

Mistra Carbon Exit

Programme plan 2018

7 December 2017

IVL Swedish Environmental Research Institute, Chalmers, University of Gothenburg, Linköping University, Royal Institute of Technology (KTH), Resources for the Future, DIW and CEPS



1 SUMMARY

This document is the Programme Plan for Mistra Carbon Exit 2018, describing achieved deliverables in 2017 and planned deliverables for 2018; achieved communication activities in 2017 and planned communication activities in 2018; and budget for 2018. This Programme plan serves as an update of Part (B) of the Programme Plan 2017.

The programme formally started on April 1st 2017. The first eight months has mainly focused on starting the programme and setting the course for the years to come. The most significant results and activities for 2017 and planned activities for 2018 include:

1.1 Key scientific achievements in 2017

- A first policy seminar was held in May in Göteborg on the topic “Making emissions trading work - The North American experience”. Dallas Burtraw, a leading carbon markets expert in the USA and scholar in Mistra Carbon Exit gave a key note followed by a discussion with Swedish industry, authorities and other researchers.
- The Swedish EPA and researchers from Carbon Exit met in September in Stockholm to discuss how Sweden can pursue deep de-carbonization targets while under an EU emissions cap.
- The programme co-hosted a workshop in Berlin in October: *Policies to stimulate climate friendly innovation in the materials sector*, where researchers from the programme, industry and representatives from the EU Commission met to present and discuss options for incentivizing investments and innovation in climate friendly materials production in the EU.
- The first case study workshop was organized on October 24th. Clients, consultants, contractors and material suppliers from buildings and infrastructure were invited to explore how innovative production practices, material choices, business models and policies can contribute to significantly reduce the climate impact of building construction processes.

1.2 Planned scientific activities in 2018

- We expect all work packages and case studies to be operational in 2018
- In the beginning of 2018 workshops will be organized by all case studies (Buildings; Transportation infrastructure; and Local arenas)
- A detailed list of expected deliverables and activities is presented in Chapter 2

1.3 Key communication activities in 2017

- Kick-off meeting in June, where researches and industrial partners met to be informed of the program, get to know each other and start the work. In a number of breakout sessions we worked to identify and critical issues for deep de-carbonization in Sweden.
- In addition to the internal meetings, Mistra Carbon Exit has also during 2017 been involved in several external workshops, seminars and meetings. The purpose has been to engage in other initiatives, exchange experiences and increase the visibility of Mistra Carbon Exit.
- Researches from Mistra Carbon EXit have taken an active part in the public climate discourse through a number of interventions in press
- The programme has produced a draft manuscript of a first programme wide report called *Messages from Mistra Carbon Exit*.
- A Mistra Carbon Exit website has been developed and is on-line since June (www.mistracarbonexit.com). The website serves as a portal for programme output and other communication activities such as news, upcoming events, short films, articles etc.
- A logo and a graphic profile have been created.

1.4 Planned communication activities for 2018

- The report *Messages from Mistra Carbon Exit* is due for publication in December 2017.
- We will produce short films and infographics illustrating our work and the knowledge gathered in our report *Messages from Mistra Carbon Exit*.

- In addition, the programme will launch a full version of the website in Swedish.
- In June 2018 Mistra Carbon Exit will be co-organizing the World Congress of Environmental Economics
- In 2018 the programme will also organize Climate breakfasts i.e. short seminars focusing on current issues. The first will be held in January discussing the topic of EU-ETS reform.

1.5 Key administrative results in 2017

- Five PhD students have been recruited: two at Chalmers Energiteknik, one at Chalmers Fysisk resursteori, one at the University of Gothenburg and one at DIW German Institute for Economic Research.
- A programme board has been formed consisting of the following five delegates: Peter Nygårds, Chair for the Foundation of the Institute for Water and Air Research (SIVL), Birgitta Resvik, Fortum, Erik Eriksson, Energimyndigheten, Stefan Nyström, Naturvårdsverket and Anna Ledin, Göteborgs stad.
- The Programme Plan 2017, which is the main steering document for the program, was developed based on the research proposal that was submitted to Mistra in September 2016 and on the feedback received by Mistra and the Mistra board in December 2016. It was submitted to Mistra in June and was endorsed the same month.
- Three management group meetings have been performed.

1.6 Planned administrative activities for 2018

- Four programme board meetings. One or two new member of the board appointed
- Four management group meetings
- A general assembly for all participating organizations. Tentatively in September
- Annual report, submitted 31 March
- First economic report, due March
- Programme Plan for 2019, submitted in Dec

1.7 Fellowship

The planned Fellowship has been briefly discussed with Mistra, but no Fellow has been appointed yet.

1.8 Budget for 2018

The budget for 2018 is 16 446 000 SEK, excluding In-kind and 23 151 600 SEK including In-kind. See chapter 5 for details.

1.9 Programme Reserve

The programme reserve has not yet been used.

1.10 Significant changes in the programme

The non-academic partner *AB Volvo* has been replaced by *Volvo Construction Equipment* and *California Air Resources Board* has been replaced by *Sacramento Metropolitan Air Quality Management District*. There have been some changes in the in-kind contributions by the non-academic partners. In summary, the total in-kind contributions have marginally decreased from 25 956 000 SEK to 25 927 600 SEK, counted over the four year programme period.

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2 INTRODUCTION

2.1 This document

This is the Programme Plan for Mistra Carbon Exit 2018. It builds on the Programme Plan 2017, which is the main steering document for the program. The **first Programme plan, for 2017**, has two parts - Part (A) and Part (B), where Part (A) describes the Programme vision and goal, Scientific background and methods, Benefit of the programme to society, Organization of the program, Skills and networks and the Work packages and Case studies, while Part (B) describes Deliverables, Communication and Budget. The **Programme plan for 2018** (this document) is mainly an update of Part (B) and consists of: Chapter 1: Summary; Chapter 2: Introduction of the programme; Chapter 3: Achieved deliverables in 2017, planned deliverables for 2018; and significant changes in the programme; Chapter 4: Achieved communication activities in 2017 and planned communication activities in 2018; and Chapter 5: budget for 2018. For a complete description of the different programme components please also refer to Part (A) of the **Programme plan 2017**.

