme	36
5.2 The programme's process and associated research agendas	37
5.3 The programme's form and accompanying agenda	38
5.4 Implementation and monitoring	40
5.5 Conclusions and lessons learned.....	42
6 Case study 3: Strategic Research Programme on A Climate-Neutral and Resource-Scarce Finland	43
6.1 Description of the challenge-driven research programme	43
6.2 The programme's process and associated research agendas	44
6.3 The programme's form and accompanying agenda	46
6.4 Implementation and monitoring	48
6.5 Conclusions and lessons learned.....	49
7 Case study 4: Canada, the Arctic Program.....	50
7.1 Description of the challenge-driven research programme	50
7.2 The programme's process and associated research agendas	50
7.3 The programme's form and accompanying agenda	52
7.4 Implementation and monitoring	53
7.5 Conclusions and lessons learned.....	54
8 Case study 5: Joint Programming Initiatives	55
8.1 Description of the challenge-driven research programme	55
8.2 The programme's process and associated research agendas	56
8.3 The programme's form and accompanying agenda	59
8.4 Implementation and monitoring	61
8.5 Conclusions and lessons learned.....	64
References	66
Appendix 1 National research programmes: the Swedish context	68
Appendix 2 Case study – The Netherlands	72
Appendix 3 Method	79
Appendix 4 An overview of the case studies	86

Sammanfattning

Den svenska regeringen har under 2017 inrättat sju nationella forskningsprogram som ska bidra till ett antal olika samhällsutmaningar som identifierats i den senaste forskningspropositionen. Tillväxtanalys gör här en omvärldsanalys av fem olika internationella forskningsprogram med liknande samhällsutmaningar som de svenska. Syftet är att fallen kan fungera som inspiration och utgöra en grund för diskussioner kring ledning, styrning och organisation av de nya programmen i Sverige.

Fokus i den här rapporten ligger på programutformning och implementation. De frågeområden som behandlas är följande:

- Hur ser processen ut för programutformning och tillhörande forskningsagenda?
 - × Vilka typer av aktörer deltog?
- Hur ser stödinstrumenten ut som används?
- Hur ser styrningen av programmet och projekten ut?
 - × Kan styrningen ta hänsyn till löpande förnyelse och i sådana fall hur?
- Hur ter sig samverkan?
- Hur försöker programmen brygga forskning och nyttiggörande i samhället?

Studien analyserar processer och erfarenheter av att arbeta med nationella forskningsprogram i ett urval av länder. Det har genomförts fem fallstudier:

1. Grand Solutions (Danmark)
2. Strategic Research Council (Finland)
3. Arctic Programme (Kanada)
4. Prime Minister's Challenge on Dementia 2020 (Storbritannien)
5. Joint Programming Initiative, JPI Climate, (Europeiska kommissionen)

De studerade programmen är olika satsningar som ska bidra till att lösa prioriterade samhällsutmaningar och stärka samverkan mellan forskningsutförare, forskningsfinansiärer och samhällsaktörer.

Informanterna betonar några generella lärdomar vid programutformning:

- Strävan efter att inkludera ett större antal aktörer i både agendasättandet och programutformning än i traditionellt utformade forskningsprogram. Ett exempel är den engelska fallstudien, där ett större antal aktörer inkluderades i flera faser av programmet.
- I utformningen av programmen finns det en önskan om att programmets inriktning ska vara sammanlänkade ("aligned") med nationella prioriteringar och styrkor. Ett exempel är fallstudien från Finland.
- En strävan att bygga in en ökad flexibilitet i programutformning och styrningen av den samlade projektportföljen.

Avslutningsvis ser vi en diskrepans mellan behovet av nya styr- och ledningsformer samt en samlad instrumentmix, vilket framhålls i den internationella forskningen, och de mer traditionella stödinstrument som vi ser i de olika fallen. När det gäller så pass komplexa politiska målsättningar som att lösa samhällsproblem uppstår behov av att program ska bidra till strukturomvandling och systemtransformation. Den internationella forskningen framhåller att det då behövs nya sätt att sätta agendan, nya mål, nya prioriteringar, nya samarbetsformer, nya kombinationer av olika stödinstrument och nya styrformer. Vad vi ser i fallstudierna är att mer traditionella samverkansprojekt visserligen förnyas och omfattar ett större antal aktörer från olika typer av organisationer. Tillsammans definierar dessa det problem som ska lösas, vilket inte är vanligt i mer traditionella forskningsprogram. I mer traditionella forskningsprogram är det, till exempel, vanligt att forskarna definierar det problem som ska lösas. Fallstudierna tyder på att de styr- och ledningsformer vi ser emellertid liknar de traditionella sätten att organisera forskning och samverkan. Vi ser inte att det behov av nya styr- och ledningsformer, som framhålls i forskningen, implementerats fullt ut i fallen.

Summary

National research programmes that focus on grand societal challenges are a relatively new phenomenon in Sweden. They differ from “traditional” programmes in certain respects:

- They are funded over a ten-year period and are more ambitious in scope
- They aim to achieve an active and strategic overall coordination of research funding and other activities in Sweden, as well as creating synergies between different actors
- Rather than focusing on creating a project portfolio in line with programme objectives (as in the case of “traditional” research programmes), they also aim to function as a platform for new and ongoing research and to be a link to international programmes and EU Joint Programming Initiatives
- They aim to contribute to increased impact in society in terms of development, knowledge building, evidence-based policies and management, and ultimately to contribute to national policy goals.

The present study describes and analyses the process and experience of working with national research programmes in selected countries. These case studies form the basis of a report describing good experiences, with conclusions about important factors to consider in the design and implementation of such national research programmes.

Case studies of the following five programmes have been carried out:

Denmark	Grand challenges
United Kingdom	Prime Minister’s Challenge on Dementia
Canada	NRC-CNRC, Arctic program
Finland	Strategic Research Council (SRC), focus on Climate Neutral Finland
EU	JPI, focus on climate change

1 Samhällsutmaningar – några organisatoriska implikationer

Myndigheten för Tillväxtpolitiska Utvärderingar och Analyser (Tillväxtanalys) har i dialog med Formas genomfört en omvärldsanalys av internationella erfarenheter av forskningsprogram som adresserar samhällsutmaningar. Tanken är att rapporten kan utgöra en grund för diskussioner om olika vägval för ledning, styrning, organisation och implementering av de nya nationella programmen i Sverige.

Frågeställningar

Fokus i den här rapporten ligger på programdesign och implementation samt hur samverkan har utformas i praktiken.

De frågeområden som behandlas är följande:

- Hur ser processen ut för programutformning och tillhörande forskningsagenda?
 - × Vilka typer av aktörer deltog?
- Hur ser stödinstrumenten ut som används?
- Hur ser styrningen av programmet och projekten ut?
 - × Kan styrningen ta hänsyn till löpande förnyelse och i sådana fall hur?
- Hur ter sig samverkan?
- Hur försöker programmen brygga forskning och nyttiggörande i samhället?

Studien analyserar processer och erfarenheter av att arbeta med nationella forskningsprogram i ett urval av länder. Det har genomförts fem fallstudier:

Grand Solutions (Danmark)

Strategic Research Council (Finland)

Arctic Programme (Kanada)

Prime Minister's Challenge on Dementia 2020 (Storbritannien)

Joint Programming Initiative, JPI Climate (Europeiska kommissionen)

Staten får en annorlunda roll och det behövs något nytt

Samhällsutmaningar såsom klimatförändringar, grön energi och en åldrande befolkning skapar nya utmaningar. Litteraturen framhåller att statens roll förändras, eftersom de problem som behöver lösas är komplexa och har en systemisk karaktär. Att forskning och innovation ska prioritera samhällsutmaningar är emellertid en svår uppgift, eftersom lösningarna enligt forskningen ska, förutom att producera excellent forskning, också ska påverka strukturomvandlingen i samhället (exempelvis en grön omställning) och en transformation av det socio-ekonomiska system som ska underlätta och främja omvandlingen (Kuhlmann & Rip, 2016). När det gäller så pass komplexa politiska målsättningar som att främja strukturomvandling och systemtransformation argumenteras i den internationella forskningen att det behövs nya sätt att sätta agendan, nya mål, nya prioriteringar, nya samarbetsformer, nya kombinationer av olika stödinstrument och nya styrformer

(Kallerud et al., 2013). Samhällsutmaningar rymmer också många heterogena krafter. Ett exempel är att olika aktörer behöver involveras som har olika syn på det problem som ska lösas och vad lösningen kan tänkas vara. Stödinstrumenten behöver klara av motstridigheter, icke-linjäritet och utvecklingsprocesser som bygger på samverkan och arbetsfördelning med aktörer som tidigare inte har samarbetat i någon högre utsträckning. Trots det väljs ofta instrument som levererar mer excellent forskning (Foray, Mowery, & Nelson, 2012; Kuhlmann & Rip, 2016), något som vi också ser i de olika fallstudierna.

Samhällsutmaningar är heterogena där vissa representerar globala problem medan andra snarare svarar mot nationella prioriteringar (OECD, 2017). Eftersom det är svårt att adressera en samhällsutmaning i sin helhet så kan utmaningen brytas ner i mindre hanterbara bitar. Vi studerar ett exempel från Storbritannien där en samhällsutmaning bryts ner i en mindre del och fokus ligger på demens.

Av definitionen i faktarutan nedan framgår att en samhällsutmaning kan ses som ett hinder som, när den tas bort, löser ett globalt problem (George, Howard-Grenville, Joshi, & Tihanyi, 2016). Lösningen bör således ha stor spridningspotential på en global marknad.

Definition av samhällsutmaning

Samhällsutmaningar eller så kallade "Grand challenges" är formuleringar av globala samhällsproblem som på ett rimligt sätt kan lösas genom samverkan och koordinering mellan ett ökande antal aktörer. Exempel på samhällsutmaningar är klimatförändringar, åldrande befolkning och digitalisering. En samhällsutmaning kan ses som en barriär som när den tas bort löser ett globalt problem. Det medför att implementeringen av lösningen har en stor global spridningspotential.

Källa: Bearbetning av George et al. (2016)

Behovet av en inriktning som är stödjande snarare än förbestämd betyder att staten får en annorlunda roll enligt flera forskare (Kuhlmann & Rip, 2016; Mazzucato, 2015). Litteraturen beskriver att en del av rollen blir motiverande där staten bland annat ska nå ut och skapa nya möten mellan olika behovsägare och nyckelaktörer i både akademien och i det omgivande samhället.

Sveriges nya forskningsprogram som adresserar samhällsutmaningar

I Sverige ska forskningspolitiken svara mot samhällsproblem som definierats nationellt. De svenska samhällsutmaningarna är klimat och miljö, hälsa, ökad digitalisering och ett hållbart samhälle (Proposition, 2016).

I forskningspropositionen står följande:

"Regeringen avser att inrätta nationella forskningsprogram, vilka utgår från de i propositionen utpekade samhällsutmaningarna. Samverkan med samhället är också viktig för att samla kunskaper från samhällets aktörer om olika intressenters behov. Genom breda och långsiktiga nationella forskningsprogram kan samverkan stärkas mellan forskningsutförare, forskningsfinansiärer och de samhällsaktörer som ska ta hand om forskningsresultaten och genomföra dem i sina respektive verksamheter."

De nya svenska forskningsprogrammen förväntas skapa kraftfulla synergier mellan olika aktörer som kompletterar varandra vad det gäller kunskap, kompetens och uppdrag. Tanken är att skapa goda förutsättningar för forskning som löser samhällsutmaningar genom till exempel tvärvetenskaplig och tvärspektoriell samverkan. (Proposition, 2016)

Nationella forskningsprogram av det här slaget har inte funnits i Sverige tidigare. De nya programmen¹ syftar till:

- En aktiv och strategisk övergripande koordinering av forskningsfinansiering och andra aktiviteter i Sverige samt att skapa synergier mellan olika aktörer.
- Att vara en plattform för ny och pågående forskning.
- Att vara en länk till internationella program och EU:s Joint Programme Initiative.
- Att bidra till ökat genomslag i samhället i form av utveckling, kunskapsuppbyggnad, evidensbaserad politik och förvaltning och bidra till politiska mål.

Samhällsutmaningar som prioriteras internationellt

Ekonomisk tillväxt och konkurrenskraft är och förblir viktiga drivkrafter för att investera i forskning. Det finns en samstämmighet kring vilka vägval för forskningen som kommer att bli viktiga i vår omvärld i framtiden (Altenburg & Rodrik, 2017; Capello, Caragliu, & Fratesi, 2015; Martin, 2013; Robinson et al., 2014; Weber & Stephanie, 2014). Litteraturen visar att de mest framträdande är:

- förväntningar på att forskning ska adressera samhällsutmaningar
- förväntningar på att forskningen ska accelerera strukturomvandling
- förväntningar på att forskningen ska bidra till hållbar tillväxt.

På den internationella nivån adresserar europeiska kommissionens forskningsprogram Horizon 2020 samhällsutmaningar som inkluderar hälsa, demografi, matsäkerhet, hållbarhet, ren energi, gröna transporter, klimat samt inkluderande och säkra samhällen. Samtidigt finns det nya studier som visar att en period med global ekonomisk instabilitet i framtiden kan medföra att EU:s forskningsengagemang avtar. Minskad framtida budget tvingar EU att spela en allt mindre roll när det gäller att välja forskningsområden och sätta prioriteringar. Minskad budget betyder också färre prioriterade områden. De två samhällsutmaningar som forskarna förväntar sig ska prioriteras i EU:s forskningsagenda år 2030 är hälsa och energikonsumtion. När det bara blir två områden som definieras som samhällsutmaningar finns det en förväntan på att dessa områden behöver vara flexibla och ska kunna förändras över tid.

Samhällsutmaningar är även centrala i FN:s lanserade agenda 2030 och hållbarhetsmålen som beskriver den roll som forskning och innovation har för att nå upp till målen.

Agenda 2030 och FN:s hållbarhetsmål

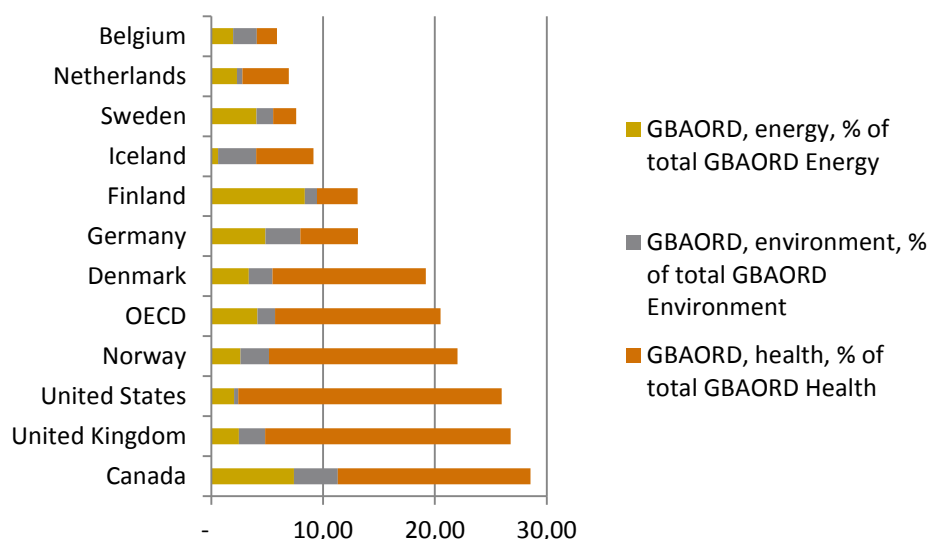
I september 2015 antog FN agenda 2030 för hållbar utveckling som identifierar 17 hållbara utvecklingsmål som ska stimulera aktivitet de nästkommande 15 åren inom alla områden som är viktiga för hållbar utveckling. Agenda 2030 riktar in sig på forskning och sätter prioriteringar inom bl.a. jordbruk, hälsa, ren energi och marin hälsa.

¹ Som adresserar samhällsutmaningar

Samtidigt är många utmaningar så kallade ”elaka problem” som rymmer mycket osäkerhet som inte kan lösas med enbart forskning (OECD, 2017). Ett problem som karaktäriseras som elakt är klimatförändring eftersom en lösning behöver äga rum i en sådan omfattning, inom en viss tidshorisont och med en sådan skala. Det medför att politiken behöver synliggöra vilken roll forskningen har för att adressera samhällsutmaningar, vilket kan skapa behov av att implementationen av forskningsprogrammen förnyas. Forskningsprogram skulle till exempel kunna behöva ingå i en samlad, koordinerad och övergripande styrmedelsmix (av såväl generella som specifika instrument) som möjliggör att problemet i samhället kan lösas.

Allt flera länder försöker främja och styra forskning och innovationssystem så att de adresserar samhällsutmaningar (OECD, 2016). En nedbrytning av forskningsmedlen på tre prioriterade utmaningar visar att länder som USA till exempel, fokuserar medel mot hälsa som står för cirka 24 procent av de totala forskningsmedlen år 2016. För Storbritannien är siffran 22 procent och för Kanada 17 procent. Sverige däremot har prioriterat energiforskning. Kanada, Storbritannien och USA har i högre utsträckning än de andra länderna valt att koncentrera sina forskningsmedel kring de tre utmaningarna energi, miljö och hälsa.

Figur 1 Forskningsbudget som öronmärks för samhällsutmaningar 2016, procent av total FoU-budget



Källa: OECD STI Scoreboard (2016), OECD R&D Statistics (RDS) Database, April, www.oecd.org/sti/rds. Data extracted from IPP.Stat on 25 July 2016

Resultat från omvärldsanalysen

Analysen visar på en stor förnyelse utanför det rena forskningspolitiska området, i gränsytor mot andra områden. Forskningspolitiken i de flesta av de studerade länderna tvinnas samman med samhällsbehov för att adressera samhällsutmaningar. Den traditionella forskningens styrformer och stödinstrument utmanas därmed och vi observerar hur de olika aktörerna försöker anpassa sig till dessa nya förhållanden.

Tabell 1 ger en översikt över fallstudierna och beskriver likheter och skillnader vad det gäller budget, tid, fokus, hur formulering av agenda och programutformning sker och slutligen typ av deltagare.

Tabell 1 Översikt fallstudierna

	UK	Danmark	Finland	Kanada	JPI
Budget	>£ 300 m	600 m DKK/year	€ 17 m	\$ CAN 86 m	Ej definierad
Tid	2015-2020	3-5 år	2015-2020	8 år	Ej definierad
Fokus	Demens	Flera (t.ex. energi, hälsa)	Klimat- förändring	Affärsutveckling i arktiskt klimat	Klimat- förändring
Hur?	Partnerskap både top-down och bottom-up	Tematiskt: mest top-down Programval: bottom-up	Formulering: top-down Urval: bottom- up	Top-down av fyra områden, bottom- up val av teknologier	Bottom-up
Deltagare	Offentlig och privat sektor, hälsosektor, NGOs, forskare, patienter och anhöriga, allmänhet	Offentlig och privat sektor, forskare, användare	Universitet, institut, företag, vissa utländska aktörer	Offentlig och privat sektor	17 medlems- länder

Källa: Tillväxtanalys

Hitta rätt balans mellan top-down och bottom-up när agendan tas fram och stödinstrumentet utformas

Fallen tyder på att samhällsutmaningarna som politiken ska lösa identifieras i respektive nations politiska styrdokument. Samhällsutmaningarna svarar mot nationella prioriteringar och fallbeskrivningarna tyder på att den globala dimensionen tonas ner. De områden som pekas ut i de politiska styrdokumenterna är ofta breda snarare än avgränsade områden. Samtidigt finns det, i enlighet med litteraturen, exempel där en utmaning bryts ner i en hanterbar bit som demens exemplet från UK och arktiskt klimat i Kanada.

Litteraturen framhåller att strukturomvandling och systemtransformation inte direkt kan påverkas av ett specifikt stödinstrument. Politiska mål behöver därför översättas till mål som stödinstrumenten kan påverka (Borrás & Edquist, 2013). Omvärldsanalysen visar att de instrument vi ser utmärks av att de är mer traditionella. Fallen visar dessutom att programmen inte fullt ut utformats för att t.ex. att sätta en agenda som kan vara flexibel över tid, eller hittat sätt att artikulera efterfrågebehovet. Figur 2 visar vilka fall som ändå ligger närmare en efterfrågedriven process. Litteraturen framhåller att även senare delar av processen som implementeringen och administrationen behöver präglas av flexibilitet. Vi har inte fullt lyckats hitta den dimensionen i fallstudierna, men det är en dimension som kan vara intressant att beakta i utformningen av de svenska programmen.

Resultaten visar att balansen mellan top-down och bottom-up är olika mellan fallen (Figur 2). Figuren är en förenkling av ett mycket komplext område och till viss del blandar styrning och instrumentens utformning. Från toppen tänker vi oss att skalan börjar med den politiska styrningen. Därefter kommer val av stödinstrument, en flexibel och motiverande styrning, en bredare uppsättning aktörer samt ett ökande antal aktörer, en efterfrågedriven agenda, få med behovsägarna, identifiering av behovet/efterfrågan och på botten ligger en fullt ut

efterfrågedriven process². En tolkning är att programmet i Finland inte har något tydligt inslag av efterfrågestyrning, utan det verkar ha ett starkare inslag av top-down. Behovsägarna och efterfrågan beskrivs som viktiga i styrningen men de är inte fullt synliga i designen av stödinstrumentet. Tolkningen bygger således på vad vi sökt efter men inte hittat, snarare än det som finns i fallbeskrivningen. I Storbritannien och Danmark däremot tyder resultaten på att behovsägarna har engagerats och i vissa fall blivit en del av agendasettandet och i projektkonsortiet. Med andra ord ett starkare inslag av bottom-up. Då de svenska programmen fortfarande är under uppbyggnad var det för tidigt att göra en tolkning av balansen mellan top-down och bottom-up. För Sverige finns ändå några intressanta frågor som vi illustrerar med ett frågetecken i figuren. Vart kommer de svenska programmen att ligga? Kommer balansen mellan top-down och bottom-up att variera mellan de sju svenska programmen? Vart vill de svenska programmen ligga?

Figur 2 Hitta rätt balans mellan top-down och bottom-up



Behov av något nytt som kan involvera ett ökande antal aktörer och fånga efterfrågebehovet

När forskningen ska adressera samhällsutmaningar ökar retoriken kring sökandet efter nya stödinstrument. Förhoppningen är att stödinstrumenten ska lösa komplexa samhällsproblem som inkluderar strukturomvandling och systemtransformation. Samtidigt behöver arbetet med samhällsutmaningar något nytt, enligt forskningslitteraturen. Nya sätt att sätta agendan, nya mål, nya prioriteringar, nya samarbetsformer och nya styrformer på samhällsutmaningar rymmer många och olika heterogena krafter. Många aktörer behöver involveras som har olika syn på det problem som ska lösas och vad lösningen är. Här ser vi en diskrepans mellan litteraturen och fallen. Även om stödinstrumenten i fallstudierna går mer åt det här hållet så är de inte något nytt utan kan bättre beskrivas som förnyelse av existerande instrument såsom multidisciplinära samverkansprojekt i det finska fallet. Det brittiska exemplet med programmet Challenge on Dementia anser vi är mest likt de nya förhållningssätt som beskrivs i litteraturen. De inblandade aktörerna är själva med och utformar programmet, de har en tydlig road-map samt att det finns möjlighet till exit av forskningsspår som inte ter sig relevanta. I övriga fall har vi svårt att se de nya strukturer

² I rapporten används top-down och bottom-up olika. I vissa fall syftar top-down och bottom-up på en mer styrningsrelaterad dimension och ibland på mer beslutsfattande och instrument utformningsnära dimensioner. I diskussionen av figur 2 synliggör vi därför vilka steg vi tänker oss mellan toppen och botten.

och instrument som litteraturen pekar på. Stödinstrumenten, utformningen av programmen samt implementeringen verkar vara traditionella och utbudsstyrda snarare än efterfrågestyrda. Det är dock inte alltid tydligt hur efterfråge- och utbudsrelaterade faktorer påverkar implementeringen eller hur stödinstrumenten utformats så att de passar de mer komplexa målsättningarna.

I det danska fallet anges orsaken till att vissa projekt misslyckats vara dåligt samarbete mellan aktörerna, bristfällig projektledning och för smalt nationellt fokus. Även om dessa typer av misslyckande inte har kunnat studeras i de övriga fallen bör det vara en intressant lärdom att ha processer för hur genomförandemyndigheterna samlar upp kunskap från alla de enskilda projekten och lär sig.

Därtill synliggör vi i rapporten att programmen skapar ett så kallat ”principal-agent” problem. Ett principal-agent problem uppstår när en entitet (en agent) kan ta beslut för en annan entitets räkning (en principal). Dilemmat uppstår när agenten är motiverad att agera i sitt eget intresse, något som strider mot principalens intresse. Vi kan inte avgöra om detta är ett större problem än i mera traditionella forskningsprogram. Men det finns vissa indikationer på att aktörerna har utnyttjat sin frihet att följa ett eget, mer avgränsat mål, snarare än den breda samhällsutmaning som politiken och finansären önskar lösa³.

