

Research for integrated and sustainable spatial planning

Strategic Agenda for the National Research Programme for
Sustainable Spatial Planning

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Spatial Planning

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Contents

Contents	4
Foreword	5
Summary	8
1. About the programme and agenda	11
1.1 Commission for a national research programme for sustainable spatial planning	11
1.2 How the agenda has been developed	13
1.3 Relation to other national research programmes	14
1.4 Experiences from challenge-driven research programmes in other countries	14
2. Challenges for sustainable spatial planning	17
2.1 What does sustainable spatial planning mean?	17
3. Survey of research funding within sustainable spatial planning	21
3.1 About the survey	21
3.2 Areas and funders in the survey	23
3.3 International investments	27
3.4 Distribution of research funding by area	29
3.5 Conclusions of the survey	30
4. Perspectives and key themes for the research programme	34
4.1 Perspectives for integrated and sustainable spatial planning	36
4.2 Themes for integrated and sustainable spatial planning	41
5. Implementation of the agenda	49
5.1 Programme logic and implementation plan: How to continue the efforts	49
5.2 Follow-up and evaluation guide future choices	50
6. Appendices	52

Foreword

We at Formas would like to thank everyone who has contributed in various ways to our work on this strategic research agenda for the National Research Programme for Sustainable Spatial Planning.

This includes the programme committee participants, the Swedish Energy Agency, Forte, Mistra, the Swedish Civil Contingencies Agency, the Swedish Environmental Protection Agency, the Swedish National Heritage Board, Sida, the Swedish Transport Administration, the Swedish Research Council, Vinnova and, of course, the programme's working group and their representatives from these organisations.

We also wish to extend our gratitude to the committee's independent chair, Ulrika Francke.

And last but not least, we thank all the universities, research institutes, government agencies, industry associations, companies, municipalities, non-profit organisations and others who have contributed by participating in workshops and stakeholder dialogues and who have provided valuable input via our referral procedure.

We look forward to our continued collaboration!

Summary

The National Research Programme for Sustainable Spatial Planning stems from a government commission received by Formas and spans the period 2017-2026. This research programme has several purposes, the main one being to promote research and innovation that support sustainable spatial planning and help to achieve relevant goals at the national and the global level. The present strategic research agenda was developed in 2018 as a point of departure for the research programme's content and activities, including calls for research funding and other initiatives for increasing the societal impact of research findings.

The research programme and research agenda will provide a platform for research and create synergies between stakeholders that complement each other in terms of knowledge, expertise and projects. Therefore, a programme committee and a working group consisting of research funders will support Formas in its work with the National Research Programme for Sustainable Spatial Planning. In addition to this collaboration, the entire process of developing the agenda has involved dialogue with a wide range of societal stakeholders.

The research agenda identifies a number of key themes and perspectives that together create a framework of priority areas to explore within the research programme. Each individual theme is closely linked to the other themes, and together with the different perspectives contributes to achieving comprehensive solutions for sustainable and integrated spatial planning.

The agenda's themes and perspectives are grounded in the various challenges facing the built environment, in the focus areas relevant to the programme, in analyses of society's need for knowledge, and in a survey of current and future investments in research funding. The survey also acts as a springboard for dialogue and increased coordination of future efforts between different research funders.

The theme Sustainable Residential and Public Environments concerns people's access to adequate and affordable housing and basic services, as well as safe, inclusive and accessible green spaces and public areas. The next theme, Sustainable Transport Systems for Everyone, highlights the need for fossil-free, dependable transport and travel that are affordable and accessible to people with different needs and abilities. The theme Human Health and

Well-Being concerns the release and presence of harmful chemicals and pollutants in air, water and soil, the environmentally friendly management of chemicals and waste, and the design of habitats and conditions for an active outdoor life. The theme Public Safety concerns the need for societal functions, the protection of vital activities and critical infrastructure, and the ability to cope with natural disasters and climate change. This theme also stresses the importance of safe, secure, inclusive and accessible public environments and green spaces. The theme Sustainable Consumption and Production is about resource efficiency, the consideration of ecosystem services, and the creation of the conditions for a circular economy in cities and their peripheries, between urban and rural areas, and in and between regions. The theme Sustainable Land and Water Use covers the planning and maintenance of buildings and infrastructure to make them adaptable to changing physical conditions and meet people's different needs. It also covers the management of conflicting objectives and interests.

The perspectives of the agenda lay the groundwork for knowledge-building within and between these themes and thus contribute to integrated, sustainable spatial planning. The perspective Governance, Policy and Economics concerns the idea that many spatial planning issues are closely interrelated yet are addressed by different laws and a wide divergence of governance approaches. The perspective Organisation, Collaboration and Leadership touches on the complexity and variety of stakeholders involved in spatial planning and the need to coordinate processes in order to enable comprehensive solutions. The next perspective deals with Accessibility and Gender Equality and the importance of considering the perspective of end users as well as people's different needs and abilities early on in the planning process. This will help to achieve a holistic view of spatial planning and to include social issues to a greater extent. The perspective Democracy and Participation highlights the essence of a well-functioning spatial planning process characterised by openness, fairness, participation and transparency. The final perspective, Digitalisation and Artificial Intelligence, emphasises today's opportunities and challenges concerning new technology solutions for more interactive, integrated and sustainable planning and management.

The content of the strategic research agenda will be put into practice based on the desired outcomes and by using implementation plans. The programmes will be monitored and evaluated during the course of the programme period.

1. About the programme and agenda

This introductory chapter briefly describes the government commission to Formas' scientific council to establish a national research programme for sustainable spatial planning, as well as the programme's points of departure and objectives. The programme is guided by a strategic research agenda, and the chapter explains how the agenda has been developed and how it will be implemented. Finally, the chapter describes the relationship to other national research programmes initiated by the government.

1.1 Commission for a national research programme for sustainable spatial planning

In 2017, the government commissioned Formas to develop a ten-year national research programme for sustainable spatial planning in collaboration with other funders (Appendix 1). The commission included developing a strategic research agenda to use as the basis for the programme's content and activities.

Formas developed this first version of the research agenda in 2018 and will revise it as necessary during the programme period.

The research agenda is in effect until 2026. In addition to constituting a strategic framework for the programme, it is intended to be a tool that supports dialogue between funders, research practitioners and other stakeholders, such as public health organisations, the public sector and the private sector.

The agenda identifies key themes and important perspectives for future activities in the research programme. These themes and perspectives address challenges and knowledge needs for sustainable spatial planning.

The agenda also includes a survey of funders' current and future investments that are relevant to the programme. The survey facilitates an assessment of possible synergies and efficient use of funds, and can thus provide a basis for coordinating Swedish funding efforts within spatial planning through the use of common priorities and goals.

The last section of the research agenda describes how comprehensive programme logic will be developed to support achieving the programme objectives. The programme logic will be implemented through three-year implementation plans. Frameworks for monitoring and evaluating the programme are also described. The overall approach will provide the programme with a clear focus, while creating the necessary flexibility to maintain the programme's relevance and impact over the entire programme period.

1.1.1. Points of departure and objectives

As stated in the government's detailed description of the commission, the National Research Programme for Sustainable Spatial Planning should address the challenges facing cities and communities in our society. The programme should provide the knowledge needed to transition to a fossil-free society accessible to all, to adapt to a changing climate, and to achieve global and national objectives that are central to sustainable spatial planning.

The global sustainable development goals of Agenda 2030 and the UN's New Urban Agenda of 2017 are key points of departure for the programme. The New Urban Agenda contributes mainly to global goal 11 (Sustainable cities and communities). In addition to goal 11, the majority of the 17 global sustainability goals relate in different ways to different aspects of the challenges of sustainable spatial planning (see also Chapter 4).

Sweden's environmental objectives represent important national points of departure for the programme. Among the most relevant objectives are Reduced Climate Impact, Clean Air, A Non-Toxic Environment, Good-Quality Groundwater, and Good Built Environment as well as the Generational Goal.

Other key points of departure within sustainable spatial planning include the national objectives for the following:

- Housing, construction and urban planning
- Architecture and design
- Cultural heritage
- Social and gender equality
- Public safety and crime prevention
- Transport and infrastructure

For more detailed information about the objectives, see Appendix 2.

With the national research programme, the government aims to promote research and innovation that support sustainable spatial planning. The research programme and agenda can provide a platform for ongoing research and create synergies between different stakeholders that complement each other in terms of knowledge, expertise and projects.

To solve the complex challenges facing society, the programme should be broad and multidisciplinary in nature, support cross-sectoral collaboration and have a strong connection to the users of the research results. Activities associated with the programme's implementation can include all aspects of the research and innovation system in which the use of research

infrastructures can play an important role. The programme will integrate a gender perspective into its activities. It will communicate the results of the research, promote its usefulness and contribute to its societal impact, as well as encourage a greater focus on research in higher education.

The programme will also act as a bridge to international research programmes and strengthen Swedish participation in the European research programmes that are relevant to sustainable spatial planning.

The objectives of the sustainable spatial planning programme are summarised as follows:

- Promote renewal and innovation in sustainable spatial planning research.
- Provide expertise and solutions for achieving the national objectives, global sustainability goals and the UN's New Urban Agenda.
- Strengthen the usefulness of the research.
- Encourage a greater focus on research in higher education.
- Make research on sustainable spatial planning more available to a global audience.
- Help to achieve gender equality at universities and in society.
- Strengthen interdisciplinary and cross-sectoral collaboration.

1.1.2 Organisational structure

National research programmes are expected to create synergies between stakeholders that complement each other in terms of knowledge, expertise and projects. Therefore, Formas has the support of a programme committee in each national research programme. The programme committee is led by an independent chairperson and has an advisory role in implementing the agenda and designing the programme. The programme committee for sustainable spatial planning consists of representatives from the Swedish Energy Agency, Formas, Forte, Mistra, the Swedish Civil Contingencies Agency (MSB), the Swedish Environmental Protection Agency, the Swedish National Heritage Board, Sida, the Swedish Transport Administration, the Swedish Research Council and Vinnova. A working group assists the programme committee. Other advisory groups will be affiliated with the programme if they are deemed to help contribute to its implementation.

1.2 How the agenda has been developed

The agenda was developed by Formas in consultation with the research funders from the programme committee. The process has also involved dialogue with societal actors and research practitioners. To ensure the relevance of the research programme, Formas conducted a workshop with representatives from civil society organisations, the public sector and the private sector in October 2017 (Appendix 3). During the workshop, current knowledge needs were discussed and inventoried as relate to the challenges within the field of spatial planning. The workshop resulted in prioritised knowledge needs which, together with a survey of research funding in the field and the conclusions of several key reports and publications, lay the groundwork for the agenda's strategic direction.

A first version of the agenda was sent out for referral in April 2018 (Appendix 4) to research practitioners at universities and institutes and to the stakeholders who participated in the workshop. Formas has considered the referral responses when finalising the agenda.

In addition, representatives from universities and research institutes were invited to a dialogue in September 2018 on the implementation of the national research programme for sustainable spatial planning.

The field of spatial planning is broad, spanning several areas and initiatives and including a variety of stakeholders. This complexity makes it challenging to provide an exhaustive description of all the dimensions of this first version of the agenda. The agenda will therefore be regularly revised and developed as necessary during the course of the programme period.

1.3 Relation to other national research programmes

In addition to the national research programme on sustainable spatial planning, Formas is overseeing a programme on climate and another on food. Forte is in charge of two research programmes, one focused on applied welfare research and one on workplace research. The Swedish Research Council is responsible for two research programmes, one on migration and integration and one on antimicrobial resistance.

All the programmes address significant national and global challenges facing society. They deal with complex issues that are not well-defined or clearly delimited. The drivers, consequences and solutions regarding one particular societal challenge also relate to other challenges, so there are many interactions, synergies and conflicts of interest between the challenges.

For example, sustainable spatial planning has obvious touchpoints with:

- The climate programme, which involves questions around adaptation, transport, energy, consumption, policy instruments, circular economy, etc.
- The migration programme, which involves questions around integration, segregation, sustainable urban planning, etc.
- The food programme, which involves questions around the circular economy and rural development.
- There are also touchpoints with the national research programmes for applied welfare and for workplace research.

