PLATON – a **PLAT**form for **O**pen and **N**ationally Accessible Climate Policy Knowledge

Part 1: Needs, objectives and impacts

1. Objectives

All the objectives and anticipated results of PLATON reflect the objectives and purposes set out in the call.

Primary objective:

1a) gain knowledge about how the **policy system** can be adjusted in **feasible** and **effective** ways to satisfy the **reporting commitments** and meet the 2030 and 2050 **emission targets** of Norway through increased greenhouse gas (GHG) **abatement and carbon uptake** in soil and vegetation, while ensuring climate-friendly **innovations**, alongside meeting **other societal goals**.

1b) ensure that the knowledge synthesised and developed in PLATON is relevant and reaches policymakers, public administration, business actors, NGOs, the civil society and the international research community – our ambitions for **user involvement, communication and outreach** are high.

2a) Verifiable secondary knowledge objectives:

- ✓ to encompass **a wide array of policy instruments** that affect abatement and carbon uptake, both in the existing climate policy system and novel structures and tools, including:
  - different funding and support mechanisms,
  - taxation with various recycling options,
  - both soft instruments like nudging and information and strong like mandates and bans,
  - instruments oriented towards both the production and consumption side,
  - instruments targeted towards identified barriers.
- ✓ to undertake a holistic perspective where **instruments –** industry-neutral or specifically targeted towards sources outside or within the Emissions Trading System (ETS) – **are studied in conjunction**, in order to identify overlaps, counteractions and complementarities. Numerical models will be key working horses for this task, combined synergistically with various qualitative approaches.
- ✓ to address policy at **all administrative levels** from the municipal, regional, national to the European and global developments, and learn from countries with comparable conditions and challenges to Norway.
- ✓ to understand the conditional **behaviour of consumers, corporations, financial institutions, public administrations and politicians** in order to suggest acceptable and feasible instruments. Instruments and measures can be hampered by many types of **barriers**, including administrative, political, technological, financial, psychological, social and cultural.
- ✓ to study whether abatement strategies overlap or conflict in the short- vs. long-run (e.g. lock-in) and the domestic vs. global perspective (e.g. carbon leakage, lifecycle perspectives).
- ✓ to analyse how **technological and organisational innovations** can be promoted that benefit the low-emission transformation and also create green competitiveness and finance opportunities.
- ✓ to identify **conflicts or synergies between abatement and other policy goals**, like growth, competitive-ness, vital local communities, fairness and job security, fiscal revenues, environment and sustainability.

2b) Verifiable secondary communication objectives:

- ✓ to **help public administration and politicians** in their policymaking and reporting tasks.
- ✓ to **involve and engage users** in defining knowledge gaps and research questions for the proposal and all the activities of PLATON.
- ✓ to synthesise and develop knowledge, along with relevant databases and model interfaces, to form **a platform for openly and nationally accessible knowledge**.
- ✓ to provide up-to-date information, **standby capacity and short response time** when users are in need.
- ✓ to facilitate **exchange of findings and perspectives across national research and expert groups**, both by collaborating in PLATON as well as in other projects and centres, by arranging meeting points and by making the knowledge pool openly and nationally accessible.
- ✓ involving key **international researchers and networks** to ensure learning across jurisdictions.
- ✓ **disseminating findings and reviews** via PLATON's website, in scientific arenas, media and social networks, workshops, etc.

The main product of PLATON will be a relevant, user-informed, up-to-date knowledge platform made widely and openly accessible by means of our communication activities. It will include both novel research

findings and syntheses of existing knowledge and be staffed with leading Norwegian researchers on national and international abatement policies. After four years, the new networks and infrastructures will expectedly have fostered new projects and activities in the same vein.

2. Importance for national knowledge-building

Knowledge-building in the platform is multifaceted and includes:

- new insight and findings that fill knowledge gaps in the international research frontier
- overviews and syntheses that assess and establish the status quo of knowledge and experiences
- applied analyses and assessments directly relevant for policymaking, business and the public debate
- assessment tools and expertise (databases, statistics, indicators, models, etc.) available for users, analysts and researchers outside and within the platform
- communication activities that ensure the knowledge is relevant, dispersed and understood.

There are no distinct boundaries between these aspects, and the thematic work packages (WPs) 1-5 will deliver on them all. An overarching WP6 staffed by professional communicators and journalists will coordinate and guarantee the quality of the communication activities. It is important for an inclusive platform to facilitate exchange of findings and perspectives across national research and expert groups from different disciplines and societal sectors, both by arranging national meeting points, by making the knowledge pool openly and nationally accessible and by collaborating in PLATON and other projects and centres. PLATON is a large fusion of two applying consortia from CICERO and SSB, respectively, with a large external network of users, experts and researchers. *Inter alia*, our researchers and partners in PLATON are key agents in the National Inventory System for GHG emissions – NIS (consisting of SSB, NIBIO and MDIR)[1], four are appointed for the TBU-Agriculture Commission and three for the TBU-Climate Commission.[2] Among relevant research projects in our portfolios are the three ongoing FME-S, the FME MoZEES, about 2/3 of the projects in Klimaforsk on climate policy and mitigation and several ENERGIX and BIONÆR projects. PLATON researchers participate in several related NFR, JPI and Horizon2020 proposals under evaluation, including four FME-S proposals (with lead of TREAT (TØI) and ENABLE (NMBU)).

The research consortium has broad competence incl. economics, political science, sociology, innovation studies, geography, urbanism, law, technology, agronomy, meteorology and biology. The balanced composition of highly renowned scholars and promising, young researchers in the climate policy field is documented in the CVs. We also benefit from international networks that will be actively involved in PLATON's research; see Letters of Interest (LoIs). We seek to combine an academic interdisciplinary approach with the perspectives of users from public agencies/ministries, private corporations and NGOs. We regard communication across expert groups, practitioners and research as pivotal for finding effective and acceptable climate policy instruments.

Our 29 paying users *(Bane Nor, Bilimportørenes landsforening, Felleskjøpet, Finans Norge, Finansdepartementet, Framtiden i våre hender, Jernebanedirektoratet, Klimastiftelsen, Kommunalbanken, Kommunenes sentralforbund, Landbruks- og matdepartementet, Landbruksdirektoratet, Landbrukssamvirket, Maritime Cleantech, Norges Bondelag, Norges Skogeierforbund, Norges Taxiforbund, Norsk industri, Nortura, NVE, Nye veier, Olje- og energidepartementet, Opplandstrafikk, Orkla, SABIMA miljøorganisasjon, SSBs statistikkavdelinger, Statens Vegvesen, Umoe, Zero)* represent diverse and comprehensive interests and needs that we aim to meet:

Several users are central public agencies and ministries that provide information and progress into policymaking processes. They make projections and policy analysis for the Government, Parliament, EU, UNFCCC and the public and will benefit from better data and behavioural models. They directly make policy or implement the decisions that are made. The government is also committed to reporting for Parliament, the EU and the UNFCCC. The purpose of the knowledge platforms and the competence of the PLATON consortium to deliver on those goals have convinced them to join. Regional interests and municipalities are also represented, that seek to gain from PLATON's expertise in local climate policy design and implementation. Many of the actors have particular sector interests and knowledge within agriculture, forestry, transportation, food or manufacturing. Some enterprises support PLATON because they are generally interested in business models, upcoming niches and climate finance. Last, there are several NGOs included as partners that regard PLATON as a valuable source of knowledge and communication services and a channel for indirect influence on policy decisions.

[1] Norwegian Environmental Agency, Statistics Norway, Norwegian Institute of Bioeconomy Research. 2018. Greenhouse Gas Emissions 1990-2016, National Inventory Report. Reported According to the UNFCCC Reporting Guidelines.
[2] TBU = Teknisk beregningsutvalg for utslipp (Technical Calculation Committee for Emissions)

Through active interaction both between practitioners and the research community and across all user groups, partners and networks, PLATON aims to be a catalyst for dynamic and mutually interdependent learning and innovation processes. Specific projects and activities as described in Section 4 are decided based on dialogue and seminar with the users. The 20% still unassigned budget for user-influenced analysis is also attractive for the participants. The users will be part of The Board of Partners that will decide upon its use and the general direction of the research and activities in PLATON.