Omvärldsanalysen visar att de valda programmen bygger på mer traditionella samarbetsformer, men med ett ökande antal aktörer, såsom public-private partnerships. Men som det har påpekats i litteraturen (se kapitel 2) ser vi att forskningsprogram som adresserar samhällsutmaningar behöver mer lärande och experimenterade. Däremot ger inte litteraturen konkreta exempel på hur program har designats. Vi vet idag mycket lite om hur forskningsprogram, som adresserar samhällsutmaningar, egentligen bör utformas. Att jobba på nya sätt är inte alltid lätt. Genomförandemyndigheterna och de andra aktörer som ska ingå är vana att jobba på ett visst sätt som det kan vara svårt att frigöra sig från. I forskningslitteraturen framhävs ofta just att dessa så kallade stigberoenden (path-dependencies) behöver diskuteras och utmanas för styrning, ledning och implementering av de samhällsutmanande programmen. I de fall som har studerats så menar vi att det engelska demensprogrammet kommit längst med att införa nya lednings- och styrformer.

Informanterna betonar några generella lärdomar vid programutformning:

- Strävan efter att inkludera ett större antal aktörer i både agendasättandet och programutformning än i traditionellt utformade forskningsprogram. Ett exempel är den engelska fallstudien, där ett större antal aktörer inkluderades i flera faser av programmet.
- I utformningen av programmen finns det en önskan om att programmets inriktning ska vara sammanlänkade (“aligned”) med nationella prioriteringar och styrkor. Ett exempel är fallstudien från Finland.
- En strävan efter att bygga in en ökad flexibilitet i programutformning och styrningen av den samlade projektportföljen.

³ Den intresserade läsaren hänvisas till avsnitt 3.2 Similarities and differences där t.ex. de strategiska innovationsprogrammen diskuteras.

2 Vad säger internationell forskning om samhällsutmaningar

Samhällsutmaningar (grand challenges) definieras som de hinder som ligger till grund för viktiga samhällsproblem. Problemen är ofta globala varför lösningarna kan få global spridning.

”[G]rand challenges”[are] specific critical barrier(s) that, if removed, would help solve an important societal problem with a high likelihood of global impact through widespread implementation. (George et al, 2016, s. 1881)

Samhällsutmaningar skiljer sig från andra problem i ett antal aspekter, bland annat genom att frågeställningarna är breda och utgör hinder för socioekonomisk utveckling. Exempel på områden som adresseras är miljö, fattigdom och digitalisering. I och med de breda forskningsfrågorna ökar komplexiteten i arbetet med att hitta lösningar till samhällsutmaningar. Historiskt har framgångsrika lösningar inkluderat element av både innovation och någon form av systemtransformation, ofta genom institutionella reformer som både underlättat innovation och transformation. I lösningarna har också ofta funnits förändrade beteenden hos individer och i samhället, samt förändringar i hur insatser utformas och implementeras. Med andra ord är traditionella arbetssätt och insatser inte tillämpbara för samhällsutmaningar. Att staten ska identifiera och prioritera frågor, samt skapa ekonomiska incitament anses inte räcka för att få tillstånd en förändring i den här typen av frågor. Både styrstrukturer, implementering och vilka aktörer som inkluderas behöver anpassas. (Kuhlmann och Rip 2014, George et al 2016) Dessa aspekter diskuteras nedan.

2.1 Aktörer

Vilka aktörer som ska ha möjlighet att delta i arbetet med samhällsutmaningar är en aspekt som tas upp i forskningslitteraturen. Utmaningarna adresserar ofta stora delar av det socioekonomiska systemet, och syftar till att förändra det i vissa aspekter. Denna komplexitet kräver djup kunskap som spänner över forskningsdiscipliner och existerande kunskapsnivåer. Enligt Kuhlmann och Rip (2014) kräver det kollektivt agerande (concerted action). Projektteamet behöver samla kunskap från en mängd vetenskapliga discipliner och FoU inom industrin och den offentliga sfären. Exakt vilka aktörer som bör ingå specificeras inte, utan det bör variera beroende på vilka som anses relevanta i varje samhällsutmaning. Lyckas relevanta intressenter att inkluderas för det med sig ett antal positiva effekter, bland annat har projektresultaten visat sig öka.

Enligt Olsen, Sofka och Grimpes (2016) kvantitativa studie av forskningskonsortiers projekt som adresserar samhällsutmaningar vinner alla parter på samarbetet, även intressenterna själva. Den positiva effekten på resultaten visade sig speciellt framträdande om samhällsutmaningen rör områden med mer splittrade och outvecklade tekniska lösningar. Positiva effekter kommer också från att inkludera internationella samarbeten. I en rapport från Science Europe (2014) anges att forskningsresultaten citeras oftare med den geografiska spridningen hos deltagarna. Trots detta är fullskaliga globala samarbeten få, enligt studien. Aktörerna är oftast från ett begränsat antal länder vilket minskar bredden av kunskap och försvårar förståelsen för samhällsutmaningarna. Denna kunskapsbegränsning försvåras ytterligare av att forskningen ofta inte är mångvetenskaplig.

2.2 Aktörernas roll

Hur denna bredd av aktörer ska inkluderas i arbetet är en annan aspekt som har behandlats i forskningslitteraturen. En allmän hållning är att de aktörer som berörs av arbetet ska beredas möjlighet att själva formulera problemen samt arbeta fram lösningar. Enligt Kuhlmann och Rip (2014) behövs detta för att mobilisera aktörerna i fråga, såväl som att få en så relevant definition av och lösning på samhällsutmaningen som möjligt. Kunskap om utmaningar finns inte bara samlad inom det offentliga, utan finns utspridd hos en mängd olika aktörer. Dessa aktörer finns inom en bredd av discipliner och sektorer och har därmed alla olika perspektiv och kunskaper med sig in i projektet. Även om det är önskvärt är en av de stora utmaningarna att lyckas engagera och mobilisera den spridda mängd aktörer, menar de.

Även Boon och Edler (2017) menar att aktörernas behov bör ligga till grund för programmets utformning, parallellt med samhällsbehoven. De poängterar att det har varit alltför vanligt förekommande att man forcerar fram multidisciplinär forskning uppifrån. Istället menar de att aktörernas vilja och färdighet är en förutsättning för att en systemtransformation verkligen ska realiseras och därmed leda till ett positivt utfall för samhällsutmaningen. För att en så stor mängd aktörer ska kunna samarbeta kring breda frågeställningar som inkluderar en hög osäkerhet på ett fruktbart sätt krävs nya organisatoriska lösningar. Att inkludera intressenter tidigt i processen är även gynnsamt för implementeringen av programmet. I en studie av 37 public-private forskningsprogram visar Wardenaar (2014) att användare av kunskap (knowledge users) som involveras tidigt i programdesignen även deltar under själva forskningsfasen i högre utsträckning och fortsätter att forma programmet.

Även om forskningslitteraturen pekar mot en aktörsstyrd organisering så finns det få konkreta exempel på hur ett fruktbart samarbete bör utformas. Samhällsutmaningar anses vara av så olika natur och behöver ha en öppen och utforskande process, varför få tydliga rekommendationer på strukturer eller processer ges. Men samtidigt gör detta behov av samarbete mellan så många olika aktörer utformningen av programmen och implementeringen till central utmaning. Enligt European Research Area Board (ERAB 2012) är implementeringen och ledningen av programmet rentav de viktigaste faktorerna för resultatet av forskningsprogrammet. Baserat på en genomgång av ett antal olika organisationsformer förordar de att implementeringen omfattar många aktörer, men att dessa även ges befogenhet att driva det dagliga arbetet såväl som att omforma programmet om det skulle behövas. De menar att det bäddar för en nödvändig självständighet från eventuella ändringar i den politiska agendan, och en mer resultatorienterad programadministration, vilket antas främja implementeringen.

Även Ferraro, Etzio och Gehman (2015) argumenterar för ett antal sätt vilka syftar till att öka programmets anpassningsförmåga till förändringar och uppmuntrar till kontinuerligt lärande. Verktygen inkluderar en deltagande infrastruktur för långsiktigt engagemang, plattformar eller mötesplatser för att säkra fortsatt aktivitet även när det inte finns konsensus mellan aktörerna, samt strukturer för kontinuerligt lärande av framgångar såväl som motgångar. En annan form av organisering grundar sig i Ostroms teorier om polycentriska samarbeten⁴. Med utgångspunkt i befintliga informella nätverk menar Smith (2017) att det är möjligt att bilda storskaliga internationella samarbeten. I hans modell befinner sig nätverken på en lägre nivå av beslutsfattare, tjänstemän och samarbetsinitiativ inom

⁴ Se exempelvis Ostrom (2011)

näringslivet. Kuhlmann och Rip (2014) menar att samarbete både i att definiera problemet såväl som att formulera lösningar kan ta formen av så kallade road-maps, vilket använts tidigare i samarbeten mellan det privata och offentliga.

2.3 Statens roll

I ett perspektiv där en mängd aktörer ska inkluderas såväl i utformningen av projektet som implementeringen behöver statens roll omdefinieras. Att prioritera och förmedla problemen samt besluta om ekonomiska incitament fungerar inte med samhällsutmaningar. Istället för traditionell top-down-styrning i form av en på förhand fastställd masterplan måste staten hantera samhällsutmaningar på ett förutsättningslöst sätt i form av en vagare form av styrning. I litteraturen beskrivs statens roll som viktig, men att de i detta sammanhang blir en av flera aktörer. I flera länder har exempelvis privata välgörenhetsorganisationer tagit en alltmer aktiv roll i frågor som rör samhällsutmaningar. (Kuhlmann och Rip, 2014) Enligt Boon och Edler (2017) bör staten fokusera på att underlätta och möjliggöra för berörda aktörer att samarbeta. De menar att svaret varken är en självstyrande bottom-up-process eller traditionell top-down-styrning, utan att hitta en balans däremellan. Konsumenter, offentliga aktörer och företags efterfrågan på innovation är ofta otydlig och svårångad, varför staten bör vara lyhörd för de nyanserade och iterativa sätt olika aktörer uttrycker efterfrågan på. De kan även delta genom att koordinera arbetet över sektorsgränser, inspirera aktörerna att gå bortom avgränsade områden och agera för att undvika enkla lösningar. De bör även analysera misslyckanden på både utbud och efterfrågesidan samt erbjuda verktyg för att hantera misslyckandena.

Kuhlmann och Rip (2014) menar att staten bör utforma styrinstrument, men att dessa bör vara experimentella och preliminära. Stöden kan även innehålla drag av klassiska prioriteringar och metoder för implementering och får gärna innehålla en mix av styrmedel, såväl regeländringar som ekonomiska incitament. De behöver dock inkludera en mängd aktörer och deras efterfrågan, samt fokusera på strategiska förändringar, exempelvis grön omställning. Trovärdigheten i statens agerande och insatser visar sig också vara viktigt för att få med sig intressenter och finansärer. Enligt Reichardts och Roggeas (2016) fallstudie av vindkraft i Tyskland är stabila strategier med långsiktiga mål, samt stödinstrumentens samstämmighet med strategin, avgörande för att få finansiering av forskningen. De menar att investerare intresserar sig för sammansättningen av stödinstrument och hur väl det passar ihop, inte enbart enskilda stöds utformning. Men framförallt behöver de vara trovärdiga i aktörernas ögon, vilket underlättas om stödinstrumentmixen är sammanhängande (cohesion och coherence) och adresserar flera olika hinder och marknadsmisslyckanden.

Följande rekommendationer för en sådan sammanhängande policy mix är enligt en ny studie (Howlett & Rayner 2017).

Consider the full range of policy instruments available

Employ a mix of policy instruments[...]chosen other to create positive interactions with each other and to respond to particular context dependent features of the policy sector

...consider incentive based instruments, various forms of self-regulation by industry and policies that can employ commercial and non-commercial third parties to achieve compliance

Do not overlook procedural policy instruments such as information instruments and the various techniques of network management

2.4 Utvärdering av projekt som adresserar samhällsutmaningar

En del av de nya krav som samhällsutmaningar ställer på arbetsprocesser är en öppenhet i formuleringen och genomförandet av projekten. Inom forskningen förespråkas en ansats samhällsutmaningar som *open-ended missions*. Detta påverkar utformningen av utvärderingar av projekten. Enligt Modic och Feldman (2017) krävs ett ökat fokus på institutionell och strukturell kontext i utvärderingar av projekt som adresserar samhällsutmaningar. Inbäddat i samhällsutmaningar ligger en stor dos osäkerhet, varför processen är komplex och sällan blir som planerat. Exempelvis kan projektet ha involverat andra aktörer, budgetomfattning och resultat än vad som angavs i projektplanen. Andra försvårande omständigheter är forskningens indirekta och långsiktiga effekt i samhället, osäkerhet kring framtida teknikutvecklingar, stor grad av retorik men låg grad av konkreta mål och svårdefinierat datamaterial för det slutliga målet. För att täcka in komplexiteten behöver utvärderingar samhällsutmaningar inkludera en uppsättning av olika, såväl kvalitativa som kvantitativa metoder.

2.5 Sammanfattning

Sammantaget indikerar forskningen att det behövs en ny ansats för att formulera, implementera och utvärdera projekt som adresserar samhällsutmaningar. Utmaningarnas komplexitet ställer krav på en inkluderande och öppen arbetsprocess och programstruktur. Mixen av stödinstrument som behövs kan liknas vid ett lapptäcke bestående av de olika aktörernas aktiviteter. Men forskningen innehåller få konkreta rekommendationer på hur processen ska designas och genomföras, men arbetat med samhällsutmaningar bör adressera komplexiteten på ett antal sätt;

- Stora, multidisciplinära projekt, gärna med en hög grad av internationella samarbeten.
- Bottom-up process för problemformulering och implementering.
- De offentliga och genomförande aktörerna bör söka efter relevanta kombinationer av stödinstrument samt metoder för att underlätta den systemtransformation som antas behövas för att lösa samhällsutmaningen.

Dessa aspekter kommer att diskuteras närmare i fallstudierna i kommande kapitel.

3 International experiences: summary and analysis

3.1 A brief introduction

The five case studies show certain differences and some similarities. This section summarises these findings and discusses practices for programmes that address “grand” or “societal” challenges. Some of the practices we suggest might be generally applicable, whereas others seem to be context-bound and thus relevant mainly to the individual case study.

3.2 Similarities and differences

These cases present some common features and some elements in which they differ. They all address societal challenges (as this was indeed one of the criteria for selection), but there are differences in how specific or generic these programmes are in this respect. Some address more or less universally agreed Societal Challenge topics (e.g. climate change) and some are more local in scope, such as the challenges of living and conducting business in the Arctic, or making the public sector work more efficiently. Thus, one might distinguish between challenges defined by the topic and a challenge-approach, which is about taking challenges in society as a starting point and working collaboratively with stakeholders to bring about some kind of societal transformation (not just developing solutions that will sit unused on a shelf).

Some of the case studies, such as the Danish Grand Solutions and A Climate-Neutral and Resource-Scarce Finland, broadly define the challenge or challenges to be addressed, but leave it to the applicant parties to define how and what part of the challenge to tackle. The UK Dementia challenge and Canada Arctic Program are much more specific in the issues they address.

The scope of the programmes, in terms of budget and time limit, varies. The Danish Grand Solutions programme funds projects that have a life span of three to five years; the UK and Finnish cases run from 2015 to 2020; the Canadian Arctic Program case is an eight-year programme, whereas the Climate JPI has no fixed expiry date. The annual budgets are difficult to compare, but those of the Danish and the UK cases are larger than the others. Some of the cases (such as the Canadian Arctic Program) require a defined minimum level of (non-public) co-funding. The Danish Grand Solutions programme defines maximum funding rates (e.g. 50–60% for companies compared to 90% for universities).

All the case study programmes involve a higher degree of stakeholder consultation than is normally seen in research and innovation programmes, although the nature of the interaction of different types of stakeholders varies between programmes. They are explicitly “top down”, in the sense that government sets the overall agenda. However, within these themes there is then variation in the extent to which programmes have a more detailed architecture orientated towards implementation. Sweden’s individual SIPs are programmes in their own right, bringing together multiple activities with the aim of effecting specific societal changes (albeit that, like the UK Dementia challenge, they require inbuilt flexi-

bility so that they can learn and adjust their strategies as they proceed)⁵. The UK Dementia challenge has a detailed architecture that considers the complementarity of individual activities and therefore involves the development of infrastructure as well as conducting research. Canada's Arctic Program is designed within the NRC and presumably coheres with the NRC's larger research programme and its implementation.

The other three cases do not involve mutually consistent, programmed activities that together build towards a predetermined goal. Thus, the Danish Grand Solutions are selected bottom-up within the government's thematic priorities; Similarly, Finland's Strategic Research Programmes select the proposals that meet thematic and quality criteria but do not have a collective architecture; the JPIs fund bottom-up research within thematic priorities agreed among the participating states.

The five cases show different mechanisms for providing input into the decision-making process. For example, decisions on funding allocations for challenge areas in Denmark are taken by policy makers (top-down) but these decisions refer to a non-binding "catalogue" of priority areas developed (in consultation with the sector). A similar catalogue is used in Finland prepared by the research council. This means that although this process is formally top-down from policy-makers, it still admits input from stakeholders. How these themes are expressed in actual proposals and partnerships is usually decided through a bottom-up process, in which applicants formulate the issues to be tackled and are chosen according to certain pre-set criteria. These criteria can be tilted more towards innovation (as in the case of the Danish Grand Solutions, in which value creation is a decisive factor) or more towards research (as in A Climate-Neutral and Resource-Scarce Finland, in which certain guiding principles and research issues to be resolved are decisive).

It seems reasonable to suppose that the UK Dementia challenge and Canada's Arctic Program (and also the Swedish SIPs) will make progress towards practical implementation goals while the other three cases are more likely to produce knowledge that may or may not turn out to be useful in setting agendas and developing policy.

The style of governance follows the same pattern, with the UK Dementia challenge and (presumably) the Canadian Arctic Program, as well as the Swedish SIPs, being closely monitored and governed. We see rather strong vertical coordination in the Danish and Finnish cases, in which central government plays an active role in defining priorities and budgets. The UK Dementia case is more about horizontal coordination, with collaboration between sector agencies and ministries in coordinating efforts to address challenges. The Board of the UK Dementia Programme comprises senior leaders from many partner organisations involved in the challenge and is chaired by the Parliamentary Under Secretary of State. Major individual initiatives under the programme have their own governance structures. In the case of the Danish Grand Solutions, IFD is led by a Board of Directors comprising nine politically-appointed members with research and industry expertise. The Fund reports to the Ministry for Education and Research but functions at arm's length from government. Unlike the Fund's other schemes, all decisions concerning investments in Grand Solutions are taken directly by the Board. The other three cases follow the more traditional research council model of defining thematic priorities, selecting projects and then leaving nature to take its course.

⁵ The Strategic innovation programmes (SIP) are not included in the cases presented in this report. The comparative analysis in this case is built on Mr. Arnold's participation in and evidence from the OECD's innovation review of Sweden from 2015.

The goals defined for the individual programmes that have been studied are rather broadly defined. The UK Dementia Programme is very specific in the issue it addresses and, although the overarching goal is broad (and very ambitious), our view is that the indicators chosen to follow up on the goal are realistic and possible to measure.

The Joint Programming Initiative was evaluated in 2016 and is the only one of the cases studied that has been formally evaluated thus far. Most of the other programmes have been scheduled for such analyses in the near future. An internal Progress Review Group continually monitors the key performance indicators of the UK Dementia Programme, which in this respect stands out as more detailed and, possibly, more ambitious than the other programmes. The programme's approach of discussing beforehand what must be done to achieve the desired outcomes and impact in the short, medium and long term, and what success will look like at each stage, should be worth considering for challenge-led research programmes elsewhere.

There is a degree of variation as to how the programmes interface with shared priorities on national and international levels. All these programmes, however, are clearly aligned to and mirror the national policy agendas in their respective fields.

The selection of initiatives under the programme varies between the cases studied. In several of the cases, consortia are selected in competition. In the case of Finland, SRC independently decides on the structure and funding of the strategic research programmes, and the projects are selected in open competition. In the UK case, the 50 commitments have been selected by a committee, although at the project level, in individual initiatives such as DPUK or DRI, projects may be selected in open competition.

Some of the programmes have clearly defined implementation plans, describing what will be carried out by whom and how. Other programmes (such as the JPI Climate and A Climate-Neutral and Resource-Scarce Finland) have no overall implementation plans. The Danish Grand Solutions and A Climate-Neutral and Resource-Scarce Finland are implemented at consortia level, which, in the Danish Grand Solutions case, is based on mandatory collaboration agreements.

Gender issues are not generally addressed explicitly in programme documents, but are present in follow-up indicators of one or two programmes.

3.3 Discussion

The case studies conducted point to several good practices and/or conditions for success. While some of these seem to be context bound and thus relevant mainly to the individual case study, other good practices or success factors can be considered applicable on a more general level.

The five case studies have yielded more examples of unique and context-bound good practices than generally applicable ones. We will start with the latter.

Existing practices

- All the cases studied are top-down in the sense that they stem from a political decision. It seems clear that alignment with national priorities is a common feature. The inclusion of a broad spectrum of stakeholders in designing the programmes provides legitimacy and, in turn, favours networking with stakeholders and decision-makers.

- Public-private partnerships (PPPs) such as the UK Dementia Challenge involve a transfer of programming activity from the funding organisation to the partnership. This creates a principal-agent problem, providing an incentive to the partnership to follow its own narrower goals rather than those of the funder. Therefore, they require close monitoring and supervision by the funder, reflected in the governance structure of the Dementia challenge, with multiple checks and balances.
- A programme that draws on a national strength or comparative advantage is more likely to be perceived as being successful. This is highlighted in all case studies.
- Although the overarching initiative, and possibly even its objectives or goals, are set from the beginning, deciding on the actual content (strategies, focus areas, priorities) through an interactive and inclusive process would seem to increase the likelihood of a successful programme.
- All the case study programmes involve a higher degree of stakeholder consultation than is normally seen in research and innovation programmes. Early dialogue with stakeholders about priorities and strategies favours inclusion and commitment. The dialogue should strive to include all relevant partners from the outset, from planning to delivery. An effort should also be made to involve stakeholders in different stages of the programme (in the formulation of programme themes, interaction plan attached to the research plan, seminars for interaction, etc.).
- From the above follows the importance of genuine collaboration between partners, and working from a base of agreed and common priorities.
- All case studies are concerned with bridging the research and industry sectors, and intersectoral emphasis is seen as favouring a good outcome (but, apart from the case of A Climate-Neutral and Resource-Scarce Finland, is not compulsory).
- A streamlined, single-stage application procedure would be seen as beneficial to the applicants and would shorten the delay between political decisions and project implementation. Applicants can get started quickly (if successful), or move on to something else more quickly (if unsuccessful).

Further practices that may be transferable

A number of practices have been identified in only one or two of the cases studied. It seems possible that some of these could also be applied in other contexts. We would suggest that this applies to the following:

- Defining from the outset, as in the UK Dementia programme, what success will look like is useful. An agreed view on this would make it easier to decide milestones based on what actions would lay the foundations for others, which actions need to be prioritised and which actions will be long term.
- Governance structures that permit a degree of flexibility so that they can learn and adjust their strategies as they proceed might allow programmes to be adapted over time to the emerging context, i.e. if some goals are no longer appropriate or if certain areas require more resources, etc. This could lead to greater programme efficiency, efficacy and coherence.
- The UK Dementia challenge has a detailed architecture that considers the complementarity of individual activities and therefore involves the development of

infrastructure as well as conducting research. Canada's Arctic Program is designed within the NRC and coheres with the NRC's larger research programme and its implementation. The other three cases do not involve mutually consistent, programmed activities that together build towards a predetermined goal. The first two cases are more likely to progress towards practical implementation goals while the other three are more likely to produce knowledge that may or may not turn out to be useful in setting agendas and developing policy.

- Active involvement and portfolio management by the staff of the public funding body is obviously a good practice. Professional project management as such (highlighted in the Danish Grand Solutions case), complemented by thorough knowledge of the theme of the specific programme (such as in the UK Dementia case) would seem to further favour a successful outcome.
- The Climate-Neutral and Resource-Scarce Finland case has a more outspoken multi-disciplinary emphasis than the other programmes. The rules of the Finnish programmes state that the programme consortia must include researchers from different organisations from at least three scientific disciplines. Whereas this constraint may not necessarily favour positive outcomes in other geographies or subject areas, the focus on inter-sectoral aspects would seem to do so. The Danish Grand Solutions and Canadian Arctic Programme cases are not so much about different disciplines, but emphasise bridging the gap between universities and industry.
- The Climate-Neutral and Resource-Scarce Finland case shows that cross-programme collaboration is encouraged. This seems applicable and useful for countries with a matrix research funding structure.

Some of the other success factors identified in one case only appear to be constrained to a specific context and are therefore not readily or directly transferable:

- The UK Dementia case suggests that including strongly committed and research heavy NGOs favours the programme's likelihood of success. The UK is rather unique in having some very strong NGOs in the health sector and these provide the programme with funds, expertise and valuable direct access to patients and carers.
- The UK Dementia case further suggests that an initial stimulus is useful for increasing activity.
- The Danish Grand Solutions and the UK Dementia cases suggest that targeted investment can be used to address gaps in research.
- The Danish Grand Solutions and Canadian Arctic Programme both have a stronger emphasis on innovation than the other cases. This manifests itself in an explicit focus on value creation. In the Danish case there is also an emphasis on speed and attempting to ensure that projects get started quickly. The Canadian Arctic Programme also focuses on providing good service to industry "clients" and understanding industry needs.

