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A Formative Meta-Evaluation of Seven Swedish National Research Programmes 2017-2021

En formativ metautvärdering av sju svenska nationella forskningsprogram, 2017–2021

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Introduction

The Swedish government has tasked the three Swedish research councils Formas, Forte and Vetenskapsrådet with leading several national research programs aimed at societal challenges. The first programs started in 2017. Until 2022, the mission has been gradually expanded to a total of 13 programs of different orientations. The national research programs are broad, ten-year investments. They aim at strengthening research and innovation that meets societal challenges that the Swedish government has identified. In order to succeed in this, the programs also have the objective to strengthen cooperation between researchers, research funders and other actors in society.

This report presents an overarching meta-evaluation, based on individual half-time evaluations of the seven national research programs that have been running for almost five years. The results of the individual evaluations are presented in separate reports. The overall evaluation and recommendations in this report highlight collective conclusions and reflections about the mission of the national research programs as a funding instrument.

The overall purpose of the evaluations is to contribute to our learning and to the continued development of the programs. These evaluations provide valuable insights into what has been successful in the programs but also point to what we may need to develop in the next five years of the programs, as well as learnings on how challenge-driven research and innovations can be funded. We are happy to see that the evaluations highlight that the programs have funded research of importance for their respective societal challenges.

All evaluations were carried out by Technopolis Group in a joint assignment by Formas, Forte and Vetenskapsrådet. The report's analysis and recommendations are entirely those of the authors.

We would like to express our warm thanks to the authors for this report, and to those who contributed to the underlying program evaluations through survey responses and interviews.

Stockholm, October 2022

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Sammanfattning

Detta är en formativ metautvärdering av de sju svenska nationella forskningsprogrammen, som lanserades efter forskningspropositionen 2016/17. Deras övergripande mål är att bidra till att lösa samhällsutmaningar. Denna rapport bygger på de enskilda halvtidsutvärderingarna av de sju nationella forskningsprogrammen.

De nationella forskningsprogrammen utgör ett visst avsteg från den traditionell forskningsfinansiering genom att de är utmaningsorienterade, det vill säga de syftar till att lösa problem i samhället genom att ta fram och *använda* ny kunskap, i motsats till en mer traditionell finansiering av forskning och innovation som bärs av idén att ta fram ny kunskap med förväntan om att detta kommer att få ospecificerade men positiva effekter på sikt. De nationella forskningsprogrammen baseras på strategiska forskningsagendor som har tagits fram i bred dialog mellan forskningsutförare och behovsägare, och andra berörda aktörer. Programmen drivs av de tre forskningsråden Formas – Ett forskningsråd för hållbar utveckling; Forte, Forskningsrådet för hälsa, arbetsliv och välfärd; och Vetenskapsrådet (VR). De nationella forskningsprogrammen leds av programkommittéer som involverar de nämnda forskningsfinansiärerna, behovsägare och andra relevanta samhällsaktörer.

Vid etableringen av de nationella forskningsprogrammen involverades ett brett spektrum av aktörer som behövs för att bedriva forskning och säkerställa att denna bidrar till att lösa de samhällsutmaningar som identifieras. Detta breda engagemang ska bestå under programmets hela löptid och bidra till att programmets agendor är relevanta, och fortsätter vara relevanta, givet ett kontinuerligt lärande inom programmen och förändringar i samhället under programtidens gång.

Placeringen av de nationella forskningsprogrammen hos de tre etablerade forskningsfinansiärerna har säkerställt ett smidigt och effektivt programgenomförande, men har även inneburit att programmen varit begränsade av finansiärernas instruktioner, instrument och praxis, på så vis att programmets sätt att arbeta har påverkats starkt av forskningsrådets förvaltnings- och finansieringsregler och traditioner. Detta har begränsat vilken typ av forskning som finansieras, vem som får bedriva forskningen och på vilka villkor, liksom vilka finansieringsinstrument som finns tillgängliga och vilket kunskapsutnyttjande som sker.

Programmen har fokuserat starkt på forskning vid universitet och högskolor och på att generera ny kunskap, men de har varit mindre effektiva när det gäller att analysera och förstå samhällets behov och att ta tillvara och sprida kunskapen. Programmets strategiska forskningsagendor är avsedda att identifiera kunskapsluckor relaterade till olika samhällsutmaningar, som den nya kunskapen i förlängningen förväntas bidra till att lösa. Forskningsaktiviteterna ska därmed skapa kunskap för att täppa till kunskapsluckorna. Utvärderingarna tyder dock på att den forskning som finansierats inte alltid möter de kunskapsluckor som identifierats i agendorna. Många av de samhällsutmaningar som tas upp är också så stora att det är svårt att vara specifik om vilka kunskapsluckorna är.

Universiteten är de främsta mottagarna av finansiering inom programmen, vilket ger dem möjlighet att bedriva större och längre projekt än vanligt och gör det lättare att involvera doktorander. Universitet med tydliga tematiska strategier har visat sig vara bättre lämpade än andra lärosäten att använda den utmaningsorienterade finansiering som de nationella forskningsprogrammen tillhandahåller, för att stärka sin forskning.



De enskilda programutvärderingarna visar att de nationella forskningsprogrammen producerar betydande mängder ny kunskap. Deltagande forskare förväntar sig dessutom att projekten ska generera mycket mer kunskap under resten av programperioden. Däremot finns svagheter i kopplingen till behovsägare och användningen av kunskapen.

De nationella forskningsprogrammen omfattar en hel del tvärvetenskaplig forskning, vilket kan förväntas i utmaningsorienterade program. De syftar också till att finansiera sektorsövergripande forskning som behövs för att ta itu med de olika samhällsutmaningarna, men i detta avseende har programmen varit mindre framgångsrika.

De nationella forskningsprogrammen har flera ganska generiska mål som är viktiga men som också återfinns i nästan all forskning som finansieras av finansiärerna, såsom exempelvis jämställdhet i finansieringen (vilket inte är ett problem i de nationella forskningsprogrammen). Målen inkluderar också deltagande i internationella program och gemenskaper, ett deltagande som är omfattande eftersom de utmaningar som de nationella forskningsprogrammen är orienterade mot till stor del är av internationellt intresse. Målen inkluderar slutligen samhällseffekter, vilket ännu så länge endast syns i begränsad omfattning. Det finns också krav på programmen ska bidra till att undervisningen vid universitet och högskolor ska vara forskningsbaserad, vilket de bidrar väl till, men detta är en fråga som i praktiken hanteras av lärosätena.

De nationella forskningsprogrammen har visat att forskningsråden kan samarbeta och samordna sig både när det gäller utformningen och genomförandet av programmen, att fungera som plattformar för forskning om utmaningsrelaterade teman och stödja kopplingar till forskningspolitik och forskningsprogram på europeisk nivå. Ett problem har dock varit att programbudgeten blev tillgänglig innan den faktiska programplaneringen var färdigställd. Det innebär att vissa utlysningar genomfördes utan förankring i forskningsagendorna.

De nationella forskningsprogrammen visar både på styrkor och svagheter med att använda etablerade forskningsråd i nya roller. Följande lärdomar kan dras inför återstoden av programperioden och även i kommande satsningar av liknande slag:

- Välj genomförandeorganisation noggrant, med beaktande av de vägval som är förknippade med att använda etablerade finansiärer.
- Var beredd att ändra instruktionerna till sådana finansiärer efter behov, på allmänna programspecifika grunder.
- Utveckla kompetensen inom finansiärerna att arbeta med samhällsutmaningar.
- Säkerställ finansiering och andra instrument (till exempel när det gäller framsyn och planering) för att bättre koppla de nationella forskningsprogrammen till samhällsbehov och användning av ny kunskap.
- Säkerställ att programkommittéerna har starkare och mer permanenta roller och når bortom forsknings- och innovationssamhället i syfte att finna andra partners som behövs för att ta itu med samhällsutmaningar.
- Säkerställ att programmets beslutsprocesser innehåller tydliga och formella inslag av reflexivitet.
- Sätt upp övergripande mål som gäller all forskning på organisatorisk nivå, inte programnivå.

På regeringsnivå är det viktigt att inte bara erkänna betydelsen av insatser för samhällsutmaningar utan också det fortsatta behovet av en mer traditionell forsknings- och innovationspolitik. Omfattningen av samhällsutmaningarna är så stor att regeringen måste



bestämma sig för vilka utmaningar som forskningen ska bidra till att lösa i stor skala och vilka som ska prioriteras ner. Med tanke på vikten av grundläggande kunskaper för att möta stora samhällsutmaningar är det viktigt att grundforskningsfinansiärer deltar. Större insatser bör fokuseras mot mycket specifika utmaningar och behöver förmodligen involvera välintegrerade plattformar eller allianser som inkluderar grundforskningsfinansiering. Mindre insatser kan dra nytta av instrument liknande de nationella forskningsprogrammen som ger utmaningsrelevant kunskap inom bredare tematiska områden, där det inte nödvändigtvis finns en helt samordnad strategi eller ett helt sammansvetsat program. I båda fallen kommer lärosäten som utvecklar fokuserade tematiska strategier att vara bättre lämpade att stödja och dra nytta av de nationella forskningsprogrammen än de med en mer fragmenterad strategi.



Summary

This is a formative meta-evaluation of the seven Swedish National Research Programmes (NRPs), launched following the 2016/17 Research Bill. Their overall objective is to help address societal challenges. This report is based on the individual evaluations of the seven NRPs in scope.

The NRPs are an important departure from traditional research policy because they are challenge-based: that is, they aim to address problems in society by marshalling and using new knowledge, as opposed to the traditional research and innovation policy approach of producing new knowledge in the expectation that it will have unspecified but positive impacts. The NRPs were based on strategic research agendas, generated via wide consultation. They were run by three research funding agencies: Formas – A Swedish Research Council for Sustainable Development; Forte, Swedish Research Council for Health, Working Life and Welfare; and Vetenskapsrådet (VR¹), the Swedish Research Council. They were led by programme committees involving the lead agencies, problem-owners, and other relevant societal actors outside the research and innovation communities, while the lead agencies played strong roles in implementation.

The way the NRPs were set up is consistent with the thrust of the research literature on societal challenges and transitions, which suggests involving the wide range of actors who are needed not only to do research but also to ensure its implementation to fix the challenge addressed. This wide involvement needs to persist through the life of the programme, helping to adjust the agenda based on learning and on changes in the context. In practice, the influence of the committees has declined over time.

Using established agencies has ensured smooth and effective programme implementation, but also means that the NRPs have been the prisoners of the funders' usual rules, instruments, and practices. They have therefore focused strongly on university research and generating new knowledge but have been less effective in analysing and understanding societal needs, and in utilising and disseminating new knowledge. The intended role of the agendas is to identify knowledge gaps on the way to tackling the societal challenge. The research activities should then create knowledge to plug the gaps. However, the evaluations suggest that the gaps plugged are not always the gaps identified in the agendas. Many of the societal challenges addressed are also so wide that it is hard to be specific about what the gaps are.

The universities are the principal beneficiaries of the programmes, which provide them with the opportunity to do bigger and longer projects than usual, more easily involving PhD students. Universities with clear thematic strategies are better placed than most to use thematic NRP funding to strengthen their research.

The individual programme evaluations indicate that the NRPs are nonetheless producing considerable amounts of new knowledge. Researchers report significant research output and expect to generate a lot more in the rest of the programme period, though there are weaknesses in their links to problem owners' needs and in knowledge exploitation. The NRPs involve a great deal of interdisciplinary research, as would be expected in problem-driven

¹ The Swedish Research Council does not have an English-language acronym, so we use the Swedish one (VR) here



programmes. They also aim to fund cross-sector research needed to address societal challenges but are less successful in doing that.

While the NRPs are challenge orientated, the way they work is strongly influenced by the strategic, management, and funding rules and traditions of the lead agencies. This limits the types of research they fund, who may do that research and on what terms, the funding instruments available, knowledge exploitation, and the NRPs' broader links to implementation.

The NRPs have several rather generic goals that are important but that also apply to almost any kind of research. These include: gender equality in funding, which is not a problem in the NRPs and is handled by the funders; participation in international programmes and communities, which is strong, as the NRPs are largely in areas of international interest; societal impact, which is weak and is supported by few funding instruments; a requirement for university teaching to be research-based, to which NRP research contributes well but is a matter that in practice is handled by the universities. In our view, these requirements should be directed to the funding organisations and universities, rather than the programme level.

The NRPs have demonstrated the ability of multiple funding agencies to cooperate and coordinate in both the design and implementation of programmes, operating as platforms for research on challenge-related themes and supporting links to European level research policy and programmes. One problem that arose was that grant budget became available before the programme planning was complete. So certain calls for proposals were made before the research agendas were complete.

The NRPs demonstrate both the strengths and the weaknesses of using established agencies in new roles. The following lessons can be drawn from the experience for the remainder of the programme period.

- Make a careful choice of implementing agency, taking account of the path dependencies involved in using existing organisations.
- Be willing to alter government instructions to such agencies as needed, on a general or a programme-specific basis.
- Develop more human capacity within the agencies to work with societal challenges.
- Improve the availability and use of funding and other instruments (for example in relation to foresight and planning) to link NRPs to needs for and use of research.
- Ensure that programme committees have stronger and more permanent roles and reach beyond the R&I community to recruit other partners needed to tackle societal challenges.
- Embed reflexivity more firmly and formally into programme management processes.
- Set generic goals that apply to all research at the organisational, not the programme, level.

At the government level, it is important to recognise not only the importance of societal challenge interventions but also the continuing need for more traditional research and innovation policies. The scale of the societal challenges is so big that countries need to decide which to address at scale and which to allocate fewer resources, while still maintaining some activity. Given the importance of fundamental knowledge in tackling the challenges, it is important for basic research funders to participate. Major interventions need to be focused on very specific challenges and should probably involve well-integrated platforms or alliances that include basic research funding. Smaller interventions can benefit from NRP-like instruments that provide challenge-relevant knowledge across wider thematic areas, where there is not necessarily a fully joined-up strategy or programme. In both cases, universities



that develop focused thematic strategies will be better placed to support and benefit from the NRPs than those with a more fragmented approach.

1 Introduction

This is a formative meta-evaluation of seven national research programmes (NRPs) launched by the Swedish government, following the 2016/17 Research Bill. The Bill was entitled *Knowledge in collaboration – for societal challenges and strengthened competitiveness*² and the programmes were intended to address societal challenges.