1.4 Experiences from challenge-driven research programmes in other countries

On the initiative of Formas, in 2017 the Growth Analysis agency conducted a global analysis of international experiences from other challenge-driven research programmes (Growth Analysis, 2017). This analysis describes the processes and experiences from research programmes in Canada, the UK, Finland and Denmark as well as on a European level. The purpose of the analysis was to identify key factors to consider when designing research programmes which, like the national programme for sustainable spatial planning, focus on societal challenges.

According to the analysis, research programmes spanning ten years are relatively uncommon and require flexibility in order to maintain relevance and impact over time. The analysis also emphasises the complexity of designing research programmes to help solve such challenges. Cross-sectoral, multidisciplinary and interdisciplinary approaches are needed, and affected stakeholders must be included early in the process.

These factors are important to consider when designing activities in the national research programme for sustainable spatial planning. They also address the programme's objectives regarding strengthening interdisciplinary and cross-sectoral collaboration.

2. Challenges for sustainable spatial planning

This chapter begins with a definition of the concepts used in sustainable spatial planning and urban planning and how they are used in the agenda. It then outlines the challenges that should be managed to achieve sustainable spatial planning.

The chapter also summarises the results of the workshop Formas conducted with various societal stakeholders in October 2017 on current knowledge needs for sustainable spatial planning.

Finally, it presents a brief report of the challenges facing spatial planning according to a Formas analysis of the research conducted during 2008-2013.

2.1 What does sustainable spatial planning mean?

The concept of spatial planning addresses equally the processes of planning, construction, use and management of buildings, infrastructure, cultural sites and natural environments, as well as the planning and promotion of inclusive, participatory and safe communities where people want to live. In light of all these factors, sustainable spatial planning means readjusting to a socially, culturally, ecologically and economically sustainable society. Sustainable spatial planning must take into account the links between all dimensions, and it must explore the tensions and conflicts of interest between cities and their peripheries, urban areas, communities and rural areas.

Cities and urban areas are linked together with the surrounding countryside and with each other in regional networks. Demographic shifts are taking place both to cities and within different rural areas, with a growing urban population. Changes in demographics pose social and economic challenges. A well-functioning interplay is needed between cities, urban areas and rural areas, especially in order to provide public services.

Another key concept is urban planning. In this agenda, urban planning is used as a collective term for several related concepts, such as spatial planning and urban planning, or simply planning. The purpose of urban planning is to meet society's basic needs; it relates to both urban and rural planning interacting together. It includes both long-term strategic planning and more detailed planning. Sustainable urban planning is grounded in a balanced holistic view, and includes

interaction with the environment as well as the use of economic and social resources.

The concept of spatial planning is used in some sectors to describe the entire chain of activities, from early planning through to implementation and management (Royal Swedish Academy of Engineering Sciences, 2018).

The agenda mainly uses the concepts of urban planning and management. Management includes the operation, maintenance, adaptation and development of an existing built environment that takes into account the needs of future generations, and it interacts with planning for a new built environment.

2.1.1 Challenges of the government commission

According to the government commission, the overall challenge of achieving sustainable spatial planning is “to strengthen the conditions for Swedish cities and communities so that they can evolve into living, green, healthy, inclusive and safe places. Swedish cities and communities should also create the foundation for good living conditions for all, taking into account people’s needs and rights, as well as lay the foundation for economic development and growth.” The overall challenge, in turn, consists of different interrelated challenges and must therefore be managed from a holistic perspective that considers all sustainability dimensions. The challenges of the government commission include areas related to:

- Collaboration, conflict of objectives, and policy instruments in the urban planning process
- Housing and social housing policy
- Participation and inclusion
- Accessible, safe and sustainable transport and mobility systems
- Sustainable patterns of production and consumption
- Sustainable waste management and use of chemicals
- Reduced environmental impact from and within cities
- Health and well-being
- A sustainable drinking water supply
- Public safety, security and risk assessments

2.1.2 Challenges identified together with stakeholders

The challenges and knowledge needs highlighted in Formas’ workshop with various societal stakeholders (Appendix 3) deal largely with issues that must be considered at an institutional level, such as different forms of governance,

regulatory frameworks and new economic models. The stakeholders also express a need to explore what is necessary for enabling knowledge transfer and ensuring the usefulness of the research.

The workshop highlighted the following considerations as important challenges and needs:

- **Conflicts of objectives and interest, implementation and collaborative processes:**
Managing conflicting objectives and interests from a global to a local level and finding ways to implement goals and strategies. Managing and developing collaborative processes, both within and between organisations at the local, regional, national and international levels.
- **Leadership and organisational issues:**
Enabling leaders and organisations to create the conditions for changes in an increasingly complex society.
- **Participation, accessibility and diversity:**
Promoting sustainable living spaces that are accessible to everyone and inclusive, and counteract social disparities, segregation and exclusion. Greater opportunities for participation are needed in all these areas, and a closer link to the user perspective is generally needed within spatial planning.
- **Digitalisation and open data:**
An in-depth understanding of the opportunities and challenges of digitalisation, how data and open data can be used, made available and utilised for integrated urban planning.

2.1.3 Spatial planning challenges according to Formas' 2015 analysis

In 2015, Formas was tasked by the government to conduct a survey and analysis of current research within the framework of our responsibilities, including spatial planning. The survey was based on Formas' eleven largest grant recipients and collected both quantitative and qualitative data on spatial planning research. The material was compiled and then evaluated by a panel of four experts.

The resulting report (Formas, 2015) identifies three overall challenges for spatial planning: rapid urbanisation, the maintenance of existing housing stock and infrastructure, and an unsustainable construction sector. In addition to these challenges, the report highlighted urban densification with (maintained) quality, the need for knowledge about how cities can become more socially sustainable, and the challenge of managing and developing cultural heritage and cultural sites over time.

3. Survey of research funding within sustainable spatial planning

The government bill “Collaborating for knowledge – for society’s challenges and strengthened competitiveness” (Government Offices, 2016/17:50) states that the national research programmes’ strategic research agendas should identify and report on funders’ shared and existing initiatives and programmes to facilitate the assessment of synergies and optimal utilisation of funds.

This chapter presents Formas’ survey of ongoing funding initiatives for research and innovation in sustainable spatial planning. The overall purpose of the survey is to create a picture of how Swedish research and innovation funding is distributed within sustainable spatial planning, which disciplines dominate this area, and how innovation and research funding is distributed in relation to the knowledge needs previously identified.

3.1 About the survey

Spatial planning encompasses many different stakeholders across multiple sectors and research areas. However, this survey only reports on investments from government funding bodies and the following government agencies: Formas, Vinnova, Forte, the Swedish Research Council, the Swedish Energy Agency, the Environmental Protection Agency, the Swedish Civil Contingencies Agency, the Swedish Transport Agency, the Swedish National Heritage Board and the Swedish Foundation for Environmental Strategic Research (Mistra). The focus is on Swedish investments (Table 1), but the survey also presents a compilation of international programmes that are particularly relevant for the area (Table 2). Investments refer to calls, programmes and similar initiatives for funding research or innovation. The survey includes both past investments and investments that have been ongoing since 2012 and that were launched by 2017 for a minimum of 10 million kronor. Background material has been gathered from each agency, and additional information has been obtained from each organisation’s website.

In the survey, Formas has chosen to divide spatial planning into eight areas based on the challenges outlined in the government commission and the identified national objectives.

Vinnova earmarks substantial funds for spatial planning. The agency has developed a special classification system for monitoring the projects it funds specifically within the area of Sustainable and Smart Cities.

This is why upcoming sections repeatedly refer to data that Vinnova has provided for the survey. The programmes that Vinnova funds within its project portfolio for Sustainable and Smart Cities are broad and cover several areas in this agenda's survey. But the programmes and investments are included only if they are dedicated to spatial planning.

In the agenda's survey, investment budgets have been categorised into eight areas and visualised as relative percentages. The data provided by Vinnova (Appendix 5) is also presented as a supplement.

Since the challenges of spatial planning are often global and require international cooperation, the survey also includes a section on international investments in funding research and development.

3.1.1 Limitations

Approximately half of the funding received by higher education institutions takes the form of direct grants, or so-called basic appropriations (Government Offices, 2015). These grants can be distributed across all research areas in which the institutions operate. The portion of the basic appropriation for projects within sustainable spatial planning is not included in this survey.

Other investments have also been made within sustainable spatial planning that are not included in the survey, because they either mainly address development or are of a lesser magnitude. Among the investments the survey excludes are structural funds from the Swedish Agency for Economic and Regional Growth, which primarily invests in development, but where cooperation can also take place with academia. The same applies for earmarked government grants awarded by agencies like the Swedish National Housing Board and the Environmental Protection Agency. Other examples include industry-funded research, such as SBUF (the Swedish Construction Industry Development Fund), which provides grants for research and development in the Swedish construction industry, and SVU (the Swedish Water and Wastewater Association), which funds applied research and development of special interest for municipal water services. The Wallenberg Foundations and the Swedish Riksbank's jubilee fund also provide project funding for spatial planning, but these are individual projects with a lower budget than what the survey covers.

3.2 Areas and funders in the survey

In the survey, Formas has chosen to divide spatial planning into eight areas:

- Built environment
- Urban development
- Circular economy and resource efficiency
- Democracy and participation
- Cultural heritage and cultural sites
- Transport
- Health and well-being
- Public safety

These areas have been selected based on the challenges outlined in the government commission and the identified national objectives. Each area contains a number of descriptive keywords.

Table 1 lists the investments (calls or programmes) and funders by area.

For Forte's and Formas' annual open calls, an estimate has been made for the areas relevant to the programme. Applications received in the annual open calls are reviewed by several different scientific review panels. The review panels at Forte that have been taken into account include Social Relations as well as Health Promotion and Behaviour. The main review panels at Formas that have been taken into account include Environmental Pollutants, Built Environment, Urban and Rural Areas, and Consumption, Production and Materials.

Table 1. Investments and programmes, and funders for each area of the survey.

Built environment

Keywords: Built environment, building process, production and construction, operation and maintenance, infrastructure, real estate, stormwater, water and wastewater, lifecycle perspective, renovation, BIM, energy-building, materials, geotechnology, development, governance and policy, economy, business models, procurement.

Investment/programme	Funder
Annual open call: Built environment	Formas
Geoinfra	Formas
SIP Smart Built Environment	Vinnova, Formas, Energy Agency
Bygginnovationen	Vinnova
Mistra Smart Underhåll	Mistra
Energy, IT and design	Energy Agency
E2B2	Energy Agency

Urban development

Keywords: Urban planning, regional planning, spatial planning, architecture, design, art, housing, residential buildings, public spaces, housing market, green and blue values, ecosystem services, accessibility, service and use of spaces, healthy housing, policy and governance, socio-economic perspectives.

Investment/programme	Funder
Urbanisation challenges and opportunities	Formas
Strong environments: Architecture	Formas
Programmes: Sustainable spatial planning 2012-2016	Formas
Social housing policy	Formas
Research projects with people and stakeholders in focus and syntheses	Formas
Annual open calls: cities, countryside	Formas
Innovation platforms for sustainable urban development	Vinnova
Challenge-driven innovation	Vinnova
Smart housing Småland, Urban Magma, Skåne	Vinnova
Innovation capacity in the public sector	Vinnova
Test beds in environmental technology	Vinnova
Urban innovation	Environmental Protection Agency
Mistra Urban Futures	Mistra, Sida
SIP Viable Cities	Vinnova, Energy Agency, Formas
Good cities of the future	Formas, Transport Administration, private funders
Discretionary project grants within artistic research	Swedish Research Council

Transport

Keywords: Traffic and infrastructure planning, road safety, accessibility, self-driving vehicles, energy-climate-transport, intelligent transport systems, mobility and mobility services, pedestrian, bicycle and public transport, transport-health, governance and policy, economics, procurement, business models.