2.2 The inception of the Programme

This research programme was formulated in response to Mistra's research call "Transformative changes in society to achieve challenging climate goals". The call asked for projects with a focus on the technical and business prospects and potential for Sweden to move closer to zero emissions of greenhouse gases and, second, on how society and its institutions can and should handle the requisite transition. It was further stated that the programme should have a systems perspective and a cross-sectoral approach but, at the same time, explore in depth one or more sectors of society where the challenges are particularly large, such as transport, steel, or building and construction.

In response to this a consortium was formed during spring 2016 and a proposal was written by lead authors (Lars Zetterberg, IVL together with Filip Johnsson and Daniel Johansson at Chalmers). The proposal was submitted on September 5, 2016. It was then approved by Mistra on December 9, 2016 (Mistra protocol DIA 2016/12).

2.3 The Scope and Structure of the Programme

The Mistra Carbon Exit programme addresses and identifies the technical, economic and political challenges for Sweden to reach the target of net zero greenhouse gas emissions by 2045¹. This target will require transformative pathways with respect to virtually all industrial processes and their associated products and services. Mistra Carbon Exit takes a novel approach to address this problem by focusing on opportunities and barriers for mitigating carbon emissions along the industry supply chains from the input of raw materials, over primary and secondary activities, to final products and services demanded by the end user. In three industrial case studies we will cover the supply chains *buildings*, *transportation infrastructure* and *transportation*. These selected supply chains allow us to capture at least 75 percent² of Sweden's CO₂ emissions. The programme will analyze and identify pathways and policies for how Sweden and Swedish companies can become frontrunners in transforming society and industries, providing low carbon products and services while at the same time addressing market risks. This will make Sweden an important international example for other countries to follow, from a technical, a social and a policy point of view.

Mistra Carbon Exit is a 4-year programme that addresses the technical, policy, economic and market opportunities for different scenarios and assumptions which meet emissions reduction targets up to the year 2045, with focus on three supply chains: *buildings*, *transportation infrastructure* and *transportation*. The work is

¹ It was recently proposed (SOU2016:47) to change target year from 2050 to 2045.

² This is an approximate value, based on the production based emissions within the Swedish borders.

divided into *five case studies* (energy carriers, buildings, transportation infrastructure, transportation and regional transformation cases), *five academic work packages* and a *communication package*. The academic work packages investigate and define transformative pathways, technology assessments along supply chains, changing market institutions and behaviors towards Swedish Leadership, policies and governance, and integration and sustainability implications.

2.4 Programme Participants

The Mistra Carbon Exit consortium includes a broad representation of researchers and actors: four universities: Chalmers, University of Gothenburg, Linköping University and the Royal Institute of Technology (KTH), three research institutes: IVL Swedish Environmental Research Institute, Resources for the Future (RFF) and The German Institute for Economic Research (DIW), The Centre for European Policy Studies (CEPS) and some 20 non-academic centers.

3 DELIVERABLES

3.1 Scientific deliverables at programme level in 2017

Meetings and seminars with stakeholders. Regular and close interaction with industry and authorities is a key to the program. These meetings allow us to provide decision support to authorities and industry based on current know-how within the consortium. The meetings also our stakeholders to tell us what issues are most important to them and hereby guide us concerning the focus of our research. In 2017 Mistra Carbon Exit has organized the following events including researchers and stakeholders:

- Kick-off meeting in June, where researches and stakeholders met in a number of breakout sessions, and worked jointly to identify and analyze critical issues for deep de-carbonization.
- The first of a series of supply chain workshops was organized on October 24th. We invited clients, consultants, contractors and material suppliers involved in the supply chain of buildings and infrastructure to explore how innovative production practices, material choices, business models and policies can contribute to significantly reduce the climate impact of building construction processes. The workshop was intended to set the case studies focusing on buildings and transportation infrastructure in motion. The findings from this WS guides us in what issues to focus on in the program
- Organized a workshop with the Swedish EPA and researches in Stockholm in September to discuss how Sweden can pursue deep de-carbonization targets while under an EU emissions cap.
- Organized a policy seminar with Dallas Burtraw, a leading carbon markets expert in from Resources for the Future, USA on the topic: "Making emissions trading work - The North American experience".
- Co-hosted the third International Transport Energy Modeling (iTEM3) workshop, in Paris, at the International Transport Forum-OECD. The agenda focused on topics such as *New transport models, Beyond 2 degrees and NDCs, Electric vehicles and behavior change* and *Future declines in diesel markets*
- Co-hosted a workshop in Berlin in October: *Policies to stimulate climate friendly innovation in the materials sector*, where researchers from the program, industry and representatives from the EU Commission met to present and discuss options for incentivizing investments and innovation in climate friendly materials production in the EU.

International scientific conferences. The programme has presented two scientific papers at two international scientific conferences:

- The Case for a Reserve Price in the EU ETS. Presentation given by C Fischer at CESifo conference in Munich Oct 13-14
- Policy sequencing toward decarbonization, J Meckling, T Sterner, G Wagner - Nature Energy, 2017, presented at Berkeley School of Economics October 2.

Engaging in other programs of relevance. Researchers from Mistra Carbon Exit have engaged in other programs of relevance:

- Fossilfritt Sverige. Several meetings with Svante Axelsson and participation at their seminars, for instance at UN:s climate conference COP23 in Bonn.
- Innovation competition "*Transformative infrastructure - innovation for zero emissions*" a project run by Naturvårdsverket, Energimyndigheten and Formas.
- Participation in a workshop in Berkeley, California, comparing climate and energy policies in California and Germany. The workshop provides an opportunity to integrate Swedish research with an existing California-Germany project.
- Presentation of at the COP23 meeting in Bonn in a seminar arranged by Fossilfritt Sverige.