The programmes in scope to this meta-evaluation (Table 1) are intended to last for ten years. This document is based on their mid-term evaluations, covering the period 2017-2021, and has a double purpose. First, it is intended to support learning at both programme and policy levels, in a period when many governments and their agencies are experimenting with ways to address the societal challenges. Second, it serves to provide the government and its agencies with an overview of the results of the mid-term evaluations.³

Table 1. Programmes in scope to this meta-evaluation

Programme	Responsible Ministry	Lead Funding Agency
National Research Programme on Food	Ministry of Enterprise and Innovation	Formas Swedish Research Council for Sustainable Development
National Research Programme on Climate	Ministry of the Environment	Formas Swedish Research Council for Sustainable Development
National Research Programme on Sustainable Spatial Planning	Ministry of the Environment	Formas Swedish Research Council for Sustainable Development
National Research Programme on Working Life Research	Ministry of Health and Social Affairs	Forte Swedish Research Council for Health, Working Life and Welfare
National Research Programme on Applied Welfare Research	Ministry of Health and Social Affairs	Forte Swedish Research Council for Health, Working Life and Welfare
National Research Programme on Antimicrobial Resistance (AMR)	Ministry of Education and Research	Swedish Research Council
National Research Programme within Migration and Integration	Ministry of Education and Research	Swedish Research Council

Note: Six further national research programmes were launched in 2021. They are not in scope to this study

Our terms of reference say that the mid-term evaluation process is intended to clarify the potential of the NRPs to meet societal challenges, identify the added value of the programmes compared with normal practice, identify barriers to goal attainment and recommend how to overcome them. The evaluation is not intended to address the scientific quality of the research funded by the individual NRPs, nor to make comparative judgments about them.

Table 2 and Table 3 shows the specific evaluation questions, respectively for this report and for the individual NRP evaluations, upon which it is based.

² Kunskap | samverkan – för samhällets utmaningar och stärkt konkurrenskraft Prop. 2016/17:50

³ It is written in English so that it can contribute to both the Swedish and the international debate. It also contains a little more detail about how Swedish government administration works than would otherwise be necessary, in order to support international readers

Table 2. Evaluation questions for the meta-evaluation

Main questions	Sub-questions
1. How does the design and implementation of the programmes contribute to producing their expected outputs and outcomes, and thereby contribute to addressing societal challenges?	<ul style="list-style-type: none"> i) Organisation and processes ii) Inputs and activities
2. What value do the programmes add to the Swedish research and innovation system?	<ul style="list-style-type: none"> i) Identified weaknesses in the research and innovation system ii) Created synergies among actors iii) Increased participation in EU programmes iv) Established themselves as platforms for research in their area v) Promoted exploitation of research results, based on their needs-oriented point of departure vi) Contributed to increased efficiency and effectiveness in the research and innovation system

Source: Faugert & Co proposal to evaluate the NRPs at mid-term (our translation)

Table 3. Evaluation questions for the individual programme evaluations

Main questions	Sub-questions
Renewal and innovation	<ul style="list-style-type: none"> • How does the programme contribute to renewal and innovation within the societal challenges identified? • How does the programme contribute to addressing knowledge gaps and/or knowledge needs?
Cooperation	<ul style="list-style-type: none"> • How does the programme contribute to cross/multidisciplinary collaborations within the framework of the programmes? • How does the programme contribute to cross-sector cooperation? • How are the programmes and the programmes' activities and efforts integrated and coordinated with other ongoing efforts in the area nationally as well as internationally?
Utilisation	<ul style="list-style-type: none"> • How does the programme contribute to the use of research results? • How does the programme contribute to strengthening the connection between research and university teaching?
Gender equality	<ul style="list-style-type: none"> • How does the programme contribute to gender equality?
Efficiency	<ul style="list-style-type: none"> • How appropriate and efficient are the programme's organisation and processes?
Recommendations	<ul style="list-style-type: none"> • How could the programme be further developed to strengthen its role as a national research platform in its field and fulfil its ambition to contribute to meeting major societal challenges?

Source: Faugert & Co proposal to evaluate the NRPs at mid-term (our translation)

The inputs to this report are the seven individual evaluations, the published research strategies of the individual research programmes and other relevant documentation, including Ramboll's evaluation of the start-up period of Formas' three NRPs (Section 3.4), as well as interviews with the directors-general of the funding agencies shown in Table 1 and with vice-



rectors for research (or their equivalents) at seven universities. The interviewees are listed at 0.

The funding agencies have kindly commented on an earlier version of this report. We are grateful to them and to our interviewees for their support. The usual disclaimer applies: any remaining errors of fact or interpretation are the sole responsibility of the authors.

2 The policy context

The NRPs respond to an international change in research and innovation (R&I) policy priorities since the start of the century to address the societal challenges. Sweden is among the leading countries in this policy 'turn'. Visible signs of this include the Lund Declaration in 2009, the adoption of societal challenges as pillars in Horizon 2020 and more recently the European Commission's work to integrate 'missions' into Horizon Europe, as well as a growing number of new policies at national level.

In recent years, therefore, Swedish national R&I policy has involved large-scale experiments aiming to go beyond the 'technology programme' tradition of Sweden's innovation agency Vinnova, and its predecessors and establish more comprehensive links reaching from basic research into society. The Strategic Research Areas (SRAs) announced in the 2008 Research Bill selectively allocated increases in institutional funding to universities via a competition based on proposals to strengthen their research capacity in societally relevant themes. The aim was to encourage the universities to expand their research activities in areas of high societal relevance. The SRAs were evaluated after five years, which was too soon to find out whether they influenced the structure of the universities but did show that the universities' ability to make and implement strategy was very variable (Teeri, et al., 2015).

The 2012 Bill introduced Strategic Innovation Programmes (SIPs) funded by Vinnova, Formas, and the Swedish Energy Agency, creating R&I platforms with strong industrial participation, and having the dual aim of promoting industrial competitiveness and tackling societal challenges. The six-year evaluations of the SIPs show that (like the earlier technology and branch research programmes) they have been pretty effective in promoting innovation for competitiveness but have struggled to reorient themselves towards societal challenges and for the SIP consortia to achieve the unity of purpose or 'directionality' needed (Åström, Arnold, & Olsson, 2021). Both examples illustrate how hard it is to change direction in policymaking and implementation in a solidly established field such as research and innovation and to work in new ways.

The UN Agenda 2030 in 2015, the national action plan for implementing Agenda 2030 (Finansdepartementet, 2018) and the Swedish national climate strategy (Energidepartementet, 2018) and other national strategies increase the policy pressure for connecting research with societal challenges. The NRPs carry on this trend.

Our traditional way of thinking about R&I and its role in society involves the idea of new knowledge eventually having 'impact' in society. Most countries prioritise funding certain themes that they believe to be important in meeting societal needs (typically through innovation and 'sector' agencies) but also fund curiosity-driven research (typically through research councils). Swedish R&I policy has a long history of debate about which of these two styles of funding should get more money. In practice, like others, Sweden hedges her bets, investing in 'relevant' thematic research to tackle known societal needs but also curiosity-driven research to build and maintain national research capacity, to capture some of the unpredictable opportunities it brings, to build fundamental understanding that opens doors to unexpected forms of new knowledge and, last not least, because scientific curiosity and knowledge have high cultural value. In practice, in both thematic and curiosity-driven research, the type, amount, and timing of any 'impact' is rather uncertain.

The new policy focus on societal challenges turns this logic on its head. It builds on theory about socio-technical transitions, in addition to pre-existing knowledge about research and innovation and requires new policymaking and implementation skills (Arnold & Barker, What

past changes in Swedish policy tell us about developing third-generation research and innovation governance, 2022). Strictly, the challenge-based approach defines a problem and invests in its solution. This implies understanding key characteristics of the solution and its implementation, and then working backwards to plan how to reach this specific solution. This often involves finding new knowledge by doing research. It is currently being promoted by the EU and the OECD in the form of ‘missions’, but it is not new.

Famous past technical ‘missions’ include the Manhattan Project that invented nuclear weapons and the Apollo Moon mission. Such missions define technical problems and drive a mixture of new research and re-use of existing knowledge to solve them. In the USA, such ambitious technical programmes have come to be known as ‘grand challenges’. Both the government and major charitable foundations continue to fund grand challenges such as building the fastest supercomputer in the world or making a new vaccine. These are technically challenging, but their social context is quite simple: there is a clearly defined problem and a customer willing to pay for a solution. But the social uncertainties associated with markets, societal impacts, laws, regulations, skills, or human behaviour are outside the terms of reference. Normally a single provider can deliver all the ingredients of the solution, and issues of implementation are out of scope for the challenge.

In Europe (and the rest of the world is slowly catching up), policy focuses more on societal than on technical challenges, and requires changes in socio-technical systems. Putting humans into the loop makes things messy. Socio-technical systems are complex and evolve, so goals and plans are unstable; their scope is broad, involving many more actors in society and potentially requiring gigantic budgets; and in addition to technical change, they involve changing ‘socio-technical regimes’, bringing in many of the awkward elements like people, skills, laws, traditions, cultures, and markets that the US technical grand challenges conveniently skip. They also pose the kind of difficult questions about roles and division of labour in research and innovation funding systems that Sweden last faced in the 1960s, when there was a policy decision to create a new agency to fund innovation⁴ and to discover how such an agency would work, which took more than a decade to resolve (Weinberger, 1997) (Arnold & Barker, What past changes in Swedish policy tell us about developing third-generation research and innovation governance, 2022).

There is now an extensive research literature dealing with socio-technical transitions, and a smaller one about missions. The literature emphasises the importance of involving a wider range of actors, especially problem-owners, in policy than we are used to in R&I. However, most of the literature works at an abstract level, taking little account of the role of government and the state, or of the practicalities of policymaking and policy implementation (Arnold, Åström, Glass, & de Scalzi, 2018). That is beginning to change, largely because governments are starting to evaluate early attempts at transition and (especially) mission policies (Larrue, 2021), for example in connection with the German High Tech Strategy (Wittmann, Hufnagl, Roth, Yorulmaz, & Lindner, 2021) and the Energy Transition (Dinges, et al., 2022), the Dutch Top Sectors (Janssen, 2020) and the Swedish Strategic Innovation Programmes (Åström, Arnold, & Olsson, 2021). This meta-evaluation of the NRPs provides a useful opportunity to shed more light on the process of translating policy for societal challenges into practice.

⁴ Styrelsen för teknisk utveckling (STU) – the Swedish National Board for Technological Development – a predecessor to Vinnova

3 The NRPs

The NRPs were implemented and are governed in ways that are new, compared with traditional Swedish practice in R&I Policy, and span many fields, participants, and types of funding instrument. The university system has absorbed most of the NRP funding but does not appear to have taken full advantage of the strategic opportunities the NRPs provide. An earlier evaluation of Formas' NRPs pointed to a number of teething troubles in the implementation.

3.1 Governing and implementing the NRPs

In the Swedish administrative tradition, ministries tend to be small while their agencies are often large in international comparison and to have considerable analytical resources, which they deploy in policy design. Generally, in Swedish R&I policy, the bigger or more radical the decision, the greater the role of the ministries and government itself. The steering relationship between ministries and agencies is built on a set of standing orders (*instruktion*), and annual letters of instruction (*regleringsbrev*) that add or change specific detail to the standing orders and allocate an annual budget to the agencies⁵. A third form of steering is 'government tasks' (*regeringsuppdrag*), in which government gives an *ad hoc* instruction to the agency or, increasingly in R&I policy, to two or more agencies acting together.

These formal steering mechanisms are accompanied by dialogue, so that while government ultimately takes the big decisions, the agencies often propose or co-create policy interventions with the ministries and generally have wide discretion in the detailed design and implementation of programmes. The agencies often suggest things that should be put into their letters of instruction or ask the government to allocate tasks to them.

In 2014, the three agencies that fund the NRPs were given tasks of analysing the state of research in their fields and identifying priority areas for investment. They reported back to the government in 2015, which was also the year when government was looking for inputs to the 2016 Research Bill. As part of this consultation, the three agencies proposed to establish NRPs, which were duly announced in the 2016 Bill as seven "Strategic investments to address societal challenges" in the form of NRPs. (One on "Social housing policy and accessibility design" was subsequently integrated into that on Sustainable Spatial Planning). The same Bill proposed a national Food strategy and to set up a committee in Formas' sphere to look after it. This was subsequently told to set up a Food NRP, completing the set of seven programmes analysed here (Table 1).

The 2016 Research Bill is clear that the NRPs are challenge based. This is an important departure from previous policy, and itself poses a challenge to the agencies to manage the programme differently from past ones, which have tended to focus on knowledge production as opposed to addressing specific challenges.

In 2017, the government wrote to Formas, Forte and the Swedish Research Council formally giving them the task of setting up NRPs. Its letter⁶ specifies that these were to be ten years in length and shall contribute to meeting various societal challenges. Each was to have a national programme committee, which includes the three funders, and others where relevant.

⁵ This normally entitles to agencies to commit a declining share of future budgets, so that they can make multi-annual funding commitments

⁶ Regeringsbeslut III:7, 2017-05-18 U2017/02404F, Uppdrag att inrätta nationella forskningsprogram

For each, the responsible funder should develop a coordinating and strategic research agenda (which could include elements of development and innovation), in cooperation with the other funders.

The programmes were expected to act as platforms, both within Sweden and in linking to international programmes, and especially to strengthen Swedish participation in the EU Framework Programme. They should identify and plug knowledge gaps. The letter sketched the required arrangements for management and administration of the programmes and set out a broader set of common goals. It observed that the NRPs should complement the Strategic Research Areas, the Strategic Innovation Programmes and the national cooperation programmes in being complementary parts of a powerful research and innovation system for increased Swedish competitiveness and addressing the grand societal challenges. In practice, however, there is no common governance or formal coordination among these programmes.

The government's instructions were subsequently followed up by individual letters, setting out its specific requirements for each NRP. The NRPs therefore have two kinds of goals:

- Specific goals, relevant to the individual NRP.
- Overarching research policy goals, which vary slightly among the NRPs, but are all similar to those of the Food research strategy, namely.
 - Coordination of research funding in the field.
 - Interdisciplinary research and collaboration.
 - Cross-sectoral cooperation, in the sense of cooperation between academics and actors at various levels in both private and public sectors, civil society, practitioners and problem-owners.
 - Activities regarding communication and societal benefit of the research.
 - Increased impact of research results.
 - Gender equality.
 - A more efficient use of infrastructure.
 - A greater focus on research in higher education.
 - Enhanced international cooperation and strengthened Swedish participation in the European programmes.

The overarching policy goals are reflected in the NRP-level evaluation questions in Table 3.