Investment/programme	Funder
Electricity	Energy Agency
Energy efficiency in the transport sector	Energy Agency
Sustainable and efficient transport	Environmental Protection Agency
Mistra SAMS	Mistra, Transport Administration
K2	Formas, Transport Administration, Vinnova
SIP Infra Sweden	Vinnova, Formas, Energy Agency
SIP Drive Sweden	Vinnova, Formas, Energy Agency
Strategic automotive research	Vinnova, Energy Agency, Transport Administration
Innovations for a sustainable society	Vinnova

Health and well-being

Keywords: Design and construction, green and blue values, outdoor life, physical factors in the environment (environmental pollution, noise, air quality), non-toxic environment, clean water, drinking water, governance and policy.

Investment/programme	Funder
Annual open calls: health and behaviour	Forte
Children and adolescent mental health	Forte, Swedish Research Council, Formas
Annual open calls: Environmental pollution	Formas
Clean air and climate protection	Naturvårdsverket
DALY	Transport Administration

Public safety

Keywords: Climate adaptation, floods, fires, landslides, mudslides, erosion, drought, safety in housing and public spaces and environments, public safety in planning, fire safety, crime prevention, vulnerability in societal functions, risk and vulnerability analyses, governance and policy.

Investment/programme	Funder
Centre for Critical Infrastructure Protection Research	Civil Contingencies Agency
Risk decision support for adaptation to future natural disasters	Civil Contingencies Agency
Safer ways to address unsafe climate risks	Civil Contingencies Agency
Projects focused on, e.g., violence-promoting environments and civil society issues	Civil Contingencies Agency
Critical flows and supply issues	Civil Contingencies Agency
Residential fires in metropolitan areas	Civil Contingencies Agency

cont'd. **Table 1.** Investments and programmes, and funders for each area of the survey.

Circular economy and resource efficiency

Keywords: Sharing economy, bio-based economy, energy, materials, consumption, lifestyle, norms, identities, waste management, recycling, reuse, lifecycle analysis, non-toxic environment, ecosystem services, chemical use, governance and policy, economics, business models, procurement.

Investment/programme	Funder
Programme: Bio-based economy	Formas
Annual open calls: Consumption, production and materials	Formas
Test beds in environmental technology	Vinnova
Policy instruments and consumption	Environmental Protection Agency
Mistra Closing the loop	Mistra
Mistra REES	Mistra
Mistra Consumption	Mistra
SIP Bioinnovation	Vinnova, Formas, Energy Agency
SIP Re:Source	Vinnova, Formas, Energy Agency

Democracy and participation

Keywords: Urban planning - participation, civic dialogue, social sustainability, social and economic inclusion, segregation, gentrification, policy and governance.

Investment/programme	Funder
Annual open: Social relations	Forte
Research on racism	Swedish Research Council
Research on democracy	Swedish Research Council
Research on civil society	Swedish Research Council
Discretionary project grants within artistic research and the humanities	Swedish Research Council
Social innovation	Vinnova
Challenge-driven innovation	Vinnova

Cultural heritage and cultural sites

Keywords: Preservation, use and development of cultural heritage and cultural sites, participation, inclusion and social sustainability, organisation and cooperation, policy and governance.

Investment/programme	Funder
Research and development for cultural sites	National Heritage Board
Global allocations: Culture and cultural heritage	Swedish Research Council
Save and preserve	Energy Agency
Discretionary project grants within social sciences and the humanities	Swedish Research Council

cont'd. **Table 1.** Investments and programmes, and funders for each area of the survey.

3.3 International investments

Today's major societal challenges are global, and international collaboration within the research programme at Nordic, European and global levels play an important role. Increased international collaboration provides the opportunity to learn about common challenges and to find good examples of sustainable solutions. Formas' survey focuses on international investments within sustainable spatial planning during 2012-2017, with a clear focus on urban development, built environment and the transition to sustainability, as well as Sweden's areas of contribution as relates to funding (Table 2).

There are several international collaboration initiatives that are relevant for spatial planning. Prime examples include the development research that Sida and the Swedish Research Council are funding.

Another example is the European Framework Programme for Research and Innovation, Horizon 2020. This programme prioritises three areas – excellent science, industrial leadership and societal challenges – in which spatial planning issues are relevant for most of the societal challenges.

According to a report from Vinnova (2018a), Sweden has a generally high level of investment in Horizon 2020 within societal challenges – on average, 4 percent of funds granted. However, the funding rate for Swedish participants is somewhat lower for some of the societal challenges that are highly topical for spatial planning, such as “Secure, clean and efficient energy” (3.9 percent), “Europe in a changing world: inclusive, innovative and reflective societies” (2.9 percent) and “Secure societies” (2.4 percent).

There is thus room for improvement for Swedish participation in the spatial planning area within Horizon 2020, as well as in the subsequent seven-year Horizon Europe Research initiative.

Other international initiatives relevant to spatial planning include ERA-Net and joint programming initiatives (JPIs). JPI Urban Europe is an important initiative aimed at creating European solutions for sustainable urban development. Its objective is to help create attractive urban areas that are capable of transitioning to become resource-efficient, economically viable and sustainable. The Swedish funders participating in JPI Urban Europe are Formas, Vinnova and the Swedish Energy Agency. These agencies all agree that Swedish participation needs to be strengthened, as does investment in the societal challenges within Horizon 2020.

The survey does not include international collaboration funded by the basic appropriation to Swedish universities or by the participation of Swedish universities in international projects with their own funding.

Nor have we included any international investments that may be relevant in areas such as energy, climate, transport and safety, but we do mention some that have clear points of contact with spatial planning. There might indeed be more international investments that might affect the programme during the programme period and that might be included in subsequent revisions to the agenda's survey.

Investment/programme	Funder
Nordic Built	Formas, Energy Agency (as Swedish funders)
Transformation to sustainability	The Swedish Research Council finances Swedish participation. Others: Belmont Forum, NORFACE and the International Social Science Council.
Sustainability and resilience; tackling climate and Sida, environmental challenges	Swedish Research Council, Formas
SKL Symbio City	Sida, SKL
Resilience and safety nets	Sida
Insurance IFAD	Sida
JPI Urban Europe <ul style="list-style-type: none"> • Sustainable Urbanisation Global Initiative (SUGI)/Food-Water-Energy Nexus New innovative solutions to the Food-Water-Energy Nexus challenge. • Making cities work Challenge-driven innovation projects for European urban areas that have the potential to result in commercially successful services and products. • ERA-NET Cofund Smart Cities and Communities (ENSCC) Smart Integrated Urban Energy and Transport Systems, Smart Tools and Services for the systems. • JPI Urban Living labs • ERA-NET Cofund Smart Urban Futures Smart and Big Data, and Smart Governance and Smart citizens 	Vinnova, Formas, Swedish Energy Agency fund Swedish participation. Others include Belmont Forum for Sustainable Urbanisation Global Initiative, SUGI.
Other JPIs that may be relevant <ul style="list-style-type: none"> • JPI Water • JPI Cultural heritage and global change • JPI Climate 	
	<u>FraNet ECO-Innovaera (environmental technology)</u>

Horizon 2020

Spatial planning issues are relevant for the vast majority of societal challenges.

Table 2. Examples of international investments within sustainable spatial planning 2012-2017 where Sweden contributes funding.

3.4 Distribution of research funding by area

Figure 1 below shows how Swedish funding is distributed over the areas Formas has defined. The distribution is shown as relative percentages. Actual figures were available in most cases, but since the investments and research projects have such different formats and span different time periods, it is difficult to indicate the exact fund amounts per area. For Forte's and Formas' open calls, an estimate of the funding amount is therefore shown.

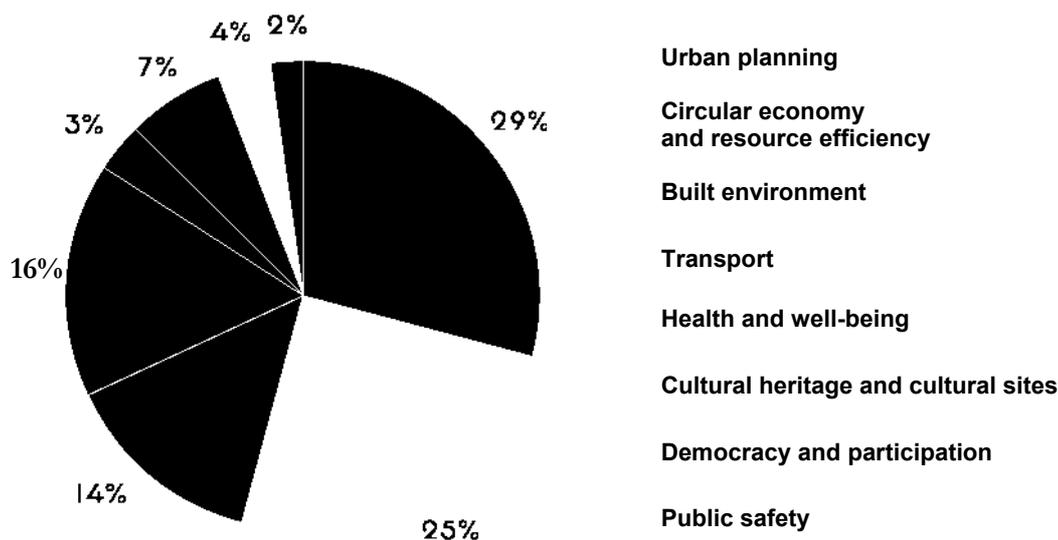


Figure 1. Distribution of research funding for the eight areas within sustainable spatial planning.¹

The figure shows that the largest share of research funding is targeted towards **urban development, circular and bio-based economy and resource efficiency**, followed by **transport and built environment**, as well as **cultural heritage and cultural sites**.

The lowest share of research funding is distributed to the areas of **health and well-being, democracy and participation, and public safety**.

3.4.1 Distribution of funds within the Vinnova project portfolio for sustainable and smart cities

As mentioned earlier, Vinnova has developed a special classification system for monitoring the projects it funds within its area Sustainable and Smart Cities. For the period 2012-2017, the largest share of funding goes to the main category of urban development and urban planning, followed by the main categories of waste management, remediation and recycling, and the construction sector. The main categories of healthy lifestyle and mental health receive the lowest share of funding. (For a more detailed report of Vinnova's distribution of funds, see Appendix 5.) The distribution of funds presented in Figure 1 largely mirrors how Vinnova's funds have been distributed within its area Sustainable and Smart Cities.

1. The strategic vehicle research programme (Vinnova, Swedish Energy Agency and Swedish Transport Administration) is not included in this survey, as it would skew the results too much towards the transport sector and is largely irrelevant to the focus of this programme.

3.4.2 Spatial planning research funding according to Formas' 2015 analysis

As mentioned in Chapter 2, in 2015 Formas conducted a survey and analysis of current research within the framework of its responsibilities, as tasked by the government.

For the field of spatial planning, the analysis states that the research is diversified, broad and multidisciplinary, with a strong tradition of stakeholder collaboration. It also points out that the research is fragmented and unable to respond quickly enough to the challenges posed by accelerating urbanisation. It notes that research funding in this area is also fragmented and that this research field has not been sufficiently prioritised in Sweden. Total research funding within spatial planning is assessed to be low compared with its importance to society. Finally, the report concludes that more stable funding programmes are needed that can keep abreast of key societal issues over time and that the field of spatial planning in Sweden would benefit from stronger international networks. This underlines the importance of the ten-year national research programme for sustainable spatial planning.

3.5 Conclusions of the survey

The conclusions that follow are based on the previous survey of research funding within sustainable spatial planning, with research funding distributed by defined area, including Vinnova's distribution of funds for the project portfolio Smart and Sustainable Cities.

3.5.1 Low level of funding and coordination

Total research funding within spatial planning is assessed to be low compared with its importance to society. Research funding is fragmented because this field has not been prioritised.

Many investments are similar in nature and are based on similar challenges and problems, yet there is often a lack of coordination between the funders. In terms of today's complex challenges, coordination must be improved and focused on coping with broad, complex challenges that span diverse sectors and disciplines. As regards international investments, coordination between Swedish funders is more developed.