The broader societal impact of PLATON is, first of all, its provision and dissemination of knowledge and facilitation of debate and engagement about the climate change challenge and the low-emission transformation. Norway is small, but can demonstrate solutions that inspire other countries. Last, but not least, the international research community will benefit from our contributions to the research frontier.

Part 2: Scientific content and organisation of research activities

3. Knowledge frontiers

The research frontier and gaps are briefly described below – organised by WP. The identified knowledge gaps that we will approach in the WP descriptions in Section 4 are identified in dialogue with user partners and by consulting policy papers, international partners and the state-of-the-art scientific literature.

In **WP1** on **net emissions from agriculture, forestry and land use**, our main focus is on increasing knowledge on how agricultural and forestry policy can be adjusted to generate lower emissions and enhance CO_2 uptake. While the knowledge on potential measures for climate action in Nordic agriculture, forestry and land use has advanced the recent years (Kamman et al., 2017, MDIR, 2015, Astrup et al,2018, Vårdal&Gaasland, 2012), the research on instruments lags behind. Policies to stimulate business innovation of soil-based net emission technologies need to be evaluated and methodological and measurement development is needed. Lack of sufficient high-quality data and estimates for studies of policy instruments is, inter alia, due to large heterogeneity across regions and farms. Another reason is limited availability of appropriate models for projections of climate policies and interplays with other sectoral policies. Related research at the European level has progressed recently (Pérez Domínguez et al. 2016). In cooperation with the EU's CAPRI model, the NIS and TBU-Agriculture, we will proceed with data and model refinements and do policy and projection analysis of the Norwegian case; see recent advances in Abadie et al. (2016); Mittenzwei (2018). A second approach in WP1 studies motivations for people's behaviour, with examples from food consumption and attitudes. March&Olsen (1995) conclude that institutional contexts influence whether individuals emphasise own benefit or that of society. Contextual motives are crucial for understanding consumers' responses to policies.

WP2 looks for effective and feasible instruments to reduce **emissions from transport and remaining non-ETS sources**. Key to impact studies of passenger and freight transport policy is to understand demand for mobility and modes (Wardman et al.,2016; Flügel et al., 2018) and what can be acceptable and just policy instruments. Strong dispute has arisen about policies to substitute biofuels for fossil fuels, both in terms of distributional and carbon footprint effects (McGill, 2015, Holtsmark, 2012; Valin et al, 2015; Torvanger, 2018). We will use updated data from the NIS, detailed import data for biofuels and the potential footprints and land use change in countries of origin, incl. Norwegian biomass, to study domestic and global impacts of current and future biofuel technologies and policies. Our research will also cover sea transport, where the knowledge frontier is moving fast due to innovative and tailored batteries for full electric and hybrid vessels. Interestingly, the Norwegian pioneering role in electrifying ferries is the product of effective collaboration among industry, finance, research, municipalities and the state. We will do innovation case studies to identify how broad coalitions can incentivise low-carbon solutions.

In **WP3** on **emissions from the ETS sector**, we analyse deep decarbonisation through innovation. Technological solutions and their marginal abatement costs have been analysed, but without an in-depth policy discussion (Fæhn&Jacobsen, 2010, Mayer et al., 2017). The ETS is the main instrument targeting these sectors. While several empirical studies have examined the effects on emissions and economic performance (Martin et al., 2016), few shed light on implications for the deployment of deep decarbonisation technologies. The reason is primarily lack of indicators. We propose two new measures (environmental expenditures in manufacturing industries and responses to tailored questions in the Innovation Survey in SSB). Contrary to Klemetsen et al. (2018)'s patent indicator we will introduce the novel indicators also in a study of Norwegian support schemes. We will also consider alternative funding arrangements in the Norwegian context; see Fæhn&Isaksen (2016); Hagem et al. (2015). Adding CO_2 pricing *on top of* the ETS price is yet another option for promoting innovation, examples are the UK ETS price floor (Edenhofer et al. 2017) and the Norwegian CO_2 tax on top of ETS in the petroleum industry. Whether they work as intended is one of our research questions.

Finally, deep decarbonisation by promoting CCS, which has become even more topical after the fresh 1.5 report from IPCC (2018), will be addressed. The subproject will build on bottom-up studies of CCS, particularly those on the current Norwegian full-value-chain initiatives (Størset et al. 2018, Oslo Economics/Atkins 2018) along with current interesting UK and Dutch projects (Turner et al. 2018). By means of detailed input-output accounts of the CCS value chain, we will integrate the Norwegian initiatives in a wider national and European model setting to study indirect and long-term spillover effects.

The projects in **WP4** that study **policies and behavioural responses in interplay** and **WP5** on **Norway in the world** are sector-overarching. They also coherently study the various governance levels. Municipalities are interesting research objects in having a double role both as policymakers *and* agents that enact on steering signals from above. This gives rise to complex processes. We have access to unique cases in the *Klimasats*[3] scheme where we will use the knowledge frontier on success factors and barriers for local transitions to a low-emission society (Armitage et al., 2007; Kasa et al., 2017) to identify possible organisational, structural and instrument design improvements.

The interplay between domestic and European instruments in the Norwegian setting is also studied, e.g. how reforms in the EU ETS transmit into Norwegian institutions and virtually all sectors. This can illustrate the importance of external surroundings for how Norway's climate policies work. Directly and indirectly through carbon, energy and commodity markets, Norway will be affected by EU's current and future policies of ETS, Effort-Sharing Regulation (ESR) and New Governance Regulation (Skjærseth et al., 2016; Jevnaker & Wettestad, 2017). Current knowledge of institutions in climate policy often focuses on macro-institutional structures (Connelly et al. 2012). Our research will fill in with knowledge about the role of micro-institutional structures such as national ministerial administrations, their structures, cultures and practices (Jordan& Schout 2006).

Inspired by the global *Shared Socio-economic Pathways* (O'Neill et al., 2017), we will study alternative climate policy packages within different projections of the global/European economy. We will also scrutinise the notion carbon-neutrality for nations in the international context (Hare et al, 2018). Norway and other countries have decided to balance emissions and sinks.[4] We will examine impacts of different operationalisations and measuring and counting challenges (cf. the consumption- production- and territorial-based principles in Barrett et al., 2013). Many experts advocate the use of multiple principles (Steininger&Schinko, 2016).

In all the scientific WPs we will also improve data, statistics and indicators from their current states, including emissions, policy instruments and responses. The state of numerical models for studying instruments' impacts will also be upgraded and linked to interfaces and documentations for easier access.

4. Research tasks and scientific methods

Methodological approaches:

The tasks of the platform require quantification and qualitative assessment. The research questions will be approached by complementary methods and nourished by active and regular dialogue with user-groups. This will help us to grasp the complexity of climate-policy development and facilitate assessment of the relative importance of various causal explanations. The scientific methods mainly consist of:

i) Empirical (ex-post) analysis of producers, households and the public sector that will provide insight into how agents behave and respond to regulations and policy instruments within specific surroundings and present barriers. Understanding historical evidence is pivotal for projecting human and institutional reactions to current and future policies. State-of-the art statistical methods are a specialty of the research teams within SSB and Frisch, who are also well experienced in survey methods and experiments. Combined with sector knowledge of NIBIO, TØI, other collaborators and user-partners, there are prospects for both high-ranking and highly relevant applied research that can guide policymaking for the next decades.

ii) Numerical (ex-ante) model analysis that relates instruments and individual responses to each other in realistic technological, economic and social structures. Complex models have accumulated knowledge from own novel and existing empirical findings. They prove to be fruitful for capturing interactions and structures in which policymaking and behavioural responses take place. Particularly, the overall impact of multiple instruments targeting, or indirectly influencing, emissions will usually require a model framework that can account for and identify interplays. Infeasibility of measures and instruments in the climate policy sphere is often arising from conflicts with other political goals (e.g. social, sectoral, regional and environmental), subjects that can be consistently studied in a numerical model framework. Since GHG emissions take place

[3] http://www.miljokommune.no/Temaoversikt/Klima/Klimasats---stotte-til-klimasatsing-i-kommunene/
[4] https://www.2050pathways.org/wp-content/uploads/2018/04/Declaration_Coalition_Neutralite_Carbone.pdf

in all corners of the society, national and sectoral targets must be studied within a coherent framework without disregarding individual and sectoral bottom-up details, barriers and opportunities.

