



NAVIGATE

Stakeholder Survey

June 2021



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Introduction

Integrated Assessment Models (IAMs) play a central role for the assessment of mitigation pathways by the Intergovernmental Panel on Climate Change (IPCC) and are frequently used to inform international climate policy debates as well as analyse regional and national decarbonisation strategies. However, to make the IAMs more accessible to users and provide more targeted advice for climate policy, the models would have to be considerably improved.

NAVIGATE is developing the next generation of IAMs that can directly support the design and evaluation of EU and international climate policies and inform the alignment of climate action with sustainable development goals. NAVIGATE aims to advance IAM capabilities in key areas for climate policy support, including structural, technological and consumer-driven transformative change as well as distributional implications of climate policy and climate change impacts.

To assess the impacts and importance of these key areas, we will conduct a model intercomparison exercise with the goal to provide a comprehensive picture of the synergies and trade-offs between production and consumption dominated mitigation strategies and to identify viable policy entry points. Concretely, we plan to improve our models representation of (1) mitigation options, (2) impacts on inequality due to climate impacts and policies as carbon revenue redistribution schemes, and (3) socio-economic trends and structural changes of the economy. Different mitigation options will lead to different transformation pathways, which will be evaluated regarding their impacts on inequality. Variations in socio-economic trends and structural changes of the economy will help to quantify uncertainties.

To make these studies as policy-relevant as possible, we would like to ask for your evaluation of the most important elements that should be considered in the design of the scenarios. We approach you because of your unique expertise in some of the most relevant areas for this study. Your feedback will be incorporated in the study protocol, which includes the design of the scenarios and the types of analysis performed.

Survey

1 Improved representation of mitigation options

1.1 Innovative reduction measures for production-related emissions

1.1.1 Industry

To achieve industry decarbonisation several measures are considered. Please score them in terms of feasibility and decarbonisation impact (1=very low, 2=low, 3=medium, 4=high, 5=very high) in the Table below. Are there important options missing?

<i>Measure</i>	<i>Feasibility</i>	<i>Impact</i>
Enhanced direct electrification (including electrification of high-temperature processes, e.g. via electric arc furnaces)		
Enhanced synfuel production/imports (incl. green hydrogen)		
Enhanced bioenergy production/imports		
Carbon Capture and Storage used widely, not only for process emissions		
Carbon Capture and Usage used widely, including usage as a substitute for fossil feedstocks		
Allowing for blue hydrogen imports (in addition to green hydrogen)		

We are considering two narratives:

- A renewables driven industry:*
 in this scenario, renewable electricity is largely available and industrial processes are powered via direct electrification (power-to-heat) or indirect electrification, i.e. using green hydrogen (e.g. in primary steel) or synthetic fuels (e.g. to substitute chemical feedstocks of fossil origin). Other solutions might be implemented to abate residual emissions (e.g. Carbon Capture and Storage for cement process emissions).
- Fuels combustion remains the prime form of energy supply:*
 in this scenario, industry transformation is less abrupt and existing combustion systems are mostly kept in place. Natural gas, biomass, blue hydrogen and synfuels are combusted to supply energy or used as substitutes of fossil raw materials, e.g. blue hydrogen for primary steel and synfuels for chemicals. Carbon Capture and Storage or Usage play a fundamental role to avoid or mitigate emissions from combustion of carbonaceous fuels as well as to reduce process emissions.

Please score consistency and relevance of these two narratives (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. If you consider them inconsistent, how could consistency be improved? If you consider them irrelevant, what narratives should be considered? What are you missing in the narratives? Are there additional relevant narratives we should consider?

<i>Scenario</i>	<i>Consistency</i>	<i>Relevance</i>
A renewable driven industry		
Fuel combustion remains the prime form of energy supply		

1.1.2 Agriculture

To achieve agriculture decarbonisation several measures are considered. Please score them in terms of feasibility and decarbonisation impact (1=very low, 2=low, 3=medium, 4=high, 5=very high) in the Table below. Are there important options missing?

<i>Measure</i>	<i>Feasibility</i>	<i>Impact</i>
Land-sharing carbon dioxide removal (CDR) options (e.g. soil carbon sequestration, agroforestry)		
Land-demanding CDR options (e.g. BECCS, re-/afforestation)		
Restoration and protection of peatlands		
Enhanced mitigation of CH ₄ emissions		
Enhanced mitigation of N ₂ O emissions		

We are considering two narratives:

1. *Sustainable land use + Green-Tech Agriculture*
Only land-sharing CDR options as soil carbon sequestration and agroforestry are considered. Peatlands are being restored and existing peatlands are protected. Advanced mitigation options of CH₄ and N₂O emissions are deployed.
2. *Land-demanding CDR + continued trends:*
Land-demanding CDR options such as BECCS and re- and afforestation are deployed in addition to land-sharing options. No restoration and protection of peatlands. CH₄ and N₂O emissions are mitigated, but no advanced mitigation options are available.