3.4 Different notions of “grand” or “societal” challenges

As the case studies in this report show, the notion of “grand” or “societal” challenges varies.

The idea of “grand challenges” emerged in US science policy in the 1980s, referring to targeted and challenging but achievable developments in science or (especially) engineering, such as creating a new generation of supercomputers. These challenges were often set in a context of international techno-economic competition.⁶ The terminology was co-opted into the European discussion about how to adapt research and innovation policy to address cross-cutting issues such as climate change⁷ and was adopted in the Lund Declaration in 2009.

By the launch of Horizon 2020, the terminology had shifted to “societal” challenges, in recognition of both the existential nature of some of the challenges posed and of the need to engage more parts of society in accomplishing the required changes than the traditional research and innovation actors. Many if not all of the “societal challenges” require radical transitions in large socio-technical systems, such as the healthcare or electricity production and distribution systems. These transitions demand the involvement of new stakeholders and more inclusive forms of policymaking and governance in order to incorporate change at the systems level⁸ – a stark contrast to the comparatively simple governance needs of the US-style grand challenges.

In parallel with the policy shift towards societal challenges, governments have been experimenting with public-private partnerships (PPPs) and public-public partnerships (P2P) as ways of making systemic interventions. Early examples include the European Technology Platforms, which evolved into the EU Joint Technology Initiatives. These address technological change within European supply chains. However, such partnerships have become increasingly important in policies for societal challenges. The Joint Programming Initiatives are P2Ps while the UK Dementia challenge (and Sweden’s Strategic Innovation Programmes (SIPs), not covered by the case studies) are PPPs. Such partnerships involve i) transfer of programming activity from the funding organisation to the partnership, ii) create a principal-agent problem, namely, that this structure provides an incentive to the partnership to follow its own narrower goals rather than those of the funder. The partnerships therefore require close monitoring and supervision by the funder. This is reflected in the complex governance structure of the Dementia challenge with multiple checks and balances (and also Vinnova’s retention of the project selection task within the management of the SIPs)⁹. The Commission monitors the JPIs closely and would appear to be disappointed as they have attracted limited participation and have not extended much beyond the topics that were already of national interest to the participating states.

⁶ Hicks, D. (2016). Grand Challenges in US science policy attempt policy innovation. *Int. J. Foresight and Innovation Policy*, 11(1/2/3), 22–42.

⁷ Georghiou, L. (2008). Georghiou, L. (2008). Europe’s research system must change, 935–6. *Nature* (452(7190)), 935–6.

⁸ OECD. (2015). *System Innovation: Synthesis Report*. Paris: OECD.

⁹ The Swedish Government has tasked Vinnova, the Swedish Energy Agency and Formas to fund SIPs.

4 Case study 1: United Kingdom, Prime Minister's 2020 Challenge on Dementia

4.1 Description of the challenge-driven research programme

The term “dementia” describes a set of symptoms that include loss of concentration and memory problems, mood and behaviour changes and problems with communicating and reasoning. It is a condition which worsens progressively and does not have a cure at present. Importantly, dementia can greatly affect an individual’s quality of life and they may require care and support from their family, the healthcare system and society at large. As the world’s population ages, the number of people with dementia is expected to grow worldwide with care costs predicted to be around \$2 trillion by 2030¹⁰, making dementia one of the biggest global health and social care challenges of our time.

The UK also faces this challenge. Thus, in 2012 the UK’s (then) Prime Minister, David Cameron, launched a national challenge to fight dementia – the original Prime Minister’s Challenge on Dementia¹¹. This programme of action attempted to address the societal challenge of dementia holistically by delivering sustained improvements in health and care, creating dementia-friendly communities and boosting dementia research. In 2015, the challenge was renewed until 2020 to take the progress made to the next level. The programme is run under the aegis of the UK Government’s Department of Health. However, as health is a devolved issue within the UK, meaning England, Scotland, Wales and Northern Ireland each govern their own health system, the Challenge only applies to England.

The Prime Minister’s 2020 Challenge on Dementia has two main goals¹²:

- to make England the best country in the world for dementia care and support and for people suffering from dementia, their carers and families by 2020;
- to make England the best place in the world to undertake research into dementia and other neurodegenerative diseases by 2020.

In this case study, we will concentrate mainly on the research arm of the programme for which the UK Government has committed a budget of £300 million until 2020.

4.2 The programme’s process and associated research agendas

The programme has adopted a partnership approach, combining both top-down and bottom-up approaches that involve close collaboration between the key players and stakeholders in the field of dementia care and research. Key organisations from the public and voluntary/charity sector are the Department of Health, National Health Service (NHS), Medical Research Council (MRC), National Institute for Health Research, Alzheimer’s Society and Alzheimer’s Research UK (ARUK)¹³. In addition, local government, industry and businesses, community groups, as well as people suffering from dementia, their

¹⁰ World Health Organization (2017) Infographic on dementia. Available at:

http://www.who.int/mental_health/neurology/dementia/infographic_dementia.pdf?ua=1

¹¹ UK Department of Health (2015) Prime Minister’s Challenge on Dementia 2020. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414344/pm-dementia2020.pdf

¹² Ibid.

¹³ UK Department of Health (2016) Prime Minister’s Challenge on Dementia 2020 – Implementation Plan.

Available at: <https://www.gov.uk/government/publications/challenge-on-dementia-2020-implementation-plan>

families and carers are also integrally involved with the programme. Thus, the support portfolio ranges from local to international initiatives covering areas from research to frontline care (see Table 1).

Table 1 Activities supported by the Prime Minister's Challenge on Dementia

Domain of activity	Areas of focus (2012–15)	Areas of focus (2015–20)
Improving health and care	Greater awareness of risk management and reduction Improved diagnosis rates Greater identification and referral of dementia in hospitals More targeted inspection of dementia care in hospitals A more aware, educated and trained NHS and social care workforce Supporting better provision of post-diagnosis support Greater support for provision of integrated care Improving care and support through the National Dementia Action Alliance Investment in dementia-friendly hospitals and care homes Greater support for carers	Greater awareness and understanding of risk management and reduction Improving diagnosis Improving support after diagnosis Better and more support for carers Greater provision of high-quality dementia care at home All hospitals and care homes to meet the criteria of a dementia-friendly health and care setting Reducing the inappropriate prescribing of antipsychotic medication Improving the availability of high-quality end of life care and planning Appropriate dementia-related education, training and support for the health and care workforce
Dementia-Friendly Communities	Creation of a more dementia-friendly society (Dementia Friends programme) More dementia-friendly communities Building a dementia-friendly generation Actions by businesses and industry	Delivering more Dementia Friends and transforming Dementia Friends into a global movement More people living in Dementia-Friendly Communities Businesses encouraged and supported to become Dementia Friendly Creating Local Dementia Alliances with local government and voluntary/civil society organisations Increasing Dementia Awareness in primary, secondary, further and higher education establishments

Domain of activity	Areas of focus (2012–15)	Areas of focus (2015–20)
Better Research	<p>World-leading, major programmes of research and significant investment in infrastructure</p> <p>Being a key player in the EU Joint Programme – Neurodegenerative Disease Research</p> <p>Increasing the role of the charity sector in galvanising public awareness and support (including funding) for dementia research</p> <p>Expansion of the dementia research workforce</p> <p>Greater participation of people suffering from dementia in research</p> <p>Increased research in care homes</p>	<p>Making the UK the best place for Dementia Research</p> <p>Funding for dementia research to be doubled by 2025</p> <p>Building new research infrastructure to support and catalyse research, thus creating critical mass to attract further investment, e.g. an international dementia institute in England</p> <p>Training new researchers and developing capacity across the spectrum of disciplines that need to be engaged</p> <p>Increased investment in dementia research from industry, supported by new partnerships between universities, research charities, the NHS and the private sector</p> <p>Cures or disease-modifying therapies to exist by 2025</p> <p>More research to inform effective service models</p> <p>Open access to all public-funded research publications</p> <p>Increased numbers of people suffering from dementia participating in research</p>
Global action against dementia	<p>Leading international collaboration across the world</p> <p>Accelerating progress on dementia research and the development of possible drugs</p> <p>Collaboration with regulators globally</p> <p>Establishing the first World Dementia Envoy and World Dementia Council; also launching the first Global Alzheimer's and Dementia Action Alliance</p> <p>Bolstering the human rights of those living with dementia</p> <p>Developing international standards of care for dementia</p>	<p>Expansion of the global dementia research agenda with increased collaboration, filling research gaps identified in World Health Organization (WHO) and the Organisation for Economic Co-operation and Development (OECD) research analysis</p>

Source: Desk research, Technopolis

Although an intervention logic model is not available for this programme, the documentation regarding the programme (from the UK government) articulates clear needs and objectives, the resources (inputs) that will be utilised in delivering the programme, its activities (see Table 1), expected outputs and outcomes. In addition, the rationale and connections from the objectives to the end result are also logical and explicit. Thus, the programme has a clear intervention logic.

4.3 The programme's form and accompanying agenda

Funding

Funding for dementia research under the Prime Minister's 2020 Challenge is procured from multiple funders including the UK government, pharmaceutical companies and charities such as the Alzheimer's Society and ARUK.

Between 2012 and 2015, government funding for this research doubled to over £60 million a year¹⁴. The government has committed to a further £300 million by 2020. Among the charities, ARUK will invest £80 million between 2014 and 2019, while the Alzheimer's Society has committed to spending at least £10 million each year on research. A number of non-dementia charities with an overlapping remit, such as The Stroke Association, British Heart Foundation, Parkinson's UK and the Motor Neurone Disease Association, will contribute financially.

The mechanism for distributing this funding is via individual research initiatives aimed at increasing dementia research activity, research capacity and the involvement of people suffering from dementia in research. This approach allows individual funders to co-fund initiatives in accordance with their own specific funding remits and research interests. This includes the Dementia Discovery Fund (DDF), a venture capital fund that aims to boost investment in dementia by bringing together investors from public, private and philanthropic sectors to identify and invest in early-stage drug development projects. By March 2016, over \$100 million had been committed to the fund.

Other research initiatives include a new Dementia Research Institute (DRI) and DPUK, which the government is funding through the Medical Research Council (£150 million and £53 million, respectively)¹⁵. The Alzheimer's Society and Alzheimer's Research UK also co-fund the DRI (£50 million each). The DRI places the UK at the centre of a global effort to tackle dementia, accelerating the pace of research and developing much needed new treatments, while DPUK brings together 38 of the UK's existing population studies on dementia, creating the world's largest study group for use in dementia research.

It is envisaged that this targeted investment for research-capacity building and infrastructure through the Prime Minister's Challenge will lead to increased research funding through more general, (i.e. non-targeted), response-mode mechanisms and public-private investment, creating a virtuous circle of research growth. Ultimately, this growth is expected to lead to the doubling of dementia research funding by 2025 and result in England becoming the best place in the world to conduct dementia research.

The DPUK Oversight Board evaluates the performance of the executive team based on an agreed set of deliverables. However, flexibility is also built in so that work packages that are no longer feasible, productive or necessary can be dropped after discussion with the Oversight Board¹⁶.

¹⁴ UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan.

Available at: <https://www.gov.uk/government/publications/challenge-on-dementia-2020-implementation-plan>

¹⁵ UK Dementia Research Institute website. Our funders. Available at: <https://ukdri.ac.uk/about-us/our-funders>

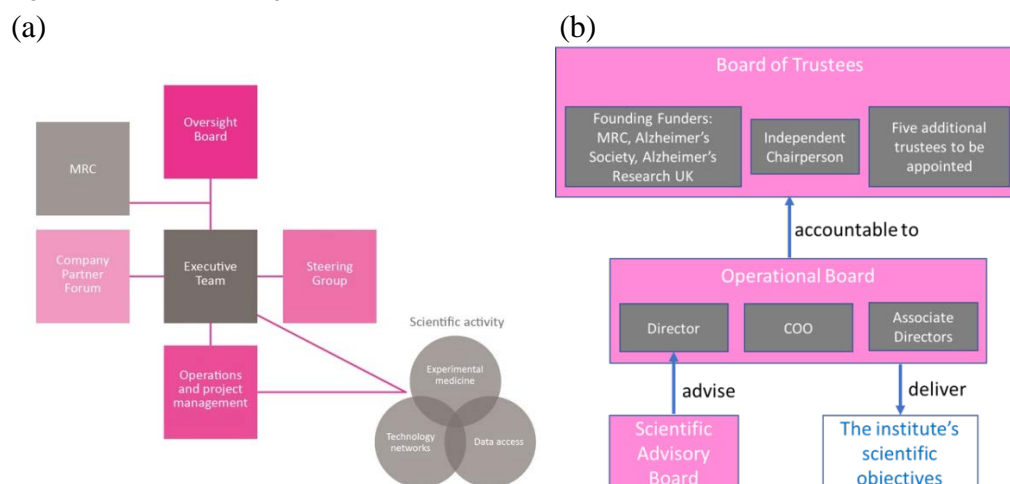
¹⁶ Interview

Governance

The delivery of the 2020 Challenge is overseen by a Dementia Programme Board¹⁷, chaired by the Parliamentary Under Secretary of State for Public Health, and comprising senior leaders from many of the partner organisations involved in the 2020 Challenge. The Board is responsible for holding the delivery partners to account and will be supported in its work by a Dementia 2020 Citizens' Panel that will provide first-hand reports on how dementia care and support is being delivered. In addition, an internal Progress Review Group continually monitors key performance indicators against the commitments made in the 2020 Challenge and reports to the Programme Board.

Major individual initiatives have their own governance structures with executive teams accountable to Trustee Groups or Oversight Boards. The governance structures of the DPUK and DRI are shown in the figure below.

Figure 1 Governance arrangements for Dementias Platform UK (a) and the Dementia Research Institute (b)



Source: Dementias Platform UK website; Technopolis desk research

Collaboration

Collaboration is key to delivering the commitments of the Prime Minister's Challenge, particularly in research. Initiatives such as DPUK¹⁸, DRI, the NIHR Dementia Translational Research Collaboration¹⁹, the EU's Innovative Medicines Initiative (IMI)²⁰ and the Dementia Consortium²¹ provide collaborative models for research into new drugs, particularly through co-investment from public, private and philanthropic funders.

DPUK and its data portal aim to give researchers access to information across several existing cohorts and, through its networks, aims to support large, multicentre research

¹⁷ UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan. Available at: <https://www.gov.uk/government/publications/challenge-on-dementia-2020-implementation-plan>

¹⁸ Dementias Platform UK website. Available at: <https://www.dementiasplatform.uk/about/overview>

¹⁹ NIHR website. Available at: <https://www.nihr.ac.uk/life-sciences-industry/access-to-expertise-and-collaborations/collaborations-for-early-phase-translational-research/work-with-experts-in-dementia-nihr-dementia-translational-research-collaboration.htm>

²⁰ Innovative Medicines Initiative website. Available at: <http://www.imi.europa.eu>

²¹ Dementia Consortium website. Available at: <http://www.dementiaconsortium.org>

studies, thus facilitating collaboration²². Once functional, the new DRI will promote collaborative working, both across the institute and by plugging into dementia initiatives across the UK and beyond²³.

Other arms of the programme also involve collaboration. For instance, the Department of Health, NHS England and Public Health England are collaborating with local government, businesses and charity groups (e.g. the Alzheimer's Society and Age UK) to deliver improvements to health and care, to increase awareness of dementia and to make more communities dementia friendly²⁴.

4.4 Implementation and monitoring

The programme follows a detailed implementation plan and roadmap developed under the leadership of the Dementia Policy Team at the Department of Health^{25,26}. These set out what actions are to be taken to ensure the 50 commitments set out in the Prime Minister's Challenge are delivered, when they will be initiated and what the success parameters will be. The implementation plan was developed in partnership with the key organisations delivering the programme and was influenced by the views of people suffering from dementia and their carers. Additionally, the Advisory Group on Dementia Research, comprising dementia research experts and research funders from charity, government, research councils and industry, gave recommendations on how to best achieve the aspirations for research of the Prime Minister's 2020 Dementia Challenge. The implementation plan has been agreed by each delivery partner and signed off by the Dementia Programme Board and Ministers.

The implementation plan and roadmap ensure coherent and sustainable routes to deliver benefits for people suffering from dementia, their carers and the wider community. To ensure that partners do not unnecessarily constrain themselves with concrete plans for the full five years of the programme without an opportunity to modify them, the implementation plan and roadmap have been built around two phases of delivery – up to 2018 and from 2018 to 2020. This permits efficient prioritisation of actions and sets out the milestones that the delivery partners will be held accountable to by the Dementia Programme Board. A full evaluation of the programme will be conducted in 2018 to understand the progress to date and reorient the action for the second phase, if necessary.²⁷

Each commitment under the Prime Minister's Challenge is delivered by a lead organisation or group of organisations in collaboration with relevant stakeholders and partners, using their own funding mechanisms. For example, the Dementias Platform UK (DPUK)

²² Dementias Platform UK website. Dementias Platform UK launches unparalleled resource for dementia research. Available at: <https://www.dementiasplatform.uk/news/dementias-platform-uk-launches-unparalleled-resource-for-dementia-research>

²³ UK Dementia Research Institute website. Our vision. Available at: <https://ukdri.ac.uk/vision>

²⁴ UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan Annex 2: Roadmaps to 2020 Delivery. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/507982/PM_Dementia_Annex_2_acc.pdf

²⁵ Ibid.

²⁶ UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan Annex 2: Roadmaps to 2020 Delivery. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/507982/PM_Dementia_Annex_2_acc.pdf

²⁷ UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan. Available at: <https://www.gov.uk/government/publications/challenge-on-dementia-2020-implementation-plan>

facilitates research by funding research projects directly, providing seedcorn funding for researchers to produce strategic research proposals to attract more funding and through in-kind support²⁸. Applications for funding or support are competitive and are subject to peer review, often following a call for proposals. Conversely, the DRI is recruiting professors and research fellows to establish their own research programmes with DRI funding support with a view to increasing international competitiveness, collaboration and interdisciplinarity in dementia research²⁹.

4.5 Conclusions and lessons learned

The Prime Minister's 2020 Challenge on Dementia is currently the only nationwide programme globally that addresses the societal challenge of dementia in such a comprehensive and targeted way. It therefore has the potential to be used as a template for other programmes that aim to address a societal challenge from all the relevant aspects and include all the relevant stakeholders.

Based on a document review, this appears to be a very transformative programme, not only for the health and care and research organisations involved, but also for communities and for society at large. Thus, the underlying approach to achieving the objectives (as interpreted from desk research and interviews) has been to facilitate joint working between multiple organisations, from government departments and arm's-length bodies, to the NHS and local authorities, research institutions, and the charity and voluntary sector. This has resulted in a complex programme that works on multiple levels with many disparate partners, each with their own individual organisational visions and missions. Thus, although the underlying aims are shared, the implementation is complex. Nevertheless, the broad goals of improving care and support for people suffering from dementia and increasing the quantity and quality of research that might improve such care and support have provided a shared focus for action. The societal challenge presented by dementia and the ambition to address it is a major driver. The same can be said about programmes that address other societal challenges such as antimicrobial resistance³⁰, global food security³¹ and clean energy³².

In our opinion, involving the relevant stakeholders (i.e. government, research councils, charities, industry, research experts and people suffering from dementia and their carers) in designing the Challenge programme and its implementation plan, through structures such as the programme and advisory boards, has made the programme's aims more feasible and achievable. Moreover, it has also allowed individual partners/stakeholder groups to contribute to their strengths, e.g. dementia charities leading on the public awareness task. Milestones have been decided on the basis that some actions will lay the foundations for others, some can and will need to be completed relatively swiftly, while others will be ongoing for years. Thus, a great deal of thought has been put into what must be done to achieve the desired outcomes and impact in the short, medium and long term, and what

²⁸ Interview

²⁹ UK Dementia Research Institute website. Join us. Available at: <https://www.ucl.ac.uk/uk-dementia-research-institute/join-us>

³⁰ Medical Research Council website. Antimicrobial resistance. Available at: <https://www.mrc.ac.uk/research/initiatives/antimicrobial-resistance/>

³¹ Research Councils UK website. Global Food Security. Available at: <http://www.rcuk.ac.uk/research/xrcprogrammes/FoodSecurity/>

³² Research Councils UK website. Why energy research matters. Available at: <http://www.rcuk.ac.uk/research/xrcprogrammes/energy/energymatter/>

success will look like at each stage. This approach could be adopted by challenge-led research programmes elsewhere.

Our analysis indicates that the strengths of the research arm of the Prime Minister's Challenge on Dementia lie in the fact that the UK is building on its existing research strengths in biomedical science and cohort studies to coalesce research capacity in the field of dementia. The funding could act as an incentive for increasing research capacity and activity in dementia research. Plus, targeted investment in translational research and big data infrastructure, as well as multicentre and interdisciplinary collaborations (e.g. DRI, but also internationally), could be an incentive for exchanging ideas and knowledge across academia, industry, research funders and people suffering from dementia, as well as developing new drugs and solutions for dementia. Moreover, infrastructural investments such as DPUK and DRI might help to simplify and standardise experimental research and data analysis as well as create economies of scale, making it easier to conduct better research more efficiently and to address gaps in research activity and expertise.

It must be noted, however, that the impact of the research arm of the Prime Minister's Challenge is still quite distant. While new infrastructure has been put in place and collaboration and research in new directions are being facilitated, the ultimate goal of making England the best place to conduct dementia research and create new life-changing drugs, treatments and care solutions for people suffering from dementia is still to be realised. This is a major drawback insofar as targets regarding investment, development of new infrastructure, and increased research activity and capacity are likely to be met based on the current level of progress, whereas the long-term goals are somewhat removed from these targets.

Ultimately, the Prime Minister's Challenge stands as a "provocation for research" according to Professor John Gallacher, Director of DPUK. The Department of Health, which hosts the Prime Minister's Challenge, does not have direct control over the DPUK and other research initiatives. This permits a scientific freedom that has encouraged creativity and productivity³³. Nonetheless, accountability is present through independent trustee boards or oversight committees that assess the performance of the initiative against an agreed list of deliverables. In the case of DPUK, work packages have been modified or removed as certain activities were no longer productive or necessary³⁴. This was conducted with the agreement of the Oversight Board. Thus, independent governance structures that allow a degree of flexibility in the implementation of a programme in response to emerging and changing contexts might enable more efficiency, efficacy and coherence of initiatives.

³³ Interview

³⁴ Interview

Professor Gallacher felt that the following general lessons based on his experience of the Prime Minister's 2020 Dementia Challenge might be useful for other countries or programmes:

1. Be inclusive and build trust with all contributors including partners and stakeholders, and the general public, where relevant.
2. Shape the programme/initiative – The boundaries should be clear and people should know what they are working for, i.e. have a common mission and defined measures of success. Even if a flexible approach is adopted, any changes should be in a consistent direction.
3. An initial stimulus to create critical mass (where necessary) or get people working together is necessary.
4. Play to your strengths – It is important to know what strengths lie in your own national system and what unique opportunities they offer.
5. Never copy someone else – Reproducing an existing programme in another country could be counterproductive. It is important to know the needs and context in your own environment and build ways of addressing those. You can learn from the experience in other contexts but the implementation has to be appropriate for the context in question.

5 Case study 2: Denmark, Innovation Fund Denmark's Grand Solutions

5.1 Description of the challenge-driven research programme

Innovation Fund Denmark (IFD) first launched the Grand Solutions programme in 2015, initially under the name “Large-scale projects”. The scheme invests in collaborative projects and partnerships at different stages across the value chain with the aim of increasing growth, creating jobs and addressing societal challenges.

The programme has a broad scope, covering research-based innovation within a wide range of subject areas. This includes a number of thematic priorities as well as an open call for proposals as described in Figure 2 below. In addition to traditional grand challenges, Grand Solutions also invests in “opportunity-driven” research in emerging fields such as quantum technology.

The budget for Grand Solutions varies each year but has been approximately DKK 600 million in the last two years, around one third of the fund’s overall budget. From the outset, the decision was taken to invest in fewer large-scale projects rather than numerous smaller projects.³⁵ IFD typically invests DKK 5–30 million per project,³⁶ although at least 7 projects selected in 2016 were granted in excess of DKK 30 million.³⁷

IDF investments typically run for 3–5 years and are expected to achieve results within a time frame of 2–10 years.³⁸

Figure 2 Grand Solutions - thematic priorities and budget

2016 budget (million DKK) ³⁹		2017 budget (million DKK) ⁴⁰	
Energy	70	Energy	103
Future welfare	21	Welfare and Education	29
Foods and resource-efficient biological production	188	Bio-resources and relationships between food, health and lifestyle	130
Environmental technology	25	Environmental technology	25
Psychiatry	30	-	-
Strategic growth technologies	70	Strategic growth technologies	120
Health and clinical research	80	Health and clinical research	75
Transport and infrastructure	20	Space technology and drone research	25
Tourism	10	Innovation in the area of knowledge work	10
Open call	80	Open call	130
Total budget	594	Total budget	647

³⁵ Aagaard, K. (2013), Ny dansk innovationsfond, *Forskningspolitik*, (4), 22–23.

³⁶ IFD (2017c), *Guidelines for Grand Solutions 2017*, available at: https://innovationsfonden.dk/sites/default/files/guidelines_for_grand_solutions_2017_-_uk_final_version.pdf [Accessed 25 August 2017]

³⁷ <https://innovationsfonden.dk/da/projekter> [accessed 25 July 2017]

³⁸ These are typical time frames but individual cases may deviate. Grand Solutions guidelines indicate a project duration of 2–5 years and a time frame for commercial impact of up to 15 years.