PhD students. In 2017 5 PhD students have been recruited to participate in the program:

- One (1) PhD student at DIW, who is expected to graduate in 2018
- One (1) PhD at Gothenburg University, who is expected to graduate in 2021,
- Two (2) PhDs at Chalmers-ET, who is expected to graduate in 2022
- One (1) PhD at Chalmers FRT, who is expected to graduate in 2022

3.2 Administrative results in 2017

- A programme board has been formed consisting of the following five delegates: Peter Nygårds, Chair for the Foundation of the Institute for Water and Air Research (SIVL), Birgitta Resvik, Fortum, Erik Eriksson, Energimyndigheten, Stefan Nyström, Naturvårdsverket and Anna Ledin, Göteborgs stad. The board will be enlarged with 1-2 delegates; preferably one from the building sector and one from another Nordic country. The board has met once (21 Nov) and has scheduled four meetings in 2018, following an annual cycle.
- A management group has been formed. The management group has met three times.
- The programme plan is the main steering document for the programme. The Programme Plan 2017 was developed based on the research proposal that was submitted to Mistra in September 2016 and on the feedback received by Mistra and the Mistra board in December 2016. It was submitted in June and was endorsed by Mistra.
- An agreement between Mistra and IVL, the programme host, was signed in April 2017.
- A consortia agreement is being developed regulating the responsibilities and undertakings of the 33 parties involved in Mistra Carbon Exit.

3.3 Planned administrative activities in 2018

- Four programme board meetings. One or two new members of the board appointed
- Four management group meetings
- A general assembly for all participating organizations. Tentatively in September
- Annual report, submitted 31 March
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3.4 Fellowship

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3.5 Significant changes in the programme

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3.6 List of deliverables on project level for 2017 and expected activities for 2018

The table below lists detailed deliverables from the case studies and work packages that are expected for the year 2018.

Table 3.1. Deliverables on project level for 2017 and expected activities for 2018

<p>Case study Buildings and transport infrastructure</p>	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> • An organizational work plan on how the case study will interact with various WPs and other case studies as well as on how the relevant partners in MISTRA Carbon Exit will work together in the case study. • Case Study Workshop, 24th October, Stockholm: Buildings and Transportation infrastructure • Recruitment of PhD student (Ida Karlsson, M.Sc.) <p>Forming of working groups:</p> <ul style="list-style-type: none"> • Buildings (Coordinated by Johan Rootzén and new PhD Student with support from Martin Erlandsson) • Infrastructure (Coordinated by Johan Rootzén and new PhD Student with support from Stefan Uppenberg and Håkan Johansson) • Cross-cutting – responsible for the cross-cutting analysis (Coordinated by Johan Rootzén and new PhD Student with support from Anna Kadefors and Anders Ahlbäck) <p>Other activities include:</p> <ul style="list-style-type: none"> • First case study meeting (Skype) in December 2017 • Participation in Betonginitiativet • Participation in and co-ordination with the project ”Färdplan för en fossilfri och konkurrenskraftig värdekedja för byggsektorn” (Skanska/MCE/Fossilfritt Sverige/SBUF) <hr/> <p>Planned deliverables 2018</p> <ul style="list-style-type: none"> • Final decision on a building to be used as a study object for this case • Final decision on transport infrastructure to be used as a study object for this case • Monthly case study meetings (Skype) • Two case study workshops (spring/autumn) • Continued participation and coordination with Betonginitiativet. <p>Report/publication:</p> <ul style="list-style-type: none"> • Survey of international initiatives • Outline and characterization of key opportunities and challenges • Draft set of scenarios/supply chain roadmaps that will set the overall frames for the case study.
<p>Case study Transport</p>	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> • Meetings and discussions with involved stakeholders (Volvo Cars, AB Volvo, Trafikverket). • Initial discussions and planning together with key academic partners. • Recruitment of PhD student that in part will be involved in the transport case study. • Planning of startup workshop in late January 2018 • Literature review of energy and material consensus of autonomous vehicles and shared mobility has been initiated.

	<p>Planned deliverables 2018</p> <ul style="list-style-type: none"> • A first workshop on the transport case study will take place at Chalmers January 25. This workshop will be critical for further planning of the case study. • A plan for how the various actors will work together in the case study, including meeting frequency etc. • A decision on simulation modeling approach and scope of the model (e.g. a specific city or a generalizable approach). • An initial assessment report of available research and stakeholder insights regarding the role of autonomous vehicles and shared mobility options in the context of a transformation of the transport supply chains towards net zero CO₂ emissions. • An organizational work plan on how the transport case study will interact with various WPs and other case studies. A sketch on a set of scenarios that will set the overall frames for the transport case study.
<p>Case study Energy Carriers</p>	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> • Meeting with NEPP project and discussion on coordination of methodologies and scenarios for the development of the electricity system • Participation in scenario discussion with WP1. • Hiring of new PhD student who will work with this case study as well as in WP2. <p>Planned deliverables 2018</p> <p>The aim is to start working with energy carriers along key industrial supply chains and along supply chains in buildings. In order to support this we plan to hold two workshops focusing on these two items. The reason for dividing them into two is that there is a significant difference in the underlying technologies as well as the expected participants.</p> <ul style="list-style-type: none"> • Workshop on electricity and hydrogen in primary production (cement, iron and steel industry) in the first half of 2018. <ul style="list-style-type: none"> ○ Initial results from Chalmers researchers on why costs and emissions of electricity depends on WHEN it is consumed ○ Industrial partners present their view on the role of electricity and hydrogen in primary production. Are there several electrification options? How do they differ in terms of annual consumption, consumption profile and flexibility? When is the choice of electrification strategy made and what directs the choice? • Workshop on electricity consumption in buildings and in the