Models for agriculture and forestry analysis: The regulations and incentives in agriculture are complex and shifts in husbandry and farming modes must be analysed within the complete, surrounding policy system of instruments and goals and the sector's physical, technological and social context. Sector models are developed for that purpose. NIBIO has access to three sector models (JORDMOD, CAPRI, Aglink) that potentially include both emission sources and sinks. JORDMOD currently includes main mitigation measures and some policy instruments. CAPRI, the main tool for EU's climate and sector policy studies, is recently been updated on its representation of Norway. CAPRI allows, *inter alia*, studies of joint policy across countries and of EU's experience with policy incentives that potentially is transferable to Norway.

Models for transportation analysis: TØI develops and uses a comprehensive set of models to calculate the effects of measures and instruments on vehicle composition, transport volume, modal split and emissions (Steinsland et al. 2018, Østli et al. 2017, Madslien et al. 2015, Vold&Jean-Hansen 2007). These include the short- and long-distance travel demand models RTM and NTM6, the vehicle demand model BIG and the freight demand models NGM and PINGO. The different models predict the total number of trips and mode-specific transport volumes both for passenger and freight transport, and hence GHG and NOx emissions, as influenced by short and long-term changes in the economy and in the energy costs.

Model for energy market analysis: LIBEMOD is a multi-good, multi-period model that covers the entire energy industry in Europe. It models 8 energy goods' extraction, production, trade and consumption in *each* of 30 European countries, incl. Norway. Prices, quantities and CO_2 emissions by sector and country are determined. The model is suited to analyse energy-related emission policy.[5]

Models for economy-wide analysis: SNOW is a Computable General Equilibrium (CGE) projection model of the Norwegian economy. It describes detailed market interactions with 40-50 production sectors, households and public consumption. Disaggregation is made with regard to grasping relevant energy and emissions impacts. It is a hybrid model where bottom-up information is integrated to represent technology shifts (Fæhn&Isaksen 2016). It is rich in its representation of existing and potential policy instruments. SNOW can be linked to a global, regionalised version for studies of cross-border interactions, like EU regulations, impacts through markets and carbon leakage and carbon footprints of domestic climate policy and responses.

iii) Surveys are particularly appropriate for gaining insight into perception and attitudes, and to reveal how attitudes and actions relate to each other, including studies of institutions such as norms and their development when time series data is utilised. The quantitative findings from surveys will often be complemented with focus group interviews to probe findings in our quantitative material (Brannen 2005).

iv) Case studies enable examining each case intensively. Our case studies will apply *process tracing:* systematic identification of the mechanisms in operation (George & Bennett 2005:147). Process tracing is helpful when explanatory factors and the outcomes are separated by lengthy time periods. We will combine information from previous research and policy documents with interviews with policymakers and stakeholders. We will benefit from our well-developed network of contacts among policymakers and researchers both in Brussels and member states. We will also use structured *comparative case studies*, i.e., the same set of general questions are posed for each case under study, thereby ensuring standardised data collection for systematic comparison. In our projects with municipalities, action research is also relevant (Eikeland, 2012).

v) Systematic literature reviews provide subject-wide evidence synthesis, summing up of the state of the art on specific subjects. Approaches include systematic reviews and meta-studies. Such reviews synthesise, but can also generate novel, insight as they can foster new perspectives on a subject or reveal relationships and analogies across phenomena and cases.

vi) State-of-the-art theories will back all the research with a main emphasis on social science theories within our main disciplines economics, political science, sociology, social psychology and technology, but with sound attention to updated natural science knowledge. From economics we will mainly exploit ideas from behavioural economics, consumer, production and investment theory, institutional economics, macroeconomics and general and partial equilibrium theory, including input-output systems. The political science analyses will draw primarily on ideas from theories on political institutions, public policy and administration, political behaviour, and political economy.

Research tasks:

[5] **LIBEMOD** 2015, http://www.frisch.uio.no/ressurser/LIBEMOD/

Within all 6 WPs, there will be collaboration across partner institutions and the scientific disciplines. We will also exploit spillovers across WPs, as numerous subprojects are linked and give complementary insight.

WP1 Net emissions from agriculture, forestry and land use (Lead: Klaus Mittenzwei, NIBIO)

WP1 will address how agricultural and forestry policy can be adjusted to generate lower emissions and enhance CO_2 uptake, alongside meeting key goals of regional development, biodiversity and food supply:

(a) We will study how the various **objectives and instruments affecting these sectors interplay**, and how the interactions are relevant for the choice of climate policy instruments for the forthcoming decades. Specifically, the use of various instruments targeting GHG emissions from agricultural processes interacts with other agricultural policies targeting goals like food and public goods provision, social and regional distribution, number of farmers/farms, land use management and the degree of national food self-sufficiency. We will analyse cost-efficiency and effectiveness given multiple goals. For this purpose, JORDMOD will be improved in several directions in order to become a consistent projection tool beyond 2020 – see **(d)** below.

A related subproject will assess policy instruments capable of abating emissions in the forestry sector. Existing regulations and societal and environmental goals, including Norwegian timber supply targets, must be seen in connection with novel climate policy designs. Furthermore, the possibility for increasing uptake in vegetation and soil of forest land and grazing fields will be addressed and seen in relation with abatement. When comes to soil, research is needed to increase knowledge about the effect of policy instruments on the adoption by farmers of management methods (e.g., improved agronomy, biochar, grassland management) for increased carbon storage in soils. A key question is how the European climate policy regulations can impact the mitigation potential of the Norwegian LULUCF[6] sector. We will interpret the European debate in light of the IPCC guidance for UNFCCC reporting and cross-sector source-sink linkages. Legal, political and natural science aspects will be assessed. This also involves looking into the potential trade-offs between short- and long-term emission reductions of the forest sector. As a backcloth to the selection and design of topical climate policy instruments, we will identify main discussions and developments in the regulatory system of emissions from agriculture in the EU.

These tasks will be addressed by researchers and statistical expertise from NIBIO, SSB, CICERO and FNI encompassing agronomic, political and economic competence. We will also involve collaborators from EU's CAPRI model experts, JRC, University of Bonn and DG AGRI. Prior to the model analyses, both CAPRI and JORDMOD will be prepared for the research questions – see below.

(b) Production in agriculture and forestry is characterised by large natural and cultural diversity giving rise to diverse land use, production modes and activity composition. This is challenging for the design of climate policies; **we will study how policies on different government levels are planned and implemented and how they interact.** In particular, municipalities administer support schemes for agriculture and, not least, the management and planning of land, including peatland regulations, along with other legal, economic and informative instruments and processes with relevant stakeholders in this sector. We will study agricultural and land management instruments in selected case municipalities and investigate their impacts on emissions as well as other local policy areas. We will assess possible barriers in terms of institutional shortcomings, lack of skills, knowledge and ineffective practices, and how they can be overcome. Moreover, different governmental bodies, -levels and sectors can have (partly) conflicting goals, such as methane reductions from agricultural production vs. self-sufficiency (increased use of grasslands for cattle). Understanding and managing such barriers, as well as identifying opportunities and possible synergies, seems paramount in programming policy instruments in climate policy. We will identify the most pressing goal conflicts across levels of governance and sectors. CICERO and FNI are main participants here.

(c) The special institutional negotiation setting in which policies are formed has implications for what are effective and feasible instruments. It is an important research issue of PLATON to **find/propose policies and measures that motivate** climate-friendly behaviour among farmers and consumers of agricultural products. In a subproject, CICERO, SSB and NORCE[7] will study how policy instruments targeted at households can be designed to be acceptable and effective. Do food practices and responses (attitudes and behaviour) to policy instruments such as taxes, labelling and other informational instruments vary with cultural variables, beliefs, values and sociodemographic variables? We will address this question by

[6] Land Use, Land-Use Change and Forestry

[7] The Group for Climate and Environmental Research in NORCE (Norwegian Research Centre AS, previously Uni Rokkan), organises the Norwegian Citizen Panel, a survey that is closely related to CICERO's ACT project.

analysing data from two sources. The ACT project in CICERO surveys public responses to climate policies and provides unique time series survey data that builds on a theoretical framework integrating theoretical perspectives from social psychology and institutional economics. The survey includes food practices and norms, opinions and beliefs about meat production and consumption, and attitudes towards policies to reduce meat consumption. We aim to combine these data with actual behaviour from transaction data on food sales. The food sales data will be organized and quality-checked in a separate subproject – see **(d)** below.