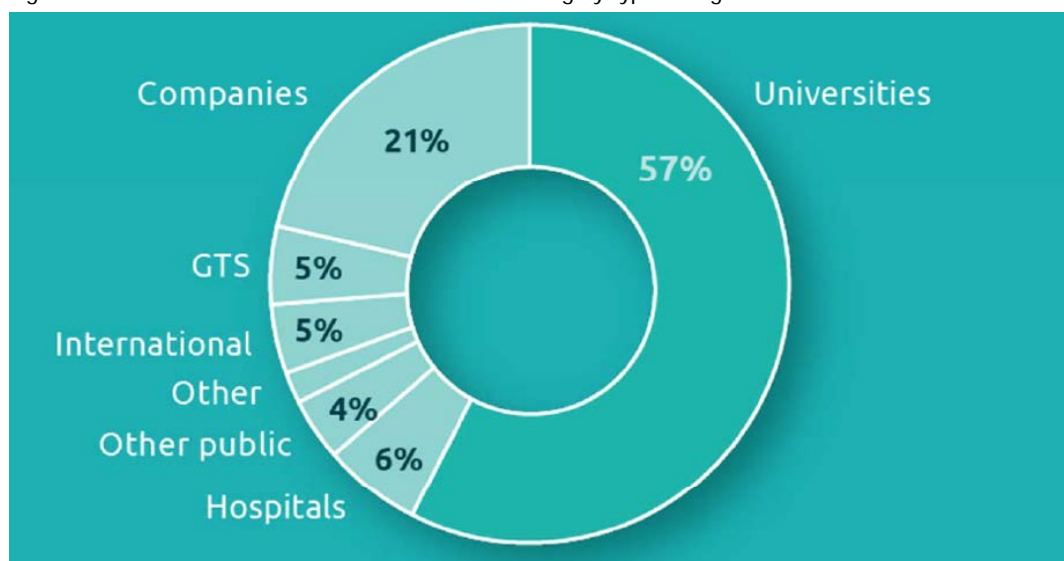
³⁹ IDF (2016b) *Guidelines Grand Solutions Phase 1 2016*, available at https://innovationsfonden.dk/sites/default/files/guidelines_for_grand_solutions_phase_1_2016.pdf [Accessed 25 August 2017]

⁴⁰ *Guidelines for Grand Solutions 2017*, Op Cit.

5.2 The programme's process and associated research agendas

Any legal entity that is involved in project activities is eligible for funding under the scheme.⁴¹ This can include universities, GTS institutes (i.e. RTOs),⁴² public and private companies as well as government organisations. Organisations from abroad can participate in projects and receive funding on equal terms with Danish project participants, although the lead applicant has to be Danish. The composition and roles within consortium tend to differ depending on the nature of the project, with universities often taking a leading role in research-based projects and businesses leading projects further towards the applied end of the value chain.

Figure 3 Grand Solutions 2016: allocation of IFD funding by type of organisation



Source: IFD (2017) *Bringing Denmark to the next level! – presentation, Spring 2017*

In a formal sense, the Grand Solutions agenda is mostly set top-down. The thematic areas (see Figure 2 above) are selected politically and funds are allocated through the annual Finance Act.⁴³ These decisions are, however, embedded in a broader bottom-up consultation process. Thus, the research themes in the Act are selected with reference to a “catalogue” of research priorities, most recently “RESEARCH2025”,⁴⁴ compiled by the research ministry on the basis of consultations with businesses, the research community and other stakeholders. In addition to the thematic challenges, a smaller part of the programme – approximately 20% of the funding available in 2016 – has been allocated bottom-up through an “open call” for proposals. This call is open for proposals in any area that fits the programme’s strategy and guidelines.

Once the political decision has been taken each year, IFD can publish call specifications and implement the programme. However, IFD has also developed a series of multi-annual “investment strategies” which serve to create some continuity in recurring thematic priority

⁴¹ *Guidelines for Grand Solutions 2017*, Op Cit., p. 6

⁴² <https://en.gts-net.dk/gts-institutes/> [Accessed 10 October 2017]

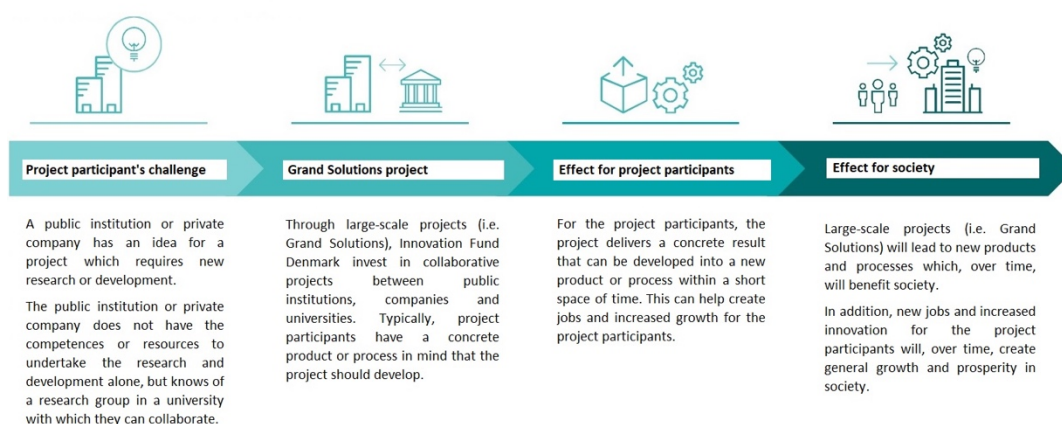
⁴³ http://www.thedanishparliament.dk/About_the_Danish_Parliament/Tasks/The_Finance_Bill.aspx [Accessed 10 October].

⁴⁴ FIVU (2017), *FORSK2025 – fremtidens løfterige forskningsområder*, juni 2017, Copenhagen: Ministry for Higher Education and Science, available at: <https://ufm.dk/en/research-and-innovation/political-priority-areas/research2025> [accessed 10 October 2017]

areas such as Energy, ICT, Environment and Health.⁴⁵ In this way, the fund is, to some extent, able to shape the interpretation and implementation of the political decisions handed down to them.

The programme's intervention logic was clearly articulated from the outset as shown in Figure 4 below. It is expected that investments in Grand Solutions will be utilised to address concrete challenges facing companies or public institutions through collaborative projects. Results, such as the development of a new process or products, are expected to deliver benefits to the project participants within a time frame of 2–10 years, depending on their position in the innovation value chain. In turn, this is expected to contribute to productivity growth and jobs in the wider economy.⁴⁶

Figure 4 Intervention logic for Grant Solutions



Source: Translated and adapted from IFD (2015), *Vækst og beskæftigelse gennem Innovationsfonden*. Copenhagen: Innovation Fund Denmark, p. 22

5.3 The programme's form and accompanying agenda

Innovation Fund Denmark was created in 2014 on the basis of a fund structure. IFD reports to the Ministry for Education and Research but functions at arm's length from government. The fund no longer has external programme committees but is led by a Board of Directors, composed of nine politically-appointed members with research and industry expertise.⁴⁷ Unlike the Fund's other schemes in which decisions are often delegated, the final decision concerning investments in Grand Solutions is taken directly by the Board following external peer review and interviews.

This "fund structure" was adopted with the aim of ensuring a more simple, transparent and flexible programming process.⁴⁸ This model obviously leaves less room for direct "bottom-up" influence on grant decisions. Rather than owning the process as in the "council" model, researchers are referred to as "clients". In this sense, it could be said that grant decisions are more "top-down" than previously.⁴⁹ However, the new model also involved

⁴⁵ Available in Danish: <https://innovationsfonden.dk/da/publikationer> [accessed 20 November 2017]

⁴⁶ See also *Guidelines for Grand Solutions 2017*, Op Cit., p. 28.

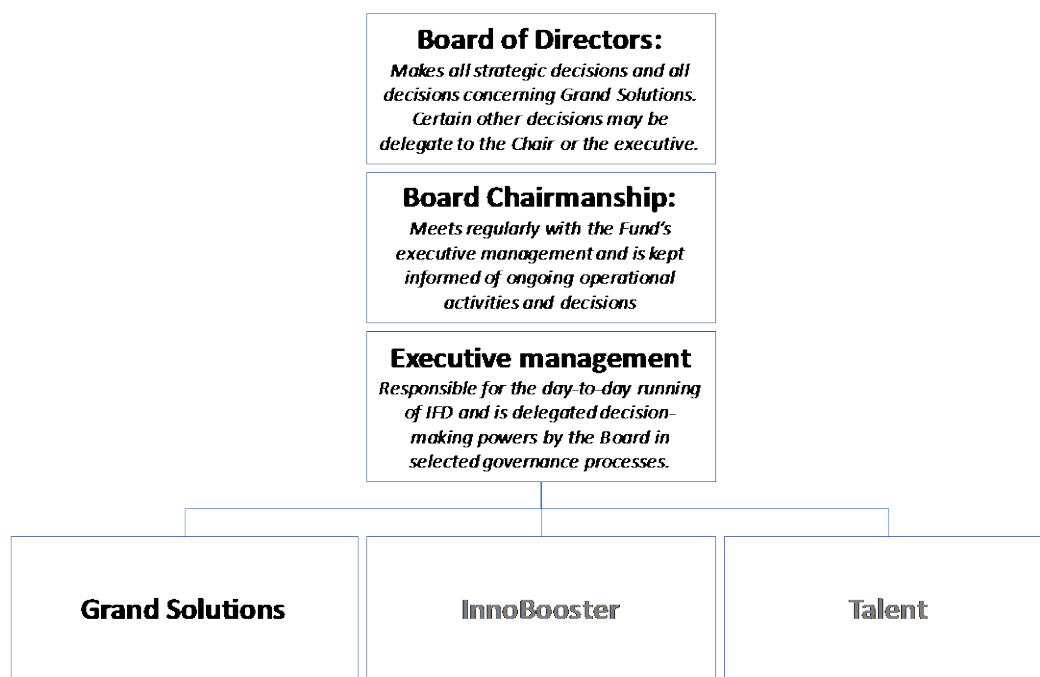
⁴⁷ <https://innovationsfonden.dk/en/board-of-directors> [Accessed 10 October 2017].

⁴⁸ Statement by the Ministry for Education and Research, 28. January 2015: http://www.folketingstidende.dk/RIPdf/samling/20141/aktstykke/aktstk89/20141_Aktstk_anmeldt89.pdf [Accessed 20 November 2017]

⁴⁹ Alternative models have been discussed in the literature, e.g. Braun (1993), "Who Governs Intermediary Agencies? Principal-Agent Relations in Research Policy-Making, *Journal of Public Policy*, Vol. 13, No. 2.

the introduction of “scientific officers” within the funding organisation. According to the Innovation Fund, this has greatly improved its ability to enter into active dialogue with research communities.

Figure 5 Innovation Fund Denmark, Governance structure



Source: Adapted and updated from: *Innovation Fund Denmark 2015 Strategy*, Copenhagen: Innovation Fund Denmark, p. 20.

The programme funds activities ranging from research, development, Proof-of-Concept and demonstration, reflecting the generally broad scope of the programme. Funding is also available for travel, dissemination, PhD candidates – although only for the time they spend on the project – and, to a limited extent, for essential research infrastructure. Thus, the “Grand Solutions” instrument is designed to be flexible enough to accommodate a variety of different project requirements, but applicants are required to state clearly where the project is positioned in the innovation value chain as this will have implications for the composition of the project consortium, the types of activities undertaken and the expected results⁵⁰.

Collaboration is a central aspect of the programme and IFD insists that each project adopts professional project management and a governance structure that reflects the aims and challenges of the project.⁵¹ Among other things, project consortia are required to prepare a collaboration agreement before the investment agreement is signed⁵² and IFD prescribes the frequency of meetings during the course of the project. Project participants can be grouped in two categories: “Project partners” and “project contributors”. Both have the same rights and obligations vis-à-vis IFD but the former is represented on the project

⁵⁰ See also *Guidelines for Grand Solutions 2017*, Op Cit., pp. 9–13, 28.

⁵¹ IFD website: *FAQ - Grand Solutions*, available at: <https://innovationsfonden.dk/da/faq> [Accessed 10 October]

⁵² See also *Guidelines for Grand Solutions 2017*, Op Cit., p. 9.

steering committee and participates in the appointment of the project manager, whereas the latter does not.⁵³ In addition, IFD encourages a clear separation between strategic leadership (i.e. the steering committee) and operational management led by the project manager.⁵⁴

5.4 Implementation and monitoring

The Grand Solutions programme has been running since 2015, with several hundred projects already completed or in progress.⁵⁵

At the operational level, the programme is implemented by IFD staff with extensive knowledge and experience of the main sectors and fields of research covered by the fund. This differs from the previous “council” model of organisation in which its main function was to provide administrative support for external programme committees. The expertise within the organisation has allowed IFD to engage more actively in dialogue with business organisations, universities and research institutes about the fund’s strategies and aims.

Applications are assessed according to three main criteria: (scientific) quality, value creation, and efficiency and implementation. A new single-phase process has been adopted for the 2017 call as shown in Figure 6. Following submission, IFD’s internal scientific officers perform an initial screening and select around 1 in 3 of the proposals which are sent for external peer review. In turn, top-ranked applicants are invited to interviews before the Board makes the final funding decisions.⁵⁶ The success rate for the Grand Solutions scheme currently stands at around 10%.

During the initial years of implementation, Grand Solutions projects started 13–18 months after the allocation of funding in the Finance Act. With the new rules, the IFD aims to provide a response to applicants within 100 days of the application deadline and to reduce the overall period from the Finance Act to project start to around 8 months.⁵⁷

Figure 6 Timeline for the application process for Grand Solutions thematic priorities 2017



Source: *Guidelines for Grand Solutions 2017, Op Cit., p. 6*

⁵³ Ibid, p. 16.

⁵⁴ *FAQ - Grand Solutions, Op. Cit.*

⁵⁵ Examples of Grand Solutions projects can be found in the IFD online Project Gallery. About one in three of the Fund’s projects are currently featured here:

[https://innovationsfonden.dk/en/projects?f\[0\]=field_investment_category%3A3&%23=facetapi-facet-search-api/projects-index-block-field-case-start-year](https://innovationsfonden.dk/en/projects?f[0]=field_investment_category%3A3&%23=facetapi-facet-search-api/projects-index-block-field-case-start-year) [Accessed 10 October 2017]f

⁵⁶ IFD. (2017b). Funding excellence in innovation - Innovation Fund Denmark’s Peer Assessment Guidelines for Grand Solutions 2017. Copenhagen: Innovation Fund Denmark, p. 5.

⁵⁷ IFD (2017e) *Årsrapport 2016*, p. 7, available at: https://innovationsfonden.dk/sites/default/files/aarsrapport_2016_final.pdf [Accessed 10 October 2017]

IFD has a proactive approach to project follow-up and portfolio management. The fund participates in Grand Solutions projects through its “investment managers” and requires projects to undergo Annual Investment Reviews, in which the progress and value creation achieved by individual projects are reviewed.⁵⁸ Depending on the outcome of the review, IFD may decide to terminate projects which fail to achieve the expected results or award up to 10% additional funding to pursue particularly promising opportunities. The fund also reserves the right to collect further information about project results and effects for up to five years after the end of the project.⁵⁹

IFD has described its approach to evaluating the effect of projects in 2016⁶⁰ and defined three specific targets for its portfolio (including Grand Solutions):⁶¹

- The majority of projects (minimum 6 out of 10) co-financed by IFD should lead to success – defined as an innovation, a new company or derived project with a focus on innovation.
- A large majority of companies (minimum 8 out of 10) in projects co-funded by IFD should find it attractive to collaborate with universities and other public research institutions.
- On average, five articles should be published in the best (top 1%) journals for every DKK 100 million invested by the fund.

These headline targets are set on the basis of an analysis of the portfolio of the fund’s predecessor organisations and will be monitored on an ongoing basis over several years alongside more qualitative aims. The fund’s aim to contribute to solutions for societal challenges is also addressed more specifically through illustrative case studies.

At the project level, the targets depend on the specific circumstances but will include short-term outputs (e.g. publications) and longer-term effects captured through ongoing monitoring. (see note 60). A recent mid-term evaluation of the project “MADE”, supported with DKK 64 million under the Grand Solutions scheme, uses a set of indicators including PhD education, scientific output (peer-reviewed articles), innovations, savings and increased revenue in companies, and increased participation in MADE and other programmes from companies not previously involved. The potential benefit of the project to the Danish economy is estimated to be around DKK 8.4 billion, assuming a dissemination of knowledge and technology to Danish manufacturing firms beyond the project participants is achieved.⁶²

A full evaluation of the Grand Solutions scheme is scheduled for 2018 but based on its experience thus far, IFD highlights the following strengths and weaknesses: The main strengths of the programme are the close collaboration between the companies and universities it enables and the focus on creating value and solutions for society. It emphasises the need for workable solutions that can be implemented and that have an impact.

⁵⁸ For a template for the Annual Investment Review presentation, see: https://innovationsfonden.dk/sites/default/files/annual_investment_review_presentation_skabelon.pptx [Accessed 10 October]

⁵⁹ *Guidelines for Grand Solutions 2017*, Op Cit., p. 16. and *Bringing Denmark to the next level*, Op Cit., p. 23

⁶⁰ IFD (2016a), *Effektmåling af Innovationsfondens projekter*, juni 2016, available at: https://innovationsfond.dk/sites/default/files/publikation_innovationsfondens_effektmaling.pdf [Accessed 25 September 2017].

⁶¹ IFD (2016c) *Innovationsfondens effektmål*, juni 2016. Available at: https://innovationsfonden.dk/sites/default/files/innovationsfondens_effektmaal_juni_2016.pdf [Accessed 25 September 2017].

⁶² IFD (2017f) *Midvejsvaluering af MADE – Manufacturing Academy of Denmark*, Innovationsfonden, October 2017, available at: <https://innovationsfonden.dk/sites/default/files/made-finaluskmr.pdf> [Accessed 20 November 2017]

A weakness could be that some projects lose focus and are unable to achieve effective collaboration between the partners. The Grand Solutions scheme invests in relatively large and complex projects (see above) and when projects struggle, it is usually related to problems with collaboration, project management and governance. The Innovation Fund addresses this potential weakness through a strong focus on good governance and project management as part of its active follow-up of the investments described above.

IFD would also like to see more international participation in the funded projects and encourages project applicants to adopt a more international outlook and seek expertise abroad that may not be available domestically.

5.5 Conclusions and lessons learned

Conversations with the Innovation Fund revealed three main drivers for successful implementation of the Grand Solutions programme. The most important factor is close and genuine collaboration between partners regarding joint goals and visions. In addition, successful projects are often driven by strong and visionary individuals. Finally, an international outlook can be a driver behind successful projects. The most significant obstacles to a successful implementation of Grand Solutions projects largely mirror the drivers. This includes unprofessional or poor project management, poor collaboration between partners and a narrow national focus.

The Innovation Fund considers the Grand Solutions scheme to be unique in a Danish context as it is the only programme that builds an effective bridge between universities and (private or public) companies. The other main public funding body, the Independent Research Fund Denmark,⁶³ primarily supports investigator-driven research carried out at universities.

The Grand Solutions programme contains several features described above that should be of interest to an international audience:

- Close collaboration with research communities and stakeholders
- The fund's close involvement in funded projects and monitoring of progress
- Explicit focus on value creation
- Streamlined, single stage application procedure with decisions within 100 days

The role of public-sector organisations, reflecting the role of the public sector in the Danish economy more generally, is also noteworthy. The involvement of public authorities is often crucial to ensuring regulatory framework conditions that allow new solutions to be adopted in society. In other cases, new solutions will be directly implemented by public-sector organisations, e.g. hospitals, and the participation required from them to facilitate this.

Innovation Fund Denmark would welcome any invitations or visits from its colleagues in Sweden to discuss these issues in more detail.

⁶³ Formerly, Danish Council for Independent Research. A new law governing the fund entered into force in July 2017 (<http://www.ft.dk/samling/20161/lovforslag/1118/index.htm>) [Accessed 25 August 2017]

6 Case study 3: Strategic Research Programme on A Climate-Neutral and Resource-Scarce Finland

6.1 Description of the challenge-driven research programme

The Strategic Research Council (SRC) is the actor responsible for the administration and funding of strategic research⁶⁴ in Finland. It was established in 2015 and acts in connection with the Academy of Finland⁶⁵.⁶⁶ Unlike the other research councils at the Academy of Finland, the SRC is largely independent, it has an independent budget and its duties can be found directly in the Act on the Academy of Finland (922/2009).⁶⁷

The SRC provides funding⁶⁸ to long-term and programme-based research aimed at identifying solutions to the major societal challenges facing Finnish society.⁶⁹ This research is conducted through strategic research programmes, which are essentially the Academy of Finland's funding instrument for strategic research.⁷⁰ The strategic research programmes were created as a third financial instrument, the two others being scientific research and innovation funding. The objective of the creation of the new funding instrument in 2015 was to collect all competitive research funding that supports societal policy from the different public funding agencies (the State Research Institutes, Academy of Finland and the Finnish Funding Agency for Innovation, Tekes), to clarify the funding activities and avoid overlaps⁷¹.⁷²

There are some differences between the new financial instrument of strategic research programmes compared to the other financial instruments for public research. The financing is more lasting and long-term than what has previously been common for public research in Finland. The allocation of funding for strategic research is more transparent and more clearly based on scientific evaluation than before. The creation of the strategic research programmes as a third financial instrument, the two others being scientific research (funded by the Academy of Finland) and innovation funding (by Tekes), also means that the research funding landscape in Finland more closely resembles the three-pillar division of Horizon2020. There is a strong emphasis on the connection between the strategic research and decision making in the new financial instrument. The strategic research

⁶⁴ Strategic research is long-term, problem-focused and high-quality research that supports societal policy and the development of society to identify solutions to the major societal challenges. In Finland, challenge-driven research is therefore called "strategic research". Challenge-driven research programmes are consequently called "strategic research programmes". Government proposal HE 25/2014, p.8

⁶⁵ The Academy of Finland is an agency under the Finnish Ministry of Education, Science and Culture, with the mission of funding high-quality scientific research and strengthening the position of science and research. "About us" Academy of Finland's homepage.

⁶⁶ The Act on the Academy of Finland (922/2009), section 5b.

⁶⁷ Interview Per Mickwitz

⁶⁸ The funding is regulated by the Academy of Finland's general conditions and guidelines for funding. Furthermore, the funding recipients should follow applicable law (Act on Discretionary Government Transfers, 688/2001) and the Academy's separate guidelines. See <http://www.aka.fi/en/funding/how-to-use-the-funding/general-conditions-and-guidelines-for-funding/>.

⁶⁹ "Strategic Research Council" Academy of Finland's homepage.

⁷⁰ "Our funding opportunities" Academy of Finland's homepage.

⁷¹ The Government's resolution on the overall reform of research institutes and research funding (05/09-2013), p.9.

⁷² For more literature on the subject, please see e.g. the 2013 Evaluation of the Academy of Finland (OKM 2013:14, available on <http://minedu.fi/en/publication?pubid=URN:ISBN:978-952-263-225-8>), which served as a base for the creation of the new financial instrument.

themes are chosen based on their societal significance, with regards to decision making. The new financial instrument could eventually increase the use of scientific research in the decision-making process, as well as generally improve the dialogue between research and politics when it comes to the results of public research.⁷³

The objective of the strategic research programmes is to provide support for evidence-based policy and solutions to the major societal challenges facing Finland. It also aims to disseminate research knowledge to users across society.⁷⁴ There is a strong emphasis on multidisciplinary approaches and active collaboration between those who produce new knowledge and those who use it. The programmes run for 3–6 years. The annual funding budget of the SRC is around 55 million euros.⁷⁵ A Climate-Neutral and Resource-Scarce Finland is one of three strategic research programmes initiated by the Strategic Resource Council in 2015.⁷⁶ The programme consists of five consortia, for which the total funding amounts to approximately 17.3 million euros.⁷⁷

A Climate-Neutral and Resource-Scarce Finland will run from 2015–20. It strives to find a solution to the climate challenge, i.e. climate change.⁷⁸ The five consortia participating in the programme are focusing on climate-neutral electricity systems, the Gulf of Bothnia as an area for sustainable growth, climate-neutral forest-based bioeconomy, new protein sources and recycling of non-renewable material resources. The programme is research focused, although there are some innovation aspects within some of the projects, e.g. the project focusing on new protein sources. In fact, an ongoing discussion between the programmes is about the extent to which the private sector should be involved in strategic research.⁷⁹

6.2 The programme's process and associated research agendas

The themes for the strategic research programmes are generally selected each year by the Finnish Government, based on a proposal by the SRC.⁸⁰ The SRC is required to propose themes that are sufficiently horizontal, range across several administrative branches, are distinct from each other and that require new knowledge produced by multidisciplinary research. The themes also need to be considered as key challenges for the future of Finland.⁸¹ The Finnish Government prepares the government's decision in cooperation with the respective ministries. During the process the Finnish Government also listens to different experts in the research and innovation field. The General Assembly chooses⁸² the themes based on their importance for Finland, their relevance to the solution to societal challenges and their development of new combinations of knowledge and research.⁸³

⁷³ The Education and Culture Committee's report, KuUB 6/2014 rd.