	<p>transportation sector in the second half of 2018.</p> <ul style="list-style-type: none"> ○ Initial results from Chalmers researchers on costs and emission related to different electrification strategies in the transportation sector. ○ Initial results from Chalmers researchers on household DSM. ○ Initial results from Chalmers researchers on prosumers. ○ Industrial partners: Which electrification options (transport) and consumption/prosumption patterns (buildings) are considered? when is the choice of electrification strategy made and what directs the choice? <ul style="list-style-type: none"> ● A first mapping of possible use of electricity with respect to amount, flexibility and the willingness to pay in different sectors relevant for the supply chains of industry, transportation and building sectors. ● Definition of a few electrification scenarios related to the common scenarios in the project.
<p>Case study Local Arenas</p>	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> ● A clear message about transport plans presented in the “Ten messages”-report. ● Participating in Uppsala Climate Protocol meeting on the 11th of October. ● Workshop with Uppsala municipality partners to identify study objects on the 27th of October. ● Participating/organizing conference with VGR for relevant stakeholders on the 26th of October. ● Starting to select study objects/organizations in the VGR area. <p>Planned deliverables 2018</p> <ul style="list-style-type: none"> ● Identify a set of study objects in Uppsala and VGR within transportation, infrastructure and buildings that are suitable to study from a low carbon transformation perspective. ● Identification of what technologies, policies and business models are most interesting including opportunities and barriers. Identification of strategic choices. For instance what infrastructure for electric transportation shall be supported? ● Information exchange with the other case studies and work packages. What issues need further analysis in the other case studies and WP’s
<p>WP1</p>	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> ● Workshop 26-27th October, Paris: International Transport Energy Modeling (iTEM3)

	<p>Planned deliverables 2018</p> <p><i>Task 1.1 Defining External Scenarios on the Global, EU and Swedish Level</i></p> <ul style="list-style-type: none"> • Literature review and assessment of existing relevant scenario work on the global, EU and Swedish level – External • Definition of scenario procedure to be used in Mistra Carbon Exit including relation between external and internal scenarios <p><i>Task 1.2 · Defining Internal Scenarios</i></p> <ul style="list-style-type: none"> • A discussion paper (draft) that provides a review of external scenarios, and scenarios consistent with Sweden’s target of net zero GHG emissions by the year 2045. Identify important issues (such as leakages and system boundaries) from supply chain perspective that need integrated approaches to address in our research in 2018-2020. • Planning process for a workshop at the Norrköping decision arena to explore the external scenarios (task 1.1) and internal scenario (<i>task 1.2</i>) with targeted stakeholder.
WP2	<p>Achieved deliverables in 2017</p> <ul style="list-style-type: none"> • Meeting with NEPP project and discussion on coordination of methodologies and scenarios for the development of the electricity system • A literature survey of scientific studies on electricity use in the supply chains of industry, transportation and buildings. • A first definition of scenarios • Presentation of supply chain analysis at the COP23 meeting in Bonn by Filip Johnsson. • Hiring of a new PhD candidate (will also work in case study Energy Carriers) <p>Planned deliverables 2018</p> <p><i>Task 2.1 Development of the electricity system and its relation to low carbon supply chains</i></p> <ul style="list-style-type: none"> • Decision on methodology to describe the key energy, material and value flows relevant for the climate impact of the construction of buildings and transportation infrastructure (including identifications of differences between the supply chains in buildings and transportation infrastructure).
WP 3	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> • Activities began in the spring of 2017 with a research visit by Lars Zetterberg to the United States, and a reciprocal visit by Dallas Burtraw to Sweden in May. Other startups during fall 2017 have been implemented as planned. • Policy seminar “<i>Making emissions trading work - The North American experience</i>” in Göteborg, May 19th, with Dallas Burtraw and about 20 representatives from Swedish industry, authorities and academia. • Workshop at the Swedish EPA (Sept) on how Sweden can pursue deep de-carbonization while under the EU Emissions cap. • Participation in a workshop in Berkeley, California in October 2017, comparing climate and energy policies in California and Germany. The workshop is a follow-up to one comparing California and

Sweden that was held in California in 2013.

- Article *Policy sequencing toward de-carbonization*, J Meckling, T Sterner, G Wagner - Nature Energy, 2017
- Under task 3.5: Draft paper *The Case for a Reserve Price in the EU ETS* by Fischer C., et al.(under task 3.5)
 - Fischer held plenary Address, FSR Climate Annual Conference, European University Institute, Florence School of Regulation, November 30–December 1, 2017.
 - Fischer held keynote Address, CESifo Area Conference on Energy and Climate Economics, Munich, October 13–14, 2017.
- Zetterberg presented an analysis of the EU ETS reform at IETA/CEPS event with Jos Delbecke in Brussels 1 December 2017

Planned deliverables 2018

Task 3.1 Focus groups on net zero emission consumption (Wibeck, Hennlock, post-doc (NN) LiU)

Short status of task:

- Pre-study on consumer behaviour research, startup August 2017

Planned deliverables:

- Topic guide for consumer focus groups
- Deliver an agenda for the task's interactive work in each case study.

Task 3.2 Non-economic vs economic incentives for switching to net zero emission consumption (Hennlock, Löfgren)

Short status of task:

- Collect information from WP1 and WP2 for the experimental hypothesis formulation. Develop scope for experimental designs, startup fall 2017

Planned deliverables:

- Deliver an agenda for experiment interactive work in each case study.

