Future climate and energy policy - a Strategy for long-term EU greenhouse gas emissions reductions

Fields marked with * are mandatory.

Introduction

Climate change is happening and without further global action to mitigate it, temperatures will rise within this century well beyond a 2°Celsius compared to pre-industrial times. This will have major impacts on our economies and societies. In order to prevent this, 178 global partners cooperating under the United Nations Framework Convention on Climate Change (UNFCCC) have ratified the Paris Agreement that calls upon all countries to keep global temperature increase to well below 2°C, and to pursue efforts to limit the increase to 1.5°C above pre-industrial levels. Parties to the Paris Agreement are to communicate by 2020 their long-term low greenhouse gas emission development strategies.

In March, the European Council invited the Commission to present a proposal for a strategy for long-term EU greenhouse gas emissions reductions in accordance with the Paris Agreement, taking into account the national plans. The European Parliament made a similar request.

The EU is on track to achieve its 2020 targets and is currently putting in place policies to reduce greenhouse gas emissions by at least 40% in 2030 and achieve high level of ambition in energy efficiency and renewable energy (the so called energy and climate framework for 2030). The policies, legislative instruments and support programmes from the European budget will put the EU on a trajectory compatible with the Paris Agreement, but further measures are needed for the time after 2030.

The EU has currently an objective in the context of necessary reductions by developed countries as a group, to reduce emissions by 80-95% by 2050 compared to 1990 levels.

Delivering the Paris Agreement will require a worldwide transition towards a global economy that will not further affect the climate in the second half of the century.

To pursue these latter objectives, the EU's long term strategy should put forward a vision for the mid-century and how the European Union can help protect the planet, defend its people and empower its economy. The EU's new long term strategy should describe economy-wide pathways with various options for decarbonisation and their implications on technology choices and socioeconomic factors.

The strategy will reflect on a long-term vision of a modern European economy working for all Europeans. Studies and stakeholder input will contribute to the formulation of this vision and help explain the choices to be made. The strategy should reflect on the essential opportunities and challenges stemming from the long-term decarbonisation and clean energy transition of the EU:

- modernising the economy;

- improving citizens' quality of life;
- ensuring fair transition and tackling social challenges;
- reindustrialising Europe through digital, circular and low carbon innovation and clean mobility;
- promoting free, fair and sustainable global competition for markets, trade and investments; and
- maintaining the EU's global leadership position on key geostrategic and security issues.

The strategy will analyse cost-efficient scenarios towards decarbonisation in line with the Paris Agreement underpinned by holistic analysis of transition options across all key sectors of the economy. This includes a wide variety of sectors, starting with the central role of energy, buildings, transport and mobility, industrial production and the provision of services, waste, agriculture and land-use, as well as the use of natural resources. It will examine the potential and implications of the deployment of innovative technologies, sectoral integration, and of facilitating alternative choices for consumers. It will examine implications for security of supply, investments, competitiveness and socio-economic factors, such as economic growth and job creation, also considering the impacts on citizens, businesses. Regions that stand to be negatively affected by decarbonisation should be supported making this transition just and socially fair.

The visions and reflections of stakeholders involved from all sectors of the economy and society on how to reach the EU's ambition will be an important input into this process. Therefore, the European Commission is very much interested in your views on a strategy for long-term greenhouse gas emissions reductions for the European Union. Please take a moment to fill in our questionnaire. We welcome contributions from the general public, stakeholders and authorities alike. Your views will help to enrich our assessment of what the EU should do in order to meet its commitment under the Paris Agreement.

Guidance on the questionnaire

After a few introductory questions related to your general profile in section 1, the questionnaire has a number of questions in section 2.

To participate in the public consultation you are not obliged to fill in all questions. The different sections include questions on greenhouse gas reductions, the impact of consumers, the economic activity, energy, forests and land use, education and research, financing, meta trends, actors and adaptation to climate change. The final section is technical and more focussed on sectoral stakeholders (industry, transport, agriculture, land use).

Some questions are multiple choice questions. Other questions are open to which you can add if you want your comments. Please keep comments clear and concise because there is a limit on the number of characters you can enter.

If you want to express your views in more detail you can also upload a document with your views and insights.

As the results will be published on the Internet, please read the specific privacy statement attached to this consultation. It informs you about how your personal data and contribution will be dealt with. In the interest of transparency, if you are replying on behalf of an organisation, please register with the register of interest representatives if you have not already done so. Registering commits you to complying with a

Code of Conduct. If you do not wish to register, your contribution will be treated and published together with those received from individuals.