3.5.2 International collaboration must be strengthened

Although the research funders have improved coordination with regard to international research funding, they must continue to create the conditions

for research practitioners to build stronger international networks in order to promote spatial planning.

3.5.3 Technical and scientific research dominate

Several areas of the survey reveal that research and innovation are predominantly technical and scientific in nature. Examples include the strategic innovation programmes, strategic vehicle research and development, the bio-based economy programme, and building innovation.

Interdisciplinary scientific research is part of several investments, for example in Mistra's programmes and challenge-driven innovation, and also plays a role in several initiatives launched in recent years. However, the survey shows that investments that encourage an interdisciplinary approach or demand a social science or humanist perspective are less prominent. To address the challenges facing society, the interdisciplinary trend must continue and become more prominent.

3.5.4 Balance the distribution of funds to meet the challenges

Formas' analysis of spatial planning research from 2015 shows that it is multidisciplinary yet fragmented, and does not respond quickly enough to societal challenges. To meet today's complex challenges, future initiatives must take a holistic perspective and an interdisciplinary approach.

The agenda's survey of funding investments shows that the highest share of funding goes towards urban development, circular economy, resource efficiency and built environment. A relatively large share of funding is spent on research and innovation in the transport sector. In addition, the lowest share of research funding goes towards health and well-being, democracy and participation, and public safety. Somewhere in between lies cultural heritage and cultural sites.

Additionally, the breakdown of Vinnova's funding from the Sustainable and Smart Cities portfolio shows that the areas of healthy urban environment as well as sustainable lifestyle and consumption receive a smaller share of the funding, as do the areas of pollution and toxin remediation as well as landfill.

Vinnova's category of sustainable lifestyle and consumption can be related to the survey area circular economy and resource efficiency, which mainly indicates a technical-scientific orientation. Consumption, however, receives a smaller share of funding and mainly focuses on the social sciences.

The survey also shows that funding within public safety is mainly provided by the Swedish Civil Contingencies Agency (MSB).

The water issues highlighted in the programme's commission primarily relate to water and sewage and to stormwater and drinking water supply, and does not constitute a separate area in the survey, largely because no specific efforts in this area have been identified. However, projects focusing on these issues exist in many of the broader investments that are included in the survey from several different funders. Vinnova's data for the water and sewage category shows that the smallest share of its funding goes towards stormwater and drinking water.

It has not been justifiable for land-use issues to receive a category of their own either, although there are projects in broader initiatives that involve land-use issues in addition to projects conducted within and by the Swedish Geotechnical Institute (SGI) and Geological Survey of Sweden (SGU).

The survey shows that the area of urban development is relatively well funded. But this area is wide and contains many different investments from different stakeholders. It is therefore important that activities within the national research programme relate to, and build on, other investments and are harmonised with them.

Addressing the challenges of sustainable spatial planning requires more focus on most of the areas that currently receive a smaller share of the funding. However, it should be pointed out that an evenly balanced funding distribution for different areas is not an end in itself – the distribution should be weighed against current needs.

4. Perspectives and key themes for the research programme

Based on the challenges and knowledge needs identified in the government commission, the results of Formas' stakeholder workshop, the survey of research funding within sustainable spatial planning, and conclusions from current reports, Formas has identified five **perspectives** and six central **themes** for the research programme. These perspectives and themes address **challenges and knowledge needs** for sustainable spatial planning and thus act as guidance for future programme activities.

The programme's perspectives and themes together lay the foundation for research that contributes to a knowledge-based, integrated sustainable spatial planning. From a spatial perspective, these themes and perspectives affect both local, regional, national and global contexts. And from a time perspective, historical, contemporary and future considerations are important.

Perspectives

- Governance, Policy and Economics
- Organisation, Collaboration and Leadership
- Accessibility and Gender Equality
- Democracy and Participation
- Digitalisation and Artificial Intelligence

Themes

- Sustainable Residential and Public Environments
- Sustainable Transport Systems for Everyone
- Human Health and Well-Being
- Public Safety
- Sustainable Consumption and Production
- Sustainable Land and Water Use

Next, these perspectives and themes will be described separately. But we wish to stress that each individual theme is closely linked to the other themes and contributes, together with the different perspectives, to achieving complete solutions for sustainable spatial planning (see Figure 2).

This means that, for example, the theme Sustainable Residential and Public Environments can also relate to other themes, namely Public Safety, Human Health and Well-Being, Sustainable Transport, Sustainable Land and Water Use, and Sustainable Consumption and Production.

Knowledge needs within and between the different themes of the programme must be highlighted from the perspectives that are fundamental aspects of urban planning and management. In practice this means that, for example, Governance, Policy and Economics is an important perspective for all themes and for links between the themes. The five perspectives lay the groundwork for knowledge-building within and between these themes and thus contribute to integrated, sustainable spatial planning.

The agenda's themes and perspectives should therefore not be considered separate silos; instead, their touchpoints will form part of the research programme's upcoming activities. Knowledge needs are often interlinked and involve several themes and perspectives.

The themes and perspectives in question also relate to the different target areas of the programme in order to clarify how future research investments and activities can be developed and monitored in relation to the global sustainability goals, the UN's New Urban Agenda and the national objectives of the commission. The relationship between the global goals and the commitments in the UN's urban agenda is based on a survey conducted by Global Challenge 2016.

The following sections also describe the knowledge needs that have been identified for each theme and perspective and that might need to be addressed by the research programme for sustainable spatial planning. The knowledge needs described are by no means exhaustive. Researchers and various societal stakeholders continuously identify knowledge needs and issues to help solve societal challenges.

To emphasise the importance of applying the perspectives to all themes, the next section begins with a review of the perspectives, followed by a description of the themes in more detail.

Perspectives

Governance

Organisation

Accessibility

Democracy

Digitalisation

Figure 2. The agenda's themes and perspectives lay the groundwork for research that contributes to integrated and sustainable spatial planning. From a spatial perspective, these themes and perspectives affect both local, regional, national and global contexts. And from a time perspective, historical, contemporary and future considerations are important.

4.1 Perspectives for integrated and sustainable spatial planning

The identified perspectives together constitute fundamental aspects of urban planning and management, and build on the following arguments.

Spatial planning is currently done at several different levels of society, nationally, regionally and locally. Traditional forms of planning at the local level must be developed to allow for improved regional planning. This requires enhanced cooperation and coordination between regional and local levels in a way that involves civil society, the private sector, the public sector and academia (Royal Swedish Academy of Engineering Sciences, 2017c). Many solutions are available locally and can be implemented at a local level (Global Challenge, 2017). For example, municipalities need to be given the opportunity to change the pace of transitioning to sustainable spatial planning. National and regional planning must also be developed to address issues of regional importance. Swedish cities and communities are affected by global challenges and also need to align with global goals, as well as international agreements and directives, during planning. Sweden must leverage global knowledge and expertise to help solve our global challenges.

Strengthening urban planning at all levels – especially regional and local – and creating the conditions for sustainable and integrated spatial planning requires inter-sectoral collaboration and multi-level governance (national, regional and local levels). It also requires established forms of dialogue with citizens and businesses (Agenda 2030).

Agenda 2030: Goals 11 and 16

Target 11.2

By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all. Improve road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.

Target 3.6

By 2020, halve the number of global deaths and injuries from road traffic accidents.

UN New Urban Agenda

- 29. Collaboration with public entities and non-governmental organisations.
- 32. Integrated housing policies.
- 39. Cities and human settlements for all to participate in urban life.
- 40. Embrace diversity to strengthen social cohesion.
- 41. Broaden inclusive platforms.
- 46: Social habitat production.
- 49. Integrate urban and rural functions into spatial frameworks.
- 53. Public spaces as drivers of development.
- 67. Well-connected and well-distributed networks.
- 87. National, sub-national and local government coordination.
- 90. Strengthen capacity of sub-national and local government.
- 94. Integrated planning balancing short-term and long-term.
- 95. Polycentric territorial policies and plans.
- 96. Urban rural synergies and interaction.
- 99. Social mix.
- 108. Housing policies social links.
- 109. Integrated vulnerable areas.
- 113. Improve and integrate road safety into planning and design.

National objectives for construction, urban planning, architecture, transport and infrastructure, public safety, cultural heritage, gender equality, accessibility and social objectives.

The different perspectives described in the following sections relate to all planning levels in society, and take as their starting point historical experiences, contemporary conditions and challenges, and future impacts and opportunities.

Using the different perspectives as a basis for making decisions about new programme activities, a foundation can be created for achieving the targets from global goals 11 and 16 and several of the commitments from the UN's New Urban Agenda, as well as the targets for the national objectives around construction, urban planning, architecture, transport and infrastructure, public safety, cultural heritage, gender equality, accessibility and social objectives.

4.1.1 Perspective: Governance, Policy and Economics

Many issues within the framework of spatial planning are closely interrelated, yet are addressed in different processes according to their respective laws. Governance takes place in many different ways – through regulations, laws and policies, through resource and funding allocation and financial incentives, and even through norms and values. Procurement processes and requirements definitions are important, powerful instruments of this governance. In addition, rapid technological developments require changes in legislation.

Today, both traditional media and social media have major impacts. Many issues related to safety, security and crime are widely disseminated through social media, which can thus affect our choices, lifestyles, identities and consumer preferences.

The perspective Governance, Policy and Economics points to the need for more knowledge for all themes concerning:

- Different forms of governance and their importance to urban planning at all levels.
- Power and political governance, with a special focus on regional and local governance and their interplay.
- Goal management in urban planning and how conflicts of objectives and interests are currently managed and how they could be managed differently.
- Methods for evaluating and communicating sustainable governance and follow-up.
- How co-creation and experimental activities can be used to test how to change governance practices.
- Models for investments, financial incentives and resource allocation, and how the societal benefits of these investments can be valued in the long term.
- How procurement processes and requirements definitions are used, and how procurement policies can be developed in relation to legislation.

4.1.2 Perspective: Organisation, Collaboration and Leadership

The organisation of urban planning is complex and consists of many different stakeholders – from Parliament, county administrative boards, municipalities and property owners, to developers and contractors, consultants and businesses. It also includes local residents as well as various special-interest and voluntary groups. Many issues in the context of urban planning are closely related, with direct or indirect consequences in related areas. Despite this, planning and management take place in many different separate processes and at different levels. There is therefore a great need to coordinate processes and legislation within urban planning to create the foundation for a holistic perspective.

The perspective Organisation, Collaboration and Leadership highlights the need for more knowledge for all themes concerning:

- The planning process at regional and municipal levels, regional structures and regional planning, and the interaction between urban and rural areas.
- Existing collaborative processes and roles and the interaction between different stakeholders (public sector, private sector and civil society) within planning and management and how these can be developed.
- Strategic planning at regional and local levels.
- How different regulations (policies and governance) affect the potential for cooperation.
- The effects of leadership, and the relationship between political leadership and the role of officials.
- New organisational forms, management models, and collaboration and leadership abilities for innovation and system change.
- Altered and new professional practices in planning and management and the importance of different roles in a transitional process.
- Changes in work arrangements and co-creation methods.

4.1.3 Perspective: Accessibility and Gender Equality

Accessibility and gender perspectives must be integrated early on in urban planning and be included throughout all stages of the planning process to take into account people's different needs and circumstances. The gender perspective can be considered by asking questions like: Who are we building for and how do we do it? Do our decisions and plans have different consequences for women than for men, for girls versus boys? Who is doing the planning and who the building? In a citizen dialogue, these questions can involve who gets the chance to be involved, what type of meeting formats are used, what the gender distribution looks like in focus groups, and the choice of dialogue leader (Swedish National Housing Board, 2018a).

Accessibility is about access to the physical environment, transport and facilities as well as access to goods, products and services (Swedish Agency for

Participation, 2017). Applying an accessibility and gender perspective also increases the likelihood of achieving a holistic view of spatial planning and including social issues to a greater extent. This often requires interaction between a wide range of stakeholders.