Each NRP is run by a lead agency with budget responsibility. Unsurprisingly, this means there are differences in style and implementation among the three groups of programmes. Each NRP has a programme committee, which includes all three responsible agencies and a variety of other organisations. Broadly, the programme committees oversee or advise internal agency working groups, which manage the design and implementation of the NRPs. Table 4 shows which organisations were represented in the programme committees and shows that – in line with transitions theory – the agencies reached out for inputs to a broader set of societal actors than is normal in R&I policy. The agencies were free additionally to set up advisory groups. The Forte programme committees (Working Life and Welfare) were supported by substantial advisory groups, with people from academia, industry, agencies, and in the case of Working Life also trades unionists. Formas used the pre-existing National Committee for Food Research to function as both programme committee and advisory group to the Food NRP; the Spatial Planning NRP sought advice from the Council for Sustainable Cities as well as various municipality networks; the Climate NRP appears not to have an advisory group in addition to the programme committee. VR set up a reference group of researchers, patients and people



from healthcare, agriculture, industry, and other agencies for AMR, while the Migration advisory group was academic.

Table 4. Organisations represented on NRP programme committees

		Food	Climate	Sustainable Spatial Planning	Working Life Research	Applied Welfare Research	AMR	Migration and integration
Lead Agency	English name	Formas	Formas	Formas	Forte	Forte	VR	VR
Formas	A Swedish research Council for sustainable development	X	X	X	X	X	X	X
Forte	Swedish Research Council for Health, Working Life and Welfare	X	X	X	X	X	X	X
VR	Swedish Research Council	X	X	X	X	X	X	X
AFA Försäkring	AFA Insurance				X			
Delegationen för migrationsstudier	Migration Studies Delegation							X
Energimyndigheten	Swedish Energy Agency		X	X				
Folkhälsomyndigheten	Public Health Agency of Sweden						X	
Havs- och vattenmyndigheten	Swedish Agency for Marine and Water Management		X				X	
Läkemedelsverket	Swedish Medical Products Agency						X	
Migrationsverket	Swedish Migration Agency							X
Mistra	Swedish Foundation for Strategic Environmental Research	X	X	X				
Naturvårdsverket	Swedish Environmental Protection Agency		X	X				
Polarforskningssekretariatet	Swedish Polar Research Secretariat		X					
Riksantikvarieämbetet	National Antiquities Office			X				
RISE	RISE Research Institutes of Sweden						X	
Rymdstyrelsen	Swedish Space Agency		X					
Sida	Swedish International Development Cooperation Agency		X	X			X	X
Sveriges Kommuner och Regioner (SKR)	Sweden's Municipalities and Regions							X
Socialstyrelsen	National Board of Health and Welfare						X	
SSF	Swedish Foundation for Strategic Research	X						
Stiftelsen Lantbruksforskning	Swedish Farmers' Foundation for Agricultural Research	X						
Statens veterinärmedicinska anstalt (SVA)	National Veterinary Institute						X	
Tillväxtverket	Swedish Agency for Economic and Regional Growth			X				
Trafikverket	Swedish Transport Administration			X				
Vinnova	Swedish Agency for Innovation Systems	X	X	X	X		X	

Sources: NRP strategic plans and web sites

The first task of the NRPs was to write a strategic research agenda, under the guidance of their programme committee. The government's instructions arrived shortly before the corresponding budget was available, so there was little time to generate these agendas and, in some cases, the early calls for proposals pre-dated the publication of the strategies. The balance of effort devoted to the agendas between the committee and the agency appears to have varied among the NRPs, with most of the work on the VR strategies done by staff and members of VR's committees, while Formas and Forte made greater use of their programme committees and advisory groups in producing the research strategies. VR's AMR programme builds on the work of the Joint Programming Initiative (JPI) AMR, which has important advantages in aligning part of the Swedish research agenda with that of the EU and easing AMR research cooperation between Sweden and the international level. The strategies say that their authors also consulted relevant research communities and societal stakeholders.

The strategies generally set out and analysed their challenge areas, explained what relevant national and international programmes were already running, set out the goals of the strategy, reviewed relevant Swedish research, defined the central themes and perspectives of the agenda, and described how the agenda was to be implemented.

Four of the NRPs published strategic agendas were in place in 2018. Of these, Climate made substantial revisions to its agenda in 2021, increasing the focus on transformative change and introducing a distinction between climate change and research policy activities. Spatial Planning made only minor adjustments to its strategy in 2021. Welfare published a revision to its 2018 strategy during 2022, which involved updating some content but only minor adjustments to the agenda itself. Migration's 2021 agenda proposed mainly to carry on with the content of the 2018 one, but also to try to do thematically focused calls for proposers with other funders.

Food, Working Life, and AMR published their first agendas in 2019, which so far have not been updated.

The NRPs have been implemented using existing funding instruments and calls for proposals from the funding agencies – most often the lead agency, but in some cases by one of the partners or through joint calls. This means that they are subject to the normal proposal assessment, funding, and administration processes of the respective agencies. It also means that the responsible agencies largely did not have funding instruments available, which they could use to take up the government's invitation, in the 2017 letter instructing them to establish NRPs, to include development and innovation in their NRPs.

Each of the NRPs is based on a 'programme logic', though only NRP AMR has published it. We have been able to obtain four of these logic diagrams (Food, Climate, Sustainable Spatial Planning and AMR), which are traditional in that they state the challenges or overall objectives in high-level terms, then describe the activities and their anticipated effects, which are increased knowledge production, take-up and eventually contribution to the goals of the respective NRP.

Formulations differ among the programmes, but the strategic agendas permit and encourage activities 'downstream' of research, reaching towards implementation and the connection of research results to society. For example, Formas' Climate agenda says that "Activities associated with the programme's implementation can include all aspects of the research and innovation system, such as research, innovation, technology development, demonstrations, market introduction and dissemination" (Formas, 2018). The Swedish Research Council's AMR agenda includes clear societal goals such as "Goal 3: Responsible use of antibiotics" and "Goal 5: Increased knowledge in society about antibiotic resistance and how to combat

it” (Swedish Research Council, 2019). Both Forte’s agendas – Working Life (FORTE, 2019a) and Applied Welfare Research (FORTE, 2019b) – aim to change practice in the professions.

While Formas has become increasingly orientated towards innovation as well as research in recent years, and Forte is concerned both with research and with linking it to professional practice, VR’s mission is to be Sweden’s traditional funder of excellent investigator-initiated research. The evaluations indicate that VR’s approach has therefore been to invite applications relevant to the respective NRPs without consideration of discipline or the potential use of the results. In the case of AMR, the evaluation says that this means researchers choose which knowledge gaps to plug, and that these are not necessarily those identified in the strategic agenda. True to its mission, VR’s study on how to run the Migration programme in future says that “calls issued under the research programme itself shall be for as unrestricted and researcher-initiated grants as possible, while calls issued in collaboration with other research funding bodies on the other hand could benefit from covering more targeted initiatives.”⁷

The VR programmes are those where the programme committees appear to have the least influence over programme implementation. Correspondingly, the subject-matter of projects in the VR NRPs will tend to be the most dominated by the views of the principal investigators, while those in the Formas and Forte NRPs will be subject to greater societal influence, and hence more systematically linked to the strategic agendas and their analysis of socio-technical needs.

VR has a long-standing practice of reallocating projects funded in the main bottom-up programme to thematic programmes, thus freeing resources in the bottom-up area. This can make perfect sense where the thematic areas involved are also working bottom-up. However, in challenge-based or other more managed programmes, it has the effect of reducing the input additionality of the programme.

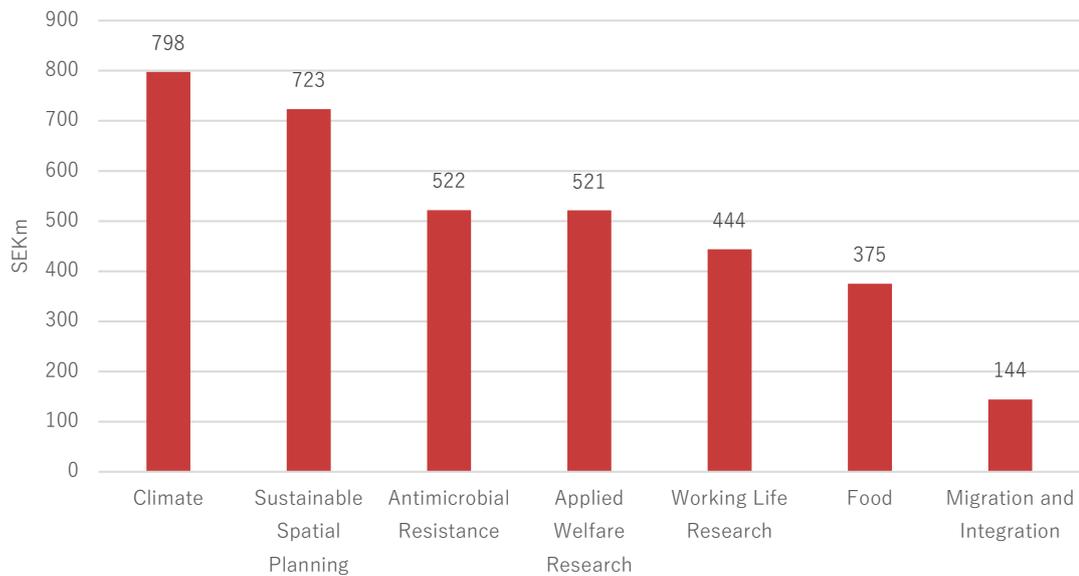
3.2 Composition of the NRP programme

During 2017-2021, the seven NRPs have allocated a total of SEK3,528m in grant funding, to be paid out over the period 2017-27. As Figure 1 shows, these commitments vary in size from Migration and Integration at SEK144m to Sustainable Spatial Planning at SEK784m. Formas has committed 54 percent of the total grant funding awarded in this period, Forte 27 percent, and VR 19 percent. Given VR’s much greater size, the NRPs are a rather small activity for it, while they comprise a greater share of the budget of the smaller research councils.

Figure 2 shows grant funding commitments per programme over time.

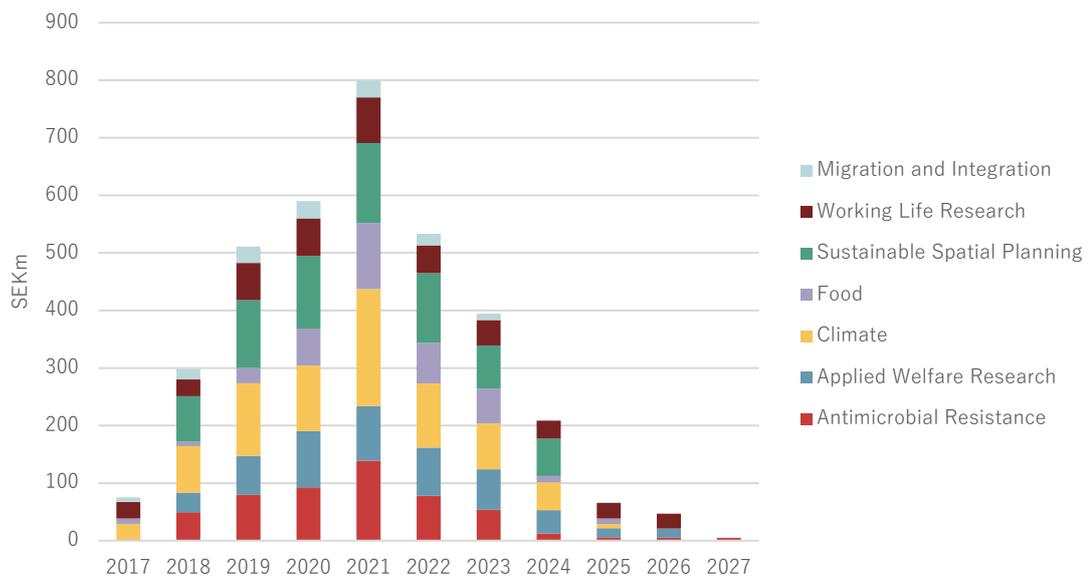
⁷ Vetenskapsrådet (2021), Komplement till forskningsagenda för det nationella forskningsprogrammet inom migration och integration: En uppdatering och komplettering med sikte på morgondagens utmaningar och möjligheter, Stockholm: Vetenskapsrådet

Figure 1. NRPs' total funding granted in the period 2017-2021 (SEK3,528m)



Source: Data from Formas, Forte and VR

Figure 2. Grant payment commitments per NRP and year, from grants dated 2017-2021 (SEKm)



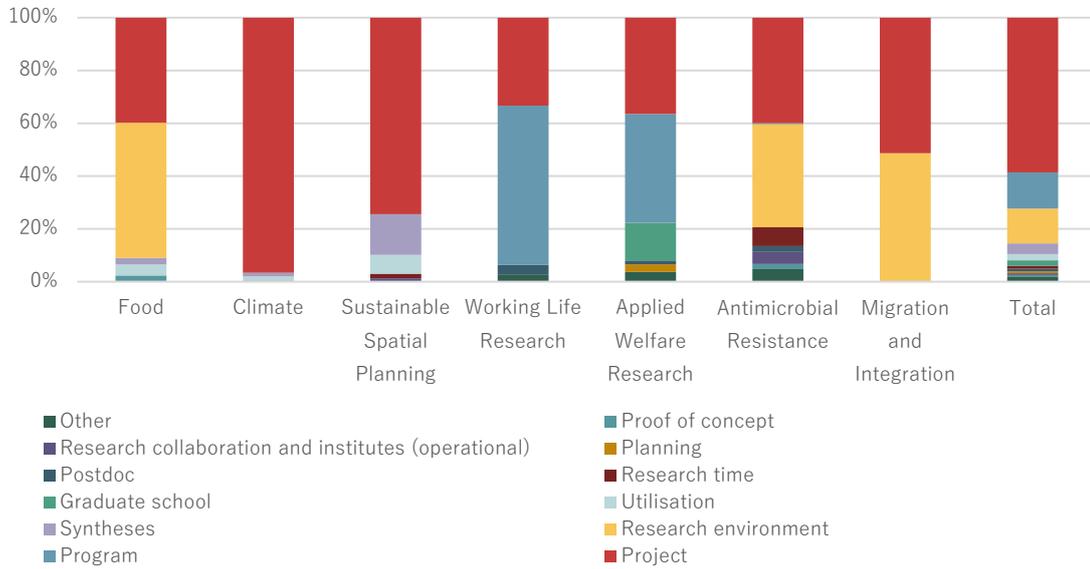
Source: Data from Formas, Forte and VR

Figure 3 shows how the funding has been used across different funding instruments, as individual agencies sought to match the instrument mix to the needs of the individual NRPs. The terminology used for funding instruments is not wholly consistent across the three agencies. In the Figure, we have endeavoured to simplify the large number of instruments used into fairly consistent categories. Most of the money has been spent via normal forms of project funding, whether for individual projects, 'research environments' (centres of excellence funding), or, in the case of Forte, programme funding. The Applied Welfare Research programme is unique in including substantial expenditure on graduate training, consistent with its role of building research capacity in the social services sector. The AMR and Food NRPs have funded small amounts of proof-of-concept activity, while Climate, Food



and Sustainable Spatial Planning have run small utilisation-orientated projects. Some 2 percent of the total grant funding committed in 2017-2021 was for utilisation and 1 percent for proof of concept.