General information about respondents

*** In what capacity are you completing this questionnaire?**

as an individual in your personal capacity

in your professional capacity or on behalf of an organisation

*** Please give your name if replying as an individual/private person, otherwise give the name of your organisation:**

Technology Industries of Finland

martti.katka@techind.fi

Text of 3 to 100 characters will be accepted

Email address:

*** For individuals, country of residence; for professionals, headquarters and main country of operations:**

Austria	**Finland**	**Lithuania**	**Slovenia**
Belgium	**France**	**Luxembourg**	**Spain**
Bulgaria	**Germany**	**Malta**	**Sweden**
Croatia	**Greece**	**Netherlands**	**United Kingdom**
Cyprus	**Hungary**	**Poland**	**Other**
Czech Republic	**Ireland**	**Portugal**	
Denmark	**Italy**	**Romania**	

Estonia	**Latvia**	**Slovakia**

*** If other, please specify:**

Text of 3 to 100 characters will be accepted

***Type of organisation (please select the answer option that fits best):**

Private enterprise

Professional consultancy, law firm, self-employed consultant

Trade, business or professional association

Non-governmental organisation, platform or network

Research and academia

Social partners

National, regional or local authority (mixed)

Other

*** If other, please specify:**

Text of 3 to 100 characters will be accepted

Please indicate the economic sector you are active in (as an individual or as an organisation)

- Agriculture, Hunting and Forestry
- Financial Intermediation
- Fishing
- Real Estate, Renting and Business Activities
- Mining and Quarrying
- Public Administration and Defence;
- Manufacturing
- Education
- Electricity, Gas and Water Supply
- Health and Social Work
- Construction
- Other Community, Social and Personal Services
- Wholesale and Retail Trade:
- Activities of Private Households as Employers
- Hotels and Restaurants
- Extraterritorial Organisations and Bodies
- Transport, Storage and Communications
- Other

* If other, please specify:

Text of 3 to 100 characters will be accepted

* If you are a civil society organisation or a public administration, please indicate your main area of focus or your area of competence:

Text of 3 to 100 characters will be accepted

Electronics, information technology, metals industries, consulting engineering, manufacturing

What size does you organisation have?

- Micro or small enterprise (10-49 persons employed)
- Medium-sized enterprise (50 - 249 persons employed)
- Large enterprise (250 or more persons employed)

If your organisation is registered in the Transparency Register, please give your Register ID number: *20 character(s) maximum*

If your organisation is not registered, you can register now.

* Please indicate your preference for the publication of your response on the Commission's website:

Under the name given: I consent to publication of all information in my contribution and I declare that none of it is subject to copyright restrictions that prevent publication

Anonymously: I consent to publication of all information in my contribution and I declare that none of it is subject to copyright restrictions that prevent publication

Not at all — please keep my contribution confidential (it will not be published, but will be used internally within the Commission)

(Please note that regardless the option chosen, your contribution may be subject to a request for access to documents Regulation under 1049/2001 on public access to European Parliament, Council and
Commission documents. In this case the request will be assessed against the conditions set out in the Regulation and in accordance with applicable data protection rules.)

Questions

Long term greenhouse gas emissions reductions

To achieve its temperature objectives, the Paris Agreement also includes a long term ambition to achieve a balance between emissions and removals of greenhouse gases by human activities in the second half of this century. Given that addressing climate change is a global challenge requiring all parties of the Paris Agreement to act, what do you think the EU should contribute to achieve the Paris Agreement's objectives:

Reduce greenhouse gas emissions in the EU by 80% by 2050 compared to 1990 levels

Reduce greenhouse gas emissions in the EU more, within the range of 80 to 95% by 2050 compared to 1990 levels

Achieve already a balance between emissions and removals in the EU by 2050

In your opinion, what are the biggest opportunities and challenges

1000 character(s) maximum

The biggest challenge is to achieve a level playing field in international markets. Subsidies for fossil fuels must be phased out, a global carbon price must be established and sanctions against carbon dumping within the WTO-process must be created.

Consumers

Next to the deployment of available and forthcoming technologies, when looking at the long term, consumer choices also have a key role in achieving the decarbonisation of our economy. Please fill in this

section based on your habits if you are an individual or, if you are from an organisation, considering the organisation practice.

In your opinion, where do you expect the largest changes to happen in your daily life in order to meet the climate change challenge?

Housing

Mobility

Food

Consumer goods and services

Housing and offices

Energy consumption

To which extent would you support the following options that allow reducing the energy consumption and related CO_2 emissions in buildings?

Improving further the energy performance (insulation, triple glazing, etc.) of your building?

Yes, I already have done it

Yes, as a priority

Yes, but not as a priority

No, I rent

No, too expensive

No, other reason

No opinion / I do not know

* If other, please specify:

The majority of energy savings potential is in the existing buildings. When these buildings are renovated, it is very important to carry out simultaneously the most cost efficient investments in energy efficiency.

Text of 3 to 200 characters will be accepted

Installing heating and water boilers that run on renewables?