Another important aspect of accessibility and gender equality is adopting a user perspective in urban planning – starting with the people who will use a feature, service or area in the public or the private space. The user perspective is also a key point of departure for sustainable spatial planning in general. For example, should the people living in a certain area participate in the development of residential areas if they possess valuable knowledge of those areas? It is also important to understand which people the area is being built for and what their needs are. This knowledge and experience contributes to a better basis for decision-making (Swedish National Housing Board, 2018b).

The perspective Accessibility and Gender Equality highlights the need for more knowledge for all themes concerning:

- How to integrate equality and accessibility perspectives into urban planning and management with a focus on people at different stages of life and with different needs.
- Design, layout and modifications of an existing environment from the perspective of equality and accessibility.

4.1.4 Perspective: Democracy and Participation

Well-functioning urban planning presupposes democracy and participation. In the field of spatial planning, different interests are weighed against each other and against individual interests in an open and democratic process, for example through consultation. Through citizen proposals, civic dialogues and advocacy activities, civil society and various social groups can be given the opportunity to influence how our cities are designed and run. These processes are crucial for raising awareness of what is needed to influence social inequality and to promote cohesive, equitable and diverse cities. Research can contribute to this end by involving stakeholders like citizens, organisations, municipalities, companies and others in order to promote innovation, societal benefit and the impact of research.

The perspective Democracy and Participation highlights the need for more knowledge for all themes concerning:

- How to foster participatory, inclusive planning and management that considers people's social and socio-economic conditions, how to promote rights and how to clarify obligations.
- Forms of dialogue in the early stages of the planning process, with a stronger focus on citizen dialogue.
- How to develop and enhance collaboration between the public sector, non-profit organisations and the private sector, as well as the role of civil society in change and transition processes.
- How to involve more people and citizens in research.

- How to use public spaces, nature, cultural sites and museums to increase participation, social inclusion and cohesion.

4.1.5 Perspective: Digitalisation and Artificial Intelligence

Digitalisation can enable planning, construction and management to become more efficient and to leverage the opportunities of open data (Royal Swedish Academy of Engineering Sciences, 2017c). It offers a tool for collaborative, integrated and sustainable urban planning and management. Digitalisation also allows for a more expressive and adaptable architecture that enables citizen participation and considers the environment and climate change. Technology for smart cities also shows great promise for development (Vinnova, 2018b). In this area, coordinated services around transport and logistics flows, energy, water, sewage and sanitation can streamline management, operation and maintenance. But digitalisation can also help to cultivate democracy and participation through information and services that enable sharing and simplify people's everyday lives. Artificial intelligence (AI) and machine learning also show great potential for sustainable spatial planning. They are already being used in the transport sector and are part of many applications and technical solutions (Vinnova, 2018b).

The perspective Digitalisation and Artificial Intelligence highlights the need for more knowledge for all themes concerning:

- How data can be collected, quality assured, made available and used for integrated spatial planning.
- How uniform data series can be developed so that they can be reproduced at local, regional and national levels.
- How national indicators and key ratios can be developed for sustainable spatial planning and how the government agencies' follow-up methods can be developed.
- How AI can be used to contribute to integrated and sustainable spatial planning.
- How methods and tools can be developed to identify and eliminate vulnerabilities and risks related to data protection and cybersecurity, and how these can be integrated into urban planning and management.
- How legislation and the legal system can be developed to support digitalisation that contributes to sustainable spatial planning.

4.2 Themes for integrated and sustainable spatial planning

As mentioned earlier, Formas has identified six central themes which, together with the perspectives, address challenges and knowledge needs for sustainable spatial planning and thus guide future programme activities.

The following sections describe these themes, as well as the national and international objectives that the research programme activities can contribute to.

4.2.1 Theme: Sustainable Residential and Public Environments

Sustainable residential and public environments involve access for everyone to adequate, safe and affordable housing and basic services, as well as access to safe, inclusive and accessible green spaces and public spaces. Public environments include all kinds of environments where people spend time and work, such as workplaces, schools, hospitals, travel hubs and shopping centres. Sustainable residential and public environments also involve inclusive, participatory, integrated and sustainable planning and management (Agenda 2030).

More knowledge and solutions are needed for:

- How architecture, design, cultural heritage and cultural sites (historical buildings, practices, traditions and landscapes) affect individuals and groups, and the importance of these factors for social cohesion and inclusion.
- How nature and cultural sites can be used as resources through design, staging and accessibility.
- How cultural sites can be valued and integrated in planning and management.
- How accessibility to services, cultural sites, nature and green spaces can be created for people with different needs and in different life stages, and how to integrate these ideas into planning, management and use.
- Demographic changes, such as an ageing population.
- How housing segregation can be counteracted in urban and rural areas.
- How inclusive public spaces and venues can influence citizen participation, gender equality, safety and democracy.
- How different features can be combined and used in the same space or the same property.
- Sharing in various forms, such as services related to housing and public environments.

Investments and activities that develop new knowledge within the theme Sustainable Residential and Public Environments create opportunities to achieve some of the targets from global goals 11 and 15, some of the key goals from the UN's New Urban Agenda, targets from the national objectives for construction, urban planning, architecture and more, and the Good Built Environment environmental objective.

Agenda 2030: Goals 11 and 15

Target 11.1

By 2030, ensure access for all to adequate, safe and affordable housing and basic services (and upgrade slums).

Target 11.3

By 2030, enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.

Target 11.7

By 2030, provide universal access to safe, inclusive and accessible green and public spaces, in particular for women and children, older persons and persons with disabilities.

Target 15.9

By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

UN New Urban Agenda

- 31. Right to adequate housing.
- 32. Integrated housing policies.
- 33. Affordable and accessible housing.
- 34: Access to infrastructure.
- 37. Public spaces to ensure human development.
- 38. Leverage natural and cultural heritage in cities.
- 39. Cities and human settlements for all to participate in urban life.
- 46: Social habitat production.
- 53. Public spaces as drivers of development.
- 56. Access to income-earning opportunities.
- 99. Social mix.
- 100. Well-designed streets.
- 112. No mass housing, people's needs at the center.

National objectives for construction and urban planning, architecture, design, cultural heritage, gender equality and accessibility, social goals.

Environmental objectives Good built environment.

4.2.2 Theme: Sustainable Transport Systems for Everyone

Sustainable transport systems involve fossil-free, safe and accessible transport and travel that are affordable and accessible to people with different needs and abilities. They also include sustainable logistics and sustainable freight transport. Sustainable transport systems need to be planned in relation to other societal functions, such as housing and buildings, workplaces and services. Integrated urban planning can thus help to promote a more sustainable approach to passenger and freight transport and to facilitate choosing sustainable transport and travel behaviours (Swedish Energy Agency, 2017).

More knowledge and solutions are needed for:

- How increased coordination between transport and urban planning locally, nationally and regionally can contribute to well-functioning labour market regions.
- The relationship between transport planning and other societal functions, such as housing and buildings, workplaces and services.
- How to transform car-oriented land use into more sustainable transport services based on people's different needs and abilities.
- How to expand public transport and ensure safe pedestrian and bicycle traffic.
- How smart mobility can be integrated or complement different modes of transport.
- How to create accessibility without the need for travel or transport in different parts of the country and for people with different needs and abilities.
- How to satisfy the requirements of supply systems taking into account different regional conditions as well as sustainable freight transport and logistics.

- People's travel habits, as well as values, choices and beliefs concerning safety and health during travel.

Investments and activities that develop new knowledge within the theme Sustainable Transport Systems create opportunities to achieve some of the targets from global goals 11 and 3, some of the key goals from the UN's New Urban Agenda, and targets from the national objectives for transport and infrastructure, urban planning, architecture, gender equality and accessibility.

Agenda 2030: Goals 11 and 3	UN New Urban Agenda
<p>Target 11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all. Improve road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.</p> <p>Target 3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents.</p>	<p>49. Integrate urban and rural functions into spatial frameworks.</p> <p>54. Promote renewable, affordable and efficient transport infrastructure.</p> <p>113. Improve and integrate road safety.</p> <p>114. Access for all to urban mobility.</p>
<p>National objectives for transport and infrastructure, urban planning, architecture, gender equality and accessibility.</p>	

4.2.3 Theme: Human Health and Well-Being

Human health and well-being are affected by both the outdoor and the indoor environment. Good health and well-being require the environmentally friendly management of chemicals and all types of waste products throughout their lifecycle, as well as the reduction of emissions and the presence of harmful chemicals and pollutants in air, water and soil. Human health and well-being are also affected by the design and construction of habitats, exposure to daylight, and access to natural and recreational areas, as well as the conditions for an active outdoor life. Participation and influence in society also affect people's health and well-being.

More knowledge and solutions are needed for:

- How to integrate a health perspective into urban planning and management.
- Designing, building and adapting the physical environment, and its effects on human health and well-being.
- How physical factors in the environment, such as noise levels and exposure to daylight, affect people's health and well-being and how this knowledge can be integrated into planning and management.
- The importance of green spaces for physical and mental health, such as access to natural and cultural environments, outdoor recreation and play environments.
- How to assess the risks of pollution in the air, soil and water, and the use of chemicals, on both the environment and human health.
- How to safely phase out, handle or destroy substances in contaminated materials and waste.
- How to achieve healthy indoor environments.

Investments and activities that develop new knowledge within the theme Human Health and Well-Being create opportunities to achieve some of the targets from global goals 3, 11 and 12, targets from the national objectives for transport and infrastructure, construction and urban planning, and the environmental objectives Clean Air and A Non-Toxic Environment.

Agenda 2030: Goals 3, 11 and 12

UN New Urban Agenda

Target 3.9

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

Target 11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

Target 12.4

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their lifecycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

National objectives for transport and infrastructure, construction, urban planning, public health policy objectives.

Environmental objectives: Clean Air, A Non-Toxic Environment, Good Built Environment.

4.2.4 **Theme: Public Safety**

To provide safety and security for people and communities, critical societal functions that create continuity and resilience in society must be secured. This means creating the conditions for the protection of vital activities, critical infrastructure, adaptation to climate change and the ability to cope with natural disasters (Swedish Civil Contingencies Agency, 2013). People and communities also need access to safe, secure, inclusive and accessible public spaces and residential environments as well as access to nature and green spaces.

More knowledge and solutions are needed for:

- How to integrate a safety and security perspective into urban planning and management.
- How to address safety and security from the perspective of fairness and social awareness.
- How interaction between different actors can be developed and adapted to local conditions in order to achieve greater safety and security in vulnerable areas.
- How to adapt society as a result of climate-driven events and processes and of natural disasters.
- Climate services and ecosystem services for existing buildings and infrastructure.
- How to integrate natural and cultural heritage into planning to create cities and communities that are adaptable to change.

- How the built environment affects fire safety and preventive fire safety measures.
- How to achieve security and robustness in critical societal functions, and to understand vulnerabilities and complex dependencies between key societal functions, and how to integrate solutions into development, management and planning.
- How to design critical infrastructure and facilities to achieve the desirable robustness and security, and how to integrate such measures into development, management and planning.
- How to develop risk and vulnerability analyses and integrate them into urban planning.

Investments and activities that develop new knowledge within the theme Safety and Security for People and Communities create opportunities to achieve some of the targets from global goals 11 and 16, some of the key goals from the UN's New Urban Agenda, and targets from the national objectives for public safety, construction and urban planning.

Agenda 2030: Goals 11 and 16

UN New Urban Agenda

Target 11.4

Strengthen efforts to protect and safeguard the world's cultural and natural heritage

78. Proactive risk-based, and all-of-society approaches.

109. Integrated vulnerable areas.

Target 11.5

By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.

Target 11.7

By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.

Target 16.1

Significantly reduce all forms of violence and related death rates everywhere.

National objectives for public safety, construction and urban planning.

4.25 Theme: Sustainable Consumption and Production

Sustainable consumption and production means efficiently using resources, considering the necessary ecosystem services and reducing the impact of hazardous chemicals. This means laying the foundation for a circular economy in cities and their peripheries, between urban and rural areas, and in and between regions. By integrating systems and services in order to use, reuse and recycle resources in planning and management, the groundwork is laid for promoting a circular economy in cities and society at large (Royal Swedish Academy of Engineering Sciences, 2018).