Task 3.3 Focus groups on Swedish leadership, niche markets and low carbon business models (Wibeck, Hennlock, Linnér, post-doc (NN) LiU, Navarra)

Short status of task:

- Analysis of survey data on de-carbonization leadership from International Negotiations Survey, COP 22, August-October 2017
- Survey question on de-carbonization leadership in International Negotiations Survey, COP 23, November 2017

Planned deliverables:

- Survey data on de-carbonization leadership from COP 22, 23.
- Topic guide for first round of focus group interviews

Task 3.4 Modelling Swedish leadership – carbon leakage vs low carbon business models (Coria, Hennlock)

Short status of task:

- Define the scope, and start development, of modelling for

	<p>competitive advantages during Swedish leadership in an international context</p> <p>Planned deliverables:</p> <ul style="list-style-type: none"> • Deliver an agenda for the task’s interactive work in each case study. <p><i>Task 3.5 Institutional framework and Swedish policy leadership (Burtraw, Zetterberg)</i></p> <p>Short status of task:</p> <ul style="list-style-type: none"> • Activity on this task began in the spring of 2017 with a research visit by Lars Zetterberg to the United States, and a reciprocal visit by Dallas Burtraw to Sweden in May. Researchers participated in a conference in California in October of 2017 that was explicitly aimed at international comparisons. <p>Planned deliverables:</p> <ul style="list-style-type: none"> • A paper previously anticipated about the role of states in the US in the development and evolution of national and international climate policy has been postponed. Its relevance and structure will be reassessed in 2018. • A paper will be prepared to address complementary policies under emissions caps and the implications on efficiency and the performance of emissions trading in the North American experience. This project will also be supported with a grant from the Swedish Environmental Protection Agency. • Researchers will collaborate in planning a workshop in the EU (likely to be in Brussels) to examine the role of complementary policies and their interaction with price formation in carbon markets, including the role of the market stability reserve in the EU, and the possible introduction of a minimum price implemented through a reserve price in the auction.
<p>WP4</p>	<p>Proposed changes in WP 4:</p> <p>We would like to expand <i>Task 4.2. Marginal cost pricing and transformative changes</i> to also include other sectors. During 2018 we will start up a project focusing on the building sector. Focus will be on barriers within the building sector to adoption of new (more climate friendly) technologies are not adopted and how policies and/or other measures could provide incentives for that.</p> <p>Sonia Yeh will not be working in Task 4.3, as written in the original programme plan.</p> <p>Achieved deliverables 2017</p> <p><i>Task 4.1 Supply Chain Pricing:</i></p> <ul style="list-style-type: none"> • Organization of workshop “Workshop Policies to stimulate climate friendly innovation in the materials sector” (co-organized with Climate Strategies and held at DIW Berlin on 20/10/2017) <p><i>Task 4.2 Marginal cost pricing and transformative changes:</i></p> <ul style="list-style-type: none"> • Publication: Jonas Meckling, Thomas Sterner, and Gernot Wagner, (2017), "Policy sequencing toward de-carbonization", Nature Energy, November 13th. <p><i>Task 4.3 Maximizing the global impacts of Swedish low-carbon innovations:</i></p> <ul style="list-style-type: none"> • Fischer presented paper “Strategic Subsidies for Green Goods” at

Chalmers October 16, 2017 to jump-start discussions of extended work under Carbon Exit.

- Fischer presented “International spillovers from fuel economy policies” at the Third International Workshop: The Energy Transition in Land Transportation, Chaire Développement Durable, École Polytechnique, Paris, France, November 09, 2017. Also related to 4.4

Task 4.4 Multilevel policies for the transport sector and their consequences:

- This task has started with some initial work on a spatial urban model.

Task 4.7 Role of procurement and end user preferences in driving low carbon construction in the infrastructure and building sectors.

- Creation of working dataset
- DIW Weekly Report titled “Green Public Procurement: an opportunity for fast-tracking de-carbonization in Germany” (to be published on 6/12/2017)

Planned deliverables 2018

Task 4.1 Supply chain pricing (Rootzén, Johnsson, Zetterberg, Neuhoff, Fischer, Hennlock)

- Meet policy makers in Sweden and EU for an in-depth dialogue on supply chain pricing policies with the purpose of informing them of our current understanding and receiving input from them that will guide us in our further analysis.
- Participate as experts in at least two workshops focusing on policies for de-carbonization of base materials, one organized by the Swedish EPA (Transformativ industri – banbrytande innovationer för nollutsläpp), the other organized by Climate Strategies (we could alternatively mention a workshop in September by the Ministry of Industry in Sweden). This connects to task 2.2 Low carbon supply chains in buildings and 4.6 The effect of carbon and innovation policies on transformation pathways of the materials sector.
- Summary/report of workshop “Workshop Policies to stimulate climate friendly innovation in the materials sector”
- Defining scope of analysis on assessing how supply chain pricing can provide incentives for de-carbonization in upstream production

Task 4.2. Marginal cost pricing and transformative changes (Burtraw, Sterner, Löfgren)

Short status of task:

- Conceptual phase.

Planned deliverables for 2018:

- Contacts and interaction with other groups working on electricity tariffs in other countries (including EDF in the USA). See also 4.3.
- Start-up project on the building sector: analysis of barriers for adoption of new technology along the value chain and the role for policies.
- Special session World Conference on Environmental and Resource Economics which will be in Gothenburg 2018 (Thomas Sterner will be the host and organizer).