Please score consistency and relevance of these two narratives (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. If you consider them inconsistent, how could consistency be improved? If you consider them irrelevant, what narratives should be considered? What are you missing in the narratives? Are there additional relevant narratives we should consider?

<i>Scenario</i>	<i>Consistency</i>	<i>Relevance</i>
<i>Sustainable land use + Green-Tech Agriculture</i>		
<i>Land-demanding CDR + continued trends</i>		

1.2 Innovative reduction measures for consumption-related emissions

1.2.1 Mobility

To achieve transport decarbonisation several measures are considered. Please score them in terms of feasibility and decarbonisation impact (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important options missing?

Change (Δ)	Policy measures	Feasibility	Impact
Reduced private vehicle activity within cities	Congestion charge, higher fuel taxes, free/lower public transit, high occupancy vehicle lane (HOV lane), providing mobility service on a per-use basis, increase accessibility		
Increased adoption of active mode (bicycles, e-scooters, walking)	Bike lane, pedestrian zones		
Shared car fleets increasing capacity factors	HOV lane, incentivized carpooling by private operators (e.g. Uber pool), park and ride		
New clean vehicle technologies (EV, H2FCV) for vehicles and trucks	Subsidies to the costs of vehicle purchase, infrastructure policy (incentives, mandates, R&D, government roll out), CO ₂ tax, vehicle emission standards		
Vehicle efficiency	Vehicle efficiency standards for cars and trucks		
Increased used of shared on-demand alternative fuelled vehicles	Congestion charge, higher fuel taxes, Mobility as a service (MaaS)		
Reduced transport activity as a result of increasing remote working	Congestion charge, higher fuel taxes		
Increase urbanization	Urban infill policies		

1.2.2 International transport

To achieve decarbonisation of international transport (aviation, international shipping) several measures are considered. Please score them in terms of feasibility and decarbonisation impact (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important options missing?

Change (Δ)	Policy measures	Feasibility	Impact
Reduction of transport activity	Fuel taxes (abolition of exemption), movement taxes, development of virtual connectivity, alternative tourism, local supply chains (local manufacturing and storage), remote working		
Shifting from aviation (high-speed) rail	Rail and road infrastructure development and connectivity, close price gap between aviation and rail, reduced business trips with aviation (teleworking and teleconferencing)		
Operational and logistic improvements	Maritime speed restrictions, airline operation or air traffic control 2)		
Improved vehicle efficiency	Efficiency standards, carbon or fuel taxes, aircraft design such as weight reduction, improved aerodynamics		

Improved fleet efficiency	Environmental certification for using airports & ports		
Increased use of biofuels, electro fuels (drop-in or full)	Fuel standards, fuel mandates, infrastructure development for fuel production and supply, effective implementation of blending restrictions , CO2 taxes/ participation in ETS		
Shift to electric (hybrid)	R&D investment, environmental certification for using airports & ports (Zero-emission berth standards), subsidies for purchase, infrastructure policy (incentives, mandates, R&D, government roll out), CO ₂ tax , vehicle emission standards		

1.2.3 Buildings

To achieve decarbonisation of the buildings sector several measures are considered. Please score them in terms of feasibility and decarbonisation impact (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important options missing?

Change (Δ)	Policy measures	Feasibility	Impact
Reduction of residential floorspace	Co-housing, provision/ promotion of shared spaces (e.g. for washing), tacing of second homes, ban of commercial use, urbanisation or shift to smaller dwellings		
Reduction in commercial floorspace	Office space rationalisation, flexible work spaces, smart working , remote working		
Rehabilitation of unused/vacant spaces	Tax relief, assistance for new functions		
Change temperature set points, reduced use of light or appliances	Informational campaigns, disseminations, smart meters with automatic regulations		
Reduction of appliance/consumer goods ownership	Sharing of appliances, development of share apps		
Shift to multi family houses	New construction codes		
Increased renovation rate	Renovation subsidies, one-stop shops with support for renovation owners		
High performance insulation, full house deep renovation	Mandatory/voluntary standards, information measures, financial initiatives (subsidies, tax relief), subsidies, one stop shops		
Heat pump /electrification, improved HVAC, Phase out of non clean fuels	Mandatory/voluntary standards, information measures, financial initiatives (subsidies, tax relief), technology assistance, mandatory audits, Limiting or banning non clean fuels, grid development		
Passive cooling (e.g. green roof, design)	Information measures, financial initiatives (subsidies, tax relief)		
Expansion of district heating/cooling	Financial incentives for grid expansion, obligatory connection to DH in quarters with DH grids		
On-site/building integrated renewables	Subsidies, R&D development, Standards		

1.2.4 Food consumption

Dietary change and towards less animal-based diets and reduced food loss and waste can help mitigate the food consumption related emissions. Several measures are considered. Please score them in terms of feasibility and mitigation impact (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important options missing?