(d) Finally, PLATON will put efforts into refining the tools of **measurement and modelling** of the emissions and uptake within and related to agriculture and forestry, as well as data and parameters on instruments and potential responses, *inter alia* from the ACT survey data. Estimates for GHG emissions from the main agricultural products per unit energy (calorie) of final consumption and the accounting of sinks in the LULUCF sector, including soil carbon storage, are among the most uncertain in the statistics. PLATON will contribute to better statistics and measurement methods and has the best qualifications for knowing the information gaps and methodological possibilities; our experts already contribute to data surveys, data matching and international development of monitoring methodologies both within IPPC, Eurostat and UNFCCC via roles in NIS, in TBU-Agriculture and in TBU-Climate.

One caveat that affects the quality of emission statistics is that we have little information on where wholesale and detail traders sell their oil products. Sector-wise combustion, including that of agriculture and forestry, is therefore uncertain. We will look into what e.g. transaction data and tax data can tell us in this respect. Another field where transaction data can add new knowledge concerns food consumption. We will study sales slips data that are accessible to SSB from 2-3 large supermarket chains. The aim of this subproject is to investigate whether the data can help identifying climate-relevant behaviour of different households, like the amount of meat consumption, the willingness to pay for local versus transported and imported food, the use of packaging waste and plastic bags, etc.

More solid data and statistics from the tasks above improve the starting point (base year) for projections to 2030 and 2050 (see **(a)**). Statistics from MDIR, SSB and the Norwegian Agricultural Agency will be involved. Combined with expert knowledge inter alia collected in MDIR's Klimatall database, the projection tool will include potential mitigation measures for agriculture and forestry for the next decades. For studies of ESR and joint EU/Norwegian initiatives, efforts will also made to further develop Norway in the CAPRI model. All these development tasks involve both economics and agronomy at NIBIO, SSB and CICERO in addition to colleagues in JRC, University of Bonn and DG AGRI.

WP2 Emissions from transport and remaining non-ETS sources (Lead: Tanu Priya Uteng, TØI)

The lion's share of emissions from outside the ETS (*non-ETS*) stems from energy use in domestic transport and in other small-scale combustion, e.g., for heating and waste incineration. Transport makes up more than 1/5 of Norway's CO_2 emissions, and the share is set to increase. We will study abatement options, and instruments to incentivise them, within passenger and freight transportation, with emphasis on road and sea. In addition, we will analyse policies for reducing emissions from waste incineration and deposits.

(a) In this WP, most resources will go into analysing **emission reductions from land passenger transport**, which constitutes the largest emission source of the sector and where political ambitions for a rapid shift from fossil-fuelled engines are high. We will consider promotion of vehicles using alternative energy sources, policies that reduce mobility demand and the role and challenges of public investments depending on administrative level, geography and population.

The last decade's rapid electrification of the Norwegian private car fleet is an interesting subject for studies of policy impact and individual behaviour. A diverse package of policy instruments has been implemented for this shift. Frisch, TØI and SSB have databases of administrative microdata registers, policy instruments, ELHUB[8] data and sociodemographic information. If so decided, the yet unassigned budget can be used for econometrically studying how they performed in concert and individually and also trying to identify learning and technological change domestically and internationally.

An important research question is how the different instruments that have been used or potentially can be used are acknowledged and accepted by the population and decision makers. While the most potent climate policies for shifting passenger transportation modes tend to be restrictive ones like access restrictions, taxes, road pricing, redistribution of road space, they are inherently politically unpopular. What is the role of alternative modes of recycling tax revenue, and how can instruments be combined? Distributional impacts of transport policy instruments and measures are closely related to the question of acceptance. If policies are

[8] Detailed data from the recent roll-out of digital meters for registering electricity use.

implemented without understanding their impacts on different geographical/spatial contexts or population groups, abatement effects can be miscalculated and political feasibility overestimated. In a first phase, we will by means of literature reviews, surveys and interviews sum up the existing knowledge on attitudes and normative barriers to instruments and synthesise the policy implications. In phase two, we will do a meta-analysis of the barriers and opportunities of instruments explained by their distributional characteristics. The data will be taken from National Travel Surveys, spatial, geographical and demographics data. The ambition is to build on existing GIS-based tools (like INMAP[9]) to analyse spatial aspects. This comprehensive project will be led by TØI and involve other external national and international research and user partners.

(b) A much-disputed issue when comes to novel energy sources for vehicles is the use of **biofuels of current and future generations**. In the shorter run, the Norwegian consumption of biofuels will have to rely on imports. The challenge is to ensure sustainability. The disagreement among researchers' conclusions on whether these policies will help to combat climate change or vice versa leads us to approach this unsolved issue econometrically. By scrutinising imports data, we will assess the impacts of the recent years' reforms of the certification directives on carbon footprints and land available for food production.

In the longer run, the ambition of the Norwegian government is to scale up the use of domestically produced forest biomass and gradually phase out imported biofuels. There is still a large knowledge gap before reliable calculations can be made of the innovation potential and cost projections as well as of the global carbon footprint of utilising harvested wood products. We will apply economic dynamic innovation theory and numerical models that combine forestry and transportation systems to analyse if there is a potential for scaling up the use of forest biomass in Norway, and at what time scales, carbon prices and forest management regime climate benefits can be expected. In particular, this subproject will address how Norwegian biofuels policies should be designed to reach technological solutions for exploiting domestic biomass for transportation biofuel. This subproject is led by NIBIO and SSB. It is related to projects WP1 and the work will be coordinated across the WPs and with several consortium partners contributing.

(c) Compared to emissions from passenger transport, policies and incentives have been far less effective in **abating freight transport emissions**. Even if heavy freight vehicles (above 7.5 tonnes) are not subject to purchase tax and the fuel tax and road toll incurred are far from internalising all external costs, the design and implementation of fiscal incentives are not nearly as simple as in the passenger car case. The problem is compounded by the fact that road freight is a competitive international industry; hence, the government cannot tax Norwegian vehicles much differently from foreign ones. An important challenge is to shift freight transport from road and over to rail and sea. Led by TØI, in cooperation with national partners within (FRISCH and IFE) and outside (the MoZEES FME Centre), we will develop microeconomic cost models for heavy duty trucks with the purpose of establishing critical conditions for battery or fuel cell electric trucks to attain competitive total costs of ownership. As a part of this study, it will be pivotal to assess the impacts of targets and policies in the EU. A second subproject will review the literature and performed surveys to synthesise the knowledge frontier on the use and performance of instruments targeted towards freight by road, including access restrictions, tolls and duties, compulsory city logistics schemes, border crossing taxation, etc. See also the related **(a)** above. We will in this context have the possibility (depending on the yet unassigned budget) to utilize data from 60 different toll-bar projects for studies of different road-pricing designs, rates and locations and how they impact freight transport.

(d) The Norwegian competencies and industrial clusters in the marine, fishing, and petroleum sectors indicate that a future competitive advantage can be gained for Norway in **decarbonising shipping**. Freight and passenger transportation, supply ships and fishing vessels are key economic activities given the long coastline and our continental shelf. Over time, low-carbon shipping technologies and infrastructure can become commercial and a viable export industry. Currently two battery ferries are in operation, and many more will be commissioned over the next few years as joint initiatives of business partners, researchers and local and central government. Innovation case studies will identify how new technological solutions can be incentivised, developed and deployed, dependent on government policy framework. Norway could position as a first mover on green innovation at sea. This subproject will sum up the technological state of the art within low-emission local and medium-distance shipping, including fuel-cells and hydrogen, battery operation, and hybrid technologies. PLATON will explore the potential for broad collaboration, different designs, and impacts on risk allocation. CICERO, TØI and NMBU will be main partners in this subproject.