Task 4.3 Maximizing the global impacts of Swedish low-carbon innovations (Fischer, Löfgren, Sterner, Burtraw)

Short status of task:

	<ul style="list-style-type: none"> • Conceptual stage/ planning. Case study in Ethiopia and contacts with people working on electricity tariffs in other countries. <p><i>Task 4.4 Multilevel policies for the transport sector and their consequences (Burtraw, Fischer, Johansson, Sprei, Sterner)</i></p> <p>Short status of task:</p> <ul style="list-style-type: none"> • This task has started with some initial work on a spatial urban model. <p><i>Task 4.5 The Political Economy of Electric Vehicle Subsidies (Habla, Sterner)</i></p> <p>Short status of task:</p> <ul style="list-style-type: none"> • Planned to start early 2018. <p>Planned deliverables:</p> <ul style="list-style-type: none"> • Development of a) a conceptual lobbying model, b) a median voter model and c) a spatial urban model with commuting behavior. We also intend to cover a case study on electric lighting in this project, which we will start discussing this year. <p><i>Task 4.6 The effect of carbon and innovation policies on transformation pathways of the materials sector (Richstein, Neuhoff)</i></p> <p>Plans for 2018:</p> <ul style="list-style-type: none"> • Defining the scope of the bottom-up transition model, and developing the design of the model <p>Planned deliverables:</p> <ul style="list-style-type: none"> • Report on model design <p><i>Task 4.7 Role of procurement and end user preferences in driving low carbon construction in the infrastructure and building sectors (Kadefors, Mandell, Chiappinelli, Zipperer)</i></p> <p>Planned activities and deliverables:</p> <ul style="list-style-type: none"> • Preliminary analysis • Individual project/paper under 4.7. (Kadefors).
WP5	<p>Achieved deliverables 2017</p> <ul style="list-style-type: none"> • Contribution to the joint “Ten messages” document • Participation by members of the WP5 team in workshops held as part of the implementation of the case studies. <hr/> <p>Planned deliverables 2018</p> <p><i>Task 5.1 Integration</i></p> <p>Short status of task:</p> <ul style="list-style-type: none"> • Adaption of the methodology for processes aiming at collective impacts. Participation in WP and case meetings. <p>Planned deliverables:</p> <ul style="list-style-type: none"> • Discussion paper closing in on specific cross cutting aspect identified as part of work packages and case studies. • Compile a first scenario describing how all the supply chains can become climate neutral to 2045, addressing opportunities, barriers and necessary strategic choices. We hope that this comprehensive assessment will highlight what issues are most important and how the

	<p>different supply chains are linked to each other. This will guide us in what issues to prioritize in our future work.</p> <p><i>Task 5.2 Sustainability assessment in relation to Sustainable Development Goals (SDG) and Swedish Environmental Objectives (SEO)</i></p> <p>Short status of task:</p> <ul style="list-style-type: none"> • Assessment of SDSN tool for SDG analysis of Solutions initiatives and applicability/adaption to the Mistra Carbon Exit approach. <p>Planned deliverables:</p> <ul style="list-style-type: none"> • Discussion paper on the SDG and SEO assessment and integration in the Mistra Carbon Exit Project. <p><i>5.3 Guidance and indicators for revision of the transformative pathways</i></p> <p>Short status of task:</p> <ul style="list-style-type: none"> • Participation in WP and case meetings. <p>Planned deliverables:</p> <ul style="list-style-type: none"> • Provide guidance and input linked to SDG and SEO aspects in the WP and case study processes.
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4 COMMUNICATION

In this chapter we present performed activities in 2017 and planned activities in 2018. For a more general communication strategy, please refer to the programme plan 2017 (section 8.1).

4.1 Communication and Outreach achieved in 2017

Website

A Mistra Carbon Exit website has been developed and is on-line since June (www.mistracarbonexit.com). The website will serve as a portal for programme output and other communication activities such as news, upcoming events, short films, articles etc.

Workshops and seminars

Mistra Carbon Exit has during 2017 been involved in several workshops, seminars and meetings directed towards information and discussion of issues relevant for the program. Participants and partners in Mistra Carbon Exit have, both as organizers, co-organizers and key note speakers..

Increasing visibility

Our researchers have also given presentations at other meetings and conferences in order to make the programme well known to our target groups, for instance Tillståndet i Miljön (Stockholm, May), COP23 (Bonn, November).

Messages from Mistra Carbon Exit – a report on current knowledge

The aim of the report has been to formulate and communicate a set of messages to our end-users. Messages that we are aware of, but might perhaps not be well known to our end-users. The report is part of the effort to make

the programme known at an early stage. The report also allows us to present what each WP and Case study will do in the coming years.

Press activities

Mistra Carbon Exit has taken an active part in the public climate discourse; see some examples in Table 4.1. Based on the coming report *Messages* we are preparing for future press activities, such as opinion pieces and seminars.

Graphic Profile

A logo and a graphic profile have been created. The graphic profile is a vital tool in the external communication and helps us to communicate clearly and with a common appearance.

Publications

One publication has been published so far: *Policy sequencing toward decarbonization*, J Meckling, T Sterner, G Wagner - Nature Energy, 2017.

Internal programme meetings

Three management meetings, one board meeting and a Programme kick off have been organized within the program. At the kick-off on June 7-8 almost all Mistra Carbon Exit partners, totaling 46 participants from 26 different organizations and four countries - came together at Hotel 11 in Gothenburg. The two day meeting included dozens of presentations and six breakout working sessions focusing on critical issues to address in the case studies.

A list of communication activities is presented in the table below.

Table 4.1. Achieved communication activities in 2017.

Date	Activity	Target groups	Channel	Place	Additional information
May 19	Policy seminar with Dallas Burtraw		Seminar	Göteborg	Theme: "Making emissions trading work - The North American experience"
May 24	Key note at Tillståndet i Miljön by Johnsson and Zetterberg		Conference	Stockholm	"Climate and Policy – where do we stand and how can we reach our targets?"
May 30	Key Note at Workshop	Swedish industry	Seminar	Östersund	Theme: "Transformative industry – Pioneering innovations for zero emissions"
June 7-8	Kick off Mistra Carbon Exit	MCE partners	Meeting	Göteborg	(46 participants from 26 different organisations and four different countries were present)
25 June	Launch website	MCE	Website		Programme website (results, news,