Figure 3. NRP grants by type of funding instrument

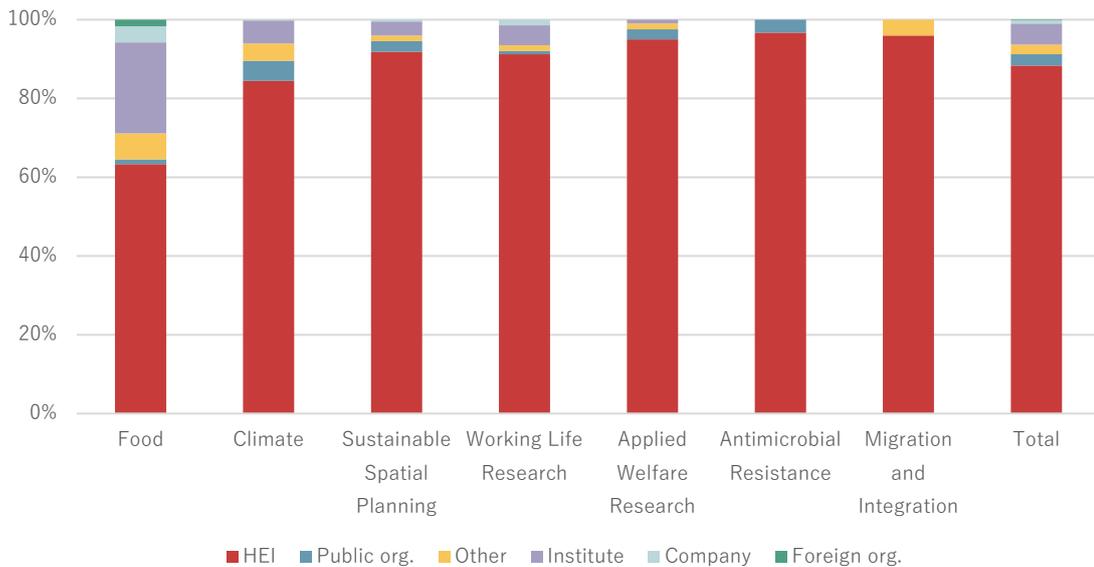


Source: Data from Formas, Forte and VR

Figure 4 confirms that the university sector has been awarded the great majority (88 percent) of the funding committed in 2017-2022. The research institutes are the second-biggest beneficiary category (5 percent), with the bulk of the money following the structure of the institute sector and going to RISE. There has been some engagement by public organisations (3 percent), as would be expected in funding orientated towards societal challenges; 'Other' organisations⁸ received 2 percent; and foreign organisations less than 0.2 percent.

⁸ 'Others' in this connection are the Royal Swedish Academy of Sciences, the Swedish Construction Federation and the following foundations: Institute for Future Studies (IFS); Bräcke Diakoni; Skansen; Stockholm Environmental Institute (SEI); Stockholm International Peace Research Institute (SIPRI)

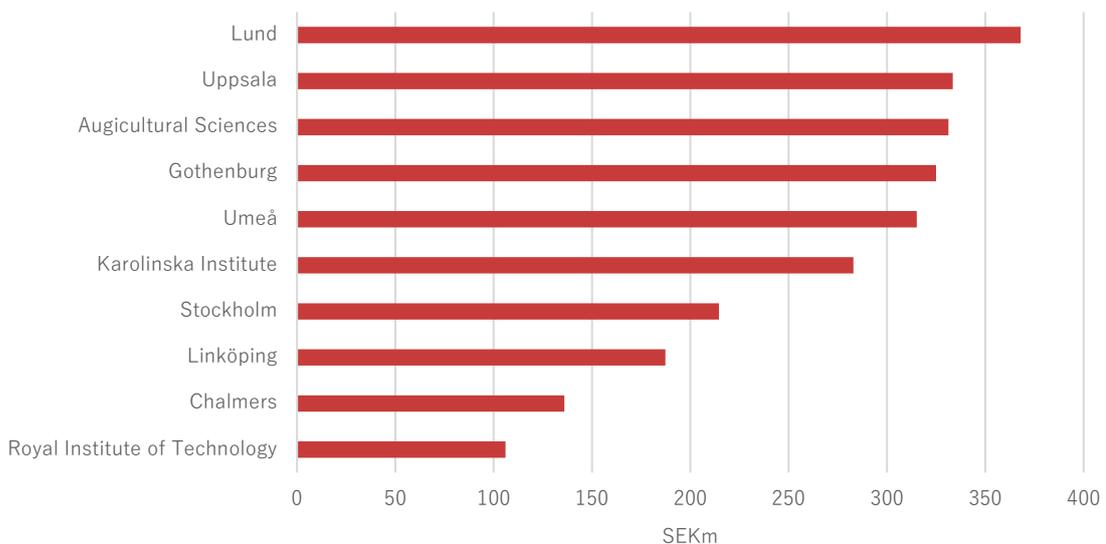
Figure 4. Share of funding per type of beneficiary



Source: Data from Formas, Forte and VR

Figure 5 shows the ten of the 104 grant recipients who received more than SEK100m from the NRPs. Collectively, they received SEK2 600m in grants, some 74 percent of the total. This largely reflects the structure of the Swedish university sector, with the large, traditional universities taking the lion's share. The Swedish University of Agricultural Sciences (SLU) receives more money than its size might suggest, participating in five of the seven programmes, and especially in Climate and Food. The proportion of the money going to the technical universities is low, reflecting the thematic foci of the NRPs.

Figure 5. Universities awarded over SEK100m in funding during the programme period

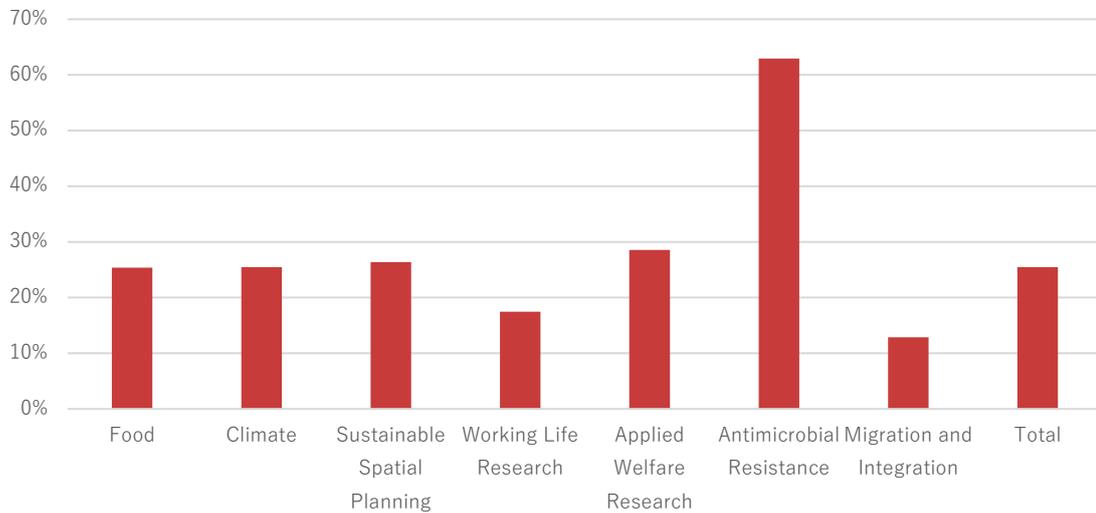


Source: Data from Formas, Forte and VR

Success rates have not varied dramatically from what is generally seen in the bottom-up programmes of the Swedish research council funding system, though it should be noted that success rates in thematic programmes are usually higher than those in bottom-up programmes. Formas’ overall success rate in its bottom-up programme was 21 percent in 2021, while that of the Swedish Research Council was 17 percent⁹.

The reader should note that VR success rates (AMR and Migration) cannot directly be compared with the others, owing to VR’s practice of moving successful applications from other schemes into thematic programmes such as the NRPs (Figure 6). Of the 90 AMR projects, 61 were transferred in from other calls. While these projects have competed with others in the original calls for proposal, when they are transferred into the NRP they have an effective success rate of 100 percent. Six of the 20 Migration projects were transferred from other calls, but the volume of applications to the Migration NRP was so high as to drown out the effect of the transfers on the overall success rate.

Figure 6. NRP success rates overall and successful applications

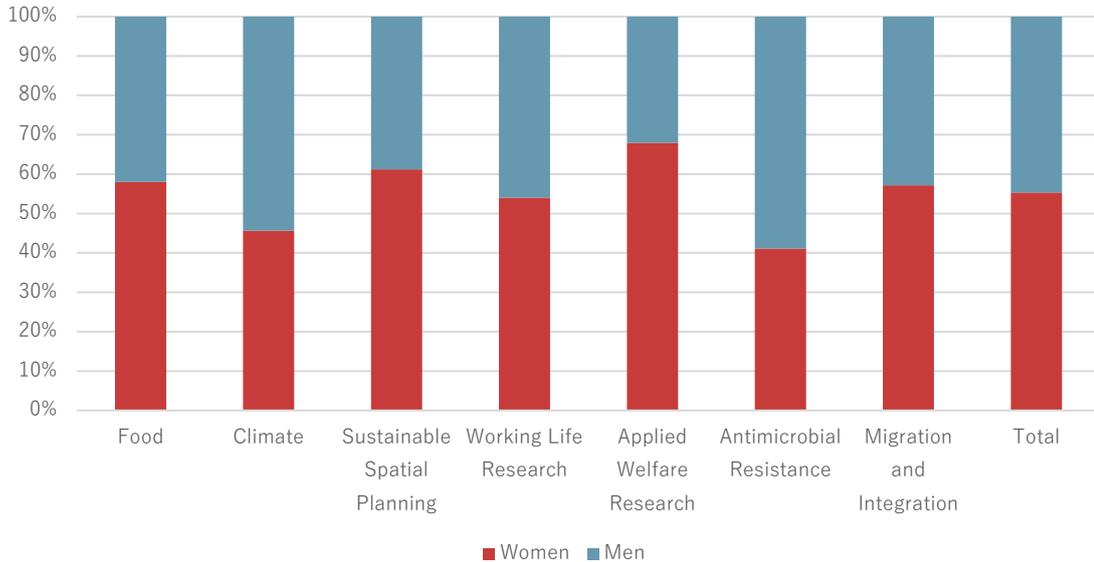


Source: Data from Formas, Forte and VR

⁹ Respective web sites consulted 11 September 2022. We found no data for Forte.

Figure 7 shows the successful applications to the NRPs split by gender. As regards to the gender split, the NRPs do not use instruments that systematically address gender issues, and the individual evaluations show that the gender success rates in the NRPs are close to equal, so that the gender split of the successful applicants roughly corresponds to the proportion among applicants overall.

Figure 7. NRP successful applications split by gender of principal investigators



Source: Data from Formas, Forte and VR

3.3 The universities' perspective

An important determinant of the success of any R&I programme is how the beneficiaries view the 'offer' that the funder makes to them. Our university interviewees discussed the availability of different forms of external funding. The SRAs were highly appreciated because they offered bases for long-term planning, capacity building, and 'profiling' of the university. Centres of excellence were attractive for the same reason, although university interviewees were also at pains to point out that a large volume of project-based funding from both the research councils and sector agencies is also necessary to maintain university research.

There was striking variation, however, among the universities' ability to put the NRPs into a strategic context. The technological universities tended to have a much clearer view of strategy and explicitly to build platforms or other entities that supported specialisation and scale in particular themes. They were interested in the fact that NRPs involve bigger and longer projects than is usual in research council bottom-up funding programmes. Other universities with less focused strategies saw the NRPs as less of an opportunity.

Most of our interviewees were aware of the bigger size of the NRP projects and the fact that their size and duration made it possible to involve PhD students more easily than in other projects. While in principle that could help them build capacity, they observed no wider process of building critical mass within or across individual universities based on the programme. Such structural changes were more likely to happen in response to programmes like the SRAs, where the universities are the applicants, than the NRPs, where the individual researchers apply.

3.4 Evidence from an earlier evaluation

Formas commissioned an evaluation of its three NRPs in 2020 (Ramboll, 2020), which provides an interesting and useful account of the way the NRPs started up. The evaluation observed that the programmes were handled well by Formas and were well on their way to becoming effective platforms. However, problem-owners needed to be more involved in planning, to ensure that the agendas dealt with current issues and priorities. There was no process defined for involving problem owners, hence their level of engagement varied with their own absorptive capacity, leading to considerable difficulty in clarifying industry's needs in the Food NRP. At the same time, some people questioned the legitimacy of including other actors than research funders as members of the programme committees. Overall, Ramboll found that the programme goals were too grandiose to be realistic – the programmes needed to set more modest and achievable goals.

While the government had laid down the structure of the NRPs' governance, the roles, and responsibilities of its different components – especially the programme committees – were insufficiently clear. The programme committees' influence appeared to decline once the first agenda was written. Because the roles of the various actors in the Swedish system are clearly defined, cooperation needs a transparent allocation of tasks consistent with those roles. In effect, the agency's standing orders were barriers to Formas implementing the programmes as the government had intended.

Consultations between Formas and external actors outside the research community tended to be rather general, so the needs of problem-owners were not sufficiently understood to let the programme committees set more detailed and potentially useful goals. The programmes were not sufficiently well known or understood, so they needed more and better communications.

Formas struggled to obtain the budget needed internally to implement the NRP agendas. Nonetheless, it was required to do so with immediate effect – even before the agendas were finished.

Ramboll made many detailed recommendations. In summary they proposed that the NRPs should:

- Clarify roles, responsibilities, and key processes for all the parties collaborating in the programmes.
- Confirm and exploit the roles of the different funders in the research and innovation system and learn how this type of collaboration can be undertaken.
- Find clearer ways to involve various actors and problem-owners to ensure that the programmes address relevant challenges and research needs.