(e) Even if small, in isolation, there are a number of **other non-ETS emission sources** where abatement measures are feasible but where incentives are still not well developed. Waste recycling, recovery and reuse

[9] INMAP is a Geographic Information System (GIS)-based tool to plot the land-use and transport interactions

is addressed by the proposed Circular Economy Package from the EC. A couple of Norwegian cases will be addressed in PLATON. First, even if much is obtained in the waste sector with the landfill ban from 2009, waste recycling incentives are part of the toolbox of municipalities, *inter alia*, via the support scheme for climate-friendly municipality initiatives, *Klimasats*[10]. In case studies and in-depth interviews, CICERO and INSAM will look particularly into recycling and reuse projects that have been granted support.

Second, a potentially much larger abatement initiative in the waste sector is on the agenda: full CCS value chain plans for the waste incineration plant Klemetsrud/Fortum. Emissions from the plant are about 300 000 tons of CO_2 yearly. PLATON's ambitions for assessing indirect effects and learning effects from this project, as well as from the contemporary CCS initiative in the cement plant Norcem/Heidelberg is presented together in more detail in WP3.

(f) Making tools for **measurement and modelling** of emissions and policy impacts in the transport field will, first of all, involve the development of model interfaces for the key transportation models at TØI, availability of modelling experts and documenting. For studies of climate policy instruments, the travel, freight and vehicle models at TØI can be linked to sub-models to combine (a) taxation, regulation and public infrastructure provision with (b) transport and vehicle demand behaviour and (c) emissions. These can be further linked to economy-wide models (see WP4).

Underlying data organised and systemised for the research projects presented above will also be made accessible, like, data from surveys and toll bars, regionally distributed GIS-based data on use of policy instruments, ELHUB-data relevant for the electrification of vehicles and data on import of biofuels. Estimates of the emissions from domestic shipping and fishing are riddled with large uncertainty, and we will delve into the different available sources to get a better grasp on why there are large discrepancies and contribute to better estimates.

Further, we aim at building a systematic knowledge base for effects of transport policy measures. It will encompass total transport demand and be split on modes of transport with associated energy and emissions, including GHGs. Natural points of departures will be the measure analyses (Klimatall) of MDIR and the tiltak.no web portal for transport policy measures at Vegdirektoratet, both developed together with TØI. We will aim at supplementing the bases by collecting individual pieces of evidence from the European and global knowledge frontier on how transport policy measures impact total demand and transport mode choice and how this, again, affects energy use, pollutants and emissions. The objective is to consolidate and synthesise this existing evidence in ways that make it relevant and applicable for Norwegian contexts.

WP3 Emissions from the ETS sector (Lead: Elisabeth Isaksen, FRISCH)

EU ETS covers GHG emissions from the Norwegian process industries and petroleum extraction and refining. Even if Norwegian energy use is mainly electricity-based, process industries are significant emitters due to non-energy emissions of CO_2 and other GHGs. Abating process emissions could render the Norwegian energy-intensive industries competitive in a future low-emission world. WP3 will delve into a variety of instruments that have already been introduced, or that can be new future options. We will look at policies that are primarily rigged for domestic, near-term abatement of GHGs and those designed for longer-run or more global mitigation purposes through spurring green innovation.

(a) ETS pricing is the primary working horse for GHG abatement within EU's and Norway's energy-intensive manufacturing. In a well-performing ETS, cost-effective abatement options are likely to be picked by the market agents. However, unless agents have confidence in the system, investments and innovations can be deterred (Fæhn&Isaksen, 2016). An econometric project in PLATON will analyse the impact of the EU-ETS on technological change, a still scarcely studied topic in the literature, particularly when it comes to investments in climate technologies. Even if the ETS price has been low until recently, carbon markets can still have stimulated clean innovations if expectations of higher prices are prevalent. We will examine effects of the EU ETS on various aspects of the innovation process simultaneously: *input* (R&D expenditures), *output* (patent applications) and *diffusion* (environmental expenditures in manufacturing industries and responses on The Innovation Survey in SSB/NIFU, where we can also insert tailored questions). All datasets will be merged with firm and establishment level variables and characteristics. We will exploit different types of discontinuities across industries, firms and establishments, such as permit allocation rules (which vary with the degree of trade exposure and energy intensity), and coverage of the EU ETS (where plants below certain capacity thresholds are excluded) to identify and isolate effects. In addition, the development

[10] Klimasats is a scheme conducted by KLD to support projects for GHG mitigation and low-emission transformation in municipalities and counties.

of ETS prices has significant indirect effects on the whole Norwegian economy and a number of other societal objectives – issues that we will address in WP4 with experienced empiricists at Grantham/LSE.

Another interesting topic is whether 'double regulating' ETS sources, i.e. pricing CO_2 on top of the ETS price, has the effect of spurring innovation and planning ahead for a low-carbon transformation. The Norwegian case is the additional CO_2 tax on top of the ETS price in the Norwegian petroleum industry. How costly are additional CO_2 prices, what are their short-run abatement impacts and can we see indications of a faster transformation than in non-targeted areas/sectors/firms? Another interesting case to learn from is the UK price floor, which implies that under a certain ETS price level, a domestic price add-on sets in. We will approach the cases of double-regulation both from a political science and economic perspective, by applying theory and collect evidence through econometric studies of undertakings, simulations, studies of documents and in-depth expert interviews with industry actors, governmental actors and experts.

(b) We will compare findings from the ETS study above with effects induced by **direct support schemes aimed at promoting innovation**. The comprehensive data base (collected in SSB) in Klemetsen et al. (2017) includes support to firms from ENOVA, Skattefunn, direct RCN funding and subsidies from Innovation Norway, and it links the information to the firms' emissions and economic performance, including innovation measured by patents. This subproject will contribute by linking the data to diffusion measures as above, arguing that these are better indicators of actual decarbonisation. A complementary approach is to study experience from the NOx-fund to indicate impacts of an analogous, not yet established, climate fund. This research question may also be addressed by means of SNOW model simulations, e.g. by using behavioural response estimates based on NOx-fund data. The model will be rigged to account for several potential technological transformations in the process industries that are yet not profitable or implemented, including substitution to bio, hydrogen-based solutions and CCS. Bottom-up costs and abatement potentials will be collected from MDIR, Oslo Economics&Atkins (2016), and ongoing projects at our partners in U of Graz, JRC, U of Strathclyde (see Section 3). This subproject has links to WP4, **(c)** and **(d)** below.

(c) The Norwegian government is currently supporting two pilot CCS projects with the intention to develop **full value chain CCS** by 2022: cement production in Brevik (Norcem/Heidelberg) and waste incineration in Oslo (Klemetsrud/Fortum). Given motivations are: (i) the low-carbon transformation requires testing and investments already now to achieve necessary cost reductions and technological robustness, including safe storage, (ii) pilot projects are cost-reducing not only for the plants at hand, but will have spillovers to other future projects in Norway and elsewhere, (iii) Due to Norway's clean power, cement production, along with waste recovery, are industries with a long future in Norway. (iv) CCS may be a central solution to obtain negative emissions via capturing and storing CO_2 from bioenergy plants.

Based on reviews and bottom-up studies of CCS we will generate detailed input-output accounts of the CCS value chain(s) and integrate them in a wider national and European setting, using the integrated country-global SNOW model – see *methodology* above. The purpose is to simulate indirect impacts on the Norwegian economy through adjacent activities and international trade – also including new goods and services like hydrogen, storage capacity under the Norwegian shelf and CO_2 for Enhanced Oil Recovery. The cost-benefit analysis of such projects will rely on external factors, and we will make sensitivity analysis to identify main caveats and success factors.

Lack of incentives for industry to engage in CCS, and thus dependency on government support, is a major caveat. Norway has shown its willingness to be a first mover on CCS. Another caveat, however, is limited interest of other European countries to engage in CCS development and deployment. CCS development and deployment depends on broad coalitions between industry, research and government, so PLATON will explore various designs of collaboration and their potential, as well as effects on risk allocation. We will span out the scope for spill-over effects to and from other ongoing CCS projects in Europe (Port of Rotterdam and the Liverpool-Manchester Hydrogen Cluster). We will benefit from our partners' network and expertise on the UK and Dutch CCS initiatives and experienced CGE model communities at U of Graz, U of Strathclyde and JRC. Finally, several of our user-partners have valuable data, networks and expertise, including *Norsk industri*, *OED* and *FIN*.