⁷⁴ "Our funding opportunities" Academy of Finland's homepage

⁷⁵ "SRC-funded research supports policy-making" Academy of Finland's homepage

⁷⁶ "Strategic research programmes 2015–2017" Academy of Finland's homepage.

⁷⁷ Academy of Finland's funding decisions.

⁷⁸ "Strategic research programmes 2015–2017" Academy of Finland's homepage.

⁷⁹ Interview Mikael Hildén.

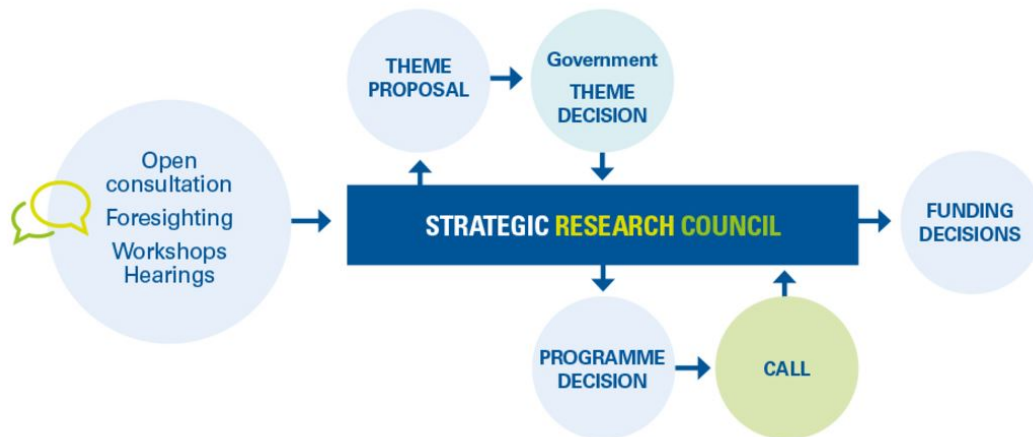
⁸⁰ "Strategic Research Council" Academy of Finland's homepage.

⁸¹ "How themes are prepared" Academy of Finland's homepage.

⁸² The themes are defined broadly in such a way that the projects applying for the funding are free to plan their application based on the premises of the research. See KuUB 6/2014 rd, available on <https://www.eduskunta.fi/SV/Vaski/Sidor/trip.aspx?triptype=riksdagshandlingar&docid=kuub+6/2014> .

⁸³ Government proposal on amendments to the Act on the Academy of Finland (HE 25/2014 vp), p.9.

Figure 7 The preparation of the strategic research themes



Source: The Academy of Finland's homepage.⁸⁴

The process of identifying the programme themes can be considered bottom-up. In the preparation of the theme proposal, the SRC involves stakeholders by conducting an online survey, as well as organising workshops and open consultations in which researchers and end users can discuss the proposal. The SRC analyses the feedback, prepares the proposal and submits it to the Government. In deciding the final themes, the Government identifies the principal societal challenges and steers research to resolve them. The SRC then formulates the research programmes based on the Government's decision.⁸⁵ The process of formulating the research programmes can therefore be considered top-down.⁸⁶

Actors participating in the programme are selected through a bottom-up process. The application is open to any research consortium that fulfils the requirements.⁸⁷ The consortia to be funded within the programme are selected by the SRC based on a review of their scientific quality, societal relevance and impact.⁸⁸

The programme "A Climate-Neutral and Resource Scarce Finland" does not have a pronounced research agenda. The reason for this is that the programme has such great project diversity that it would be difficult to have a common agenda. Instead, the programme's guiding principles are formulated as four key issues in a programme document provided by the SRC.^{89 90} These key issues are derived directly from the Government's theme decision.⁹¹ Thus, the process of the programme document is top-down. The programme has reformulated the key issues in the programme document into

⁸⁴ <http://www.aka.fi/en/strategic-research-funding/themes/theme-process/>

⁸⁵ "How themes are prepared" Academy of Finland's homepage.

⁸⁶ Interview Per Mickwitz.

⁸⁷ "Finansieringsprinciper" Academy of Finland's homepage.

⁸⁸ "Strategic Research Council" Academy of Finland's homepage.

⁸⁹ Interview with Mikael Hildén.

⁹⁰ This also applies to the other strategic research programmes. They all span very broad themes and comprise such different projects that they have also chosen to follow the programme document instead of a coherent research agenda. Interview Mikael Hildén.

⁹¹ Interview with Per Mickwitz.

questions, which the individual projects strive to answer in their research.⁹² The questions are⁹³:

- How can we improve resource efficiency and support the move towards a circular economy that will serve to boost exports and skills-based growth in Finland?
- What are the requirements for climate neutrality and resource efficiency in society?
- In what ways can the public sector best support the overall transition towards a climate-neutral and resource-scarce society?

The programme seeks to offer solutions to climate change and, in order to limit the effects of climate change, a transition towards a climate-neutral and resource-scarce society is needed. The means to achieve this type of society is by transitioning to a circular economy, which involves efficient recycling of renewable and non-renewable natural resources and making full use of material and energy flows.⁹⁴

The individual projects have formulated their own intervention logics and the programme attempts to support their implementation as far as possible. Added value is created through identifying and strengthening areas in which meaningful cooperation between the projects exists. In this regard, the programme follows a research-oriented logic. The goal is to create research-based insights of strategic value to political development. Thus, the goal has not been to create a tool for a direct instrumental intervention to achieve specific goals. The intervention logic of the programme is to promote high-quality research and an in-depth dialogue with different societal actors. What sets the strategic research programmes apart from other research programmes is expressly this combination – their objective is not to conduct research and then simply communicate it, but to achieve more interesting research results and a deeper societal discussion during the lifetime of the programme – by strongly emphasising the interaction and co-creation aspect in the research process. Regarding specific questions, such as “What is the programme doing to reduce greenhouse gases?”, there is no intervention logic that explicitly states what certain actors should do to reach the goal. Thus, there is no logframe in place. The idea is that insights are created through cooperation and the end result depends on how these insights are utilised.⁹⁵

6.3 The programme’s form and accompanying agenda

The strategic research programmes are independently funded by the SRC⁹⁶.⁹⁷ Even though the SRC acts in connection with the Academy of Finland, it independently decides on the structure and funding of the strategic research programmes. Also, it is the SRC alone that selects the research projects for the programmes. The projects are selected through open competition.⁹⁸

The SRC strives to fund projects that are as versatile and extensive as possible.⁹⁹ Emphasis is placed on projects that can create new types of collaboration between science and

⁹² Interview Mikael Hildén.

⁹³ “Strategic research programmes 2015–2017” Academy of Finland’s homepage.

⁹⁴ Ibid.

⁹⁵ Interview with Mikael Hildén.

⁹⁶ This is out of the ordinary, since joint funding is more common in Finland. Interview Per Mickwitz.

⁹⁷ Interview with Per Mickwitz.

⁹⁸ The Government’s resolution on the overall reform of research institutes and research funding (05/09-2013), p.10.

⁹⁹ The Government proposal on amendments to the Act on the Academy of Finland states that the SRC should choose the projects to be funded based on their societal importance, impact and quality of research. The rest is

societal interaction.¹⁰⁰ The funding is granted to long-term multidisciplinary research that seeks solutions to the grand challenges facing Finnish society.¹⁰¹ Funding is granted to consortia that include at least three research groups from a minimum of two different organisations, comprising researchers from at least three scientific disciplines¹⁰².¹⁰³ The consortia may also include foreign organisations and businesses.¹⁰⁴ The funding is granted on a long-term basis at full amount¹⁰⁵, covers all costs and is granted under the full-cost model.¹⁰⁶ Based on the midterm evaluation of the programme, the SRC decides whether there is a need to adjust the funding.¹⁰⁷

Because of the nature of the programme “A Climate-Neutral and Resource-Scarce Finland”, the collaboration aspect is quite distinct. Since the projects within the programme are so diverse, they do not have a strong common focus and therefore do not generally collaborate with each other to a high degree. Instead, they collaborate across programmes with other projects associated with the same area of expertise (for example, “energy”), in a type of meta-programme. The programme directors have also collaborated with each other since the very beginning by conducting joint meetings to achieve a common cause. This cross-programme collaboration has worked very well because of the continuous dialogue. All major events involving dialogue with decision-makers have been organised through cross-programme collaboration.¹⁰⁸

Within the Climate-Neutral and Resource-Scarce Finland programme, three of five consortia leaders are women. Of all the 28 sub-projects within the consortia, 11 are led by women.¹⁰⁹ There is, however, not an explicitly formulated gender equality plan, even though the programme follows a general principal of gender equality. On a higher level, it has been stipulated that Academy of Finland funding should contribute to this development.¹¹⁰

Communication is an essential part of all strategic research programmes and their projects.¹¹¹ The emphasis of these challenge-driven research programmes has been placed on the use of research as a basis for decision making. Thus, the strategic research programmes focus on the close interaction between researchers and policy-makers.¹¹² The aim is to involve end-users as early as possible in research projects, so that their information requirements can be incorporated into the research plans. Because of this, applicants of the

up to the SRC to decide. See the Government proposal on amendments to the Act on the Academy of Finland (HE 25/2014 vp), p.9.

¹⁰⁰ “Projects selected for Strategic Research Council’s programmes” Academy of Finland’s homepage (10/05-16).

¹⁰¹ “Apply for SRC funding” Academy of Finland’s homepage.

¹⁰² “Finansieringsprinciper” Academy of Finland’s homepage.

¹⁰³ The rationale behind these criteria is to ensure the multidisciplinary aspect of the programmes. There is also great awareness that the grand societal challenges concern society as a whole, so it seems a fair assumption that this is the reason for involving several different actors from different disciplines.

¹⁰⁴ “Strategic Research Council outlines key principles for funding” Academy of Finland’s homepage (29/01-15).

¹⁰⁵ The SRC’s principles for funding “Strategisen tutkimuksen neuvoston (STN) rahoitusperiaatteet”.

¹⁰⁶ “Finansieringsprinciper” Academy of Finland’s homepage.

¹⁰⁷ Interview with Per Mickwitz.

¹⁰⁸ Interview with Mikael Hildén.

¹⁰⁹ Calculations based on data from “Strategisen tutkimuksen ohjelmahaut 2016 - ohjelmiin valitut konsortiot” Academy of Finland’s homepage (13/06-16) and “Vuonna 2015 rahoitettavat hankkeet (12.10.2015)” Academy of Finland’s homepage.

¹¹⁰ Interview with Mikael Hildén.

¹¹¹ Ibid

¹¹² “First strategic research projects ready to start” Academy of Finland’s homepage (20/10-15).

SRC funding are required to submit an interaction plan along with their traditional research plan. The interaction plans must describe how the consortium intends to engage end users throughout the project's life cycle¹¹³, as well as reflect a profound understanding of cooperation, interaction and communication with stakeholders.¹¹⁴ Additionally, all projects include communication officers, who play a visible role in the projects. The programme directors also have a communicative role, since they have contact with, for example, ministries and the private sector. This emphasis on outgoing information and contact with different societal actors is one of the major differences between ordinary Academy of Finland-funded research projects and strategic research projects.¹¹⁵

6.4 Implementation and monitoring

A Climate-Neutral and Resource-Scarce Finland does not have a pronounced implementation plan. Instead, implementation is carried out in the consortia, in which the individual sub-projects seek to find answers to the key questions stipulated in the programme document through their research.¹¹⁶

The SRC is responsible for project follow-up and impact assessment of the programmes.¹¹⁷ Unlike other research funding instruments in Finland, the SRC has a stronger mandate and responsibility to monitor the programmes. The monitoring is conducted in two ways: The programme director, who is employed by the SRC, continuously updates the SRC on the status of the projects within the programme. Additionally, the SRC conducts midterm evaluations of the programmes.¹¹⁸

The midterm evaluation of the programme "A Climate-Neutral and Resource-Scarce Finland" is currently underway, and will be completed by the end of October. The evaluation is based on information provided by the projects themselves.¹¹⁹ The SRC uses multiple quantitative indicators, such as number of publications, presentations and international funding applications. Each of the projects also provide so-called *impact narratives*. The impact narratives are forms, in which each project describes how decision-makers have been able to take their research into consideration when making decisions. Based on the midterm evaluation, the SRC decides whether there is a need to adjust the funding.¹²⁰

As the midterm evaluation of the programme is still ongoing, it is still too early to say with any degree of certainty the effects of the programme thus far. There is, however, clear evidence that the projects have been able to jointly highlight issues that otherwise would not have had the same impact they have had now. The communication with societal actors has been fruitful thus far and adaptations and adjustments in society can be seen accordingly. One example of this is that the work conducted by the project focusing on new protein on the use of insects as food has been a contributing factor to recent policy changes in the field in Finland.¹²¹

¹¹³ "Strategic Research Council announces its first strategic research programmes" Academy of Finland's homepage (11/02-15).

¹¹⁴ Mickwitz et al. (2015).

¹¹⁵ Interview with Mikael Hildén.

¹¹⁶ Ibid.

¹¹⁷ "Strategic Research Council" Academy of Finland's homepage.

¹¹⁸ Interview with Per Mickwitz.

¹¹⁹ Interview with Mikael Hildén.

¹²⁰ Interview with Per Mickwitz.

¹²¹ Interview with Mikael Hildén.

The weaknesses of the programme lie in its diversity. The theme is so comprehensive that the projects do not form a coherent ensemble. Because of this it is hard, for example, to formulate a common research agenda.¹²² This obstacle has been partially overcome by the organisation of projects from different programmes in meta-programmes, in which they can collaborate within a common area of expertise. In this way, they can contribute more to the societal discourse within the area than they could if they only worked within the programme. This is also a way for single projects to achieve critical mass. Thus, the diversity is also one of the programme's strengths. Another strength is the communication with different societal actors.¹²³

6.5 Conclusions and lessons learned

The implementation of the programme has encountered some ups and downs. The programme has been well received among the political decision-makers. The fact that they have been open to dialogue and willing to attend information events (even ministers have been in attendance) shows that the decision-makers are taking the strategic research programmes and their mission seriously. In this regard the projects have managed to remain current and up-to-date, while at the same time focusing on future challenges. An initial challenge has been to ensure that the researchers and the officials are on the same level. Getting the researchers to “package” the research in a way that ensures the attention of the political decision-makers has been a challenge. This has been an ongoing learning process on both sides.¹²⁴

Recognising that today's major societal challenges are complicated and intersectoral, all programme consortia must include researchers from different organisations from at least three scientific disciplines, and cross-programme collaboration is encouraged. Although it has admittedly been hard to evaluate interdisciplinary research applications – and there is still room for improvement in this matter – this approach has proved a success, thus far. This intersectoral emphasis could also be implemented in other countries.

A great effort has been made to involve stakeholders in different stages of the programme. Key actors are invited to participate in the formulating of the programme themes, stakeholders' information requirements are taken into account in the research plan through an interaction plan and several seminars have been arranged to interact with stakeholders. The interaction plan in particular could also be applicable in other countries.

The strategic research programmes have succeeded in establishing immediate and direct communication with decision-makers at a high level. There is a generally positive outlook among the decision-makers, as well as a genuine interest by the government and individual ministers in the programmes. It is a good example of a well-functioning science-policy dialogue. This could also be an option in Sweden, since the distance to decision-makers is relatively short. It would be far more difficult to introduce in countries that had a more hierarchical system.¹²⁵

¹²² Though there had been initial discussions regarding the links between the projects, and even between the programmes, there has never been an attempt to formulate a coherent agenda. Interview with Mikael Hildén.

¹²³ Ibid.

¹²⁴ Ibid.

¹²⁵ Interview with Mikael Hildén.

7 Case study 4: Canada, the Arctic Program

7.1 Description of the challenge-driven research programme

The Prime Minister of Canada launched the National Research Council Canada (NRC) Arctic Program on 21 August 2014 with the aim of advancing social and economic development in Northern Canada.¹²⁶ Through carrying out research in-hours and building partnerships with industrial and government stakeholders, the NRC has implemented the programme to develop “low-impact”, sustainable technologies¹²⁷ and also helped bridge the gap between laboratory research and the marketplace.

The programme has four main priority areas:¹²⁸

- *Resource development*: Increasing the reliability of offshore development in ice-covered waters.
- *Northern Transportation*: Developing and implementing technologies that will increase efficiency and reduce the number of incidents and structural damage to vessels.
- *Marine Safety Technologies*: Improving the performance of life-saving equipment in harsh environments.
- *Community Infrastructure*: Increasing the quality of life in northern communities through more reliable and relevant infrastructure.

Several of these priorities involve issues related to climate change *adaptation* (e.g. the creation of infrastructure that can withstand changing climate conditions), whereas climate change monitoring and mitigation come under the remit of other government departments.

The federal government in Canada has budgeted CAD 17 million (approx. 11.5 million euros) for the Arctic Program over eight years and expects CAD 65 million (approx. 44 million euros) in co-investment from industry during this period.¹²⁹ The programme is currently being redeveloped to reflect changing political priorities (see below) but the four main priorities remain as described above.

7.2 The programme’s process and associated research agendas

The programme was developed on the basis of four “input streams”: The priorities of the federal government in Canada, industrial needs, input from the local communities located in the Northern Canada as well as ongoing work internationally in the Arctic Council.

For the federal government in Canada, the Arctic Program contributes to a broader policy agenda. For the previous government, these priorities were set out in the “Northern

¹²⁶ “PM announces launch of the National Research Council Arctic Program”, Whitehorse, Yukon – 21 August 2014 (<https://www.canada.ca/en/news/archive/2014/08/pm-announces-launch-national-research-council-arctic-program.html>)

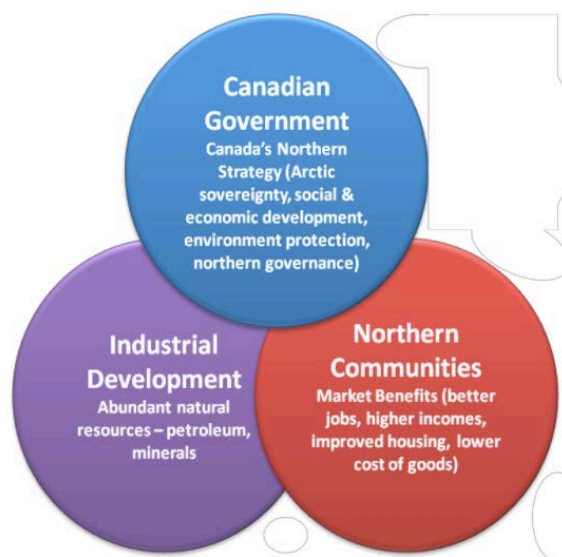
¹²⁷ NRC-CNRC (2015), *National Research Council Canada 2014–15 Departmental Performance Report*, Ottawa: National Research Council of Canada, p. 20.

¹²⁸ NRC-CNRC: “Arctic Program”, website, available at: <https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/arctic.html> [Accessed 13 October, 2017]

¹²⁹ “Harper announces NRC will launch Arctic Program – Feds commit \$17 million over eight years”, The Canadian Press, August 21, 2014 (<http://www.macleans.ca/politics/ottawa/harper-announces-nrc-will-launch-arctic-program/>)

Strategy”, which had had four overarching aims:¹³⁰ Exercising Arctic sovereignty, promoting social and economic development, protecting the North’s environmental heritage, and improving and devolving northern governance.¹³¹ In their original form, the main influences on programme priorities were described as shown in Figure 8.

Figure 8 Arctic Program Thrusts



Source: Ian Potter, NRC¹³²

In addition, studies and other work with partners in the Arctic Council – including Sweden – have also provided an important contribution to the development of programme priorities.¹³³

As a consequence of changes in the political and economic context, the NRC is currently in the process of redeveloping the Arctic Program. Politically, a change of government in Canada in 2015 means that the Northern Strategy is being replaced by a new Arctic policy framework, currently under development in collaboration with northern partners.¹³⁴ The decline in commodity prices since 2014 has also contributed to decreased interest from industry in investing in the development of natural resources in the Arctic. The four main priorities of the programme have been maintained but there is a change of emphasis within this framework. Whereas the programme leaned towards industrial priorities under the previous government, the new programme will have more emphasis on contributions to public policy.¹³⁵

¹³⁰ “Canada’s Northern Strategy: Our North, Our Heritage, Our Future”, Government of Canada, 2009, p. 4 (<http://www.northernstrategy.gc.ca/cns/cns.pdf>)

¹³¹ See: <http://www.canadainternational.gc.ca/eu-ue/policies-politiques/arctic-arctique.aspx?lang=eng> [Accessed 15 October 2017]

¹³² Ian Potter (2014), *National Research Council of Canada: RTOs, Program Design and Accessing Canada’s North*, presentation, Sept. 23, 2014 (http://site.uit.no/canada2014/files/2014/09/CNNII_23SEP_1_7_Potter.pdf)

¹³³ NRC-CNRC (2016), Arctic Program, October 2016, p. 2.

¹³⁴ See for example: “Trudeau announces review of Arctic strategy, joint drilling ban with U.S.”, CBC 19 Dec. 2015 (<http://www.cbc.ca/news/politics/trudeau-obama-arctic-1.3905933>)

¹³⁵ Interviews suggested that the original programme had a 75/25 split between industrial and societal priorities whereas the new version will be closer to a 50/50 split.

Whereas the four high-level programme priorities were decided “top-down” by the programme management on the basis of the four streams of influence described above, individual projects have been selected in a more bottom-up manner. Initiatives for individual projects may come from researchers within the NRC or collaborators such as industry (e.g. oil & gas, transport, marine and marine safety, and construction), government institutions, planners and regulators.¹³⁶

The programme has objectives that are defined at different levels. At the most general level, NRC programmes aim to achieve the outcomes desired by external stakeholders, create new national capabilities, showcase Canada as a place of innovation, and build the Canadian economy through industry. Internally, the NRC aims to achieve a shared vision and teamwork and instil trust and mutual respect around the NRC.¹³⁷ The four “thrusts” of the programme each have specific related targets, such as the “reduction of incidents” under “Northern Transportation”. In turn, each of these have been broken down into more specific themes that need to be addressed to achieve the programme-level objectives. Finally, projects are selected by the programme management based on the extent to which they contribute to the target outcomes.¹³⁸

7.3 The programme’s form and accompanying agenda

The programme is being run by the National Research Council Canada (NRC). Unlike research councils in some other countries, the NRC is a research organisation and not a research funding body. It is an agency – not a “line department” under the federal government – and has a degree of autonomy from the political government. Described as Canada’s “National Research and Technology Organisation (RTO)”, the NRC has a focus on boosting industry and “translating research and technology into prosperity for the country”,¹³⁹ as well as supporting societal issues and public policy.

The Arctic Program is one of nearly 40 current NRC programmes and forms part of its Ocean, Coastal and River Engineering (OCRE) portfolio. Decisions about project support are taken by the Programme Manager in consultation with the internal programme board comprising 7–8 members, including relevant research directors and heads of NRC research centres. The Programme Leader has the financial authority to make multiple decisions but meets with the Arctic Program board monthly to discuss programme management, particularly cases in which conflict resolution is needed, for example, concerning access to resources (i.e. people and facilities). In the future, it is possible that an external programme board will be established with representation from industry and government.

Activities under the programme include in-house research by the NRC as well as collaborative research with partners. Where relatively risky research at the lower end of the Technology Readiness Level (TRL) scale is required, this is often undertaken and funded 100% internally by the NRC. When fundamental issues have been resolved and “de-risked”, the NRC will then approach partners in order to build a consortium to move the project forward. In other cases, proposals will come from external partners or will be developed jointly between the NRC and industry or universities.

¹³⁶ <https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/arctic.html>

¹³⁷ Ian Potter, *Op Cit*, p. 12.

¹³⁸ Description based primarily on interview insight (see also: NRC-CNRC (2016), Arctic Program, *Op Cit*.)

¹³⁹ NRC-CNRC (2013): *National Research Council Canada – Strategy 2013–2018*, Ottawa: National Research Council Canada, available at: https://www.nrc-cnrc.gc.ca/obj/doc/reports-rapports/NRC_Strategy_2013_2018_e.pdf [Accessed 15 October 2017]

What the NRC offers to external partners is to “help de-risk your innovative ideas, assist with performance evaluation of technologies and evaluate new methods of increasing safety and efficiency”.¹⁴⁰ In particular, participants are offered technological advisory services and expertise on a one-to-one basis in areas such as ocean energy technologies, offshore oil and gas, data mining and the Canadian Arctic Shipping Risk Assessment System (CASRAS). Partners will also have access to NRC research facilities, instrumentation and equipment, including, for example, an offshore engineering basin, ice tanks and a thermal measurement lab. The advisory services and access to facilities help participants reduce risk and increase technological performance, thereby contributing to the programme objectives.

7.4 Implementation and monitoring

Under each of the four main priority areas, a number of projects have been implemented to develop technological solutions. Examples are provided in the table below.

Table 2 Example of projects under the four Arctic Program priorities

Resource Development	Northern Transportation	Marine Safety Technology	Community Infrastructure
Design ice loads on fixed structures Vessel station-keeping in ice and ice management Ice gouging and its influence on the design of seafloor facilities The engineering implications of climate change on ice conditions	Input into Canada's Arctic shipping regulations Vessel routing through difficult ice conditions Development of the Canadian Arctic shipping risk assessment system Extending the life of ice roads	Input into safety regulations Developing evacuation egress technologies Developing evacuation survivability technologies Development of next generation evacuation and survival systems	Reliable water supply Creating more energy-efficient buildings Updating sewage and wastewater treatment Using bioremediation techniques on contaminated sites

Source: NRC Arctic Program website¹⁴¹

Like other NRC programmes, the Arctic Program is subject to a structured internal review process and has undergone a three-year review as well as more frequent quarterly evaluations to flag issues or challenges. The details of these reviews have not been made public but may be reported at a very aggregate level in government reporting.