Two years later, the mid-term evaluations (of all seven NRPs) confirm Ramboll's findings. We do not have access to enough information to know whether there have been improvements at the detailed level. Overall, however, there is a need to (re)establish closer links to the full set of organisations represented in the programme committees and ensure that the agendas evolve in line with changing circumstances.

4 Performance

The NRPs in principle, have two sets of goals – programme-specific goals, which relate to their particular societal challenge, and research policy goals that are generic to all the NRPs. The Migration NRP did not set any specific goals, relying entirely on the research policy goals.

4.1 Specific goal achievement

The NRPs have a long list of specific (programme-level) goals (Table 5), which in practice strongly overlap with what are referred to as ‘research policy’ goals.

Table 5. Specific goals of individual NRP programmes

NRP	Specific goals
Food	Research and innovation should better contribute to: <ul style="list-style-type: none"> • A sustainable, competitive, and attractive food sector. • The ability to achieve profitability for stakeholders throughout the food system. • Ensuring that the Swedish food system is resource efficient, contributes to gender equality, is environmentally friendly and is climate neutral. • Good food security in Sweden as well as preparedness and resilience to climate change and societal disruptions. • An increase in Swedish food production that is in demand worldwide for its added value, such as long-term sustainable production and high food safety. • Sustainable food consumption and reduced waste throughout the food system. • International recognition that the Swedish food sector is innovative, sustainable, and known for tasty food that promotes well-being and health.
Climate	<ul style="list-style-type: none"> • Contribute to renewal and new thinking through high-quality and excellent research and innovation in climate (both adaptation and mitigation). • Contribute new knowledge and new solutions to reach the national climate goal and contribute to the Paris Agreement and the global sustainability goals. • Strengthen communication, utilisation, and impact of research, both nationally and globally. • Contribute to increased use of infrastructure in the climate area. • Contribute to linking research to higher education. • Contribute to increased internationalisation of climate research through existing and new collaborations. • Contribute to strengthening interdisciplinary and cross-sectoral collaboration within the area. • Contribute to strengthening synergies and cooperation among funders, research performers as well as society's users of climate research. • Strengthen gender equality both in the universities and in society.
Sustainable Spatial Planning	Theme: Sustainable living and living environments: <ul style="list-style-type: none"> • sustainably designed and inclusive physical environments • housing supply for all Theme: Sustainable mobility systems for all: <ul style="list-style-type: none"> • integrated and coordinated transport planning • increased share of sustainable travel and transport • sustainable mobility practices

	<p>Theme: Human health and well-being:</p> <ul style="list-style-type: none"> • habitats that positively affect public health • reduced environmental pollution in buildings, air, soil and water <p>Theme: Safety and security for people and communities:</p> <ul style="list-style-type: none"> • access to safe and secure public places • safety and robustness of essential activities • reduced risks in the built environment <p>Theme: Sustainable consumption and production:</p> <ul style="list-style-type: none"> • habitats for reduced and sustainable consumption • reduced climate footprint and emissions in construction and management <p>Theme: Sustainable land and water use:</p> <ul style="list-style-type: none"> • planning for long-term land and water use • land and water use adapted to climate change
Working Life Research	<ul style="list-style-type: none"> • Increase knowledge about identified challenges and solutions in the field of working life research through high-quality and societally relevant research. • Ensure that the research results and available knowledge are used and come to benefit working life research. • Improve coordination between research funders, researchers, and other social actors in the field of working life research, through active and strategic coordination.
Applied Welfare Research	<ul style="list-style-type: none"> • Establish high-quality client- and practice-oriented research that can be applied in social services in order to develop and improve the work as well as the life situation and circumstances of the users. • Increase the proportion of professionals in social services who are trained in research and who can contribute these skills to building knowledge within the social services sector. • Increase research collaboration between researchers, professions, users, and relatives.
Antimicrobial Resistance	<ul style="list-style-type: none"> • Create systems for needs-based prioritisation of research through support for collaboration and exchange of knowledge between relevant actors and dissemination of research results as a basis for evidence-based policy and management. • Through support for research, contribute to increased knowledge, innovation and development of new treatment options, improved treatment hygiene and diagnostic methods, monitoring and control of emergence and spread of resistant bacteria. • Strengthen the national research system in terms of access to and utilisation of infrastructure, research connection of higher education, competence supply, internationalisation, gender equality and methods to increase dissemination and impact of research.
Migration and Integration	<p>The specific goals are the same as the overall goals, which are expressed in the specific evaluation as</p> <ul style="list-style-type: none"> • Contribute to high-quality research and the growth of knowledge. • Contribute to evidence-based policy and administration. • Contribute to strong connections between research and higher education. • Contribute to developing the dialogue among researchers, practitioners, and decision-makers. • Contribute to gender equality.

- That the research programme is well coordinated with other national and international programmes, creating synergies.
- That the research programme is adapted to the needs of the research themes pursued and is run in a flexible manner.
- That the research programme creates the conditions for interdisciplinary and cross-sector research cooperation.

Source: Individual NRP evaluations

We have simplified the specific and research policy goals together into a shorter and more coherent list, which we use to structure some of our conclusions in Chapter 5.

- Goals orientated to addressing societal challenges.
 - Renewing knowledge and filling knowledge gaps to provide a relevant knowledge base for tackling societal challenges.
 - Producing knowledge suited to tackling societal challenges, via interdisciplinary and cross-sector research, linking research to international agendas and taking steps to support the utilisation of research.
 - Increasing cooperation and coordination among research funders in tackling societal challenges.
- Achieving impact.
 - On policy, industry, and civil society.
 - On professional practice.
- Addressing ‘hygiene factors’, relevant to all research production.
 - Gender equality, links between research and higher education, dissemination, use of infrastructures, supporting utilisation and participating in international research programmes and communities.

Note that we include internationalisation and utilisation under both societal challenges and hygiene factors.

At this stage, the NRPs evaluated are full of optimism about reaching their goals, but have only just started, so – especially in relation to the specific goals – there is limited evidence so far of progress being achieved. Survey responses from the researchers are more positive than the expert reviewers or the evaluations overall about actual and expected goal attainment, reflecting both a normal positive bias and the fact that the researchers are looking at the project level while the evaluations overall focus on the programmes.

Given the age of the programmes, differences among their tasks and the use of different evaluation teams for each, we do not offer any performance comparisons here, though the individual evaluation reports provide many useful perceptions. One clear pattern, however, is that five of the seven programmes are seen as being successful in knowledge renewal and gap-filling, which is their primary purpose in relation to supporting wider policies to address societal challenges. Three of the programmes – Food, Sustainable Spatial Planning and Applied Welfare Research – do work which is particularly close to application and are correspondingly seen as the ones achieving impact (in industry in the first two cases, and in upgrading skills in social welfare in the third).

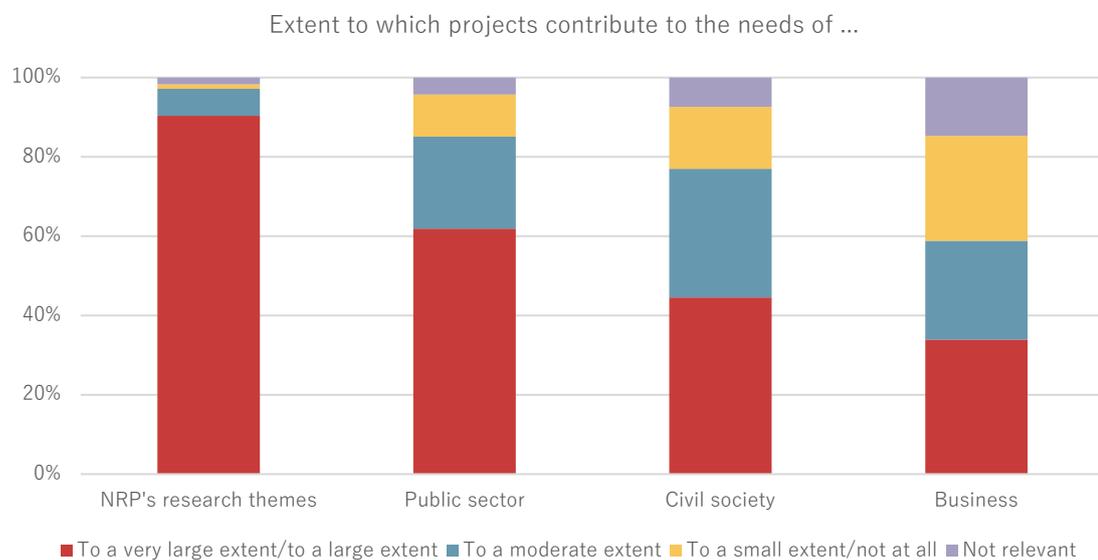
4.2 Research policy goals

This section synthesises messages about the common goals of the programmes from the individual NRP evaluations.

4.2.1 *Renewal and innovation*

All the programmes evaluated had produced knowledge outputs, though the degree of innovativeness varied. Close to 100 percent of the principal investigators surveyed said that their own projects filled knowledge gaps or addressed knowledge needs in their programme. Figure 8 shows that the principal investigators saw their projects as highly relevant to research goals but less so to wider society. Some of the evaluations, however, point out that the knowledge gaps filled are not always those described in the strategic agendas.

Figure 8. Project contributions to research and other sectors of society



Source: Survey of project leaders

4.2.2 *Cooperation across disciplines and sectors*

The evaluations focus on interdisciplinary¹⁰ and cross-sectoral cooperation. Figure 9 and Figure 10 show the researchers' perspectives on these questions.

As would be expected from problem-orientated programmes, most of the NRPs do a lot of interdisciplinary work, and while several of the evaluations observe that there is still scope for more, this is an important positive. AMR is more focused than the others, doing interdisciplinary research but focusing within the disciplines relevant to drug discovery.

The evaluations offer two slightly different perspectives on cross-sector work. One is from the survey, which asks researchers about the extent of inter-sectoral cooperation in their projects. The other is from the grant data, which records which organisations are formally involved in the projects. The survey suggests a higher level of cross-sector working than the

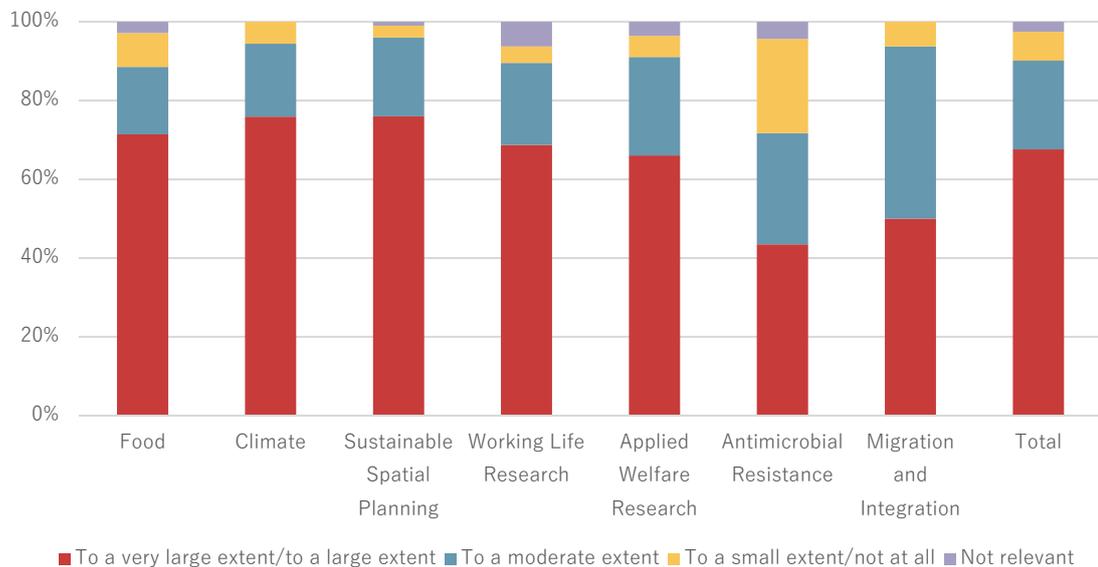
¹⁰ We use the term here to cover inter-, trans-, and multi-disciplinarity. The distinctions are not analysed in the strategies or the evaluations

grant data, probably because the researchers' responses include cross-sectoral interactions that are not funded by the grant.

The evaluations suggest that more cross-sector cooperation needs to be done, first, in order to obtain the breadth of knowledge needed to work in a problem-orientated way and produce results that will be exploited and implemented. Second, they indicate that some of the work on the research strategies as well as more generally the oversight and implementation suffer from too little cooperation with sectors (and actors and government organisations) that are not much involved in the research but whose knowledge is needed to keep the NRPs relevant to their challenges.

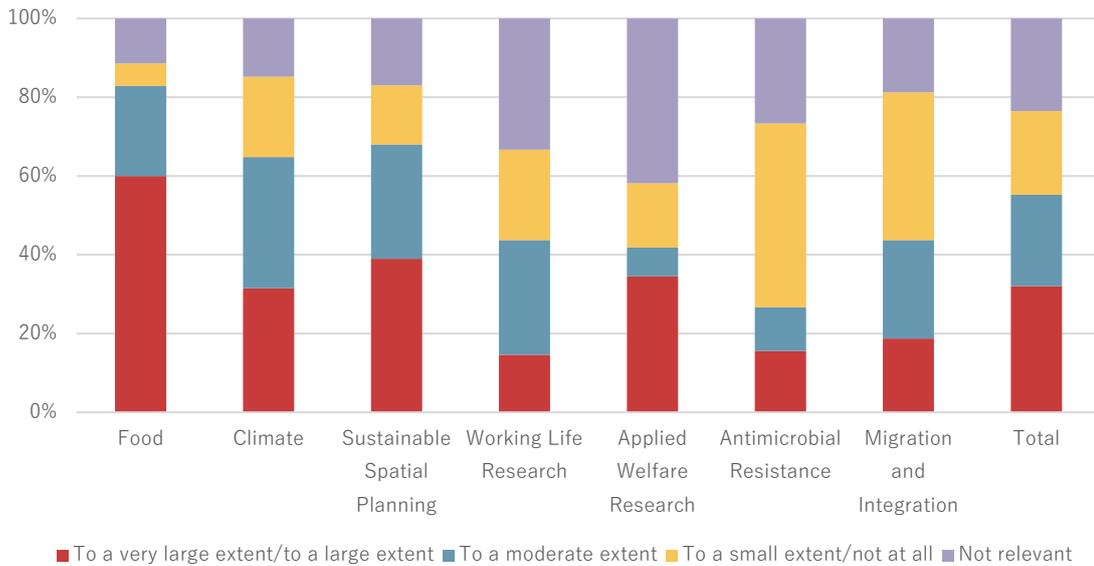
Cross-sector cooperation seems to be high in Food, Climate and Spatial Planning, with a lot of it probably being informal. Unsurprisingly, Working Life and Welfare cooperations tend to be with the government sector. AMR and Migration tend to focus on research cooperations and to some extent on government. Companies are formally absent from these programmes, as VR does not fund them.