(d) Tools for measurement and modelling of emissions and policy impacts in the ETS sectors will rely on bottom-up sources of costs and abatement potentials, as well as the databases on policy measures mentioned in the subprojects (ETS, CO_2 taxes, support schemes). We will also aim at developing indicators that can be used to suggest whether the ETS industries are on their way to the low-emission society. The country model version of SNOW will be the main relevant model tool for studies of this sector. Expertise, documentation and interfaces will be developed; see also WP4. The subprojects in WP3 will involve FRISCH, SSB, FNI and several of our national and international research partners and user-partners.

WP4 Policies and behavioural responses in interplay (Lead: Taran Fæhn, SSB)

The low-emission transition will involve most parts of the society. *WP4* will integrate the findings from the previous WPs and study issues that need a holistic perspective. This includes analysing the societal, economy-wide context of individual instruments in interplay, sectoral policy goals, division of labour of various administrative levels and summed effects of individual responses.

(a) Studying the Norwegian energy and climate policy targets for 2030 and 2050 will require **a holistic view on numerous specific and generic instruments and goals**. The effectiveness and cost-efficiency of the policy system will depend on other societal priorities. The fact that many of Norway's climate policy targets and instruments are common with the EU narrows the scope for national policymaking. Not only does the ETS price directly affect emissions; EU's ESR will shortly apply to the Norwegian non-ETS emissions. While WP5 will go more deeply into how the ESR and the ETS directly affect Norwegian policies and economy, this WP will primarily delve into the indirect impacts via the interlinked European/Norwegian energy markets. Several energy and environmental goals can be in conflict, e.g. industrial competitiveness vs. emission mitigation, energy affordability vs. export revenues, national vs. global abatement. A tightened ETS market will for instance increase energy prices and have distributional impacts across the Norwegian economy. Central and regional administrations, energy producers, energy-intensive industries and other energy consumers will be differently influenced by ETS price variation and other energy and climate policy changes. We will map relevant interplays among instruments and distributional consequences. By means of SSB's SNOW model, we will compute impacts of shifts in the EU-Norwegian policy on sectors and emissions and discuss policy implications. A string of interviews will also be carried out here. We will benefit from user competence in NVE, OED and FIN.

Along with the international commitments and Climate Act targets, the Parliament has agreed to make Norway climate-neutral by 2030. Neither for the globe as a whole or for single nations are these ambitions well-defined. In the Norwegian case, white papers have indicated that forests, CCS (cf. WP3), oceans, quota trading and/or project-based cooperation be part of the solutions for achieving a greenhouse gas balance. One of PLATON's subprojects will scrutinise possible and reasonable operationalisations and their macro-economic cost implications. We will study the discussions of the balance concept and operationalisation in other nations (New Zealand and Ireland) and, also, assess the relevance of going beyond limits set by the frameworks of UNFCCC and EU, including different ways of counting emissions under the consumption and territorial principle, where the global SNOW model can be used. SSB, CICERO and FNI will be involved.

(b) This subproject will take a holistic view of the toolbox of municipalities and discuss **how purposes and instruments in some cases give mutual synergies and in others tend to be counteracting**. Moreover, the state, county and municipality levels of governance interact, also with potential mutual synergies or counteracting plans and instruments. Municipalities are simultaneously local policymakers *and* agents that enact on steering signals and requirements from state and counties. However, the impacts of their actions as agents (e.g. through responding to the *Klimasats* scheme) will depend on how they as policymakers design their instruments and measures vis-á-vis local firms and inhabitants. By using the network of our partner INSAM, we will select case studies that illustrate synergies and trade-offs, e.g., in the fields of mobility as a service and citylogistics. CICERO and INSAM will conduct qualitative interviews of municipal, county and state level officers and politicians as well as of relevant stakeholders. As supplement, focus group studies that include relevant actors will focus on possible barriers for implementing instruments and measures and identify possible improvements in the multi-level governance processes.

(d) One task for ensuring **access to data and measurement/modelling tools** in WP4 will be to process the data on the Klimasats projects in order to make relevant and useful information available on issues like abatement potentials in different types of measures, distribution of expenses, staff involved, etc. The WP will also provide the SNOW model as an openly and nationally available resource. Our proposals are to make SNOW fit for studies of how the yearly national budgets affect GHG emissions through numerous emission sources and several, partly overlapping or counteracting, policy measures; to refine the representation of energy-emission links and physical vs. economic variables; update estimates of marginal abatement costs and public infrastructure representation and based on previous WPs, take into consideration how agents' behaviour can deviate from conventional rationality assumptions by being myopic, dependent on social settings, risk-averse, etc. By means of PLATON's experts, training of stakeholders and up-to-date documentations and instructions, PLATON will establish a SNOW model interface for involved users.

WP5: Norway in the world (lead: Jørgen Wettestad, FNI)

As a small country with an open economy, Norwegian GHG emissions and climate policy cannot be studied in isolation. As already illustrated, Norway has international commitments and repeatedly enters new negotiations. The main processes take place within the UNFCCC framework, including the 2015 Paris Agreement, and within the framework of the EU cooperation. Along with such direct impacts on Norwegian abatement and policy design, indirect impacts from abroad works through numerous market interactions, political and social networks. Changes in external conditions can often influence Norwegian emissions far more than domestic circumstances. Strong interlinkages to the rest of the world also make carbon leakage and carbon footprints abroad topical. Finally, Norwegian decision makers can learn from others' experiences. We aim to identify cases for relevant knowledge transfer across countries.

(a) Norway's international commitments have different details of operationalisation and firmness in terms of experience and precedent. The ESR is yet under development and its outcomes and implications for Norway are highly uncertain. Critical questions are to what extent and how the ESR and its flexible mechanisms will influence Norwegian possibilities to achieve policy goals in the non-ETS sector and how Norwegian diverting sectoral interests will be met. We will address these issues both by studying the legal and political processes taking place, drawing upon FNI's and CICERO's well-developed network of contacts with leading European researchers and policymakers, and by partial and general modelling of different flexibility scopes and mechanisms. Models at TØI, SSB and FRISCH will be employed. SNOW is fit for studying the interplay between ETS and ESR and across ESR sectors. LIBEMOD can provide bottom-up details for the impacts in European energy markets. See also WP2 and WP4 above. For agriculture and forestry, a pivotal issue that we will address (see WP1) and that is not yet settled is how the regulations and accountability for LULUCF measures are to be implemented and practiced in Norway.

EU's newly adopted Governance Regulation framework is to be an overarching EU structure of the various aspects and regulations of GHG emissions and energy issues. It represents a new form of governance aimed at helping the EC improve its monitoring of climate and energy targets within five dimensions: energy security, energy markets, energy efficiency, decarbonisation, innovation and competitiveness. FNI and CICERO will assess implications for Norwegian actors, incl. governmental, based on interviews with EU policymakers and input from well-informed research partners. For all European cooperation, there may be discrepancies between Norwegian and EU interests and goals, e.g., in the LULUCF sector. WP1 and WP4 will particularly address discrepancies between the European, national and regional administrative levels.

PLATON will take Norway's *Nationally Determined Contribution – NDC* pledged in the Paris Agreement as given in the medium term. Long run impacts of the COP agreements can be analysed by means of the yet unallocated 20% of the budget, if so is decided.

(b) Effects of instruments are highly dependent on the specific **international conditions and markets**. We will look carefully into how the effectiveness and macroeconomic costs of domestic policies will rely on external conditions. Part of the purpose with this subproject will be to investigate the sensitivity of national abatement costs and their distribution to a range of uncertain, but plausible assumptions for the next decades, including demographic, technological, world-economic and global political developments, as well as the social and normative assumptions on behaviour of consumers, producers and governments. We will build on previous partial and economy-wide studies of Norwegian abatement costs and on updated knowledge from the analyses of all the previously presented WPs on behaviour and barriers. A main working horse in this subproject will be the CGE model SNOW at SSB.

(c) A subproject will assess the emissions impacts when accounting cascading and linked **effects on emissions within and across national borders**. CICERO and SSB will count emissions under the consumption, production and territorial principles. Within the different perspectives, a footprint classification will be made of consumer goods. Further, we will assess the significance of the choice of counting methods in studies of policy instruments with diverse impacts on consumption of single commodities, and on the consumption patterns of households by using the country-global SNOW version for grasping cross-border carbon footprints. Cf. also WP1, where lifecycle perspectives are applied for biofuels and meat.