The internal milestones and Key Performance Indicators (KPIs) against which the Arctic Program is reviewed are not in the public domain but include, for example, the value of in-kind contribution from partners, publications of research findings and targets for licensing and patenting. Individual projects have their own targets which – depending on the field – demonstrate contributions to the overall programme objectives. Projects may be discontinued if they fail to live up to targets or if external circumstances change, rendering the projects less relevant.

¹⁴⁰ <https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/arctic.html>

¹⁴¹ <https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/arctic.html> [Accessed 13 October 2017]

7.5 Conclusions and lessons learned

The main drivers behind the programme are the engineering challenges faced by stakeholders in the North. There are significant risks involved in operating in a cold climate. Thus, reducing the risk of transportation and other necessary operations is a significant driver behind the programme.

What makes the programme unique is the geographical focus on the northern regions of Canada. The programme encompasses a variety of stakeholder inputs (international, national, industry and local) and requirements (housing, transportation, resource development). This sets it apart from other NRC programmes that tend to have a more technological focus (e.g. aerospace or building technologies). The Arctic Program cuts across these and draws on different technological areas depending on the regional needs.

The programme management at the NRC emphasises the importance of considering the changing political environment. Thus, an important lesson learned from the programme is that challenges should be defined very carefully so as to remain relevant regardless of changing political majorities. The Arctic Program is planned to run for eight years, a period which spans several political cycles. This allows for long-term planning and priority-setting but also makes it potentially vulnerable to changing political priorities. In this situation, it has been important for the four main challenges that define the programme to be relatively apolitical and therefore able to gain support from the new political government elected in 2015. Adjustments and rebalancing within the programme framework can then be made to reflect changing government priorities.

In terms of the implementation, the programme leadership regards the adoption of a “programme-based research model” within the NRC, exemplified by the Arctic Program, as a strength. Compared to a previously more open-ended and loosely-defined research focus, this model involves time-delimited initiatives with clear success criteria, expressed in milestones and KPIs. This is combined with a degree of flexibility that allows long-running programmes, such as the Arctic Program, to adapt to changing circumstances and new opportunities.

8 Case study 5: Joint Programming Initiatives

8.1 Description of the challenge-driven research programme

The Joint Programming Initiative (JPI) was launched by the European Commission in 2008 to coordinate the Member States of the European Union to define common objectives and join forces for research and innovation. The overall objective of the programme is to promote transnational collaboration for a more efficient use of European research resources and as a way of tackling major societal challenges that surpass what can be addressed at a national level alone. The circumstances leading to the Commission launching this initiative was the perception that the research collaboration taking place among member states was not enough. Through the JPI the member states were given a platform to formulate joint agendas and mobilise the research to involve all relevant societal interests.¹⁴²

There are currently ten JPIs covering areas such as citizen's security, food safety, quality of human and environmental health, climate change and energy supply:¹⁴³

- *JPND*: Alzheimer and other Neurodegenerative Diseases
- *FACCE*: Agriculture, Food Security and Climate Change
- *JPI HDHL*: A Healthy Diet for a Healthy Life
- *JPI CH*: Cultural Heritage and Global Change: A New Challenge for Europe
- *JPI UE*: Urban Europe - Global Urban Challenges, Joint European Solutions
- *JPI Climate*: Connecting Climate Knowledge for Europe
- *JPI-MYBL*: More Years, Better Lives - The Potential and Challenges of Demographic Change
- *JPIAMR*: Antimicrobial Resistance - The Microbial Challenge - An Emerging Threat to Human Health
- *Water JPI*: Water Challenges for a Changing World
- *JPI Oceans*: Healthy and Productive Seas and Oceans

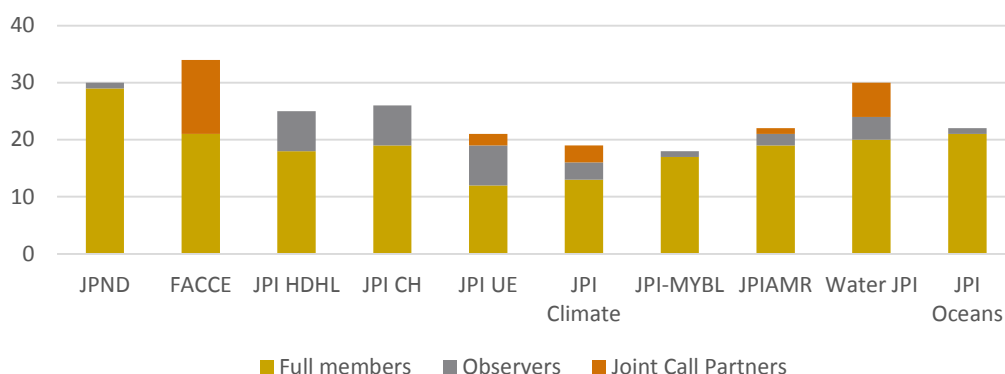
Beyond diverse focal challenges, the JPIs can vary in size, organisation and in the number of participants. This variation in design is due to the bottom-up approach of each JPI and also because there is no central governance regarding the number of participants or specific requirements for investments, other than providing the required critical mass for research.¹⁴⁴ The variation of country participants in the ten separate JPIs is shown in Figure 9.

¹⁴² Towards Joint Programming in Research: Working together to tackle common challenges more effectively {COM(2008) 468}

¹⁴³ http://ec.europa.eu/research/era/joint-programming-initiatives_en.html

¹⁴⁴ Towards Joint Programming in Research: Working together to tackle common challenges more effectively {COM(2008) 468}.

Figure 9 Number of country participants in each JPI, classified according to full members, observers and joint call partners.



Data source: *Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group*

In this case study, JPI Climate (*Connecting Climate Knowledge for Europe*) will be used to exemplify how a JPI might be structured. The case may contribute with programme-specific information in addition to a more general description of the JPIs as a concept.

JPI Climate

JPI Climate covers the area of climate change, such as the need to transform energy systems away from a dependence on fossil fuels and the need to protect European citizens, businesses and nature from climate risks¹⁴⁵. The collaboration includes members from 17 different countries, both within and outside of the EU¹⁴⁶. The actors participating in the process on behalf of the countries in JPI Climate are institutions that are legally permitted to make strategic decisions and engage resources from national research funds¹⁴⁷. Such actors are generally ministries of science and research, academies of sciences, scientific institutions, and agencies that can represent and make decisions on behalf of national research interests.

Contrary to most national research programmes, JPI Climate does not have an end date, but is a voluntary bottom-up mechanism that can continue to exist for as long as members channel resources to the initiative. However, it has been decided that the current research agenda of JPI Climate will cover the period from 2016–2025 and is thereafter bound to be changed or revised¹⁴⁸.

8.2 The programme's process and associated research agendas

The first initiative for the collaborative research between member states came from the European Commission in 2008. However, decisions regarding which specific JPIs would be established were taken using a bottom-up mechanism. The Member States of the European Union had the opportunity to put forth proposals to the High Level Group on

¹⁴⁵ <http://www.jpi-climate.eu/programme/objectivesvision>

¹⁴⁶ <http://www.jpi-climate.eu/programme/membercountries>

¹⁴⁷ Joint Programming Initiative - Connecting Climate Knowledge for Europe (JPI Climate): Strategic Research & Innovation Agenda, 2016–2025

¹⁴⁸ Interview

Joint Programming (GPC), which then decided on ten programmes¹⁴⁹. JPI Climate was a merger of two separate proposals¹⁵⁰. The content, strategy and research agenda for each programme were decided by the participants. In JPI Climate, the first organisational strategy put forward included four modules focusing on four distinct aspects or challenges of climate research. Based on these modules, a team of researchers formulated an extensive research agenda in which each challenge was described. The modules then worked separately to concretise the challenges and created individual research agendas. The process was based around a series of workshops:

- Workshop with professors and postdocs from various disciplines, with the objective of creating research questions for the coming 5–10 years
- Workshop with “future leaders” – young researchers – with the objective of tackling questions about innovation and ground-breaking technologies
- Workshop with stakeholders, with the objective of envisioning current and future needs and priorities¹⁵¹

Change of structure

The organisational structure comprising four separate modules – each working with various aspects of the challenge of climate change and with isolated research agendas – was updated in 2016, following recommendations from an evaluation conducted by the European Commission through an Expert Group¹⁵². JPI Climate created a special task force with the mission of recasting a common research agenda¹⁵³ and to make it less extensive, more accessible and with a higher degree of integration between different academic disciplines. The proposal was then discussed within the Governing Board and submitted to the Transdisciplinary Advisory Board, before new priorities were formulated through interaction with various stakeholders¹⁵⁴.

The accessibility of the updated research agenda has been aided using conceptual images¹⁵⁵. Both interviewees emphasised the use of visual tools in working in a complex organisation and with major societal challenges such as climate change.

JPI Climate has a clear visual intervention logic for how the programme will achieve the desired priorities and goals, which naturally changed in agreement with the updated research agenda in 2016. The intervention logic presented in the first research agenda shows the complex mechanism of how the four modules were expected to integrate, as shown in Figure 10.

¹⁴⁹ Towards Joint Programming in Research: Working together to tackle common challenges more effectively {COM(2008) 468}

¹⁵⁰ Interview

¹⁵¹ JPI Climate Scoping Process: Societal Transformation in the face of Climate Change

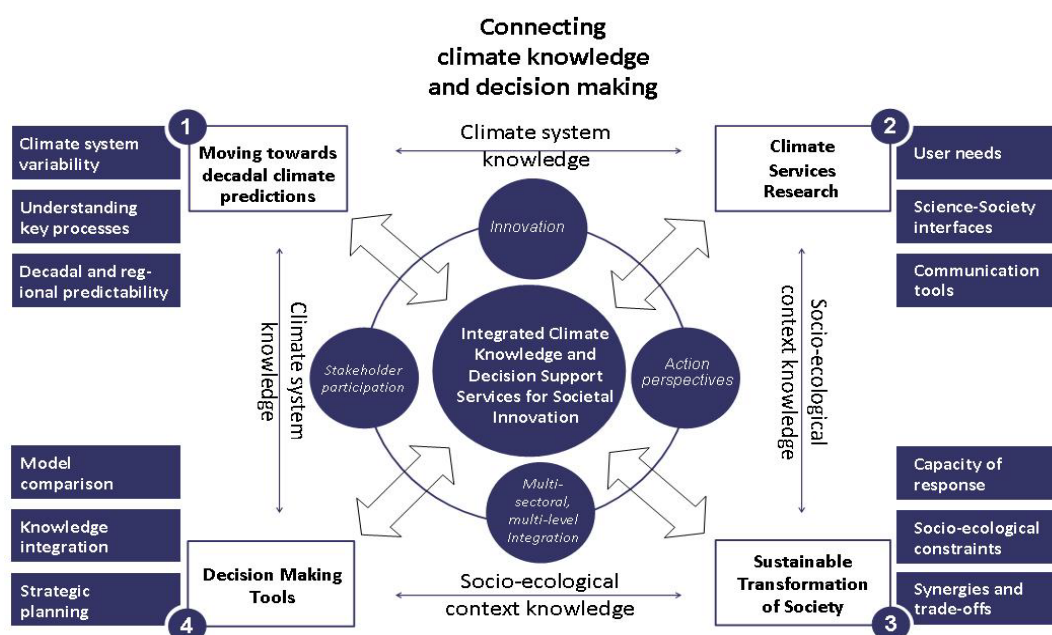
¹⁵² Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group

¹⁵³ JPI Climate Strategic Research and Innovation Agenda 2016–2025

¹⁵⁴ JPI Climate Scoping Process: Societal Transformation in the face of Climate Change

¹⁵⁵ Interview

Figure 10 JPI Climate intervention logic 2011



Source: JPI Climate Strategic Research Agenda 2011.

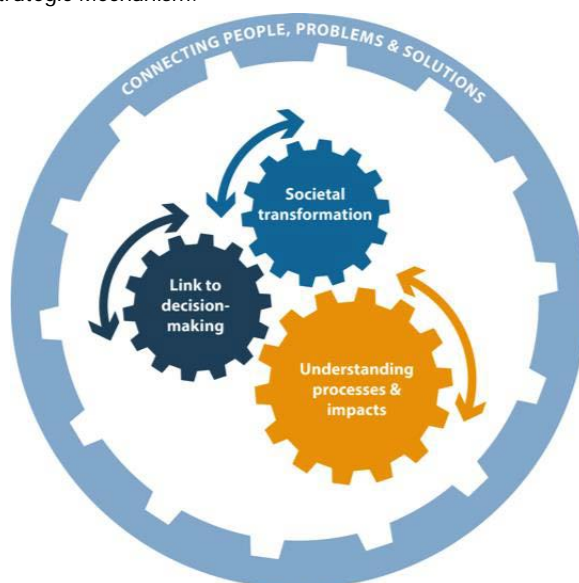
The logic builds on a perception of the modules as four different approaches to climate change research, that each will contribute to the core objective of the JPI (inner circle). At the same time, as shown in the figure, the insights and developments in the core will impact the modules.

In the updated Strategic Research and Innovation Agenda¹⁵⁶, the intervention logic has been defined as three overarching challenges and the strategic mechanism (Figure 11) “connecting people, problems and solutions in a systematic approach”. The challenges are as stated in the bulleted list below.

- Understanding the processes and consequences of climate change
- Improving knowledge on climate-related decision-making processes and measures
- Researching sustainable societal transformation in the context of climate change¹⁵⁷

¹⁵⁷ Joint Programming Initiative - Connecting Climate Knowledge for Europe (JPI Climate): Strategic Research & Innovation Agenda, 2016–2025

Figure 11 JPI Climate Strategic Mechanism.



Source: JPI Climate Strategic Research and Innovation Agenda 2016–25.

Each of the challenges and the strategic mechanism are presented in the SRIA describing the specific aim of the research, which activities are needed to tackle the challenge and, finally, the role of JPI Climate in the research.

8.3 The programme's form and accompanying agenda

Collaboration

Since the reorganisation of JPI Climate, the collaboration within the programme concerning interdisciplinary research has improved. However, in some respects, a lack of coordination between researchers and funders could result in a certain lack of efficiency¹⁵⁸. One of the greatest challenges of collaborating within the JPIs in general is the need to coordinate dissimilar national priorities and the countries' different views and expectations of the programming initiative¹⁵⁹. When striving to tackle major societal challenges, transnational coordination is key, since these societal challenges are global matters that call for highly qualified knowledge and experience within several disciplines and areas that cannot be expected to be found in one single country. The added value of the collaborations programmed by the JPIs is the gathering of knowledge from different countries to view challenges from various perspectives, as well as communicating information to countries where this knowledge might not yet be represented¹⁶⁰.

There is always a need for cooperation between complementary skills from different disciplines and areas. It is also equally important for the advancement of research and innovation to have a greater impact that in some cases the work with similar issues in different countries is given the opportunity for cooperation. This is a way of avoiding duplication of research and innovation, as well as achieving greater leverage on national funds by channelling them into common priorities. The collaborations within the JPIs can

¹⁵⁸ Interview

¹⁵⁹ Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group

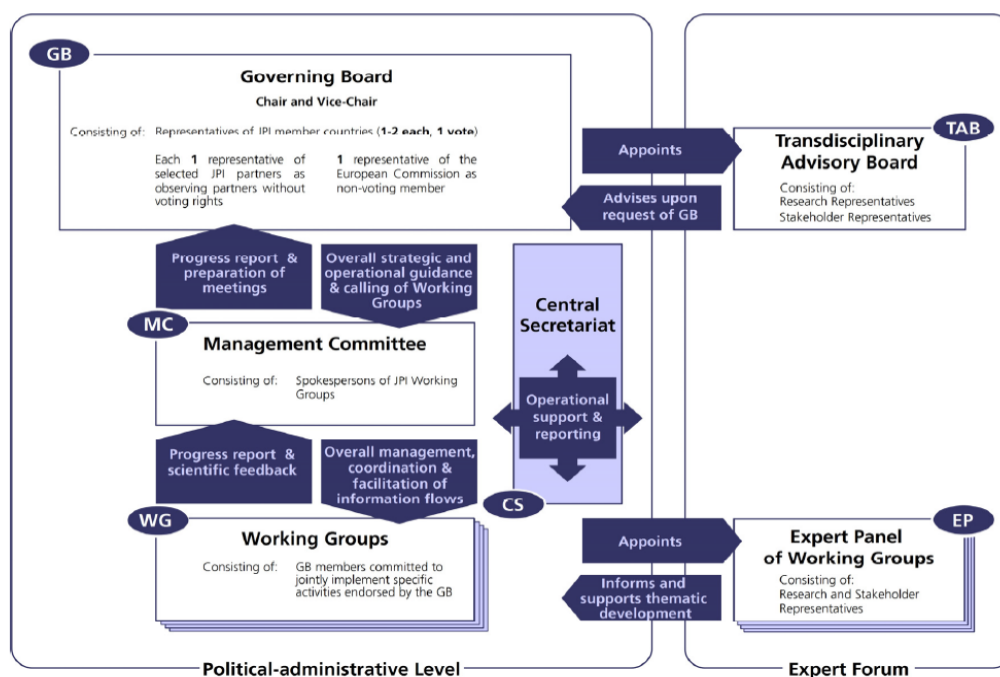
¹⁶⁰ Interview

lead to a more efficient advancement of knowledge and the identification of novel solutions more quickly.

Governance

The governance structure of JPI Climate, including responsibilities and co-operation, is shown in Figure 12 below.

Figure 12 JPI Climate governance structure.



Source: JPI CLIMATE - Connecting Climate Knowledge for Europe: Governance

All member countries are represented in the JPI Climate Governing Board and this comprises actors that represent and make decisions on behalf of national research interests. The executive work is carried out by Working Groups that report to the Governing Board via the Management Committee. In JPI Climate, as in all other JPIs, a Central Secretariat lends operational support to the Governing Board, the Management Committee and the Working Groups. Upon request the Governing Board can receive advice from a Transdisciplinary Advisory Board and there is a similar instrument for the Working Groups through an Expert Panel¹⁶¹.

Funding

The JPI has received CSA funding¹⁶² from the European Commission to get the initiative running and the operational costs of JPI Climate are primarily funded in-kind by members and participants. The main part of the funding for the JPIs primarily comes from national research resources, which is also the case for JPI Climate. The primary focus regarding funding within the JPIs has always been to channel national resources for research to a

¹⁶¹ JPI CLIMATE - Connecting Climate Knowledge for Europe: Governance

¹⁶² The CSA (Coordination and Support Actions) is funding that can be granted for actions that do not cover the actual research, but the coordination and networking of projects, programmes and policies.

European level in order to advance transnational research collaboration.¹⁶³ Significant funding, however, is still provided by the Commission, primarily through the Horizon 2020 ERA-NET Cofund¹⁶⁴ instrument. Considering the overall purpose of the JPIs is to channel national resources into transnational research collaborations, it is no surprise that the kind of funding described above is, to a great extent, aligned with the goals and purposes of the initiative.

The evaluation of the JPIs, carried out in 2016,¹⁶⁵ showed that by the end of 2015 almost 265 million euros had been committed to transnational projects as a result of 32 Joint Calls involving 37 countries. However, almost two-thirds of this investment came from just seven countries (Germany, Sweden, The Netherlands, France, UK, Italy and Norway), showing that there are considerable differences in national conditions as well as in how the countries view the purpose and value of the joint efforts.

Communication and gender equality

Communication is a well-integrated part of the process in JPI Climate. Communication is described as “well-functioning”¹⁶⁶ and the document of Open Knowledge Policy¹⁶⁷ also shows that it has been prioritised. The Open Knowledge Policy comprises two principal parts, one regarding internal policy guidelines and the other formulating recommendations for funders, researchers and stakeholders in the climate research system. In short, the policy guidelines focus on accessibility through open information and, in addition, external promotion of the guidelines that have been drawn up.

There are no specific plans concerning gender issues, nor has this been integrated into the research. However, there has been a relatively equal gender distribution within the organisation and among participants in activities¹⁶⁸. The issue of social equality was integrated to some extent in the first call through a major mobilisation of social sciences and humanities¹⁶⁹.

8.4 Implementation and monitoring

Following recommendations from the Expert Group via the Commission, the GPC functions as a coordinating party in the implementation of the JPIs. This includes follow-up activities through self-assessments, and registering achievements and successes¹⁷⁰.

In February 2015, the GPC established the following three Implementation Groups (IGs):

¹⁶³ Interview.

¹⁶⁴ The ERA-NET instrument under Horizon 2020 is designed to support public-public partnerships in their preparation, establishment of networking structures, design, implementation and coordination of joint activities, as well as topping up of single joint calls and of actions of a transnational nature.

¹⁶⁵ With a final report in 2016: Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group

¹⁶⁶ Interview

¹⁶⁷ Guidelines on Open Knowledge – Improving the societal benefit of climate research activities

¹⁶⁸ Interview

¹⁶⁹ Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group

¹⁷⁰ Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group

- The IG1 on “Fostering Relationships among the JPIs and the GPC” provided the essential elements for producing a document entitled “Keeping the GPC up to the job – Tasks and Profile of the GPC Delegates”, which has been adopted by the GPC
- The IG2 on “Improving Alignment and Interoperability” performed an alignment mapping exercise that highlighted the importance of a high level national commitment, an overarching inclusive national strategy, and using the national budget as an instrument for promoting alignment
- The work of the IG3 “Monitoring and Evaluation” is concentrated on the establishment of minimum conditions for JPIs to be used for both possible new JPIs, as well as for the assessment of existing JPIs

Regardless of this implementation framework, implementation has proven to be a challenge. The evaluation by the Expert Group assessing the JPIs provides one explanation for this by stating that most countries seem unwilling or unable to co-invest in the central executive resource that is needed to effectively implement the strategic agendas of the JPIs.¹⁷¹

Thus, the question of implementation in the case of the JPIs cannot be given one single answer, since it means very different things to different actors within the process. For research funders, implementation generally means deploying resources out to relevant projects, while from a programme perspective it can mean conducting activities or reaching relevant target groups. Since the JPIs not only consist of diverse types of actors but also different countries with different implementation systems, there may be a need for a more coordinated definition of implementation if it is to be assessed successfully. In JPI Climate, the Governing Board establishes temporary or permanent Working Groups to facilitate the implementation of the JPI.

The governance principles and the organisational structure of the JPIs are subject to iterative, ongoing learning processes and adjustments. In JPI Climate, there are critical reviews and possible revisions 12 months after adoption by the Governing Board, followed by recurring reviews based on a schedule prepared by the Governing Board.¹⁷²

The monitoring of all JPIs should be carried out in accordance with the criteria and minimum conditions for assessment presented in the report of the GPC Implementation Group 3 “Monitoring and evaluating JPIs”¹⁷³. The monitoring perspectives are (1) JPI Assessment, (2) Evaluation of performance and impact of JPIs and (3) Development of minimum conditions for new and existing JPIs. The assessment of the JPIs decided to focus on four aspects (which was conducted in the evaluation by the EC expert group):

- Evaluate progress by member states (participating counties) on Joint Programming and identify remaining challenges
- Assess the current commitment by participating countries (including the progress of alignment)
- Define success criteria and entry/exit criteria
- Consider some priorities for participating countries (recommendations for the future)

¹⁷¹ Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group, p. 9.

¹⁷² JPI CLIMATE Connecting Climate Knowledge for Europe – Governance.

¹⁷³ Implementation Group 3: MONITORING & EVALUATING JPIs – FINAL REPORT

In addition, the evaluation conducted a performance assessment through eight key indicators:

- Societal challenge positioning
- International leadership
- Driving innovation
- Variety of instruments
- Instruments in joint R&I
- Share of national investment
- Degree of national alignment
- Self-sustainability

As stated in the 2016 evaluation of the JPIs, none of the programming initiatives have operated long enough for them to demonstrate tangible effects, thus far. This is especially true as the JPIs focus on grand challenges, in which the effects are specifically long term. The evaluation did, however, highlight some success factors in the continuing implementation of the initiatives:

- Involvement of stakeholders
- Strong political support and commitment from member countries
- Stability of the support and commitment from member countries
- Ability of the representatives to take decisions on behalf of their countries
- Robust national structure
- Coordination with other European and international initiatives

These success factors are presented alongside a wide range of issues which, according to the evaluation, inhibit the progress of the JPIs. The conclusions are stated in Figure 13.

Figure 13 Conclusions of the EC expert group's evaluation regarding issues facing the JPIs

Area of issue	Conclusion of the evaluation
Ambition	The societal challenges of the JPIs were selected by the national representatives of the GPC because of their importance and commonality, although the overall level of ambition to really support them is disappointing.
Commitment	The level of co-investment in joint calls and actions is no greater than for the best ERA-NETs. It seems that most countries are unwilling or unable to co-invest in the central executive resources needed to effectively implement the strategic agendas of the JPIs.
National alignment	Most countries (with some exceptions) are neither adapting their national research activities towards the SRA/SRIAs nor the activities of the JPIs.
National structures for coordination, funding and management of JPIs	Some countries have mirror groups, or have already embraced societal challenge research, but too many have made no real progress.
Role of the Commission	The provision of financial support through CSAs and the ERA-NET instruments has clearly been vital to the development of the JPIs. There is a general feeling that the MS-led joint-programming process is not sustainable without a stronger role for the Commission, especially during times of severe economic austerity in many countries.
Operational bureaucracy	There is a high degree of operational inertia affecting the progress and potential impact of the JPIs. Too much of the scarce executive resources seem to be devoted to securing financial support from the Commission, supporting the GPC and dealing with national delegates that do not have sufficient decision-making authority.