Figure 9. Extent of interdisciplinary collaboration within projects



Source: Survey of project leaders

Figure 10. Extent of cross-sector collaboration within projects



Source: Survey of project leaders

4.2.3 Inter-agency cooperation

The decision to include a mapping of other research efforts as standard component of the research strategies appears to have been a good one, making the NRPs more aware of the bigger context and providing a starting basis for cooperation and division of labour. Those NRPs that were established within a bigger policy context such as the Swedish food strategy, the Swedish climate change strategy and law, the national AMR strategy or in the case of Migration the Delmi Delegation for Migration Studies – were in a better position than others to devise strategies. The co-location of the AMR NRP and the secretariat for the JPI AMR at VR provided opportunities to interact with both the EU and the national levels, and the NRP has co-sponsored two Calls with the JPI. However, the NRP is very small compared with both the JPI and the considerable Swedish national effort, so it is more likely to have been influenced by these larger constructions than to have influenced them. Generally, however, while the programme committees were very involved in the strategies and launch of the NRPs they had less influence over strategy implementation, and this may partly account for the limited amount of active cooperation.

The NRPs involved several joint calls by different agencies, indicating that some synergies were found across the funding system. Some frustration was however expressed about the need to fund joint calls from existing resources, rather than being able to attract more resources to these points of synergy.

As indicated above, some international links were established at the programme level, but in most cases were not central features of the NRPs. Similarly, at the project level internationalisation was seen as natural (Figure 13). In practice, the NRPs developed formal links to international programmes to varying degrees. Food has links to the Agriculture, Food Security and Climate Change and Healthy Diet for a Healthy Life JPIs, as well as to some ten ERA-NETs though Formas' active participation in these. The Climate NRP was not so explicitly connected, and more generally has experienced some difficulties in establishing cooperations owing to its very broad scope. Spatial Planning has strong links to Sweden's

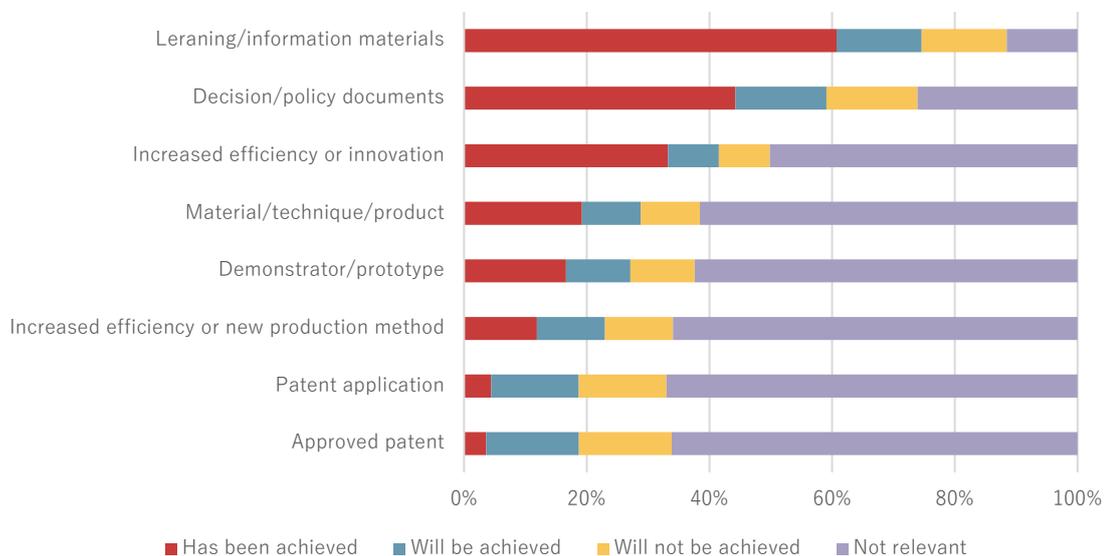
Council for Sustainable Cities¹¹ and internationally with NordForsk, JPI Urban Europe and ERA-NET Urban Accessibility and Connectivity. Working Life appears to have broad international contacts, but not through programme channels. Welfare tackles the specific needs of Swedish Social Services, and hence has few international links. AMR, in contrast, is deeply involved with the JPI AMR, since VR hosts the JPI’s secretariat, in addition to working in a field where international cooperation is especially prevalent. Migration, on the other hand, is very focused on Sweden. The evaluations do not contain any clear evidence to indicate whether the NRPs increased the amount of interaction with the international level. Such interaction is the norm in EU member states these days. At the minimum, it seems likely that having NRPs in areas relevant to JPIs provided a way to focus on JPI-relevant themes. (AMR is the obvious exception, directly linking the JPI AMR with the already large body of Swedish AMR research.)

4.2.4 Exploitation of results

The general picture was that the strategies and NRPs took too little account of results exploitation, which was poorly understood both at the strategic and at the individual project level. The lack of research on exploitation in the strategies limited the projects’ opportunities to contribute to implementation. The Food and AMR programmes made a little use of proof-of-concept funding instruments, but the others did not support exploitation. In practice, the Welfare NRP’s overall ambition of increasing absorptive capacity and the use of research in Swedish social services sets it apart from the other NRPs in being more focused on exploitation, though through professional practice more than via innovation.

The principal investigators said their contributions towards exploitation were largely to do with generating information and regarded the idea of contributing to innovation in the economy and society as largely irrelevant (Figure 11).

Figure 11. Extent of project contribution to exploitation



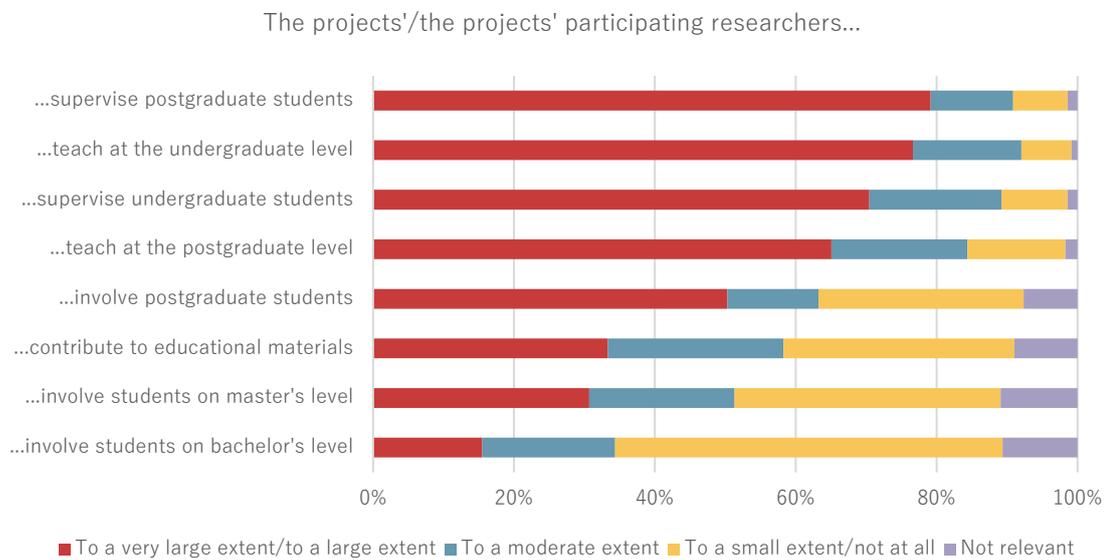
¹¹ Rådet för hållbara städer

Source: Survey of project leaders

4.2.5 Research-based teaching

Both the principal investigators surveyed (Figure 12) and the evaluations more broadly indicated that there are links between the NRP project and teaching, as is the case with pretty much any other kind of research, given that Swedish higher education is research-based as a matter of policy and principle. In a couple of cases, it was suggested that better links could best be created by investing more in graduate schools. Vice-rectors for research tended to see the maintenance of research-teaching links as the routine business of the universities, so that making them an explicit goal was an example of the goal overload imposed on the NRPs.

Figure 12. Linkage between the research and university teaching

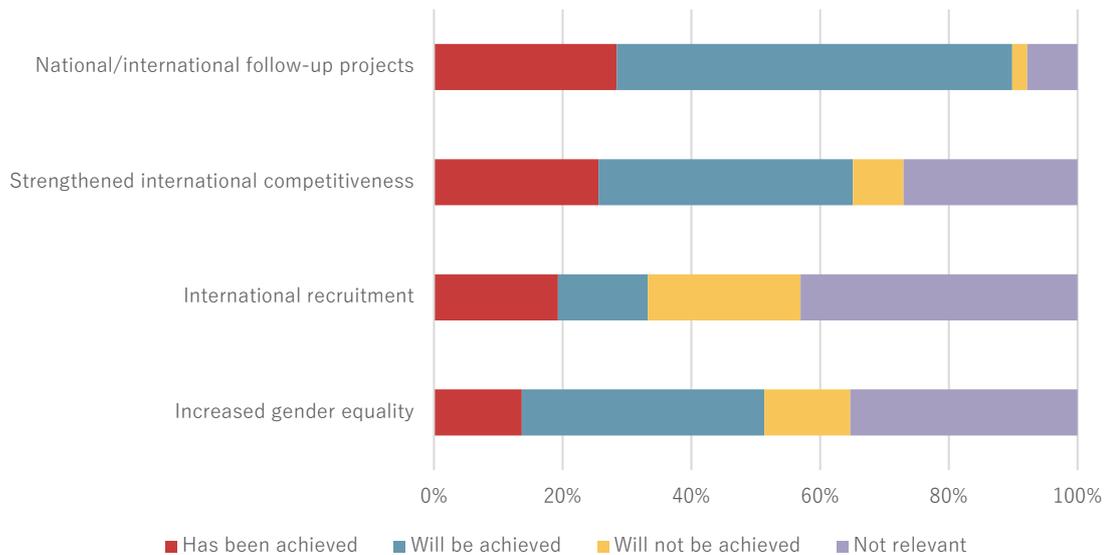


Source: Survey of project leaders

4.2.6 Gender equality

The funders' processes and instruments include safeguards to try to ensure equality of gender treatment. The gender balance among the principal investigators of the projects funded largely reflects the gender balance of the proposals received and of the respective field more widely. We interpret research-teaching linkages, internationalisation, and gender equality more or less as 'hygiene factors', which participants felt should be handled at the organisational level rather than that of specific programmes. They were seen as important but also generic goals, so the NRPs were not necessarily the right level at which to tackle them. Rather, they too should be (and to a considerable extent are) addressed at the level of the funding organisations, their processes, and their funding instruments.

Figure 13. Effects on internationalisation and gender equality

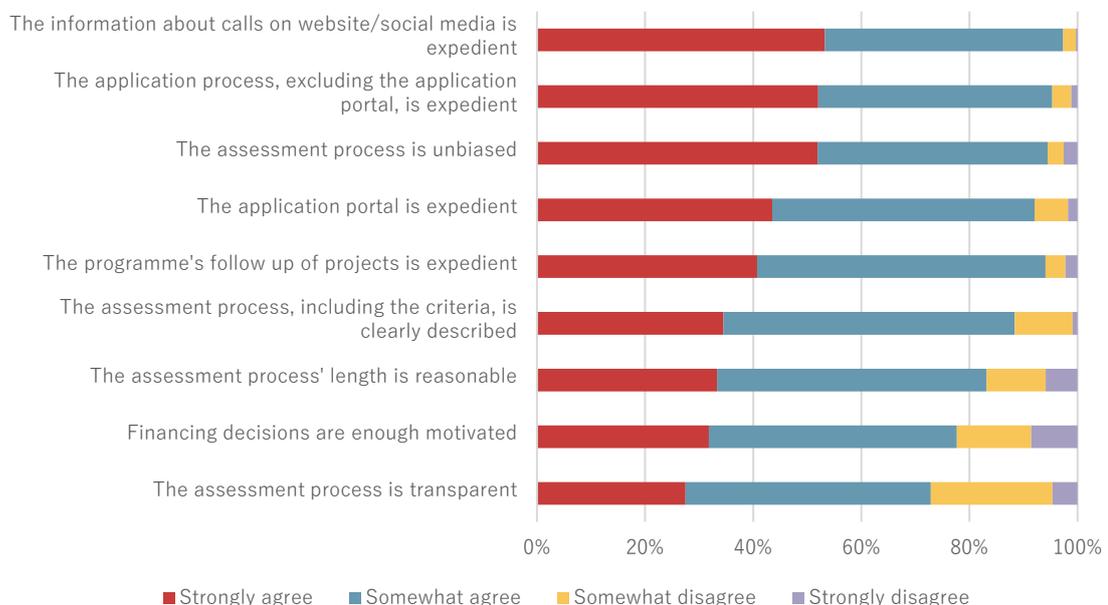


Source: Survey of project leaders

4.2.7 Programme efficiency and effectiveness

Survey respondents were rather positive about the various dimensions of programme administration (Figure 14), though it should of course be noted that this population only includes people who have had at least one application to the NRPs accepted. (Equivalent charts for each of the three agencies are shown at 0.)

Figure 14. Survey responses on agencies' administrative processes – all three agencies taken together



Source: Survey of project leaders



All the NRPs to varying degrees suffered from goal overload (both among specific and research policy goals). Their breadth tended to promote fragmentation, reducing the likelihood of any individual activity having effects on the overall challenges.

The evaluations indicate that the use of the three established research councils and their existing instruments means that management can be effective and efficient, based on established systems and processes. This also involved path dependencies, however, with funding rules and instruments generally not being friendly to participation by non-research organisations or activities outside investigator-initiated research, and VR is not allowed to fund company participations. The authority of the agencies also does not extend as far as many of the implementation activities needed to ensure impact or the achievement of challenge-based goals.

4.2.8 Broader findings

Overall, the evaluations suggest that strategies and their implementation tended to involve too little exploration of needs or understanding of the socio-technical systems on which the research results were intended to act, so the projects over-focused on research and technology at the expense of implementation. This meant there was in some cases under-use of social science to explore social and systemic aspects of implementation. In many cases, exploitation routes were under-explored in the strategies and poorly understood by researchers. Very few funding instruments were available, which could fill this gap.