(d) Several of the subprojects described above compare the Norwegian case with **experiences abroad and transfer of knowledge** is considered. Impacts on competitiveness and costs of Norwegian climate policies will, e.g., rely on policies and targets of other countries, not least in the EU; see WP1, WP2 and WP4. In WP3, we will look particularly into UK and the Netherlands in the analysis of CCS, as well as the UK price floor experiences. Examples of countries that are operationalising their climate neutrality targets will be assessed, like Ireland and New Zealand. In relation to **(a)** above we may, if part of the unassigned

budget is so targeted by the Board, do a comparison with Germany and/or Sweden, to see if there is anything to learn for Norway in terms of the implementation of the new Governance Regulation framework.

(e) Resulting **knowledge tools to share** from this WP will primarily be based on our surveys of international experiences. These will be systematised and made accessible in a joint effort by all partners.

WP6 Communication and user involvement (Lead: Christian Bjørnæs, CICERO)

WP6 will deliver on the *communication objectives* in Section1. A team of highly skilled and experienced communication experts from the main research partners will ensure that the project delivers the expected impacts through dissemination, communication, media work and measures to promote stakeholder engagement. The key outcomes and outputs from the other WPs will form the basis for the preparation of activities and materials in WP6.

(a) Establishing a communication strategy and platform implies an intensive first phase for WP6. A kick-off seminar with the whole consortium of main partners, national and international research partners and user partners will mark the start-up of the collaboration. A dissemination and communication strategy will be delivered, which will be the starting point for annual workplans. We will also develop a partner need assessment and an appealing visual identity for PLATON. Our presence in social media will be established, utilising our research and user partners' follower base on Twitter, Facebook, and LinkedIn. PLATON's web platform will be technically established; within a year's time we expect it to be fully functional as a one-stop shop for knowledge about climate policy instruments and impacts.

(b) The web platform will gradually be filled with content. It will include all produced and synthesised knowledge from the scientific WPs, as well as updated information on PLATON's activities and their results. Besides representing the knowledge frontier on national and international findings, it will present relevant and improved data, statistics and indicators as well as introductions to technical tools and models for analysts that wish to use them in own assessments. Given the overall aim of helping policymakers to develop instruments and report about measures and achievements, main target groups will be central and local public administration and politicians. Ministries, public agencies and municipalities are user partners and we have close contact with other key actors, including MDIR. A section will be dedicated to results from data, measuring, estimates and modelling work as a basis for impact studies of climate policy instruments.

More broadly, the platform will target everyone with interests in policymaking, emissions, and political and societal climate-related processes. These include business and industry, various sector interests, public audience via e.g. media and schools, and researchers and analysts. The website will, thus, contain both in-depth information (scientific, methodological and technical) and easily accessible popularly written articles, social media posts, op-eds etc. The website will be visible and up-to-date and direct users to relevant material and contact persons. We will disperse through many channels, incl. magazines, social media accounts and the websites of our research and user partners. Links will be set up to related project sites and info channels like tiltak.no and SSB.no. The main research partners have excellent and well-established channels for public outreach. Together these institutions have 26.000 followers on Facebook and 23.000 followers on Twitter and reach millions of internet users annually. We will also disperse through CICERO's well-established newsletter KLIMA (8.000 subscribers), SSB's publication series, as well as work closely with NGO user partners such as Norsk klimastiftelse, Zero, Sabima and Framtiden i våre hender to spread articles and news and to organise seminars and meetings for the public in cities such as Bergen, Trondheim, Stavanger and Tromsø. We will also encourage all user partners in jointly publishing and sharing content from PLATON in their own digital channels.

(c) Active involvement of user partners, stakeholders, decision makers, civil society and the research community will form the other main communication line of PLATON. Four main groups will have priority: **i.**Policymakers and public administration, **ii.**Industry and business, **iii.**General public and **iv.**Researchers. Our Board of Partners consists of representatives from all these groups. It will influence PLATON's direction, not least through allocating the residual 20% from RCN. Users have already been actively involved in the proposed research program. We will arrange open as well as more tailored bilateral meetings and seminars; given the broad nature of the platform, we do not expect all user partners to give equal priority to all aspects, research questions and work packages. We will seek to involve partners more deeply in questions relevant to their own sector. All user partners contributing cash will be offered at least one workshop each to discuss climate policy measures relevant for their work. In addition, PLATON will provide open arenas such as breakfast seminars and public meetings to facilitate open debates in different parts of the country. We value disputes and the visibility of opposing arguments about policy choices among researchers and stakeholders.

i. We have direct contact with policymakers in our networks and via solid representation in TBU-Climate (Fæhn, Kallbekken, Madslien) and TBU-Agriculture (Kallbekken, Hagem, Søgaard and Høie). We will engage in public hearings and have a hotline for advice on urgent matters. **ii.** For contact with business and industry, close collaboration with existing and potential business- and innovation-oriented national projects are crucial. We participate in several, like FMEs: MoZEES, CICEP, CREE, CenSES, and potentially ENABLE, TREAT, INCLUDE, KPNs: 255077,280989 and LAVUTSLIPP2030 projects: 281109, 281113, 280390, 280989. We will visit private sector user-partners and arrange seminars and debates on desired subjects of common interest. **iii.** For outreach to civil society, the collaboration with NGO user partners through joint communication activities and products and sharing of knowledge, is key. Schools and media will be approached. **iv.** We will include national researchers by inviting to seminars/conferences and exchange knowledge, findings, methods, data. See also Section 2. We collaborate on several projects across Norway, as well as across borders and expect contributions to the international frontier in publications and conferences. For dissemination details, see form.

Part 3: Administrative organisation and progress plan

5. Organisation

Scientific cooperation: The main partners CICERO, SSB, TØI, NIBIO, FRISCH and FNI have complementary expertise that enables the consortium to cover research and analysis on all emission sectors and impacts of policy from different scientific angles and methodological approaches. The research questions and tasks are organised in WPs, where the first three cover the emission sectors, WP4 takes and overarching perspective on sectors' and agents' interaction, while WP5 looks across national borders. WP6 coordinates communication tasks. The main partners head one WP each according to their specialities, however all WPs integrate the competence of the other institutes. Moreover, we will exploit spillovers across WPs, as numerous subprojects are linked and give complementary insight. This is a truly inter-institutional and inter-disciplinary research programme, since we find that pivotal for providing nuanced knowledge on complex topics to policymakers and society at large. NIBIO has competence in agriculture, forestry and land use and TØI in transportation with various approaches. SSB, FRISCH and CICERO have more generic sector competence, but cover different approaches, including economic modelling, econometrics, survey analysis and qualitative approaches. FNI has solid experience in studies of EU policy and disciplinary strength within political science and law. We supplement our disciplines with other national and international research partners, primarily within technology (IFE), anthropology/geography (SUM), cultural aspects (NORCE) and innovation theory and management (INSAM).

Role of user partners: Crafting a feasible, more effective climate policy requires the understanding of how actors will react, decide and behave in response to instruments in the context they are introduced. Users in PLATON are engaged in or affected by policy decisions; see also Section 2. Their perspectives and information can, in combination with academic approaches, generate new insights and research questions. We appreciate the opportunity to assign 20% of the budget to ideas from such dialogue. The Board of Partners will meet 1-2 times a year. It will represent all users. We are, frankly, overwhelmed by the positive feedback and must consider how to organise nearly 30 stakeholders. In the contracting process, we will be better informed about each user's expectations. One solution is to have a 'general assembly' that picks its representatives. The Board will decide upon the unallocated budget as well as other administrative and strategic issues. CICERO, FRISCH and SSB have experience with FME management that will be valuable.

Coordination and administration: The WP leaders Mittenzwei, Priya Uteng, Isaksen, Wettestad, Bjørnæs along with the project manager Fæhn and co-manager van Oort will form the platform leadership. As can be seen from the CVs, this constitutes a sound combination of competence, experience and gender. Fæhn is an experienced project manager, has strategic and personal responsibility for a research division of 12 persons and has also lead interdisciplinary teams. The WP leaders will organise 5-8 subprojects, headed by subproject leaders (see list in form and CVs) and follow up user interests in their WP. The leader group will meet regularly and cooperate closely. Workshops with teams from different projects will be arranged to ensure spill-overs across subprojects and WPs.