More knowledge and solutions are needed for:

- Resource management, closed-loop solutions and the circular city.
- How to integrate a long-term lifecycle perspective into planning, construction, operation and maintenance with respect to cultural environments, construction and building materials, waste management, recycling and reuse.
- How alternative economic and social models (such as sharing economies, or models that better manage long-term impacts) as well as policy and governance can affect consumption.
- The spatial significance of where production and consumption take place and their regional conditions.
- How to integrate environmental solutions and ecosystem services into planning and management.
- People's relationship to natural and cultural heritage resources and to ecosystem services.

Investments and activities that develop new knowledge within the theme Sustainable Consumption and Production create opportunities to achieve some of the targets from global goals 11, 12 and 15, some of the key goals from the UN's New Urban Agenda, targets from the national objectives for construction and urban planning, and the environmental objectives A Non-Toxic Environment, Good-Quality Groundwater, and Reduced Climate Impact.

Agenda 2030: Goals 11, 12 and 15

Target 11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

Target 12.1

Implement the 10-year framework of programmes on sustainable consumption and production.

Target 12.5

By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

Target 12.7

Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

Target 12.8

By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

Target 15.9

By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

UN New Urban Agenda

71. Urban-rural linkages for a circular economy.

74. Reduce waste generation.

76. Resource efficiency of raw and construction materials.

119. Investment in sustainable systems for water, sanitation and hygiene, sewage, solid waste management.

63. Unprecedented threats from unsustainable consumption and production pattern.

65. Improve urban eco-system and environmental services.

66. Smart city approaches for environmentally friendly choices.

122. Support producer responsibility schemes.

National objectives for construction and urban planning.

Environmental objectives: A Non-Toxic Environment, Good-Quality Groundwater, Reduced Climate Impact.



4.2.6 Theme: Sustainable Land and Water Use

For sustainable land and water use, society needs to plan and maintain buildings and infrastructure to make them adaptable to changing physical conditions, to meet people's different needs and to promote biodiversity. Access to land is fundamental to all urban planning and often involves conflicts of interest and objectives. Urban climate adaptation must be coordinated with the planning of new and existing infrastructure and settlements (Royal Swedish Academy of Engineering Sciences, 2017c). This means that land use must be integrated with and consider the effects of climate change in the planning and building processes.

Sustainable water use involves integrated management of water that considers the effects of climate change, uses measures to reduce stormwater runoff, and reduces the risk of flooding and pollutant emissions. Sustainable water use also needs to consider the impact of drinking water supplies from other sectors, such as wastewater management, agriculture and road transport, as well as how groundwater is affected by pollutants and by excessive extraction.

More knowledge and solutions are needed for:

- The impacts of climate change on soil conditions and on existing and new geotechnical structures and infrastructure.
- Climate adaptation measures related to land.
- Integrating water and climate-regulating ecosystem services in urban environments.
- How to integrate a long-term lifecycle perspective into planning, construction, operation and maintenance with respect to drinking water supplies, water and sewage issues, and stormwater management.
- People's approach to drinking water and water use, both historically and in terms of future opportunities.
- How to consider stormwater and sewage systems early in the planning process and implement them in the building process to address societal and climate change.

Investments and activities that develop new knowledge within the theme Sustainable Land and Water Use create opportunities to achieve some of the targets from global goals 6, 12 and 15, some of the key goals from the UN's New Urban Agenda, targets from the national objectives for construction and urban planning, and the environmental objectives A Non-Toxic Environment, Good-Quality Groundwater, and Reduced Climate Impact.

Agenda 2030: Goals 6, 12 and 15

Target 6.5

By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

Target 12.7

Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

Target 15.9

By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

UN New Urban Agenda

65. Improve urban ecosystem and environmental services.

66. Smart city approaches for environmentally friendly choices.

71. Urban-rural linkages for a circular economy.

74. Reduce waste generation.

73. Rehabilitating water resources.

119. Investment in sustainable systems for water, sanitation and hygiene, sewage, solid waste management.

National objectives for construction and urban planning.

Environmental objectives: A Non-Toxic Environment, Good-Quality Groundwater, Reduced Climate Impact.

5. Implementation of the agenda

The agenda has identified central themes and key perspectives for future activities in the research programme. These themes and perspectives address challenges and knowledge needs for sustainable spatial planning.

This chapter describes how the agenda's themes, perspectives and objectives guide the planning of activities within the framework of the programme. It also describes how the agenda's priorities are driven forward by implementation plans, and how programme logic will be used as a tool when planning the activities in order to achieve the objectives and contribute to the desired programme outcomes. The chapter concludes with an account of the follow-up and evaluation work that forms an important basis for developing the programme.

The agenda is a living document and will be regularly updated during the programme period.

5.1 Programme logic and implementation plan: How to continue the efforts

Chapter 2 describes the global and national objectives on which the programme is based. Chapter 1 defines the objectives specific to the national research programme for sustainable spatial planning.

To achieve the objectives, so-called programme logic will be used. Programme logic is a description of how the programme intends to achieve its goals and is based on an analysis of the expected outcomes and effects to be pursued to achieve the objectives. The programme is implemented using three-year implementation plans that describe the activities to be carried out during the programme. This can include new investments in research funding, or activities for coordinating, communicating and utilising ongoing research. The planned activities will help to meet both the specific needs of the area and the overall objectives of the national research programmes.

When designing the implementation plan, the programme committee is expected to shed light on how different funders' activities are planned in time, in scope and in relation to each other to achieve the greatest possible effect. The programme committee is also expected to take into account synergies that can be achieved in relation to other national and international activities. The programme's first implementation plan will be created in 2018, after the agenda is determined, and it will apply for the period 2018-2020.

5.2 Follow-up and evaluation guide future choices

Follow-up and evaluation are essential support tools in the programme committee’s work on implementing and, if needed, revising the strategic research agenda.

In accordance with the commission, Formas will follow up on the national research programme each year to monitor its progress. For follow-up purposes, Formas is developing several indicators that will be used to:

- Monitor the activities of the funders who interact within the programme.
- Monitor the projects and activities of the programme’s research practitioners and others who are being funded or otherwise take part in the programme’s implementation.

Because the programme is long term, Formas will also conduct several evaluations during the programme period. An initial evaluation of the programme is scheduled to take place after two years, and will focus on the programme’s organisation and logic. A second evaluation is scheduled for the halfway point, and will provide information on how well the programme is evolving in relation to its objectives. At the end of the programme, a final evaluation is planned that will focus on the programme’s impact on society’s ability to meet the challenges and impact on the research system. Formas’ evaluations will also inform the overall evaluation of investments in national research programmes that the government intends to initiate.



Figure 3. The research agenda outlines the overarching objectives and priorities of the programme over a ten-year period. The implementation plans set out the activities to be conducted over a three-year period and how they relate to the agenda and the programme logic.

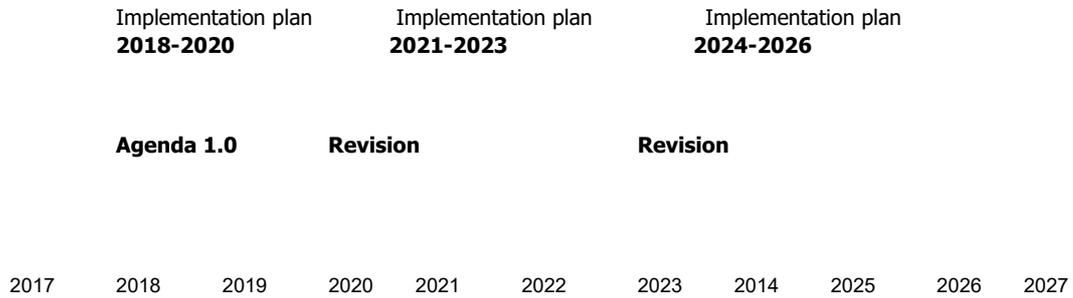


Figure 4. Overall timetable for follow-up, evaluation and revision of the research agenda.

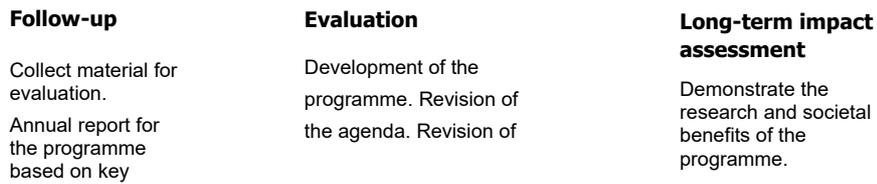


Figure 5. The relationship between follow-up, evaluation and impact assessment of the national research programme.

6. Appendices

Appendix 1 Government commission to establish national research programmes – general commission and extracts from decisions on sustainable spatial planning

1. Commission to establish national research programmes

1.1 The government's decision

The government has tasked the Swedish Research Council, Swedish Research Council for Health, Working Life and Welfare, and Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning with establishing ten-year national research programmes that can help to meet different societal challenges. For each national research programme, a programme committee should be formed that includes the relevant funders. The work of each programme also includes the design of a coordinated strategic research agenda, which will be developed for each programme jointly by the responsible funders.

The government agencies responsible for the national research programmes will conduct follow-ups of the programmes and present them in a uniform manner. The commissions are to be reported on annually by 1 March to the Government Offices (Ministry of Education and Research with a copy to the Ministry of the Environment and Energy, Ministry of Health and Social Affairs, Ministry of Enterprise and Innovation, and Ministry of Employment).

1.2 Background

In their joint report for the research policy bill, the government research funders have proposed to establish national research programmes (U2015/05147/F). In its research policy bill “Collaborating for knowledge – for society’s challenges and strengthened competitiveness” (Bill 2016/17:50), the government announced its intention to launch the national research programmes proposed by the research funders. National research programmes are expected to create synergies between stakeholders that complement each other in terms of knowledge, expertise and projects. The research programmes are also expected to create the conditions for interdisciplinary, cross-sectoral collaboration. They can also serve as a platform for ongoing research within a field. The national research programmes will also provide a natural link to international research programmes and strengthen Swedish participation in the European research programmes relevant to sustainable spatial planning.

The national research programmes, together with existing strategic research areas and strategic innovation areas as well as the newly created collaboration programmes, will be complementary components of a powerful research and innovation system for increased Swedish competitiveness and the management of major societal challenges.

1.3 More about the commission

To enable the foundation for long-term planning, the national research programmes will cover a ten-year period. Each programme should have a programme committee that, under the leadership of the responsible agencies, can assist the funders in the design, implementation and regular updating of the strategic research agenda. The programme committee should consist of the funders concerned. Funders other than government funders should also be able to sit on the programme committees. Advisory groups with a broad skillset can be associated with the committees to assess society's knowledge needs within each challenge and national research programme. The programmes are to be run according to a strategic research agenda developed for each programme by the responsible funder in consultation with the other relevant funders. The strategic research agenda should recognise funders' shared and existing initiatives and programmes, and can, where appropriate, include development and innovation. The programmes can initiate research to address identified, prioritised knowledge gaps. The programmes should be tailored to the conditions of the various research areas and be conducted in a flexible way. The funders base their work within the programmes on current supporting documentation and analyses within each agency's area of activity where appropriate. The national research programmes should encourage a greater focus on research in higher education, as well as gender equality and a greater impact of the research results on society in terms of development, knowledge-building, evidence-based policy and management. The programmes are expected to provide a natural link to international research programmes, for example through so-called joint programming initiatives (JPIs).

The programmes should be regularly evaluated and continuously monitored. The government therefore intends to initiate future evaluations while follow-ups should be conducted by the agencies in accordance with this mandate.