The roles of the programme committees and advisory groups appeared to be limited. There was felt to be too little involvement of other stakeholders and non-research actors for the programmes to be transparent or to take full account of the context and systemic aspects of the work. In particular, problem-owners played too small a role, especially after agendas were drafted. Programme committees similarly played reduced roles once programmes were planned, reducing the programmes' contact with problem-owners and other relevant actors. Since these are long programmes, intended to maintain up-to-date understanding of needs and linking them to knowledge gaps, there is a great need for periodic review or 'reflexivity,' potentially resulting in updating agendas. Given the complexity of the challenges involved, it might be fruitful to devote more effort to reflexivity and eventually to modifying strategies and implementation more than has been the case.

It was also clear that in at least some NRPs it was not only advice that was needed from non-research organisations but also their active involvement in the programme or in related activities, in order to help the NRP connect better with needs and with implementation.

Use of programme logic or theory of change was limited in the NRPs and involved paying little attention to actors and activities 'downstream' of research, so that the strategies and programmes were under-informed about how to link research to exploitation and societal change. More deliberate use of programme logic, also in the 'downstream' was felt to be a way to increase the relevance and effectiveness of the programmes in addressing challenges and inducing change, as well as allowing goals to be more specific and permitting the development of indicators that could help programme management monitor and reflect on its progress.

While one goal was to fill knowledge gaps, it was not always clear what specific gaps needed to be filled. Especially where project acquisition was heavily bottom-up, this meant that the researchers chose the gaps to fill, which were not necessarily the ones prioritised in the programme or that society needed.

5 Conclusions and lessons for policy

It is important to stress the primarily formative intentions of this evaluation. The NRPs operate in a new area of policymaking, where we are all feeling our way forward. There is a big theoretical research literature but very little practice. Unlike in traditional research and innovation policy and evaluation, there is no ‘normal’ or ‘best’ practice with which we can compare.

In this section, we first sum up our responses to the evaluation questions (Table 2). In the spirit of policy learning, we then go on to draw some lessons, which we hope can inform future policymaking and implementation.

Our overall conclusion is that the NRPs have been well implemented and effective by the norms of traditional research policy, while also aiming to address the needs of challenge-based policy. In this context, there are strengths but also weaknesses in the NRPs, from which we try to draw lessons below.

5.1 Summative conclusions

Our brief asks us to examine the design and implementation of the programmes and then to discuss the value added by using the NRP funding instrument.

5.1.1 Design and implementation of the programmes

At the aggregate level, it is clear that the design of the NRPs has taken account of the need to run challenge-based programmes in a different way to traditional ‘knowledge push’ programmes. The NRP governance and approach reflect in important respects what is written in the research literature on transitions (and more recently missions). It recognises that the NRPs address societal challenges by searching for problems and solutions and then working backwards to deduce knowledge needs, expressed in the form of strategic research agendas. Involving three agencies lets the overall programme draw on the wide range of research expertise needed and supports collaboration among them, where appropriate. The use of programme committees intended to reach out beyond the research and innovation community to others whose input and engagement is needed, is based on central ideas in transitions studies. The long duration of the programmes and the NRP principle of reviewing and revising agendas on a three-year cycle reflects the focus on long-term interventions and the need for ‘reflexivity’, in the sense of pausing to learn both from experience and from changes in the (complex) systems in which societal challenges are embedded, and to modify agendas as the programmes develop. These are radical changes in the way funders think and work. The evaluations suggest that weaknesses in the NRPs include a failure to push the changes hard enough, so there has not been enough challenge focus, interaction and activation of people outside the R&I community, or sufficient systematic reflexivity.

This lack of challenge focus stems in part from the government level. Most of the NRPs tackle very broad areas, which are important but where the needs and priorities are poorly defined. This has led to fragmentation of the work and a tendency to make only incremental progress in research. It is not only a matter of the small resources being insufficient to tackle big problems; it is a failure of clarity of purpose and prioritisation.

The evaluations indicate that, while the programme committees and people outside the three implementing agencies were important in programme design and writing the first strategic agenda, their role has declined over time. Such draining away of attention is not so much of a problem in traditional R&I programmes, which are short and do not much tend to change



their strategy or design, and which are sometimes jokingly referred to in the R&I community as ‘fund and forget’ interventions. However, it is more of a problem in programmes that are long and need to evolve as circumstance change.

The individual programme evaluations indicate that the NRPs are producing considerable amounts of new knowledge and closing knowledge gaps, based on implementing their challenge-based research agendas. Researchers report significant output and expect to generate a lot more in the rest of the programme period. However, the evaluations indicate that the research done in the NRPs is not always as well aligned to the knowledge gaps identified in the research agendas as would be desirable. The agendas and the programme implementation tend to reflect a need for more input from problem-owners in programme design and governance. A symptom of this is that the NRPs’ ‘programme logics or theories of change’¹² focus a lot on the research process and too little on defining the problems they are supposed to address or the activities and actors who need to be involved in order to make the journey from research to societal change. The breadth of the programmes’ scope makes it especially hard to develop a problem-based theory of change, because most of the NRPs relate not to a single societal challenge but to a whole bundle of them.

The NRPs involve a great deal of interdisciplinary research but less cross-sector collaboration, in particular to consult and engage actors ‘downstream’ from the current research effort. Both of these are needed when tackling societal problems, which are rarely mono-disciplinary in character and need the involvement of many different types of organisations. There are opportunities for greater cross-sector cooperation both in reflecting on the evolution of the programmes and in building stronger links to other activities.

While the NRPs are challenge orientated, the way they work is strongly influenced by the strategic, management, and funding rules and traditions of the lead agencies. This limits the types of research they fund, who may do that research and on what terms, the funding instruments available, knowledge exploitation, and the NRPs’ broader links to implementation.

The government has injected a number of goals into the programme that we describe above as ‘hygiene factors’ because they are goals common to pretty much all research. We believe these should be treated at the level of the funding organisations and the universities, rather than endlessly being repeated within funding programmes. This is not to say that they are unimportant – quite the reverse – but that they are being handled at the wrong level if they are included in programme goals, unless the programme is expected to do something out of the ordinary such as a funding scheme for women only. By and large, the NRP-funded work observes these hygiene factors, but it is hard to establish whether the NRPs provide additionality.

- Gender equality issues are already baked into the funders’ and the universities’ procedures. The NRPs have no specific instruments to address gender inequalities, over and above these. Gender unevenness in the award of NRP grants is sufficiently small that it is unlikely to be systemic.
- International participation in programmes and global scientific communities is axiomatic these days – it is barely possible to be a scientist at the national level. The problems

¹² That is, a step-by-step explanation of how activities such as research will lead to societal impact or solving societal problems. Four of the programmes have done this in the form of ‘logic charts’ or programme logics

addressed by the NRPs are of great international interest and the programmes and funding organisations are well internationally connected.

- Research funding systems have in recent years put increasing emphasis on the societal use and impact of research results. With the exception of the Welfare NRP, all the evaluations are disappointing in that respect.
- Swedish research universities are expected to do research-based teaching. In some cases, the NRPs fund graduate schools or research centres likely to host PhD students and the evaluations report that such links are plentiful.
- Little is said in the evaluations about the use of infrastructures, so we do not have evidence about this factor.

At the aggregate level, it is clear that the design of the NRPs has taken account of the need to run challenge-based programmes in a different way to traditional ‘knowledge push’ programmes. This is evident in the use of programme committees with broad memberships, basing the programmes on strategic research agendas that aim to focus on challenges, wide consultation outside as well as inside the research community, and the allocation of comparatively large thematically focused budgets for research. At this stage, there is potential for the programmes to add value to the wider Swedish research and innovation system, but to realise that potential it will be useful to take note of the lessons below.

5.1.2 Added value

The NRPs have identified knowledge gaps in the existing system in relation to tackling challenges, some of which have been addressed, though there is a need for more systematic understanding of and linkage to challenges and problem-owners. Some synergies have been created among actors, but these are impeded by the overly research-focused scope of the strategic research agendas and the limitations on existing funding institutions to reach beyond the traditional research performers.

The NRPs have supported links to certain EU programmes but do not appear to have triggered a more dramatic shift in participation – probably because the importance of EU linkages at the policy and project levels is already well understood in the research community.

The NRPs have indeed established themselves as platforms for research in their areas, but their reach beyond the agencies’ core activities is limited. Their challenge orientation and their ability to work with knowledge exploitation is less than would be desirable to address societal challenges. However, they represent a very important start to the work of developing the research and innovation system so that it can better handle societal challenges in addition to the traditional support of research and innovation.

As indicated above, the exploitation of research results in the NRPs is almost uniformly disappointing.

The criterion of increased effectiveness and efficiency in the R&I system appears to us to be unreasonably demanding. The NRPs have added to the existing evidence – for example from the Strategic Research Areas and the Strategic Innovation Programmes – to show that agencies are capable of organising and coordinating both among themselves and with other funders. The examples mentioned are all novel programmes, so inter-agency cooperation appears to be a powerful way to experiment with new policy instruments. However, both this report and the SIP evaluation (Åström, Arnold, & Olsson, 2021) point to the presence of path dependencies arising from agencies’ traditional practices. The SRA evaluation identified problematic path dependencies at the universities, whose governance was a barrier to making and implementing strategy (Teeri, et al., 2015). We discuss this question further below.

5.2 Formative conclusions

The NRPs provide food for thought about how to develop policy in the context of societal challenges. We discuss this at two levels. First, we draw some lessons about the way the implementing agencies should work with societal challenges under something like the current arrangements, using cooperating agencies. However, we do not think this is optimal. Therefore, in a second section, we look at needs and options for more radical changes at the policy level.

5.2.1 *Improving performance under current organisational arrangements*

This meta-evaluation shows that, while current organisational arrangements have limitations, it is nonetheless possible to use them to provide knowledge to help other parts of the government system address societal challenges.

Carefully consider the core missions and operating regimes of the agencies to be used.

Path dependencies arise from the specific missions of the three funding agencies. The choice of agency therefore has a substantive effect on the manner of programme implementation. All three agencies involved in the NRPs have been honing their skills in dealing with their core tasks for over twenty years. VR is wholly researcher-governed and specialises in funding investigator-initiated research, largely without reference to its societal value. Forte and Formas have elements of societal governance in addition to the dominant role of researchers. Forte produces knowledge in the context of the caring professions. Formas does so in the context of the environment and has been assuming a role in innovation during the past decade. Their funding instruments, selection processes and other routines are tuned to these legitimate but different tasks. As this report shows, path dependencies arise from the agencies' existing capabilities, which can be detrimental to a new mission. It follows that their ability to handle new tasks will depend on the relevance of their existing capabilities and their capacity to develop new ones.

Agencies' standing orders and instructions from their parent ministries are sometimes obstacles to performing new tasks such as tackling societal challenges. The three agencies could usefully **review the limitations in addressing societal challenges placed on them by their governance and determine whether these should be permanently relaxed or whether a mechanism is needed that allows them to be relaxed in relation to particular programmes and tasks imposed by government.**

Designing and implementing policy interventions to address societal challenges involves using new theories and skills, which extend existing knowledge and practice in research and innovation policy. Such reskilling does not happen quickly or spontaneously. **Ministries and their agencies should consider using off-the-job education and training to build a cadre of people with the needed capacity.**

The evaluations show that the three agencies are poorly equipped with tools and funding instruments that build links between understanding new knowledge needs, knowledge generation and its exploitation. **The agencies should explore the acquisition of such tools and instruments and their opportunities for exploiting relevant instruments from other agencies.**

The NRPs and other programmes suffer from unnecessary goal overload. **Government should reduce this by allocating responsibility for what we describe as 'hygiene factors' to the organisational rather than the programme level.**

Designing and implementing NRPs requires substantially more work than regular programmes. They need to develop agendas, involve more extensive consultation as well as continuing consultation with other actors. On the positive side, as large programmes, they tend to benefit from administrative economies of scale. **The extra management costs involved mean that NRPs and similar complex interventions should be used sparingly.**

Government appears to have instructed the three agencies to implement the NRPs by generating research agendas at the same time as allocating budget to be used for grant-making. As a result, the agencies were obliged to call for proposals before having strategies. Clearly, it would be better in future to **phase the allocation of grant budget to agencies in a way that is consistent with their planning tasks.**

These considerations suggest that the current NRP model could be strengthened by

- Careful choice of implementing agency, taking account of the path dependencies involved in using existing organisations.
- Willingness to alter government instructions to such agencies as needed, on a general or programme-specific basis.
- Training and developing more human capacity within the agencies to work with societal challenges.
- Better availability and use of funding and other instruments (for example in relation to foresight and planning) to link NRPs to needs for and use of research.
- A stronger and more permanent role for programme committees that can reach out beyond the R&I community and recruit other partners needed to tackle societal challenges.
- Embedding reflexivity more firmly and formally into programme management processes.

5.2.2 *Next steps in policy development*

In this final section, we recognise the broad systemic character of societal challenges and relax the constraint of working within existing organisations and suggest that higher-level policy decisions are needed. At this point, there is no map or ‘best practice’ to guide us and the experience with the NRPs is not a useful guide to this higher-level thinking. We therefore offer the following comments as inputs to a debate that is badly needed in Sweden, as it is in other countries.

The research and innovation community are writing much of the literature on societal challenges and tends to regard them as a ‘third framing’ (Schot & Steinmuller, 2018) or ‘third generation’ of research and innovation policy. This is a truth with modification, but it is important not to get over-excited and imagine that this new role for research and innovation policy somehow displaces first generation bottom-up research policy or second-generation science and innovation policy. **All three ‘generations’ are needed to produce holistic policy for research and innovation** (Arnold, Åström, Glass, & de Scalzi, 2018).

But, as this report emphasises, tackling the societal challenges requires a great deal more than research and innovation policy. Since these are ‘wicked’ systemic problems, their solution affects large parts of society and must include implementation, otherwise the enterprise is pointless. **Priorities for tackling societal challenges need to be set at national level.** The bigger societal challenges are very large indeed and require large resources. Few countries can afford to tackle very many of them at scale, while those that ‘prioritise’ large numbers of small interventions develop policies that are fragmented and risk being sub-critical. Decisions about which challenges to prioritise affect sectoral responsibilities going



across most or all of government. While government priorities will inevitably evolve over time, they do need to be set centrally – and in particular at a high enough level that they can involve multiple ministries' responsibilities.