6. National coordination, dissemination, communication and data management

National research coordination and cooperation by means of our network, active establishment of meeting points and open access to the web platform is described in Section 2.

Data Management Plan is attached. Data will be stored, handled and reused in accordance with FAIR principles and GDPR regulations. Securely anonymised data will be accessible on PLATON's website.

Dissemination and communication is described in WP 6 and a more detailed dissemination plan attached.

7. International cooperation

We will collaborate and co-write with world-leading international researchers; see Section 3, list of partners in the form, LoIs and CVs. Our scientific workshops will include top researchers from the fields, picked from inside and outside the consortium. We will actively expose our approaches and findings to experts in conferences, review processes and journals. Interacting with the research frontier will safeguard the quality of our results and make sure that we build on the most recent knowledge. Our presence at the research frontier is also ensured by having Kverndokk, Wettestad and Boasson as authors in 6th IPCC AR.

8. Gender equality

The project manager is female, as are 50% of the WP leaders. The project encompasses app. 30 researchers, of which 40% are women. Our international and national partners also are fairly on balance.

9. Progress plan with milestones

See the form's progress plan with milestones. The form's dissemination plan includes deliveries.

10. References

Abadie, L.M. et al., 2016, Using food taxes and subsidies to achieve emission reduction targets, *NorwayJournal of Cleaner Production*, 134: Part A,280-297. **Armitage** D., F. Berkes, N. Doubleday, 2007, Adaptive Co-Management: Collaboration, Learning, and Multi-level Governance, Univ. British Columbia Press, Vancouver. **Astrup**, R.et al., 2018. A sensible climate solution for the boreal forest. *Nature Climate Change*. **Barrett**, J. et al., 2013, Consumption-based GHG emission accounting: a UK case study, *Climate Policy*, 13:4, 451-470. **Brannen**, J., 2005, Mixing methods: The entry of qualitative and quantitative approaches into the research process. *International Journal of Social Research Methodology*, 8:3, 173-184. **O'Neill**, B. C et al., 2017, The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century, *Global Environmental Change* 42, 169-180. **Connelly**, J.et al. 2012, *Politics and the Environment: From Theory to Practice.* London: Routledge. **Edenhofer**, O.et al., 2017, Decarbonization and EU ETS Reform: Introducing a price floor to drive low-carbon investments, *Policy Paper*, Merkator research institute **Eikeland**, O., 2012, Action research and organisational learning: a Norwegian approach to doing action research in complex organisations, Educational Action Research, 20:2, 267-290. **Flügel**,S., N.Fearnly, J. Toner, 2018, What factors affect cross-modal substitution? – Evidences from the Oslo Area. *International Journal of Transport Development and Integration*, 2:1, 11-29. **Fæhn**, T., K. Jacobsen, 2010, Klimapolitikk og klimavennlige teknologier - ingeniørkunnskap i en makromodell, *Økonomiske analyser* 5, 11-16. **Fæhn,** T., E.T. Isaksen, 2016, Diffusion of climate technologies in the presence of commitment problems, *Energy Journal* 37:2, 155-180. **George**, A. L, A. Bennett. 2005, *Case Studies and Theory Development in the Social Sciences*, Cambridge, MA: MIT Press. **Hagem**, C., M. Hoel, B. Holtsmark, T. Sterner, Refunding Emissions Payments, DP Resoruces For the Future 15:05. **Hare**, B. et al, 2018, New Zealand's zero Carbon Bill – getting the Paris Agreement right, *Climate Analytics* 17/17/18. **Holtsmark**, B., 2012, Harvesting in boreal forests and the biofuel carbon debt. *Climatic Change*, 112 :2, 415-428. **Jevnaker**, T, J. Wettestad, J., 2017, Ratcheting up carbon trade: the politics of reforming EU emissions trading, *Global Environmental Politics*, 17:2, 105–124. **IPCC**, 2018, *Global warming of 1.5 °C, Summary for policymakers*. **Jordan**, A. A. Schout, 2006, *The Coordination of the European Union: Exploring the Capacities of Networked Governance*. Oxford, UK: Oxford University Press, **Kammann,** C. et al., 2017, Biochar as a tool to reduce the agricultural greenhouse gas burden – knowns unknowns and future research needs *Journal of environmental engineering and landscape management*, 25:2, 114-139. **Kasa** S., H. Westskog and L. E. Rose. Municipalities as Frontrunners in Mitigation of Climate Change: Does soft regulation make a difference? *Environmental Policy and Governance* 28.2 (2018): 98-113. **Klemetsen, M.** et al., 2018, Can Direct Regulations Spur Innovations in Environmental Technologies? A Study on Firm-Level Patenting, *Scan J Econ*. 120/2 338.71. **Madslien** et al., 2015, Nasjonal godstransportmodell. En innføring i bruk av modellen, TØI Report 1429, Institute of Transport Economics, Oslo, **March**, J.G., J.P. Olsen, 1995, *Democratic Governance*, New York: Free Press. **Martin**, R., M. Muûls, J. W. Ulrich, 2016, The Impact of the European Union Emissions Trading Scheme on Regulated Firms: What Is the Evidence after Ten Years? *Review of Environmental Economics and Policy.* **Mayer**, J., G. Bachner, K.W. Steininger, 2017, Macroeconomic implications of switching to process-emission-free iron and steel production in Europe. *Graz Economics Paper*, 2017. **McGill**, B., 2015, Biodiversity: Land use matters. *Nature*, 520(7545), 38-39. **MDIR**, 2015, Klimatiltak og utslippsbaner mot 2030 - Kunnskapsgrunnlag for lavutslippsutvikling, M386/15, Miljødirektoratet. **Mittenzwei**, K., 2018, Økonomisk modellering av klimatiltak i jordbruket. Dokumentasjon og anvendelser i CAPRI og Jordmod. *NIBIO Rapport* 4:60, NIBIO, Ås. **Oslo Economics**/Atkins, 2018, Kvalitetssikring (KS2) av demonstrasjon av fullskala fangst, transport og lagring av CO2, Statens prosjektmodell D050b. **Pérez** Domínguez, I. et al. 2016, An economic assessment of GHG mitigation policy options for EU agriculture (EcAMPA 2). *JRC Science for Policy Report*, EUR 27973 EN, 10.2791/843461, **Skjærseth**, J. B., et al,. 2016, Linking EU Climate and Energy Policies: Decision-making, Implementation and Reform, Cheltenham, UK: Edward Elgar. **Steininger**, K.W., T. Schinko, 2016, Environmental Policy in an Open Economy: Refocusing Climate Policy to Address International Trade Spillovers, in B. Bednar-Friedl, J. Kleinert (eds.), Dynamic Approaches to Global Economic Challenges, Springer International Publishing Switzerland 2016. **Steinsland** C. et al., 2018, The climate,economic and equity effects of fuel tax, road toll and commuter tax credit, *Transport Policy.* **Størset**, S.O. et al. 2018, Industrial opportunities and employment prospects in large-scale CO2 management in Norway. Report produced by SINTEF: Report 2018:0594. **Torvanger**, A., 2018, Governance of bioenergy with carbon capture and storage (BECCS): accounting, rewarding, and the Paris agreement, *Climate Policy*, **Turner**, K.et al. 2018, Making the macroeconomic case for near term action on CCS in the UK? The current state of economy-wide modelling evidence, Univ Strathclyde, **Valin**, H. et al, 2015). *The land use change impact of biofuels consumed in the EU. Quantification of area and greenhouse gas impacts.* **Vold** A, V. Jean-Hansen, 2007, PINGO - A model for prediction of regional and interregional freight transport in Norway, *TØI Report* 899, Institute of Transport Economics, Oslo, **Vårdal**, E., I. Gaasland, 2012, Hvordan kutte utslippene fra jordbruket, *Klima* 3/2012. **Wardman**, M, V.P.K. Chintakayala,G.C. De Jong, 2016, *Values of travel time in Europe: Review and meta-analysis, Transportation Research Part A: Policy and Practice*, 94, 93-111. **Østli** V et al. 2017 2017, A Generic Discrete Choice Model of Automobile Purchase. *European Transport Research Review* **9**: 16.