Yes, I already have done it

Yes, as a priority

Yes, but not as a priority

No, I rent

No, too expensive

No, other reason

No opinion / I do not know

* If other, please specify:

In district heating biomass should be used instead of fossil fuels. Photovoltaics should be used in buildings for distributed power production. Rather install renewable energy systems that feed to existing heating and water hardware.

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Text of 3 to 200 characters will be accepted

Installing heating and cooling equipment and use electric appliances with the best energy performance label?

Yes, I already have done it

Yes, as a priority

Yes, but not as a priority

No, I rent

No, too expensive

No, other reason

No opinion / I do not know

* If other, please specify:

District heating and cooling in cities should be integrated and widely used. District heating and cooling should be connected with large scale heat pumps in order to maximise the use of waste heat from buildings.

Text of 3 to 200 characters will be accepted

Buying carbon free electricity or generating your own renewable electricity?

Yes, I already have done it

Yes, as a priority

Yes, but not as a priority

No, I rent

No, too expensive

No, other reason

No opinion / I do not know

* If other, please specify:

The most important low carbon source of electricity is nuclear power. In low carbon electricity system nuclear power should be used together with bioenergy in cogeneration, wind power and solar energy in distributed generation and hydropower in balancing power. All low carbon options should be used simultaneously. Also individual solar power systems to charge e.g. vehicle batteries.

Text of 3 to 200 characters will be accepted

Having a smart meter and consuming electricity mostly when prices are low?

Yes, I already have done it

Yes, as a priority

Yes, but not as a priority

No, for privacy concern

No, I do not want to change my consumption habits

No, other reason

No opinion / I do not know

* If other, please specify:

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Text of 3 to 200 characters will be accepted

There should be available energy services for consumers with smart-meters so that demand response, energy storage potentials e.g. electric car batteries and small scale electricity generation could be optimised. Energy service providers should be able to aggregate large numbers of consumers so that energy efficiency in smart grids could be fully utilised in digitalised electricity systems.

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Domestic waste

Do you sort your waste (paper, plastics, glass, metal, glass, organic...)?

Yes

No

I do not see the interest

What would make you increase the separation of waste (paper, plastics, glass, metal, glass, organic...)?

Adapted infrastructure (containers, etc.)

Awareness campaign

Financial incentives such as deposit schemes

Other

Circular economy should be based on an enabling legal framework in order to achieve cost efficient infrastructures and logistic chains.

* If other, please specify:

Text of 3 to 200 characters will be accepted

Do you think increased recycling and reuse are important to achieve greenhouse gas reductions?

Yes

No

I do not know

Mobility

To which extent would you support the following options that allow reducing the energy consumption and related CO2 emissions?

Buying a vehicle that does not run on petrol or diesel (for instance an electric car)?

Yes

Yes, but only if not more expensive than conventional petrol or diesel cars

Yes, but only if sufficient refuelling infrastructure is available

No

Considering using car sharing services?

Yes

Yes, but only if an easy to use and affordable service is in place

No

For short trips, avoiding private car and rather using public transport?

Yes

Yes but only if an accessible and regular service is in place

No, because they are too slow

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No, because it is too expensive

No

For short trips, avoiding private car and rather using (electric) bike or other active mobility modes?

Yes

Yes, but only if proper bike lanes are in place

No

For longer distance, avoiding flights or car whenever an alternative is available?

Yes

Yes, provided a convenient alternative is in place

No, too slow

No, too expensive

No, other reason

* If other, please specify:

In cities electric collective transport should be favoured, like trains, electric buses, undergrounds and trams. In private cars public support should be directed to electric cars and plug-in hybrids and to development of charging infrastructure.

Text of 3 to 200 characters will be accepted

Do you think better urban planning would reduce the use of private cars and reduce congestion in the urban areas?

Yes

Yes, if combined with better public transport

Yes, but difficult to put in place

No

Do you think using more IT tools such as tele-working or video-conferencing could reduce mobility needs?

Yes

Yes, to some extent

No, as difficult to put in place

No

Food

Food production, processing and delivery have an impact on greenhouse gas emissions and natural resources consumption.

Would you consider it important that further awareness raising is undertaken about the impact of various
types of food consumption on climate?

Yes

No

Would you consider the impact of food on greenhouse gas emissions when

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buying it? Yes

Yes, if information is available about the carbon intensity of food

Not if more expensive

No

Also taking into account the importance to have a balanced diet for health purposes, would you consider changing to a less carbon intensive food diet (e.g. reduce red meat consumption)?

Yes

No

I would require more information before changing my diet

Consumer goods and services

The products/services you consume and the way they are produced also impact energy consumption and related greenhouse gas emissions.

Do you ever consider the impact on greenhouse gas emissions when buying and consuming a product or
services?