Funders and beneficiaries need to learn to think in new ways to address challenges. Re-thinking policy from 'knowledge push' in traditional R&I to 'problem pull' in tackling challenges is a surprisingly big mental leap, which proved difficult to make in the NRPs. Their strategies were found to be overly research focused, their understanding of problems, problem-owners and wider socio-technical systems was incomplete, and the instruments they had at their disposal for supporting the connections between new knowledge and exploitation were limited.

Policymaking is complicated by the fact that there is no clear definition of 'societal challenge'. In some cases, such as climate change, the problem is formulated in a very simple way. The overall objective is to prevent the climate from heating to dangerous temperatures and the specific objective is to manage the amount of greenhouse gases in the atmosphere down to levels consistent with reaching the overall objective. While it is possible to frame other societal challenges of similar clarity – for example, to reduce levels of plastics pollution in the oceans to levels that no longer threaten marine ecosystems – many of the 'societal challenges' that appear in real government policies are composite wish-lists with elastic and untestable goals.

Basic research funding is needed as a component in policies to address societal challenges. R&D aimed at innovation can lead to more radical innovations when the opportunity is introduced to work at lower technology readiness levels. Fortunately for the present purpose, research councils are not expected to fix societal challenges on their own but to provide knowledge inputs relevant to societal challenge interventions, and to help couple the needed knowledge to knowledge users. This will require new ways of identifying and organising to meet certain knowledge needs, affecting both the way some research is done and how it is funded and managed by the state. (It emphatically does **not** mean that government should stop funding bottom-up research.)

We understand the role of the NRPs as that shown in Figure 15, namely to identify high-level societal challenge goals, to use these via their strategic research agenda development processes to identify knowledge needs, especially knowledge gaps but also changes in the character of knowledge, and to fund research to address these, thus contributing towards reaching the societal challenge goals. This may be as good as it gets, if there is no bigger strategic intervention to address the societal challenge involved. However, as the evaluations show, separating the work of filling knowledge gaps from other activities related to societal challenges is less than optimal; if there were a bigger plan, then the process of finding the right knowledge would benefit from closer linkage to the overall intervention.

Figure 15. Systemic role of the NRPs



While further experimentation is needed to find effective ways to mobilise, **less fragmented arrangements are needed for funding integrated interventions that tackle societal challenges**. While the NRP lead agencies made extraordinary efforts and established new ways of working with the NRPs, their dominance of design and implementation limited what the NRPs could do. This suggests that a wider and longer-lasting influence is needed from other societal actors. Funding and instruments from other parts of the policy repertoire (such as innovation, systems analysis, foresight, and demand-side policies) can be needed, not only to address challenges but also to understand enough about the ‘downstream’ and the wider context to set good and specific goals for the research component of interventions. It may be useful to experiment, for example, with platforms answering centrally to government or joint management by different sector authorities, both of which could help broaden the approach to include the broader set of societal actors and actions needed in challenges.

The universities could benefit more from NRPs and make a greater contribution to tackling societal challenges if they had more specific strategies. The Swedish universities vary greatly in the extent to which they have thematic strategies. The SRA evaluation (Teeri, et al., 2015) found that the most successful universities in the SRA competition were those that aligned their applications with their thematic strengths, based on internal decisions about building specialisation and critical mass. Universities that submitted multiple SRA proposals bottom-up did less well than those with centrally targeted application strategies. Similarly, thematic specialisation (some of it based on SRA funding) was important in attracting NRP money, which had the potential to strengthen strength. Since NRP applications came from individual researchers, the universities had little central control or awareness of the application pattern, and therefore under-exploited the developmental and capacity-building potential in the programmes.

The idea that societal challenges need large-scale, expensive interventions that involve many parts of society has the important consequence that governments need to decide which to pursue at scale (and possibly acquire leadership in the economic activities associated with tackling them), and in which to establish more limited positions. Just as the real effect of a decision to pursue all 17 Sustainable Development Goals would be to achieve none of them, so **priorities are needed for interventions addressing societal challenges. This implies a tiered approach**, for example:

- Prioritising a very small number of challenges (three?), tackling these at scale using platforms outside the existing governance structures to create interventions that access



and report to the whole of government, federating existing resources and creating new ones where appropriate. This would include NRP-like activities in relation to knowledge acquisition but probably at larger scale and with a narrower focus, aligned to a clearly defined challenge.

- Recognising a second tier of challenge activity, tackled in a more fragmented way, where Sweden would want to be a 'fast follower', and where a strengthened NRP design would form an important building block.

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Appendix A Interviewees

Funding agencies

Jonas Björk	Forte
Ingrid Pettersson	Formas
Sven Stavström	Vetenskapsrådet

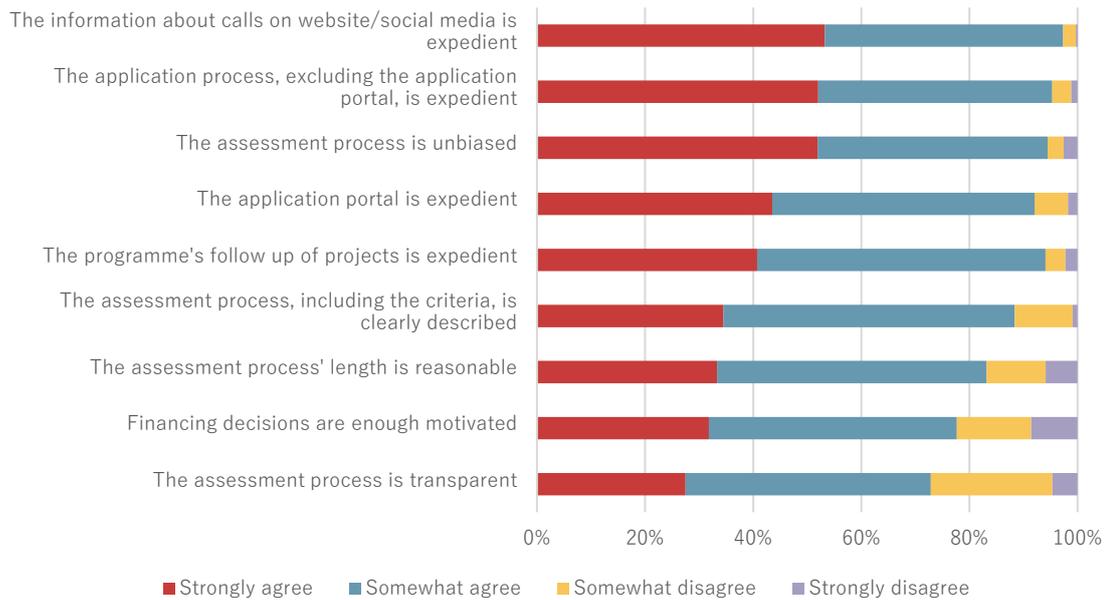
Universities

Martin Bergö	Karolinska institutet
Maryam Hansson Edalat	Stockholms universitet
Per Mickwitz	Lunds universitet
Dieter Muller	Umeå universitet
Anders Palmqvist	Chalmers tekniska högskola
Karin Schmekel	Karolinska institutet
Annika Stensson Trigell	Kungliga Tekniska Högskolan
Margareta Wallquist	Chalmers tekniska högskola
Cornelia Wittoft	Linnéuniversitetet

Appendix B Principal investigator views on agency processes

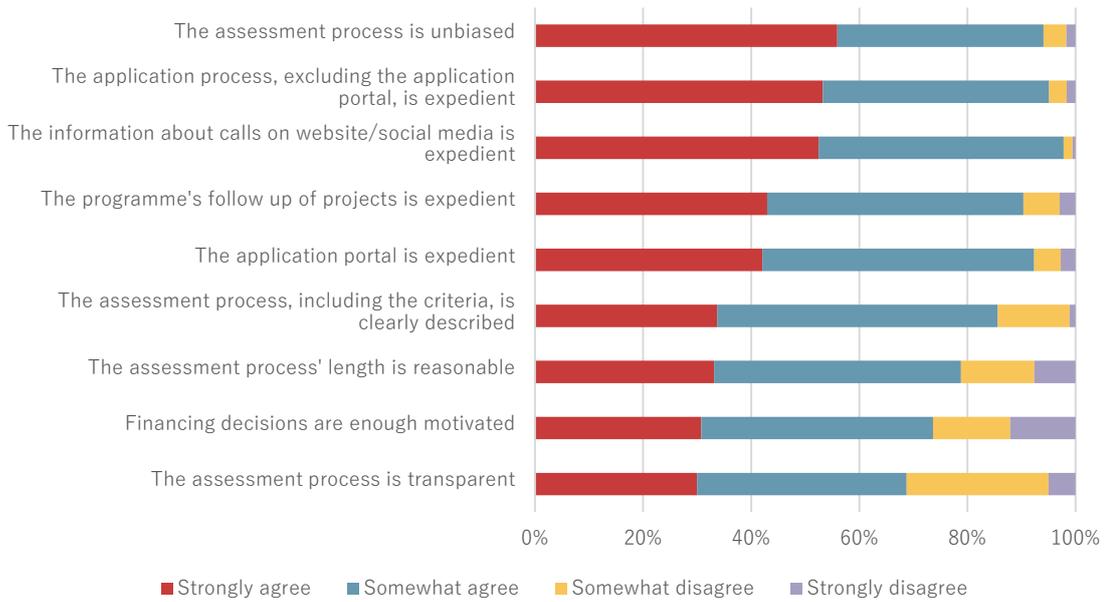
The individual evaluation reports give programme-specific analyses of principal investigators' views on administrative processes. Here, for the convenience of the agencies, we have aggregated these responses to the agency and the overall NRP levels. The pattern of responses is fairly similar among NRPs, agencies and programmes, and is broadly similar to what we see in other programmes, with no evident surprises. The reader should, however, recall that the survey only went to successful applicants, so there is likely to be a positive bias in the responses.

Figure 16. Survey responses on agencies' administrative processes – all three agencies taken together



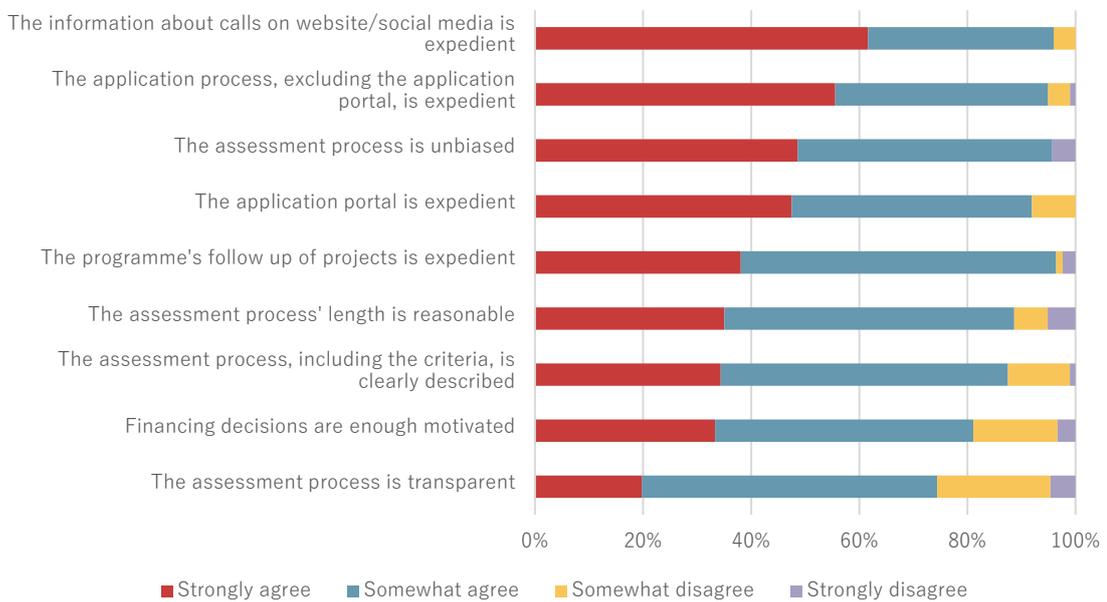
Source: Survey of project leaders

Figure 17. Survey responses on agencies' administrative processes – Formas



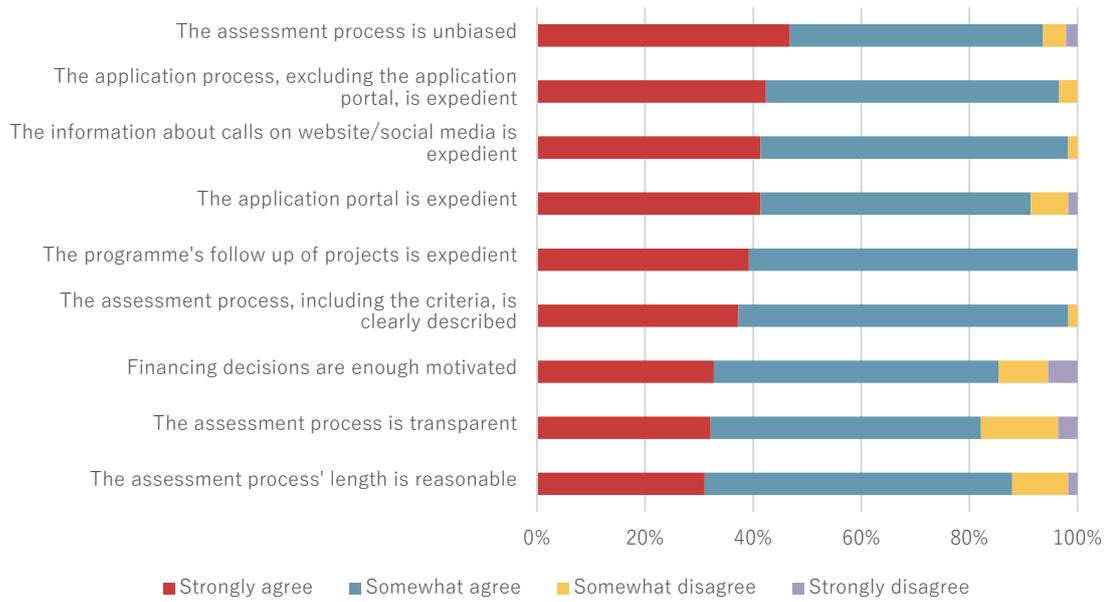
Source: Survey of project leaders

Figure 18. Survey responses on agencies' administrative processes – Forte



Source: Survey of project leaders

Figure 19. Survey responses on agencies' administrative processes – VR



Source: Survey of project leaders



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