2. Extract from: Government decision 1:12, 2017-05-18, Ministry of the Environment and Energy, Commission to establish national research programmes on climate and on sustainable spatial planning

2.1 The government's decision

The government tasks the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) to establish national research programmes for climate and sustainable spatial planning, in accordance with the government decision of 18 May 2017 (ref. no. U2017/02404/F). The commission runs for ten years, through 2026. Formas shall also announce calls for special three-year grants to support research on social housing policy. Formas must annually report on the implementation of the national research programme commission to the Government Offices (Ministry of the Environment and Energy) when it issues its annual report.

2.2 Background

National research programme for sustainable spatial planning, 2017-2026

A sustainable society means, among other things, that citizens should have the right to clean air free of toxins, clean water and noise levels that are not harmful to health. Meeting our societal challenges requires research and development on topics such as the planning process, construction, mobile solutions, a safe and secure drinking water supply, sustainable waste management and chemical use, risk assessments for environment and health, lifecycle analyses, and policy instruments. Both in Sweden and globally, sustainable spatial planning also concerns people's living conditions and rights, habitats, social conditions and safety, and economic and social inclusion, as well as better public health opportunities including a more active outdoor life. The government wishes to strengthen the foundation for cities to be able to evolve into living, green, healthy and safe places where people engage and develop, and where innovations take place. Increased construction offers opportunities for sustainable urban development across all three dimensions — environmental, economic and social. More knowledge is needed about choices, attitudes and behaviour patterns among consumers and individual households. The user perspective represents an important point of departure. Research on collaboration, conflict of objectives and the use of policy instruments in the planning process is also needed, as is research on citizen participation in urban planning and the shifting roles between society and citizens. Key research areas in the planning and building processes also include requirements definitions, procurement practices and leveraging the opportunities of digitalisation. Many solutions are available locally, and the government intends to make it easier for municipalities to change the pace of the transition to sustainability.

People's access to housing, work, services, nature, cultural and play environments, and other leisure activities is central to a good quality of life, growth and development. Transport brings accessibility to citizens as well as businesses, but can adversely affect health, the environment and the climate. Accessibility without mobility might offer a solution, but the transport system still needs to evolve into a greener, smarter and safer system. This requires an overarching approach to different modes of transport. A sustainable transport system is built using integrated solutions for public transport and pedestrian and bicycle traffic, and better use of existing transport systems. New knowledge will be needed to understand how to develop policy instruments, technologies and innovations in the transport sector, including lifecycle analyses. Research is also needed about people's choices and attitudes concerning mobility and transport.

A sustainable society is grounded in safety and security, one that helps to protect society and the individual against different internal and external threats. Safety and security issues must become a natural part of the building process and spatial planning. Achieving this requires national research capabilities for crime prevention, security and civil contingencies, science and technology as well as capacity to address the challenges of climate change, including drought and flooding, forest fires and extreme weather events.

2.3 More about the commission

National research programme for sustainable spatial planning, 2017-2026

Formas shall establish and launch a ten-year national research programme for sustainable spatial planning. This programme should be based on the various societal challenges facing cities. Examples are the transition to a fossil-free welfare society and adaptation to a changing climate, the sustainability goals of Agenda 2030, the UN's New Urban Agenda, and the relevant environmental objectives. Also of interest are the national objectives for cultural environments and the goals for architecture and design, as well as the government's objectives for housing, construction, transport policy, infrastructure, urban planning and public safety, crime prevention work, social objectives and gender equality. The programme shall also promote universal design. There is fierce competition for land in our cities, yet we need to find out how multiple functions can coexist in the same spaces. This requires effective solutions for land access and compensation. We also need more knowledge about how to manage such complex contexts and processes.

The national programme should have a broad, interdisciplinary character, a strong connection to the users of research results and an international perspective. Furthermore, the programme should relate to the government's collaboration programme. The research should include components of collaboration, communication and promotion of the usefulness of research results. The programme can span the entire spectrum – from research, innovation and technological development to demonstration, market introduction and dissemination.

Appendix 2 Global and national goals to be achieved by the programme

Agenda 2030 — Global Sustainable Development Goals

The national research programme for sustainable spatial planning is linked to the goals and targets of Agenda 2030. Read more about these goals and targets at sustainabledevelopment.un.org.

Sweden's environmental objectives

See www.sverigesmiljomal.se/environmental-objectives.

The generational goal

The overall goal of environmental policy is to hand over to the next generation a society in which the major environmental problems are solved, without causing increased environmental and health problems outside Sweden's borders. The generational goal is a target for environmental policy. The goal provides guidance on the values to be protected and the transition needed to achieve the desired environmental quality. The generational goal aims to guide environmental action at all levels of society.

Good built environment

Cities, urban areas and the wider built environment should provide a good, healthy living environment and contribute to positive regional and global environments. Natural and cultural values must be taken into account and developed. Buildings and facilities should be sited and designed in an environmentally sound manner to achieve long-term environmental stewardship of land, water and other resources.

Clean air

The air must be so clean in order to avoid damage to human health, animals, plants and cultural values. Breathing in polluted air negatively affects health. For many people, pollutants in the air can also shorten life expectancy. The most harmful air pollutants to health are inhalable particles, ground-level ozone and certain hydrocarbons.

Reduced climate impact

In accordance with the UN Framework Convention on Climate Change, the concentration of greenhouse gases in the atmosphere should be stabilised at a level in which human impact does not endanger the climate system. This objective must be achieved in a way that preserves biodiversity, ensures food production and does not jeopardise other sustainable development objectives.

Good-quality groundwater

Groundwater must provide a safe, sustainable supply of drinking water and contribute to a good living environment for plants and animals in lakes and watercourses.

A non-toxic environment

The presence of man-made or extracted substances in the environment should not endanger human health or biodiversity. Concentrations of non-naturally occurring substances should be close to zero, and their impact on human health and ecosystems negligible. Concentrations of naturally occurring substances should be close to background levels.

Other national objectives relevant to the programme

1. Objectives for urban planning, housing market, construction and surveying operations

The housing boom offers great potential for transitioning to a climate-smart, attractive society where people play a central role. The overarching goal of urban planning, the housing market, construction and surveying operations is to provide all people throughout the country a good living environment from a social standpoint. This involves promoting the long-term environmental stewardship of natural resources and energy and facilitating housing and economic development. The government's target is to build a minimum of 250,000 new homes by the year 2020.

Targets for urban planning are:

- A clear role for spatial planning in the sustainable development of cities, urban areas and rural areas.
- A regulatory framework and other policy instruments that best meet efficiency requirements while ensuring legal certainty and responsible citizenship.
- Good conditions for the construction of housing and premises, the establishment of companies and other buildings while ensuring a good living environment.

Targets for the housing market are:

- Long-term, well-functioning housing markets where a range of housing options can meet consumer demand and needs.

Targets for construction are:

- Long-term, sustainable construction works.
- Effective regulations and other policy instruments that, from a lifecycle perspective, strive to achieve efficient resource and energy use as well as a good indoor environment through construction and management.
- Healthy competition in the construction and real estate sector.

Targets for surveying operations are:

- Efficient and secure cadastral procedures and fit-for-purpose property divisions.

- The information provided should be clear, nationwide, long-term, stable and secure. More basic information should be communicated and be of use to more people and in more areas of application.
- Effective and legally secure land registration operations that contribute to a well-functioning property market.

2. Objectives for architecture and design

The government has presented a new architecture and design policy for sustainably designed living environments. Architecture and design are to contribute to a sustainable, equal and less segregated society with carefully designed living environments, where all people are empowered to influence the development of their shared environment.

3. Objectives for cultural environments

State-funded efforts on the cultural environment will promote:

- A sustainable society with diverse cultural environments that are preserved, used and developed.
- People's participation in cultural environment efforts and the chance to understand and take responsibility for the cultural environment.
- An inclusive society with the cultural environment as a common source of knowledge, education and experiences.
- A holistic approach to landscape management that takes account of the cultural environment in the development of society.

4. Objectives for democracy and human rights

The democracy policy aims to create a living democracy that is sustainable, invites participation and offers equal opportunities for influence. The human rights policy aims to ensure full respect for Sweden's international commitments on human rights. Other parliamentary-bound objectives linked to this area are: national minorities, anti-discrimination and racism policies, and Sami policy.

5. Objectives for national minorities

National minorities policy aims to provide protection for national minorities and strengthen their potential for influence, as well as to support our historical minority languages to keep them alive.

6. Objectives for policy against discrimination and racism

The government's anti-discrimination policy aims to achieve a society free from discrimination.

7. Objectives for Sami policy

Sami policy aims to promote a living Sami culture built on ecologically sustainable reindeer husbandry and other Sami industries.

8. Objectives for gender equality policy

Gender equality policy aims to enable both women and men to hold the same power to shape society and their own lives. Towards this end, the government works according to six targets:

1. An even distribution of power and influence. Women and men should have the same rights and opportunities to be active citizens and to shape the conditions for decision-making.
2. Economic equality. Women and men should have the same opportunities and conditions in terms of paid work that provide life-long financial independence.
3. Equal education. Women and men, and girls and boys, should have the same opportunities and conditions in terms of education, what they choose to study and personal development.
4. Even distribution of unpaid work and care in the home. Women and men should take the same responsibility for work in the home and have opportunities to give and receive care on equal terms.
5. Equal health. Women and men, and girls and boys, should have the same conditions for good health and be offered care and health care on equal terms.
6. Men's violence against women should cease. Women and men, and girls and boys, should have the same rights to bodily integrity.

9. Objectives for criminal policy

Criminal policy aims to reduce crime and increase people's sense of security.

Creating a secure society requires an active and inclusive welfare policy as well as strategic, purposeful crime prevention and law enforcement efforts. Women's perceived insecurity is far greater than men's. There are also differences in the vulnerability of men and women to crime and committing their own crimes. The ability to live a safe life free of crime should not depend on what area or part of the country you live in or who you are.

10. Objectives for public safety

Sweden's public safety policy aims to protect the lives and health of the population and the functioning of society, as well as the ability to uphold fundamental values like democracy, the rule of law, and human rights and freedoms. A precondition for achieving these objectives is to ensure that our country's political independence is safeguarded and that our territorial integrity can be maintained.

Appendix 2 Workshop participants with societal stakeholders, 3 October 2017

ArkDes
County administrative boards in collaboration with RUS
Crime Prevention Council Bra
Geoforum Sweden
IQ Centre for Innovation and Quality in the Built Environment
Jernkontoret (Swedish steel producers' association)
K2, Sweden's national centre for research and education on public transport
SIDA
Sustainable Innovation
Sweden's Architects
Sweden's public housing company SABO
Swedish Agency for Economic and Regional Growth
Swedish Agency for Participation
Swedish Association of Local Authorities and Regions
Swedish Waste Management Association
Swedish Board of Agriculture
Swedish Chemicals Agency
Swedish Civil Contingencies Agency
Swedish Construction Industry Development Fund SBUF
Swedish Energy Agency
Swedish Environmental Protection Agency
Swedish Forest Industries Federation
Swedish Geotechnical Institute
Sweden Green Building Council
Swedish Land Registration Authority
Swedish National Heritage Board
Swedish National Housing Board
Swedish Technology & Design Companies
Swedish Tenant Association
Swedish Tourist Association
Swedish Trade Council
Swedish Transport Administration
Swedish Transport Agency
Swedish Water & Wastewater Association
VA Public & Science
Viable Cities
Vinnova

Appendix 4 Referral bodies – Draft agenda for the National Research Programme for Sustainable Spatial Planning

More information about the referral bodies is available at formas.se.