					contact, etc)
Sep	Meeting Fossilfritt Sverige		Meeting		
Sep 6	Workshop with interventions by Rootzén and Zetterberg	Industry, researchers and policy makers	Meeting	Stockholm	Mistra Carbon Exit participates in panel.
Sep 18	Article D Burtraw, H Larsson		MCE website		Theme: "The EU- ETS has a lot to learn from US carbon trading systems"
Sep 21	Press/Article about Programme Director		Mistra Newsletter		Theme: "Ingenjören som pusslar samman ett klimatneutralt Sverige"
Sep	Meeting with California Air Resources Board, L. Zetterberg, D. Burtraw		Meeting	Sacramento, California	
Oct 10-11	Innovation seminar			Malmö	Innovationstävling "Transformativ infrastruktur - innovation för nollutsläpp"
Oct 20	Policy Workshop, co- organised by DIW and Mistra carbon Exit	Stakeholders from industry, authorities and civil society	Workshop	Berlin	Theme: "Policies to stimulate climate friendly innovation in the materials sector"
Oct 24	Case Study Meeting: Buildings and infrastructure	Stakeholders involved in the supply chain of buildings and infrastructure	Meeting	Göteborg	Case study start up.
Oct 26-27	International Transport Energy Modeling (iTEM3)		Workshop	Paris	
Oct 29	Workshop Report		MCE website		Theme: "Supply chain of buildings and infrastructure"
Nov 15	Workshop COP23 Bonn, Key note by F Johnsson	Stakeholder workshop	http://fossilfritt- sverige.se/	Bonn	Theme "Fossil free cement, steel and fuel –making business of industry transition"

Nov 16	Press/Comment.		Newspaper Aktuell Hållbarhet		Theme: "Comment on the EU ETS reform"
1 Dec	The EU ETS revision for Phase 4. Event organized by IETA and CEPS.	EU industry and MS delegations		Brussels	the EU ETS reform
Dec	Report	Partners and targets groups	MCE publication		Theme: "10 messages from Mistra Carbon Exit"

4.2 Planned Communication and Outreach in 2018

During 2018 we will continue to evaluate and develop our communication strategy, platforms and activities. This will include further development of the website through, for example, the publication of a Climate Calendar identifying significant events on the external climate agenda as well as programme activities. We will produce short films and infographics illustrating our work and the knowledge gathered in our report *Messages* from Mistra Carbon Exit. In addition to this we will launch a full version of the website in Swedish.

Communicating the content of the report *Messages* from Mistra Carbon Exit will be a main focus throughout the year. Our plan is to use and communicate the different “messages” from the report in outreach activities through social media, the programme website, seminars and press activities.

A main communication activity will be the participation in CEPS Ideas Lab in February where Mistra Carbon Exit will participate in an innovative platform of exchange and co-creation with representatives from national governments, businesses, NGOs and European institutions in Brussels to debate key policy issues for Europe.

In June 2018 Mistra Carbon Exit will be co-organizing the World Congress of Environmental and Resource Economists in Gothenburg, Sweden. In addition, Thomas Sterner, researcher in Mistra Carbon Exit, is Chair of the Scientific Programme Committee during the congress.

In 2018 we will also organize Climate breakfasts i.e. short seminars focusing on current issues. The first will be held in January discussing the topic of EU-ETS reform.

In the beginning of the year workshops will be organized by the case studies (Buildings; Transportation infrastructure; and Transportation).

Our planned communication and outreach activities for 2018 are summarized in table 4.2 below

Table 4.2. Planned communication activities in 2018.

Activity	Target groups	Channel	Responsible	Place	Additional information
Climate breakfast		Seminar	Lars Zetterberg	Stockholm	Theme: “EU-ETS reform
CEPS IDEAS Lab		Conference		Brussels	
Workshop Case study Energy		Workshop			
Workshop Case study Transport		Workshop			
Workshop Case study Local Arenas		Workshop			
Annual report		Report	Lars Zetterberg Kerstin Kristoferson		
World Conference of environmental economics,		Conference	Co-organized by MCE	Göteborg	
Annual meeting		Meeting	Lars Zetterberg		
Film		Social media	Kerstin		Main objective to communicate the

		Website	Kristoferson		report to a broader audience.
Infographics		Social media Website Press	Kerstin Kristoferson Helena Larsson		Main objective to communicate the report to a broader audience.
Website (Swedish version)		Website	Kerstin Kristoferson		Main objective to communicate the report to a broader audience.
Campaign: Messages from Mistra Carbon Exit		Social media Website Seminar Press	Kerstin Kristoferson Helena Larsson		Main objective to communicate the report to a broader audience.
Interviews with researchers		Social media Website Press	Helena Larsson		Main objective to communicate the report to a broader audience

5 BUDGET

This chapter presents a summary of the budget, according to the Mistra budget template. The total budget for the programme is 81 927 600 SEK, whereof 25 927 600 is provided by in-kind contributions. The remaining amount, 56 000 000 SEK, is provided by Mistra. A breakdown of Mistra funds is presented in Table 5.1; in-kind contributions are presented in Table 5.2; work package budgets are presented in Table 5.3; and Mistra funds per consortium member are presented in Table 5.4.

Table 5.1 Received and used cash funds	Budget 2017	Budget 2018	Budget 2019	Budget 2020	Budget totalt totalt
Balance	0	0	0	0	0
Income					
Mistra's contribution	8 641 474	16 446 000	16 392 368	14 520 158	56 000 000
Sum Income	8 641 474	16 446 000	16 392 368	14 520 158	56 000 000
Costs					
Gross wages and other remunerations	4 813 644	9 503 294	9 549 778	8 076 135	31 942 851
Travel expenses	257 289	526 990	484 733	442 988	1 712 000
Material	0	0	0	0	0
Depreciation	0	0	0	0	0
Other direct costs	600 379	974 440	870 112	920 068	3 365 000
Services	450 000	450 000	450 000	450 000	1 800 000
Sum costs	6 121 312	11 454 724	11 354 624	9 889 191	38 819 851
Indirect costs incl. offices etc.	2 520 162	3 491 276	3 537 745	3 130 966	12 680 149
Sum costs	8 641 474	14 946 000	14 892 368	13 020 158	51 500 000
Strategic reserve	0	1 500 000	1 500 000	1 500 000	4 500 000
Sum costs incl strategic reserve	8 641 474	16 446 000	16 392 368	14 520 158	56 000 000
SALDO	0	0	0	0	0
In-kind contribution "academic partners"	1 120 526	2 185 000	2 087 632	1 606 842	7 000 000
In-kind contribution "non-academic partners"	4 793 800	4 895 600	4 763 600	4 474 600	18 927 600
TOTAL PROGRAMME BUDGET	15 680 800	23 151 600	22 868 600	20 226 600	81 927 600