Source: Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group.

8.5 Conclusions and lessons learned

There are several drivers for a successful implementation of the Joint Programming Initiative, and the success factors identified in the evaluation of the JPIs are worth highlighting. An essential factor for ensuring a successful implementation is the support and commitment from member countries, which also means that member countries must have the pre-existing conditions necessary for providing such support and commitment.

Funding from the European Commission through CSAs and ERA-NET was an initial incentive in implementing the Joint Programming Initiative through the ten JPIs. The CSA funding created the conditions for quickly building an effective organisation, governance structure and relevant networks.

The JPI model has some unique and interesting qualities. The JPI is not a regular research programme, but rather a systematic way of mobilising national research resources into transnational collaborations. It contains strong bottom-up features and has no time frame or predetermined budget. This, in theory, makes it a highly flexible model for collaboration.

The differences in national structure regarding research funding might be an obstacle in implementing the JPIs, as well as the coordination of dissimilar national priorities. There seems to be a tendency for the organisation of the JPIs to assume a preconceived notion of conformity among the member states and associated countries when, in fact, the systems for research funding vary significantly among the countries.

The view on the JPI collaboration also varies between countries, often in conjunction with the national conception of membership of the European Union. While some members explicitly use the JPI as an instrument to carry out relevant transnational research, others tend to rather exploit the collaboration.¹⁷⁴ The lack of national priorities/investments/-efforts that mirror the efforts of the JPIs makes it more difficult to mobilise national research resources. The Commission monitors the JPIs closely and the fact that they have attracted limited participation and gone little beyond the topics that were already of national interest to the participating states seems to be a cause for concern.

General lessons of interest for other initiatives:

- Interactive process, involvement of stakeholders throughout the process
- Considerable advantages of transnational collaboration regarding research in grand challenges, such as avoiding duplication and making development more efficient through knowledge dissemination
- The Swedish national research programmes may function as mirror programmes to the JPIs, making the mobilisation of national research resources into transnational collaborations more efficient and effective

¹⁷⁴ Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group.

References

- Altenburg, T., & Rodrik, D. (2017). *Green industrial policy: Accelerating structural change towards wealthy green economies*.
- Borrás, S., & Edquist, C. (2013). The choice of innovation policy instruments. *Technological Forecasting and Social Change*, 80(8), 1513–1522. doi: <https://doi.org/10.1016/j.techfore.2013.03.002>
- Capello, R., Caragliu, A., & Fratesi, U. (2015). Global trends and the economic crisis: Future alternative European growth strategies. *Technological Forecasting and Social Change*, 98, 120–136. doi: <http://dx.doi.org/10.1016/j.techfore.2015.06.005>
- ERAB (European Research Area Board). (2012). Study to assist the European Research Area Board: Investing in Research and Innovation for Grand Challenges. JIIP.
- Ferraro F., Etzion, D. & Gehman, J. (2015). Tackling Grand Challenges Pragmatically: Robust Action Revisited. *Organization Studies* 2015, Vol. 36(3) 363–390. [DOI: 10.1177/0170840614563742]
- Foray, D., Mowery, D. C., & Nelson, R. R. (2012). Public R&D and social challenges: What lessons from mission R&D programs? *Research Policy*, 41(10), 1697-1702. doi: <http://dx.doi.org/10.1016/j.respol.2012.07.011>
- George, G., Howard-Grenville, J., Joshi, A., & Tihanyi, L. (2016). Understanding and tackling societal grand challenges through management research. *Academy of Management Journal*, 59(6), 1880–1895. doi: 10.5465/amj.2016.4007
- Georghiou, L. (2008). Europe’s research system must change, 935–6. *Nature* (452(7190)), 935-6.
- Hicks, D. (2016). Grand Challenges in US science policy attempt policy innovation. *Int. J. Foresight and Innovation Policy*, 11(1/2/3), 22–42.
- Howlett, M and Rayner, J. (2017). Design Principles for Policy Mixes: Cohesion and Coherence in “New Governance Arrangements”. *Policy and Society*, 26:4, 1-18.
- Kallerud, E., Klitkou, A., Sutherland Olsen, D., Scordato, L., Amanatidou, E., Upham, P., Oksanen, J. (2013). Dimensions of research and innovation policies to address grand and global challenges *Position paper of the CPRI project*.
- Kuhlmann, S., & Rip, A. (2016). The challenge of addressing Grand Challenges, A think piece on how innovation can be driven towards the “Grand Challenges” as defined under the prospective European Union Framework Programme Horizon 2020. Brussels, European Commission.
- Martin, R. (2013). Foresight and “grand challenges” within research and innovation policies. *Foresight*, 15(1), 29–39. doi: 10.1108/14636681311310123
- Mazzucato, M. (2015). A mission-oriented approach to building the entrepreneurial state *Report commissioned by the UK government*. London, UK.
- Modic, D. & Feldman, M. P. (2017). Mapping the human brain: comparing the US and EU Grand Challenges. *Science and Public Policy*, 44(3), 2017, s. 440–449. [doi: 10.1093/scipol/scw085]

- OECD. (2015). *System Innovation: Synthesis Report*. Paris: OECD.
- OECD. (2016). *STI Outlook Future technology trends*.
- OECD. (2017). International co-operation in STI for the grand challenges - insights from a mapping exercise and survey. In M. Cervantes (Ed.), *DSTI/STP(2017)13*. OECD, Paris, yet to be declassified.
- Olsen, Sofka, Grimpe. (2016). Coordinated exploration for grand challenges: the role of advocacy groups in search consortia. *Academy of Management Journal*. Vol. 59, no. 6, 2232-2255. [<http://dx.doi.org/10.5465/amj.2015.0730>].
- Ostrom, E. (2011) *Governing the Commons. The Evolution of Institutions for Collective Action*, Cambridge, Cambridge University Press.
- Proposition. (2016). Kunskap i samverkan – för samhällets utmaningar och stärkt konkurrenskraft (Vol. 2016/17:50). Regeringen.
- Reichardt, K. & Rogge, K. (2016). How the policy mix impacts innovation: Findings from company case studies on offshore wind in Germany, *Environmental Innovation and Societal Transitions* 18 (2016) 62–81 [<http://dx.doi.org/10.1016/j.eist.2015.08.001>]
- Robinson, D., Schoen, A., Philippe, L., Gallart, J., Philine, W., Kuhlmann, S., & Gonzalo, M. (2014). Policy-lensing of research and innovation system scenarios: a demonstration for the European research area. JRC, The fifth conference on the Future-Oriented Technology Analysis (FTA) 2014 "Engage today to shape tomorrow", Brussels november 2014.
- Science Europe. (2014). Life, Environmental and Geo Sciences Committee Opinion Paper Science Europe. The Importance of International Collaboration for Fostering Frontier Research. December 2014.
- Smith, K. (2017). *Oxford Review of Economic Policy*, Volume 33, Number 1, 2017, pp. 49–65 *Innovating for the global commons: multilateral collaboration in a polycentric world*
- Wardenaar, T. (2014). *Organizing Collaborative Research: The dynamics and long-term effects of multi-actor research programs*, Den Haag, Rathenau Instituut 2014
- Weber, M., & Stephanie, D. (2014). Exploring Transformative research and innovation futures and their embedding in the ERA. JRC, The fifth conference on the Future-Oriented Technology Analysis (FTA) 2014 "Engage today to shape tomorrow", Brussels, November 2014.

Appendix 1 National research programmes: the Swedish context

Background

National research programmes focusing on grand societal challenges are a relatively new phenomenon in Sweden. Until recently (and also currently), Swedish research programmes typically focus on specific areas (technology, industrial sectors, etc.), inviting researchers and industry to collaborate. Programmes or centres are funded in four or six-year cycles, usually with external evaluations as a prerequisite for continued funding.

The new Swedish national research programmes focusing on societal challenges differ from the programmes described above. They are funded over a ten-year period, and are more ambitious in scope: they aim at an active and strategic overall coordination of research funding and other activities in Sweden, as well as creating synergies between different actors. Rather than only focusing on creating a project portfolio in line with programme objectives (as in the case of the more “traditional” research programmes), these new programmes also aim to function as a platform for new and ongoing research and to be a link to international programmes and EU Joint Programming Initiatives (JPIs). These challenge-driven programmes further aim to contribute to gender equality, research utilisation of higher education and efficient use of infrastructure. Thus, the new challenge-driven research programmes strive to support an increased impact in society in terms of development, knowledge building, evidence-based policies and management, and ultimately to contribute to national policy goals.

Although new, the history behind these challenge-driven programmes is rather extensive. The starting point can be dated to 2009, and the Swedish Presidency of the Council of the European Union. A conference on research and innovation during the Presidency led to the so-called Lund Declaration, which called upon member states and European institutions to focus research on the grand challenges of our time by moving beyond rigid thematic approaches and aligning European and national strategies and instruments (“Europe must focus on the Grand Challenges of our time”).¹⁷⁵

In 2011, Vinnova launched the Challenge-Driven Innovation programme.^{176,177} The programme would provide concrete innovations to societal challenges, but also enable actors in the innovation system to work more actively and systematically with social challenges. The solutions developed were expected to be competitive and, in the long term, demanded in an international market. Around this time, Vinnova and the respective ministries stopped using the hitherto common “triple helix” phrase now, there were many more players participating, and the term was no longer accurate. The programme built on four broad challenges, defined by Vinnova: future health and medical care, sustainable industrial development, sustainable attractive cities and the information society. By 2017, these had been replaced by the global objectives of Agenda 2030.

¹⁷⁵ <http://www.vr.se/download/18.7dac901212646d84fd38000336/>

¹⁷⁶ <https://www.vinnova.se/m/utmaningsdriven-innovation/>

¹⁷⁷ Fuenfschilling, Bauer, Clemente: Circle in collaboration with Vinnova: Transformative Innovation Learning History – Challenge-Driven Innovation, Vinnova, Sweden. <http://www.transformative-innovation-policy.net/learning-histories/>

This programme was followed by the strategic research and innovation agendas (2012–2016).¹⁷⁸ Here, stakeholders jointly formulated vision and goals in an area, and defined needs and strategies for the development of an innovation area. The starting point for the agendas was to address community challenges and to create growth and strengthen Sweden's competitiveness in the area.

The Government Bill on Research

In the 2016 Government Bill on Research, the Government instructed the Swedish Research Council, the Swedish Research Council Formas and the Swedish Research Council for Health and Working life to establish ten-year national research programmes in identified areas.¹⁷⁹

For each national research programme, a programme committee should be formed in which relevant research funders were to be included. The research programmes were to design strategic research agendas, drawn up jointly by responsible funders for each programme.

This was a direct response to an initiative and proposal from the three research councils to the Government, in preparing the 2016 Research bill.¹⁸⁰

In May and June 2017, the Government instructed the research councils to establish seven national challenge-driven research programmes:

- Climate (The Swedish Research Council Formas)
- Sustainable social development (The Swedish Research Council Formas)
- Food (The Swedish Research Council Formas)
- Working life (The Swedish Research Council for Health, Working Life)
- Applied welfare research (The Swedish Research Council for Health, Working Life)
- Antibiotic resistance (The Swedish Research Council)
- Migration and integration (The Swedish Research Council)

All interviewees agreed that these new programmes differed from earlier ones, in three main aspects: they have a longer time frame, they encourage and require a greater degree of cooperation and collaboration between research councils¹⁸¹, and they focus on societal needs. The latter requires a strategic research agenda elaborated together with different types of stakeholders.

¹⁷⁸ <https://www.vinnova.se/m/strategiska-innovationsprogram/>

¹⁷⁹ Kunskap i samverkan — för samhällets utmaningar och stärkt konkurrenskraft (prop. 2016/17: 50).

¹⁸⁰ Analys och förslag till regeringens forsknings- och innovationsproposition. Redovisning av regeringsuppdrag (U2015/1362/F) – gemensam analys från Energimyndigheten, Formas, Forte, Rymdstyrelsen, Vetenskapsrådet och VINNOVA. https://publikationer.vr.se/produkt/analys-och-forslag-till-regeringens-forsknings-och-innovationsproposition-redovisning-av-regeringsuppdrag-u20151362f-gemensam-analys-fran-energimyndigheten-formas-forte-rymdstyrelse/?_ga=2.187624552.1306575167.1510930884-1205023382.1510930884

¹⁸¹ Forte points out that collaboration between research councils is not unique. Forte has collaborated with other research funders in programmes concerning children's and young persons' mental health, as well as with Formas in the past.

One Government Offices representative defines “impact” as the keyword for these programmes. This makes it important to include stakeholders and end users, even in an initial process that results in a programme.

Once the programmes were identified, the Government Offices left the initiative and implementation to the research councils. Officials from the ministries declared themselves available for dialogue, but stressed that the research councils must be given time and confidence to develop their ideas and programmes.

A coherent Swedish approach

Coordination between the three research councils responsible for the programmes – the Swedish Research Council Formas, The Swedish Research Council (VR) and the Swedish Research Council for Health, Working Life (Forte) – is essential to ensure that major national programmes that address societal challenges work well.

The three research councils do not usually work precisely the same way regarding, for example, prioritisation of programmes and projects. Implementation of these new programmes places the needs of society very clearly at the forefront, and this makes coordination of the efforts of the research councils a logical and necessary step. All interviewees at the research councils emphasised that such coordination and dialogue is positive, and that this has worked well from the start. The ambition has been to address the issue of these new types of programmes through a coherent national approach.

Coordination and collaboration between the three research councils

These programmes also contain challenges for the research councils themselves on three different levels: how to seamlessly include this new and different instrument in the organisation, how to handle the research council’s strategic role and achieve a consensus internally and, finally, how to cooperate externally with the other research councils. These are three arenas in which the research councils must find their roles.

On a more comprehensive level, the three research councils are working together to define what these research programmes are, and how to work with them. This cooperation involves dialogue. As several interviewees point out, this dialogue is fruitful and, in itself, is a positive outcome. The coordination and cooperation between the three research councils is an essential and necessary part of this. The three research councils efficiently coordinating their efforts would provide another opportunity to look at the whole picture, and not only at each research council’s own area of responsibility.

Experience from previous research and innovation programmes reveals a concern that technological progress or innovation do not automatically provide optimal solutions to addressing grand societal challenges such as climate change and ageing societies. These programmes build on that experience, away from innovation policy aimed at promoting innovation in general and towards an expectation that innovation should lead to the development of solutions to identified problems or societal challenges.

This shift requires novel approaches in the design and implementation of research and innovation programmes and policies, and this initiative offers the opportunity to think differently. Here, the research councils can and need to work more closely on policy and implementation, and this creates opportunities to consider other types of efforts and instruments that lead to a greater impact in society. The research councils are not restricted to the usual funding instruments, and the challenge-driven research programmes create an opportunity to work in other ways than with calls for research funding. This could include, for example, actions that focus more directly on strengthening a specific area of research or knowledge. Unlike “traditional” research programmes, there is now an opportunity and a need to think about the whole chain – from research to market.

The process offers a difficult balance. While providing an opportunity to take a step back and see social and societal challenges in a broader perspective, the programmes also need to allocate a certain amount of funding each year. The long-term perspective is key, but there are short-term needs and obligations to meet. This means that it is not always possible to be as creative as the programmes may require, resulting in a risk of falling back on routine and proven operating procedures (i.e. handling calls and allocating research funding in the same way as the “regular” programmes).

Appendix 2 Case study – The Netherlands

This case study is not included in the cross-country comparative analysis. Formas requested a summary of the Dutch top sector initiative. The Swedish Agency for Growth Policy Analysis (Growth Analysis) summarises two of their previous publications here, including the top sectors. This summary is only based on text material and does not include interviews. The two reports by Growth Analysis focus on export and trade, and international competitiveness.

Description of the challenge-driven research programme

In 2010 the Cabinet announced a new Enterprise policy with the aim of strengthening the Dutch economy. The policy was launched by the newly-elected minority government following a coalition agreement. (Ministry of Economic Affairs 2011, Tillväxtanalys 2015a)

Like many other countries, the Netherlands faced challenges such as increased international competition, rising unemployment and demographic changes. The economy had not recovered after the financial crisis and exports were expected to remain at lower levels. (Tillväxtanalys 2015b) At the same time, Dutch businesses' investment in R&D was decreasing, and small and medium-sized enterprises (SME) in particular had problems procuring finance for high-risk innovation projects. The subsidy system was organised according to the public structure rather than the private sector structure, making it unclear and ambiguous in the private sector's view. The new policy objective was to increase public-private partnerships as well as create a more coherent and sector-based enterprise policy. With the exception of innovation policy, the approach also involved agenda setting in education, the use of foreign policy, and a focus on deregulation to facilitate new company creation and on streamlining the business environment. (OECD 2014a) The three main goals were:

- To position the Netherlands in the top five knowledge economies in the world by 2020
- To raise the Dutch R&D effort to 2.5% of GDP by 2020
- To establish Top Consortia for Knowledge and Innovation (TKI) with more than 500 million euros in public and private funding, and at least 40% funded by the private sector by 2015. (Ministry of Economic Affairs 2013, s. 17)

The policy is divided into two parts; *the economic agenda* which include regulative and administrative improvements for companies, and *the top sector initiative*, in which financial support is divided between nine sectors, also called the top sectors. This is less than the previous number of prioritised areas in the former strategy. Some areas are the same, while others have been merged or removed. (Ministry of Economic Affairs, 2011) The top sector initiative aimed to build on already strong national competitive strengths, for example, IT structure, the high-tech sector and science institutions. They are all knowledge intensive, industrial frontiers and science and export oriented. Products and technique in these sectors are considered to be a part of the solution for grand challenges. (Tillväxtanalys 2015b; OECD 2014a)

The nine top sectors are:

- Agro Food
- Horticulture and propagating stock
- High-Tech materials and systems
- Energy
- Logistics
- Creative industry
- Life sciences and health
- Chemicals
- Water

(Ministry of Economic Affairs, 2011, p. 5)

The programme's process and associated research agendas

The top sector policy aims at addressing both grand challenges and the national economic problems described above through a cohesive policy, ranging across different political topics. The political themes are knowledge and research, foreign policy, sector pre-conditions, education and training, and sustainability. All the political topics are supposed to be addressed in the top sector agendas. In Table 3 the political themes as well as the aim of every theme has been summarised. (Ministry for Economic Affairs, 2011)

Table 3 Themes for top sectors

Focus area	Aim
Knowledge and research	Greater collaboration, grouping and specialisation in research through a joint research agenda.
Foreign policy	Dutch foreign policy supports the top sectors through economic diplomacy and exports, for example.
Sector pre-conditions	Concrete solutions to sector-specific obstacles such as procurement regulations, tax and infrastructure.
Education and training	Explore new ways of increasing the knowledge and skills required in the sectors.
Sustainability	Inventory of how further sustainability can be achieved in each sector.

Source: Tillväxtanalys 2014a; Ministry of Economic Affairs 2011

These focus areas have been addressed in a research agenda. Representatives from the collaborating parties in each sector will draft an agenda together, including a strategic plan and relevant instruments. The agenda will be submitted to the government where it will be evaluated by the level of ambition, stakeholder commitment and how well it can be subsequently monitored and evaluated. Approved agendas will be formalised into top consortia for knowledge and innovation (TKIs). The TKIs have formulated the sectors' visions and prioritisations for innovation and research in an innovation contract, reflecting the joint ambitions and strategic plan for achieving the set goals. The top teams will then launch the

specified activities, based on the agendas and the government's prioritised areas. This joint process is a strategy to create a more adjusted agenda for each top sector and increase its legitimacy among the parties, as well as in society as a whole. (OECD 2014a)

The policy aims at introducing a demand-driven approach in the top sectors' research agendas. Involving parties in the formulation of the agenda has resulted in more coherent goals among the parties within each top sector, according to representatives at the Ministry for Economic Affairs. Another effect is more concentrated research and innovation activities. (Tillväxtanalys 2014a)

The programme's form and accompanying agendas

The Ministry of Economic Affairs, Agriculture and Innovation has main responsibility for the implementation and monitoring of the top sector policy. It also has the role of coordinating the other ministries assigned responsibility for one or more of the top sectors. The ministries function as contact partners and are responsible for the public sector's contribution to development within the sector. (Ministry of Economic Affairs, 2011)

Table 4 The nine top sectors and the ministries responsible

Top sector	Minister responsible
Agro-food	Economic Affairs, Agriculture and Innovation
Horticulture and propagating	Economic Affairs, Agriculture and Innovation
High-Tech materials and systems	Economic Affairs, Agriculture and Innovation
Energy	Economic Affairs, Agriculture and Innovation
Logistics	Infrastructure and the Environment
Creative industry	Education, Cultural Affairs and Science
Life sciences	Health, Welfare and Sport
Chemicals	Economic Affairs, Agriculture and Innovation
Water	Infrastructure and the Environment

Source: Ministry of Economic Affairs, 2011, s. 8

A central aspect of the top sector initiative is establishing collaboration between highly relevant knowledge institutes, businesses and public parties for each sector. Improved collaboration in research is believed to increase pioneering research and innovation. The only goal addressing the top sector policy specifically is the participation of public and private actors for a total of amount of 500 million euros by 2015. (Awti 2014)

Each top sector has a working group, a "top team" or TIK, comprising representatives from the private sector, public agencies and knowledge institutions. They are responsible for developing joint goals and visions for the top sector, as well as implementing the specified activities.

Increasing the cooperation in both the formulation and implementation of the policy has changed the role of the government. In a report conducted in 2014 by the Dutch Advisory Council for Science, Technology and Innovation (Awti) about the implementation of the policy, the focus is no longer on governing by fiscal instruments, but managing a network. (Awti 2014)

The policy set out to form a new subsidy system with fewer specific subsidies, using loans instead of subsidies. In attempting to increase businesses investments in R&D, the government uses two tax schemes: one that aims at reducing the wage costs of R&D employees

(WBSO) and the other a relief scheme for a number of other R&D costs and investments (RDA). WBSO was introduced before the top sector policy but was extended in order to increase the chance of SMEs to grow. The RDA was introduced in 2012 and increased from 40% to 60% in 2014. (Ministry of Economic Affairs, 2013)

The policy also includes facilitating collaboration between knowledge institutions, private parties and public agencies. The rules formulated and agreed on by the parties have made it easier for SMEs to participate. They also formed the basis for the cooperation in the top teams. The government promotes cooperation using two instruments: a supplement contribution to the top teams for research and participation in European projects (TIK) and a scheme supporting SME's participation in the top sectors with feasibility studies, knowledge vouchers and hiring knowledge workers (MIT). The MIT Budget was increased to 30 million euros in 2014. (Ministry of Economic Affairs, 2013)

The subsidies in the top sector initiative are financed by the allocation of funds from a number of ministries (see Table 4 above), as well as funding from EU foundations. Around 105 million euros per year is dedicated to top sector instruments. However, according to the OECD (2014a) review of the innovation policy in the Netherlands, it is not easy to accurately calculate the actual budget assigned to the top sector initiative. Resources committed to purposes such as R&D spending from different ministries, EU funding and local authorities could also be assigned to the top sector budget. When taking some additional funding into account such as labour market interventions and research and innovation, the budget was estimated at around 1.1 billion euros per year from 2013–2016. (OECD 2014a; OECD 2014b, s. 388–390)

In 2013 the total amount of finance for top sector projects was 571 million euros, of which private actors contributed with 199 million euros. (Ministry of Economic Affairs, 2014)

Implementation and monitoring

The implementation of the policy started in February 2011 with the appointment of top teams for each top sector. In May the same year these top teams were to submit their research agenda.