Universities and colleges

Blekinge Institute of Technology
Chalmers University of Technology
Ersta Sköndal Bräcke University College
Swedish Defence University
Swedish School of Sport and Health Sciences
University Of Gothenburg
Stockholm School of Economics
Dalarna University
University of Borås
University of Gävle
University of Halmstad
University of Skövde
Kristianstad University
University College West
Karlstad University
Karolinska Institutet
University of Arts, Crafts and Design
Royal Art Academy
Royal College of Music
KTH Royal Institute of Technology
Linköping University
Linnaeus University
Luleå University of Technology
Lund University
University of Malmö
Mid Sweden University

Mälardalen University
Red Cross University College of Nursing
Sophiahemmet Högskola
Jönköping University Foundation
Stockholm University of the Arts
Stockholm University
Swedish University of Agricultural Sciences
Södertörn University College
Umeå University
Uppsala University
Örebro University

Research institutes

Institute for Futures Studies
Swedish Defence Research Agency
IVL Swedish Environmental Research Institute
RISE Research Institutes of Sweden
SEI Stockholm Environment Institute
VTI National Road and Transport Research Institute

Funders not included in the programme committee

Swedish Trade Council's research fund, Knowledge Foundation
Swedish Riksbank's Jubilee Fund
Foundation for strategic research
STINT Foundation for International Cooperation in Research and Higher Education
The Wallenberg Foundations

Government agencies

ArkDes
National Housing Board
Crime Prevention Council Bra
ESF Structural Funds
Public Health Authority
Board of Agriculture
Chemicals Agency
Consumer Agency
Swedish Land Registration Authority
MFD Swedish Agency for
Participation
Civil Contingencies Agency
National Heritage Board
Sami Parliament
Forestry Agency
Geological Survey of Sweden
Swedish Geotechnical Institute
Agency for Economic and Regional
Growth
Transport Administration
Transport Analysis
Transport Agency

Strategic innovation areas and other research centres

F3, Centre for Excellence
InfraSweden 2030
K2
Lighthouse, Maritime Centre for
Excellence
MKC (Multicultural Centre)
Nordregio
SIP Drive Sweden

SIP Viable Cities
SIP BioInnovation
SIP Lightweight/LIGHTer
SIP Re:Source
Sustainable Innovation
SIP Smart Built Environment

Civil society organisations

Swedish Local Heritage Federation
Local Association of Tenants

Appendix 5 Vinnova's summary of funding within Sustainable and Smart Cities for 2012-2017

Vinnova's summary of funding within Sustainable and Smart Cities for 2012-2017 shows that the largest share of funding goes towards urban development and urban planning, followed by waste management, sanitation and recycling, and the construction sector. Healthy lifestyle and mental health receive the lowest share of the funds. However, it is important to point out that projects can be classified within several categories. This means that funding for urban development and urban planning, for example, can also go to one or more of the other categories, because each project and its funding can be categorised as belonging to several different categories. The bars thus shows the amount of funding that "reaches" each thematic category (Figure 6).

The funding applicants also themselves assess the research area their projects relate to, and this classification is commented on below for each area. Here too, applicants can classify a project into several research areas. Therefore, the proportion of classifications in different research areas can provide an idea of the primary research topic of the projects as well as the breadth (or lack of breadth) in the projects that are part of the different areas of Vinnova's summary, but do not give any indication about whether the projects have an interdisciplinary nature.

Figure 6. Sub-areas in Vinnova's summary on Sustainable and Smart Cities. Total 2,856 projects for 2012-2017.

Vinnova's data is also more extensively classified by area. For the area of urban development and urban planning, the largest share of the funding goes towards residential development and living environment, followed by the category of green urban environment. Significantly smaller shares go towards healthy urban environment, climate adaptation, sustainable lifestyle and consumption, housing segregation and gentrification, children's perspectives (within spatial planning) and accessibility design. The area of urban development and spatial planning is dominated by technology (47%), followed by social sciences (27%).

For the area of waste management, remediation and recycling, the largest share of funds is spent on recovery, recycling and reuse, followed by waste management, while a smaller share goes towards toxins and pollution remediation, landfill, and reduction of food waste.

As far as the construction sector goes, the dominating category is construction works, while a smaller proportion goes towards real estate services and property management as well as building materials. Technology dominates (2/3), while 13 percent and 10 percent of projects are classified as science and social sciences.

For water and sewerage the largest share of funds goes towards the sewerage and sewage treatment category, followed by water supply, while smaller shares go towards the categories of stormwater management and drinking water. Technology dominates with just over two-thirds, followed by science (19%), and roughly equal proportions for medicine and health and for social sciences (about 9%).

In the area of urban mobility and transport infrastructure, the largest share of funds is for public transport services, followed by integrated mobility services and physical transport infrastructure. The smallest share goes towards the categories of pedestrian and bicycle infrastructure, parking spaces, sustainable travel and urban logistics. Just under two-thirds is classified as in the field of technology and 27 percent as social sciences.

Appendix 6 List of references

- BFUF R&D Fund of the Swedish Tourism & Hospitality Industry. (2014). *Besöksnäringens forsknings- och innovationsagenda 2014-2030 — En sammanfattning*.
- Fabre, E. A. (2016). *Nordic Urban Ways — Local leadership, governance & management for sustainable development*. Global utmaning.
- Formas. (2015). *En hållbar framtid genom stark forskning och utveckling — Formas underlag till Sveriges forskningspolitik 2017-2027*
- Formas. (2015). *Forskning till stöd för att uppnå miljö kvalitetsmålet Giftfri miljö — Analys och strategi*.
- Formas. (2015). *Meeting societal challenges — Status, impact and future research directions in Environment, Climate, Building & Planning and Agriculture research in Sweden*.
- Formas. (2011). *Hållbar stadsutveckling — Forskningsöversikt*.
- Forte. (2015). *Forskning möter samhälle — Fortes underlag till regeringens forskningspolitik inom hälsa, arbetsliv och välfärd 2017-2027*
- Global utmaning. (2017). *Local implementation of the SDGs and the New Urban Agenda*.
- Government Offices. (2016). *Progress report: Smart Cities — Progress report 1*. N2016:43. Ministry of Enterprise and Innovation.
- Government Offices. (2017). *Progress report: Circular and Bio-Based Economy — Progress report 2*. N2017:12. Ministry of Enterprise and Innovation.
- Government Offices. (2017). *Progress report: Next Generation Travel and Transport — Progress report 2*. N2017:13. Ministry of Enterprise and Innovation.
- Government Offices. (2017). *Progress report: Next Generation Travel and Transport — Progress report 3*. N2017:47. Ministry of Enterprise and Innovation.
- Government Offices. (2017). *Progress report: Smart Cities — Progress report 2*. N2017:15. Ministry of Enterprise and Innovation.
- Government Offices. (2017). *Progress report: Smart Cities — Progress report 3*. N2017:51. Ministry of Enterprise and Innovation.
- Government Offices (2015) *Finansiering av forskning i Sverige*. <https://www.regeringen.se/regeringens-politik/hogskola-och-forskning/finansiering-av-forskning-i-sverige/> (Retrieved 2018-07-27)

Government Offices. (2016b) *Government Bill 2016/17:50 Collaborating for knowledge – for society's challenges and strengthened competitiveness.*

Government Offices. (2016a). *Government strategic collaboration programme.* <http://www.regeringen.se/regeringens-politik/regeringens-strategiska-samver-kansprogram/> (Retrieved 2018-07-27)

Government Offices. (2016). *Progress report: Circular and Bio-Based Economy – Progress report 1.* N2016:40. Ministry of Enterprise and Innovation.

Growth Analysis. (2017). *International scanning of research programmes that focus on societal challenges.*

IQ Centre for Innovation and Quality in the Built Environment. (2015). *Inspel till den forskningspolitiska propositionen 2016.*

IQ Centre for Innovation and Quality in the Built Environment. (2017). *Är vi redo för en samhällsomvandling? En ickeskrift från IQ samhällsbyggnad.*

JPI Urban Europe. (2015). *Long-term strategic agenda – Transition towards sustainable and liveable urban future.*

JPI Water. (2016). *Strategic research and innovation agenda 2.0.*

OECD. (2016). *Science, Technology and Innovation Outlook 2016 – Megatrends affecting science, technology and innovation.*

Royal Swedish Academy of Engineering Sciences. 2018. *Planera för framtidens goda stad: Slutrapport från IVA-projektet Framtidens goda stad.*

Royal Swedish Academy of Engineering Sciences. (2017a). *Den urbana utvecklingens drivkrafter och konsekvenser, IVA-projektet Framtidens goda stad.*

Royal Swedish Academy of Engineering Sciences. (2017b). *Idédriven stadsplanering positiva utvecklingsspiraler, IVA-projektet Framtidens goda stad.*

Royal Swedish Academy of Engineering Sciences. (2017c). *Attraktiva livsmiljöer och flöden — åtta teman för planering av framtidens goda stad, IVA-projektet Framtidens goda stad.*

Royal Swedish Academy of Engineering Sciences. (2017d). *Stadsplaneringspraktikan: Så här styrs och planeras framtidens goda stad, IVA-projektet Framtidens goda stad.*

SOU 2015:109. (2015). *Bättre samarbete mellan stat och kommun — Vid planering för byggande.*

SOU 2015:85. (2015). *Bostäder att bo kvar i — Bygg för gemenskap i tillgänglighets-smarta boendemiljöer.*

- SOU 2017:22. (2017). *Från värdekedja till värdecykel*.
- SOU 2017:64. (2017). *Detaliplanekravet — Delbetänkande av Översiktsplanutredningen*.
- SOU 2015:88. (2015). *Gestaltad livsmiljö*.
- Sunden, T., Skarendahl, J., & Byman, K. (2015). *Strategisk innovationsagenda för minskad klimatpåverkan från byggnadsprocessen*. Sustainable Innovation AB.
- Swedish Agency for Participation. (2017). *Tillgänglighet i korthet*. <http://www.mfd.se/delaktighet/tillganglighet-i-korthet/> (Retrieved 2018-07-27)
- Swedish Association of Local Authorities and Regions. (2017). *Klimatet — Såklart! Programberedningen för klimat*.
- Swedish Civil Contingencies Agency. (2013). *Forskning för ett säkrare samhälle — Ny kunskap för framtidens utmaningar — MSB:s forskningsstrategi 2014-2018*.
- Swedish Energy Agency. (2017). *Strategisk plan för omställning av transportsektorn till fossilfrihet*. Report 2017:07.
- Swedish Environmental Protection Agency. (2016). *Strategi för Naturvårdsverkets arbete med hållbar stadsutveckling 2016-2018*.
- Swedish Geotechnical Institute. (2017). *Hållbart markbyggande — en handlingsplan i ett föränderligt klimat*. SGI Publication 35, Swedish Geotechnical Institute, Linköping.
- Swedish National Heritage Board. (2016). *Riksantikvarieämbetets FoU-program 2017-2021 — för kulturarv och kulturmiljö*.
- Swedish National Housing Board. (2018a). *Jämställdhet i samhällsplaneringen*. <https://www.boverket.se/sv/samhallsplanering/sa-planeras-sverige/nationella-mal-for-planering/jamstalld-het-i-samhallsplaneringen/> (Retrieved 2018-07-03).
- Swedish National Housing Board. (2018b). *Gestaltning och arkitektur avgörande för en god livsmiljö*. <http://www.boverket.se/sv/samhallsplanering/stadsutveckling/gestaltning-och-arkitek-tur/> (Retrieved 2018-07-27).
- Swedish National Heritage Board. (2016). *Urban News*.
- Swedish National Housing Board. (2015). *Byggnaders klimatpåverkan utifrån livscykelperspektiv — Forsknings- och kunskapsläget*. Report 2015:35.
- Swedish Transport Administration. (2004). *Planering för bioenergi — regional och kommunal planeringsstrategier*.

Swedish Transport Administration. (2017). *Trafikverkets inriktning för forskning och innovation 2018-2020 — Strategisk utveckling*.

Swedish Water & Wastewater Association. (2014). *Vattenvisionen — Forsknings- och Innovationsagenda för vattensektorn*.

United Nations. (2016). *The new urban agenda*. Habitat III United Nations Conference on Housing and Sustainable Urban Development, 17-20 October 2016, Quito.

Vinnova. (2018a). *Årsbok 2017: Svenskt deltagande i europeiska program för forskning och innovation*. Report 2018:07.

Vinnova. (2018b). *Artificiell intelligens i svenskt näringsliv och samhälle: Analys av utveckling och potential*. Report 2018:08.

World Wildlife Fund (WWF). (2016). *Living planet report 2016, Risk and resilience in a new era*. WWF International, Gland, Switzerland.