Table 5.2 In-kind contribution, SEK	Budget	Budget	Budget	Budget	Budget totalt
	2017	2018	2019	2020	totalt
IVL	50 000	50 000	50 000	50 000	200 000
Chalmers-ET	260 000	760 000	610 000	370 000	2 000 000
Chalmers-FRT	110 526	450 000	477 632	461 842	1 500 000
Chalmers-GMV	125 000	350 000	375 000	150 000	1 000 000
GU	225 000	225 000	225 000	225 000	900 000
LiU	100 000	100 000	100 000	100 000	400 000
KTH	0	0	0	0	0
RFF	0	0	0	0	0
CEPS	250 000	250 000	250 000	250 000	1 000 000
DIW	0	0	0	0	0
Volvo Cars	750 000	750 000	750 000	750 000	3 000 000
Volvo CE	67 500	157 500	157 500	67 500	450 000
Cementa	225 000	225 000	225 000	225 000	900 000
JM	144 000	144 000	144 000	144 000	576 000
NCC	45 000	45 000	45 000	45 000	180 000
Skanska	574 800	506 600	374 600	175 600	1 631 600
Trafikverket	387 500	387 500	387 500	387 500	1 550 000
Thomas Betong	450 000	450 000	450 000	450 000	1 800 000
A-betong	20 000	100 000	100 000	100 000	320 000
Outokumpu	36 000	36 000	36 000	36 000	144 000
Stena Metall	450 000	450 000	450 000	450 000	1 800 000
Fortum	108 000	108 000	108 000	108 000	432 000
Göteborg Energi	720 000	720 000	720 000	720 000	2 880 000
Energiforsk	33 750	33 750	33 750	33 750	135 000
Danske Bank	33 750	33 750	33 750	33 750	135 000
VGR	158 500	158 500	158 500	158 500	634 000
Uppsala klimatprotokoll	22 500	22 500	22 500	22 500	90 000
Naturvårdsverket	0	0	0	0	0
Hagainitiativet	135 000	135 000	135 000	135 000	540 000
FORES	135 000	135 000	135 000	135 000	540 000
Voestalpine	140 000	140 000	140 000	140 000	560 000
Air Quality	0	0	0	0	0
PEAB	157 500	157 500	157 500	157 500	630 000
TOTALT IN-KIND	5 914 326	7 080 600	6 851 232	6 081 442	25 927 600

Table 5.3 Budget per work package, SEK	Budget 2017	Budget 2018	Budget 2019	Budget 2020	Budget totalt	In-kind academic partners totalt	Budget incl in-kind academic partners totalt
Total budget	8 641 474	16 446 000	16 392 368	14 520 158	56 000 000	7 000 000	63 000 000
Strategic Reserve	0	1500000	1500000	1500000	4500000	0	4 500 000
Programme Mgmt	1 125 000	1 125 000	1 125 000	1 125 000	4 500 000	0	4 500 000
Communication	1 000 000	1 000 000	1 000 000	1 000 000	4 000 000	0	4 000 000
Case study: Buildings	105 000	345 000	225 000	145 000	820 000	180 000	1 000 000
Case study: Transport	210 526	673 684	652 632	652 632	2 189 474	410 526	2 600 000
Case Study: Transport infrastructure	105 000	345 000	225 000	145 000	820 000	180 000	1 000 000
Case study: Energy carriers	160 000	484 211	484 211	324 211	1 452 632	347 368	1 800 000
Case study: Local arenas	100 000	100 000	100 000	100 000	400 000	0	400 000
Work package 1	481 316	997 632	815 526	559 211	2 853 684	246 316	3 100 000
Work package 2	685 000	1 990 263	1 910 263	1 430 263	6 015 789	1 284 211	7 300 000
Work package 3	1 976 316	2 805 263	3 031 579	2 773 684	10 586 842	1 078 158	11 665 000
Work package 4	2 268 316	4 129 947	4 163 947	3 930 947	14 493 158	2 041 842	16 535 000
Work package 5	425 000	950 000	1 159 211	834 211	3 368 421	1 231 579	4 600 000

Table 5.4 Mistra funds per consortium member	Budget 2017	Budget 2018	Budget 2019	Budget 2020	Budget totalt
Summa medel från Mistra	8 641 474	16 446 000	16 392 368	14 520 158	56 000 000
IVL	3 750 000	4 050 000	4 150 000	4 050 000	16 000 000
Chalmers-ET	1 165 000	3 165 000	2 565 000	1 605 000	8 500 000
Chalmers-FRT	589 474	2 400 000	2 547 368	2 463 158	8 000 000
Chalmers-GMV	125 000	350 000	375 000	150 000	1 000 000
GU	1 150 000	1 825 000	1 825 000	1 700 000	6 500 000
LiU	400 000	850 000	1 050 000	700 000	3 000 000
KTH	0	175 000	175 000	150 000	500 000
RFF	1 000 000	1 000 000	1 000 000	1 000 000	4 000 000
CEPS	250 000	250 000	250 000	250 000	1 000 000
DIW	212 000	881 000	955 000	952 000	3 000 000
Programme reserve	0	1 500 000	1 500 000	1 500 000	4 500 000