Implementation of the top sector policy is conducted through the top sector agendas. Each top sector has developed an agenda that should include activities in all five focus areas in Table 3, and set out specific goals for the top sector. The activities and goals should be formed in accordance with specific opportunities and obstacles within each sector. The activities are both developed and implemented within each sector. The activities within each sector have been summarised in Table 5. However, there are roadmaps for joint projects between the sectors that aim to explore unexpected links for research and innovation. Initially, there were three cross-over themes involving several top sectors: IT, Nanotechnology and Bio-based economy. However, others have been initiated. One example is the two top sectors Horticulture and propagating and Agro food in a joint project that supports innovative businesses developing new products or services for more efficient resource utilisation. Other cross-sector initiatives focus on sustainable soil and plant health. (Tillväxtanalys 2014b; Ministry of Economic Affairs, 2013)

Since 2014 there has been a greater focus on aligning the sector activities of grand challenges and, more specifically, on Horizon 2020. This has been conducted on both a policy level as well as a sector level. With the exception of collaborating on themes to solve grand challenges, the aim was also to increase the top sectors' cooperation with

international research teams. Other European initiatives such as European Innovation Partnerships, Joint Programme Initiatives and European Technology Platforms should also increase cooperation. (Ministry of Economic Affairs and Ministry of Education, 2014)

Table 5 Top sector activities

Top sector	Activities
Agro food	Agro-food sector: various (animal and vegetable) food chains, Food Valley.
Horticulture and propagating	Plant breeding, vegetables, fruits and trees, flowers and bulbs, Greenports
High-tech materials and systems	High-tech materials and systems, Brainport, nanotechnology, automotive, aircraft, Agro, security, steel
Energy	Sustainable energy management, international energy market (Gas Roundabout) and Energy Valley
Logistics	International supply chains, management role at hubs, service logistics, innovation in air traffic, freight, water, main ports at Rotterdam and Schiphol and hinterland connections
Creative industry	Architecture, fashion, gaming, industrial design, media
Life sciences	Vaccines, diagnostics, pharmaceutical, biomedical materials, preventive techniques and human and animal health remedies, Bio Science Park at Leiden, Health Valley
Chemicals	Petrochemicals, basic chemicals and fine chemicals, Maintenance Valley
Water	Water and delta technology, maritime construction, water as a resource, water purification

Source: Ministry of Affairs, 2011, s. 5

According to representatives from the Dutch foreign ministry, one result of the specification of relevant areas for cooperation in the sector agendas is that a few activities in trade and innovation have been prioritised. This meant that the Ministry could offer activities of a more qualitative standard. (Tillväxtanalys 2014a)

In 2014 the top sector initiative continued with an enhanced focus on clarifying the link between research and the private sector, increasing the amount of technical education and improving the framework for SMEs. (Tillväxtanalys 2014b)

Regular monitoring was incorporated into the strategy at an early stage. Annual development in the top sector is to be reported to Parliament, more specifically concerning economic and social effects, processes and projects. (Ministry of Economic Affairs, 2011) How the reports are meant to change the design of the top sector initiative has not been articulated. Two status reports from the Ministry of Affairs have been identified, covering 2013 and 2014 respectively, but no subsequent publications are available in English.

The reports point out that it is too early to draw any conclusions about the policy's impact and effectiveness. One indication of the success of the policy used by the Ministry of Economic Affairs are improvements in the World Forum's Competitiveness Index. Most indicators have shown a positive trend since the implementation of the top sector policy. In 2014 the improvements involved increased R&D funding from businesses and increased collaboration between knowledge institutions and businesses. The Ministry also presented the preliminary results on achieving the main goals of the policy. The calculations show a positive trend in R&D funding and private party funding of R&D, indicating that at least

two of the set goals regarding R&D are likely to be reached. However, the calculations also show major differences between the top sectors. (Ministry of Economic Affairs, 2014)

It should also be mentioned that when the top sector policy was implemented, some concerns were raised regarding the possibly overrated benefits of cooperation, its inherent backward focus rather than forward focus and that the sector orientation does not focus on global value chains and will diminish horizontal policies. (OECD 2014a)

Conclusions and lessons learned

Since the introduction of the policy in 2010, a number of evaluations have been carried out by other organisations. In 2014, the OECD conducted a mid-term review of innovation policy in the Netherlands, commenting on the top sector policy. In the same year the Dutch Advisory Council for Science, Technology and Innovation (Awti) released a status report on the top sectors. A recent evaluation was released but no English version or summary have been found.¹⁸²

Both the OECD (2014a) and Awti (2014) concluded that the top sector policy has brought positive changes to the system. It is regarded as a modern policy in its focus on cooperation, inter-departmental sectors and demand approach. The extensive inclusion of monitoring and evaluation maintains a high international standard, according to the OECD report. The Awti (2014) report highlights the major impact the policy has had in shifting the politics to a more integrated approach with focus on the sectors and organising the cooperation between actors in a new way, emphasising demand-driven aspects. The policy has also changed the role of the government from managing by subsidies to network management. The report argues that there has been an increased dialogue between parties and self-organisation.

However, there are some improvements to be made. One is to increase cooperation, both in engaging new stakeholders within the sectors and in increasing the inter-sector cooperation. Grouping the projects according to economic sectors and not by tasks chosen in a concerted process diminishes the multidisciplinary dimension. Cross-sector cooperation must be improved in order to address grand challenges and participate in international research contexts such as Horizon 2020. Some stakeholders have not started to take an active role in the cooperation this far, hence they need to be engaged and included in order for a shared vision to be created. Parties still missing are innovative SMEs, universities of applied sciences and regional authorities, to name a few. (Awti 2014; OECD 2014a)

A second improvement would be to extend monitoring and systematic learning in certain aspects. Even though monitoring was ranked high by the OECD by international standards, it still highlighted a number of potential improvements, including systematic learning from each sector and the incorporation of the lessons in designing the governance. Effects outside the top sectors should also be included in the evaluations by including their impact in an international context. (OECD 2014a)

Thirdly, the instruments used and the role of the government should be reconsidered. Specifically, the Ministry of Economic Affairs needs to change its role in practice and become more proactive and facilitating. The instruments used need to be revised, to ensure they are not micromanaging or burdening the top sectors with administrative tasks. The vision for the top sectors could also be clarified regarding the new roles of the parties and

¹⁸² <https://www.topsectoren.nl/>

communicated to a broader range of actors, for example, by listing intermediate-level goals. (Awti 2014; OECD 2014a)

References

- Awti (Advisory council for Science, Technology and Innovation). (2014). Status of the top sectors in 2014. English summary.
- Ministry of Economic Affairs. (2014). Working Together on Growth: Enterprise Policy Monitor.
- Ministry of Economic Affairs. (2013). Enterprise Policy on Track. Progress Report on Enterprise Policy 2014.
- Ministry of Economic Affairs. (2011). To the Top Towards a new enterprise policy. February 4, 2011.
- Ministry of Economic Affairs and Ministry of Education, Culture and Science. (2014) Global challenges, Dutch solutions.
- OECD. (2014a). OECD Reviews of Innovation Policy. The Netherlands. OECD Publishing.
- OECD. (2014b). OECD Science, Technology and Industry Outlook 2014, OECD Publishing.
- Tillväxtanalys. (2015a). Samspelet mellan innovations- och handelsfrämjande, Nederländerna på hemmaplan och i fält. Svar Direkt 2015:11.
- Tillväxtanalys. (2015b). Näringspolitiska insatser för stärkt konkurrenskraft. Svar Direkt 2015:13.

Appendix 3 Method

The assignment has been carried out in an approach involving the following tasks:

- *Inception meeting with the client*
In the meeting the proposal was reviewed and revised, and a preliminary decision was reached on which case studies to conduct. A summary of amendments, decisions or information put forward during the meeting was submitted to the client.
- *Document review*
The document review provided information on contextual issues concerning the societal challenges and these types of programmes as a means of meeting these challenges. The review was based on documents provided by the client and was complemented by an additional document search.
- *High-level stakeholder interviews*
Interviews were carried out with seven key actors in Sweden. The interviews, conducted in situ and by telephone, collected views and opinions surrounding the more strategic questions. The selection of interviewees and the semi-structured interview guide were discussed and agreed with the client.
- *Case studies*
The five case studies were based on desk research and interviews in situ and by telephone with key stakeholders. The cases were selected from countries comparable to Sweden in terms of research systems, political and cultural similarities, etc. The choice of research programmes was made on the basis of how well the results could be expected to guide the actors in Sweden to implement the new ten-year national and research programmes mentioned in the national research bill. The programmes chosen should have been initiated after 2005, and special emphasis was given to thematic research programmes (e.g. energy, bio economy, social welfare, etc.) and/or programmes described in terms of social challenges (e.g. digitisation, climate change, migration). It was also considered relevant to address transnational programmes such as the EU's Joint Programming Initiatives (JPIs).

Case selection was carried out in dialogue with the client and principal stakeholders.
- *Internal findings workshop*
The study team carried out a half-day online workshop in which findings and tentative overall conclusions from the case studies were discussed. The workshop also served to inform and prepare the findings validation workshop with the client.
- *Draft report and findings validation workshop with the client*
A draft report was delivered to the client and principal stakeholders, and a PowerPoint presentation of the report and discussion were held at the client's premises. This meeting gave the client and principal stakeholder an opportunity to discuss the findings of the report and to suggest amendments.
- *Final report*
The study team integrated the comments in the draft report made by the client and the principal stakeholders during the validation workshop and in written comments after the meeting into this final report.

- *Project management and Quality control*
The project was carried out in close dialogue with the client. A “second review” for accuracy, timeliness, adequacy of information and presentation of the project proposal and draft report was conducted by Erik Arnold, Adjunct Professor in Research Policy at the Royal Institute of Technology (KTH), Stockholm and Chairman of the Technopolis Group.

Text documents used to inform case descriptions

Aagaard, K. (2013), “Ny dansk innovationsfond”, *Forskningspolitik*, (4), 22–23.

“About us” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/about-us/> (read 19/09-17).

Academy of Finland’s funding decisions. Available on http://webfocus.aka.fi/ibi_apps/WFServlet?ekaLataus=0&IBIF_ex=x_RahPaatYht_report&IBIAPP_app=aka_ext&UILANG=en&ETUNIMI=&SANAHAKU=&SUKUNIMI=&PAATVUOSI_A=2015&PAATVUOSI_L=2015&SUKUPUOLI=FOC_NONE&TMK=FOC_NONE&HAKU=00000000000000000548&TUTKDI=FOC_NONE&ORGANIS=FOC_NONE&LAJITTELU=PAATOS (read 28/09-17).

“Apply for SRC funding” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/strategic-research-funding/apply-for-src-funding/> (read 02/10-17).

Danish Government. (2012). *Denmark – a nation of solutions: Enhanced cooperation and improved frameworks for innovation in enterprises*. Copenhagen.

DEA (2014), *Hvilke Udfordringer Skal Regeringens Nye Model for Samfundspartnerskaber om Innovation Holde Sig for Øje?*

Dementia Consortium website. Available at: <http://www.dementiaconsortium.org>

Dementia Discovery Fund Website (2017). *Dementia Discovery Fund Annual Update*. Available at: <http://theddfund.com/portfolio/>

Dementias Platform UK website. Available at: <https://www.dementiasplatform.uk/>

European Commission website. Joint Programming Initiative. Available at: http://ec.europa.eu/research/era/joint-programming-initiatives_en.html

Evaluation of Joint Programming to Address Grand Societal Challenges – Final Report of the Expert Group

FIVU (2012), *FORSK2020 - Strategiske forskningshorisonter*. Copenhagen: Danish Ministry for Research, Innovation and Higher Education.

FIVU (2013), *INNO+ - Et inspirations-og prioriteringsgrundlag for strategiske investeringer i innovation*. Copenhagen: Danish Ministry for Research, Innovation and Higher Education.

FIVU (2017), *FORSK2025 – fremtidens løfterige forskningsområder, juni 2017*, Copenhagen: Danish Ministry for Higher Education and Science, available at: <https://ufm.dk/en/research-and-innovation/political-priority-areas/research2025> [accessed 10 October 2017]

- Government of Canada (2009) “Canada’s Northern Strategy: Our North, Our Heritage, Our Future”, Government of Canada, 2009, p. 4, available at: <http://www.northernstrategy.gc.ca/cns/cns.pdf> [Accessed October 15, 2017]
- Government proposal on amendments to the Act on the Academy of Finland (HE 25/2014 vp).
- Guidelines on Open Knowledge – Improving the societal benefit of climate research activities
- “Harper announces NRC will launch Arctic program – Feds commit \$17m over eight years”, The Canadian Press, August 21, 2014 (<http://www.macleans.ca/politics/ottawa/harper-announces-nrc-will-launch-arctic-program/>)
- “How themes are prepared” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/strategic-research-funding/themes/theme-process/> (read 28/09–17).
- IFD (n.d.), Investment Agreement (Grand Solutions), template, available at: https://innovationsfonden.dk/sites/default/files/investment_agreement_1.pdf [accessed 10 October 2017].
- IFD (2015a), Innovationsfonden - GUDP Informationsmøde, Copenhagen: Innovation Fund Denmark.
- IFD (2015b), Vækst og beskæftigelse gennem Innovationsfonden. Copenhagen: Innovation Fund Denmark.
- IFD (2016a), Effektmåling af Innovationsfondens projekter, juni 2016, available at: https://innovationsfonden.dk/sites/default/files/publikation_innovationsfondens_effektmaling.pdf [Accessed 25 September 2017].
- IFD (2016b), Guidelines Grand Solutions Phase 1 2016, available at: https://innovationsfonden.dk/sites/default/files/guidelines_for_grand_solutions_phase_1_2016.pdf [Accessed 25 August 2017]
- IFD (2016c) Innovationsfondens effektmål, juni 2016. Available at: https://innovationsfonden.dk/sites/default/files/innovationsfondens_effektmaal_juni_2016.pdf [Accessed 25 September 2017].
- IFD (2017a), Bringing Denmark to the next level!, presentation, Spring 2017, available at: https://innovationsfonden.dk/sites/default/files/2017_informationsmoede_spring_final_0.pdf [Accessed 10 October 2017].
- IFD (2017b), Funding excellence in innovation - Innovation Fund Denmark’s Peer Assessment Guidelines for Grand Solutions 2017, Copenhagen: Innovation Fund Denmark.
- IFD (2017c), Guidelines for Grand Solutions 2017, available at: https://innovationsfonden.dk/sites/default/files/guidelines_for_grand_solutions_2017_-_uk_final_version.pdf [Accessed 25 August 2017]
- IFD (2017d), Investeringer for fremtiden, Copenhagen: Innovation Fund Denmark.

- IFD (2017e) Årsrapport 2016, Copenhagen: Innovation Fund Denmark, available at: https://innovationsfonden.dk/sites/default/files/aarsrapport_2016_final.pdf [Accessed 10 October 2017]
- IFD (2017f), Midtvejsevaluering af MADE – Manufacturing Academy of Denmark, Innovationsfonden, October 2017, available at: <https://innovationsfonden.dk/sites/default/files/made-finaluskmr.pdf> [Accessed 20 November 2017]
- Implementation Group 3: MONITORING & EVALUATING JPIs – FINAL REPORT
Innovative Medicines Initiative website. Available at: <http://www.imi.europa.eu>
- Join dementia research website. Available at: <https://www.joindementiaresearch.nihr.ac.uk>
- JPI Climate website. Vision, objectives and principles. Available at: <http://www.jpi-climate.eu/programme/objectivesvision>
- JPI Climate website. Member Countries. Available at: <http://www.jpi-climate.eu/programme/membercountries>
- Joint Programming Initiative - Connecting Climate Knowledge for Europe (JPI Climate): Strategic Research & Innovation Agenda, 2016–2025
- JPI Climate Scoping Process: Societal Transformation in the face of Climate Change
- JPI Climate Strategic Research and Innovation Agenda 2016–2025
- JPI CLIMATE - Connecting Climate Knowledge for Europe: Governance
- Long, R. (2015) Finding a Path for the Cure for Dementia. Report for the UK Government. Available at: <https://www.gov.uk/government/publications/challenges-to-finding-treatments-for-dementia>
- Marjanovic S, Lichten CA, Robin E, et al. How policy can help develop and sustain workforce capacity in UK dementia research: insights from a career tracking analysis and stakeholder interviews. *BMJ Open* 2016;6:e012052. doi:10.1136/bmjopen-2016-012052
- Mickwitz, Per; Maijala, Riitta "Strategic research and the Strategic Research Council" *Tieteessä tapahtuu*, 6/2015, pp.29–33. Available on http://www.aka.fi/globalassets/33stn/materiaaleja/mickwitz-and-maijala_strategic_research_and_the_strategic_research_council.pdf (read 11/09-17).
- NIHR website. Available at: <https://www.nihr.ac.uk/life-sciences-industry/access-to-expertise-and-collaborations/collaborations-for-early-phase-translational-research/work-with-experts-in-dementia-nihr-dementia-translational-research-collaboration.htm>
- NRC-CNRC: “Arctic Program”, website, available at: <https://www.nrc-cnrc.gc.ca/eng/solutions/collaborative/arctic.html> [Accessed 13 October, 2017]
- NRC-CNRC (2013): National Research Council Canada – Strategy 2013–2018, Ottawa: National Research Council Canada, available at: https://www.nrc-cnrc.gc.ca/obj/doc/reports-rapports/NRC_Strategy_2013_2018_e.pdf [Accessed 15 October 2017]

- NRC-CNRC (2015), National Research Council Canada 2014-15 Departmental Performance Report, Ottawa: National Research Council of Canada.
- NRC-CNRC (2016), Arctic Program, October 2016.
- “Our funding opportunities” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/funding/our-funding-opportunities/> (read 12/09–17).
- “PM announces launch of the National Research Council Arctic Program”, Whitehorse, Yukon – 21 August 2014 (<https://www.canada.ca/en/news/archive/2014/08/pm-announces-launch-national-research-council-arctic-program.html>)
- Potter, Ian (2014), National Research Council of Canada: RTOs, Program Design and Accessing Canada’s North, Presentation, September 23, 2014, available at: http://site.uit.no/canada2014/files/2014/09/CNNII_23SEP_1_7_Potter.pdf [Accessed 10 October 2017].
- “Projects selected for Strategic Research Council’s programmes” Academy of Finland’s homepage (10/05-16). Available on <http://www.aka.fi/en/about-us/media/press-releases/2016/projects-selected-for-strategic-research-councils-programmes/> (read 28/09-17).
- “SRC-funded research supports policy-making” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/strategic-research-funding/src-in-brief/> (read 12/09–17).
- “Strategic Research Council” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/about-us/SRC/> (read 28/09-17).
- “Strategic Research Council announces its first strategic research programmes” Academy of Finland’s homepage (11/02–15). Available on <http://www.aka.fi/en/about-us/media/press-releases/2015/strategisen-tutkimuksen-neuvosto-nimesi-tutkimusohjelmat/> (read 26/09-17).
- “Strategic Research Council outlines key principles for funding” Academy of Finland’s homepage (29/01–15). Available on <http://www.aka.fi/en/about-us/media/press-releases/2015/strategisen-tutkimuksen-neuvosto-linjasi-rahoitusperiaatteiden-paapiirteet/> (read 08/09-17).
- “Strategic research programmes 2015–2017” Academy of Finland’s homepage. Available on <http://www.aka.fi/en/strategic-research-funding/programmes/programmes-20152017/> (read 19/09–17).
- “Strategisen tutkimuksen ohjelmahaut 2016 - ohjelmiin valitut konsortiot” Academy of Finland’s homepage (13/06-16). Available on <http://www.aka.fi/globalassets/33stn/materiaaleja/2016-hankkeet-julkiset-kuvaukset.pdf> (read 01/10–17).
- Taylor, H. (2016) Accelerated Access Review: Final report. Available at: http://www.abhi.org.uk/media/1352/aar_final.pdf
- The Act on the Academy of Finland (922/2009).

The Government's resolution on the overall reform of research institutes and research funding (05/09-2013). Available (in Swedish) on <http://vnk.fi/documents/10616/1034423/Statsr%C3%A5dets+principbeslut+om+en+totalreform+av+statens.pdf/83a2fa21-aca9-46a0-835b-63304b81576c> (read 19/09–17).

The SRC's principles for funding "Strategisen tutkimuksen neuvoston (STN) rahoitusperiaatteet". Available at http://www.aka.fi/globalassets/33stn/materiaaleja/strategisen-tutkimuksen-rahoitusperiaatteet_12.12.2016.pdf (read 15/11–17)

Towards Joint Programming in Research: Working together to tackle common challenges more effectively {COM (2008) 468}

UK Dementia Research Institute website. Available at: <https://ukdri.ac.uk/>

UK Department of Health (2015) Prime Minister's Challenge on Dementia 2020. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414344/pm-dementia2020.pdf

UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan. Available at: <https://www.gov.uk/government/publications/challenge-on-dementia-2020-implementation-plan>

UK Department of Health (2016) Prime Minister's Challenge on Dementia 2020 – Implementation Plan Annex 2: Roadmaps to 2020 Delivery. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/507982/PM_Dementia_Annex_2_acc.pdf

"Vuonna 2015 rahoitettavat hankkeet (12.10.2015)" Academy of Finland's homepage. Available on <http://www.aka.fi/globalassets/33stn/haut/vuoden-2015-stn-haku.pdf> (read 02/10-17).

World Health Organization (2017) Infographic on dementia. Available at: http://www.who.int/mental_health/neurology/dementia/infographic_dementia.pdf?ua=1

Interviewees

Sweden:

Peter Allebeck, Forte (interviewed on 26 September 2017)

Jonas Björck, Ministry of Education and Research (interviewed on 31 October 2017)

Michael Jacob, Ministry of Enterprise and Innovation (interviewed in person on 4 October 2017)

Henrik Lange, formerly Ministry of Environment and Energy Innovation (interviewed in person on 22 September 2017)

Hanna Ridefelt, Formas (interviewed in person on 4 October 2017)

Monica Svantesson, VR (interviewed on 22 September 2017)

John Tumpane, Formas (interviewed on 15 September 2017)

UK:

Professor John Gallacher, Director, Dementias Platform UK (interviewed in person on 9 October 2017)

Denmark:

Tore Dewvold, Deputy Director at Innovation Fund Denmark, responsible for Grand Solutions, 25 September 2017)

Finland:

Mikael Hildén, Programme Director/A Climate Neutral and Resource-Scarce Finland, 21/09–17.

Per Mickwitz, Chair/Strategic Research Council, 25/09–17.

Canada:

Mark Murphy, Portfolio Business Advisor at NRC-CNRC, 10 October 2017

Anne Barker, Arctic Program Leader at NRC-CNRC, 1 November 2017

JPI:

Linda Berqvist Ampel, JPI Climate/Formas, 13 October 2017

Lisa Almesjö, JPI Climate/Formas, 13 October 2017

Appendix 4 An overview of the case studies

An overview of some of the characteristics of the five cases shows the following picture:

	Denmark	UK	Finland	Canada	JPI
Size	DKK 600 million (€80m)/year	Over £300 million	€17 million	\$17 million from federal government + \$65 million from industry co-funding	No defined size Together the 10 JPIs had invested 200 million euros by the end of 2014
Time frame	3–5 years	2015–2020	2015–20	8 years	No defined time horizon
Focus (challenge)	Multiple (e.g. Energy, food, health)	Dementia	Climate change	Four priorities: Resource development; Northern transportation shipping; marine safety technologies; community infrastructure	Multiple (e.g. climate, food, health)
Approach	Thematic: mostly top-down by policy-makers. Project selection: Top-down by the Fund's board, based on input from external reviewers and interviews	Partnership – both bottom-up and top-down	Formulation: top-down Selection: bottom-up	Top-down definition of four areas and bottom-up internal decisions on projects to undertake based on relevance and stakeholder interests	Strategic framework, a bottom-up approach and high-level commitment from member states

	Denmark	UK	Finland	Canada	JPI
Participants	Government funding bodies: Innovation Fund Denmark Project participants (with varying degrees of co-financing): Public and private sector, researchers and users	Finance from: government, health and care sector, charity sector Setting the agenda: government, health and care sector, charity sector, medical research council, researchers, patients and carers, industry Project participants: the health and care sector, charity sector, researchers, patients and carers, businesses and industry, general public	Five consortia. Universities, (state-owned) companies, public research institutes, a few international actors	Project participants including NRC regulators, communities and industry.	Institutions that are legally permitted to make strategic decisions and utilise resources from national research funds
Implementation	by consortia based on mandatory collaboration agreements	50 commitments, lead organisation/s for each. Detailed roadmap for implementation	No overall implementation plan, carried out in consortia	The NRC carries out research and offers RTO services to project participants	Overall Implementation Groups: IG1 – Fostering Relationships among the JPIs and the GPC IG2 - Improving Alignment and Interoperability IG3 Monitoring and Evaluation
Monitoring	Project level: Active follow-up from the Innovation Fund, incl. annual review. Programme level: Framework for measuring effects in place. Evaluation due in 2018	Separate mechanisms for the Challenge as a whole and individual initiatives within the Challenge	Programme director updates the SRC on projects. SRC: midterm evaluations of the programmes	The Artic Program is subject to an internal review process and measured against KPIs. Projects are reviewed in accordance with project-specific targets and continued relevance.	EU-level: Funding from the Commission to specific JPIs is monitored + Implementation Group 3 National level: monitoring of the resources channelled to the JPIs

Myndigheten för tillväxtpolitiska utvärderingar och analyser

Tillväxtanalys är en analysmyndighet under Näringsdepartementet. På uppdrag av regeringen utvärderar och analyserar vi svensk tillväxtpolitik.

Vi arbetar för att stärka den svenska konkurrenskraften och skapa förutsättningar för fler jobb i fler och växande företag i alla delar av landet. Det gör vi genom att ge regeringen kvalificerade kunskapsunderlag och rekommendationer för att utveckla, ompröva och effektivisera statens arbete för hållbar tillväxt och näringslivsutveckling.

Sakkunniga medarbetare, unika databaser och utvecklade samarbeten på nationell och internationell nivå är viktiga tillgångar i vårt arbete. Myndighetens primära målgrupper är regeringen, riksdagen och andra myndigheter inom vårt kunskapsområde. I våra utvärderingar och analyser har vi en oberoende ställning.

Vi är cirka 35 anställda och finns i Östersund (huvudkontor) och Stockholm.

Våra publikationer

Vi publicerar rapporter i tre olika serier på vår hemsida:

Rapportserien – Tillväxtanalys huvudsakliga kanal för publikationer. I rapportserien ingår även myndighetens faktasammanställningar.

Statistikserien – Löpande statistikproduktion

PM – Metodresonemang, delrapporter och underlagsrapporter är exempel på publikationer i serien.