Change (Δ)	Policy measures	Feasibility	Impact
Reduced consumption of livestock products	Meat tax, informational campaigns, cultivated meat, advances in plant-based alternatives (e.g. seaweed based)		
Reduced food waste at farm, processing retail and household level	Knowledge and training of farmers, awareness campaigns, technological advances, restrictions		
Shift to cultivated meat	Meat tax, R&D investment in development, subsidy schemes, consumer		

For the consumption related emissions we are considering two narratives:

1) *Consumer, lifestyle driven transition*

Awareness on environmental issues result in a consumer, lifestyle driven transition. Community and neighbourhood initiatives allow for comprehensive refurbishments, on site electricity generation and the constitution of energy communities that improve the affordability of these long term investments. The bottom up movement creates broader awareness, changing habits and voting preferences where policy further incentivises the transition (e.g. through financial initiatives, labelling, R&D investments, improved bikelanes and rail connectivity, city planning). Increased digitalisation and urbanisation provides the infrastructure to share services (such as appliances, spaces and rides), reduce travel distances but also share knowledge and experiences. High quality products are more valued with long lasting design, availability of spare parts and repair services.

2) *Technology, regulated transition*

Legally binding international agreements pressure policy makers to enforce reduction measures through a regulated technology-driven transition, with limited changes in citizen behaviour to maintain public support. An all-electric transition of public transport and private cars takes place, incentivised by emission standards, and the roll out of fast charging points throughout urban and rural areas. Mandatory building standards, new construction codes combined with subsidies result in large scale implementation of high performance insulation and deep renovation. Tariffs schemes that energy market indexed results in hourly changes in energy prices incentives the installation of smart meters and efficient energy use. There is a harmonised implementation of aviation technology standards and distance based air-passenger taxes across all countries.

Please score consistency and relevance of these two narratives (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. If you consider them inconsistent, how could consistency be improved? If you consider them irrelevant, what narratives should be considered? What are you missing in the narratives? Are there additional relevant narratives we should consider?

Scenario	Consistency	Relevance
Consumer, lifestyle driven transition		
Technology, regulated transition		

2 Impacts on inequality

2.1 Climate change impacts

We are considering the following climate change impacts. Please score them in terms of importance (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important impacts missing?

<i>Measure</i>	<i>Importance</i>
Energy demand (e.g. space heating/cooling)	
Agriculture (e.g. crop failures)	
Labour productivity (e.g. reduction due to heat stress)	
Capital productivity (e.g. damages from extreme events)	
Overall GDP impact	
Inequality across countries (e.g. poorer countries suffering more)	
Inequality within countries (e.g. more disadvantaged households and communities suffering more)	

2.2 Redistribution schemes of financial revenues from climate policies

We are considering the following redistribution schemes of financial revenues from climate policies. Please score them in terms of importance (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important redistribution schemes missing?

<i>Measure</i>	<i>Importance</i>
Distribution-neutral (i.e., not affecting the income distribution at all)	
Equal per-capita transfers (e.g., through a “climate dividend” per person)	
Increased support for low-emission technologies	
Reduction in labour tax rates	
Direct investments in green infrastructure	
Reduction in capital tax rates	

3 Improved representation of socio-economic trends and structural changes of the economy

We are considering the following macro-economic scenarios affecting the development of emissions. Please score them in terms of importance (1=very low, 2=low, 3=medium, 4=high, 5= very high) in the Table below. Are there important scenarios missing?

<i>Scenario</i>	<i>Importance</i>	<i>Political implementability</i>
<p><i>COVID recovery package:</i> “green” instead of conventional recovery package, i.e. specific economic support to low carbon activities and technologies, such as renewable energy, low or zero carbon vehicles, energy efficiency of buildings.</p> <p><i>Structural change:</i> variation in speed and pattern of transition from agriculture based economies to industry and service based economies (developing countries) including the reallocation of labour and output across sectors</p> <p>Update of long-term GDP scenarios based on quantified deviations of existing scenarios from observed trends of GDP growth</p>		