Yes I do so regularly

Yes but I often lack the information to do so

No, I don't consider this

Would you consider buying products and services from companies that produce their goods and services in a greenhouse gas neutral manner?

Yes

No, if more expensive

No, other

No opinion / I do not know

Consumer awareness about carbon foot print of products should be enhanced by adequate information.

* If other, please specify:

Text of 3 to 200 characters will be accepted

Your work and your economic sector

For both individuals and organisations, details on the economic sector should be provided in Section 1.

Employment and a socially fair transition

In the coming decades, the transition to a low carbon economy will impact even more how we work and how we produce goods and services. Which statements below correspond in your opinion to the impact of climate change and the low carbon transition in your working environment?

Do you expect your company to create or reduce jobs due to the low-carbon transition?

Create

Reduce

No opinion / I do not know

What could affect your job most in the future?

The low carbon transition

Digitalisation

Impact of globalisation

Socio-economic policies (for instance fiscal policy)

Other

If there is a global level playing field that prevents carbon leakage, then transition to low carbon society shall create new jobs in Europe.

* If other, please specify:

Text of 3 to 200 characters will be accepted

Do you think you or the sector you are active in would benefit from training of staff in the context of the energy and low carbon economy transformation?

Yes

Yes, to some extent

No

No opinion / I do not know

The impact of the low carbon transition on your sector

Do you consider the low carbon transition as an opportunity or as a challenge for your sector?

An opportunity

A challenge

Both

None

No opinion / I do not know

Indicate by how much your sector could reduce greenhouse gas emissions by 2050 compared to today?

It cannot reduce

Up to half

By more than half

Can decarbonise entirely

No opinion / I do not know

What would be the preferred route to reduce these emissions in your sector?

Further electrify

Availability of carbon free electricity and other energy

Use other low carbon fuels, like hydrogen

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Improve to the maximum energy efficiency

Circular economy, including recycling and re-use

Development of new products and business concepts

Other

No opinion / I do not know

* If other, please specify:

It is essential to use all cost efficient low carbon technologies and business concepts simultaneously for reducing greenhouse gas emissions efficiently.

Text of 3 to 200 characters will be accepted

Will you (or your sector) invest in new low-carbon technologies?

Yes, as a priority

Yes, but not as a priority

No, it has already invested enough

No

No opinion / I do not know

Do you think your sector could be further integrated with others so as to decrease emissions while increasing overall efficiency?

Yes

No

No opinion / I do not know

If your sector can be further integrated to others, please mention how and to which

District heating and cooling can be integrated with smart grids and heat pumps giving the possibility of optimisation of enerty use and effectively recovering waste heat.

sector(s): *200 character(s) maximum*

Do you think the low carbon transition will lead the EU economy to:

Modernise and reinforce its competitiveness

Modernise, and reinforce its competitiveness, but only if non-EU countries and regions also engage in the transition towards a low carbon economy

Lose competitiveness

No opinion / I do not know

Do you think the low carbon transition can help the EU industry modernise and grow?

Yes

Yes, but only with public support

Yes, but only if non-EU countries and regions also engage in the transition towards a low carbon economy

No

No opinion / I do not know

How can opportunities and challenges (in particular related to carbon intensive sectors or regions) be addressed? What key economic transformations should the EU pursue to achieve a low carbon and resilient economy?

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1000 character(s) maximum

There should be an enabling legal framework for low carbon investments. Carbon dumping must be prevented by fair rules of international trade. Subsidies for fossil fuels must be phased out and a global carbon pricing system established. Furthermore, carbon dumping should be prohibited and sanctioned within WTO-process.

Energy

The energy system today is responsible for ca. 75% of the EU's greenhouse gases emissions and undergoes a rapid transition due to e.g. cost reduction of renewables, improvements of energy-efficiency and rapid development of new technologies (e.g. batteries) driven i.a. by policies put forward by the EU and its Member States. Accelerating this change will play a central role in the transition of our economy towards a carbon-neutral economy.

In the following table listing different energy technologies, please rank each option in the table below from 1 (important) to 5 (not important) on what role you think they will play in the clean energy transition (not all options need to be ranked)?

	1	2	3	4	5
Energy efficiency reducing the need to produce energy	○	X	○	○	○
Renewable energy from wind, solar or hydro	○	○	X	○	○
Other forms of renewable energy, like geothermal, wave or tidal	○	○	○	○	X
Nuclear energy	X	○	○	○	○
Fossil fuels with Carbon Capture and Sequestration	○	○	○	○	X
Solid biomass for heat and electricity production	○	X	○	○	○
Advanced Liquid Biofuels	○	X	○	○	○
Biogas from agricultural and domestic waste	○	○	○	X	○
Electricity storage (e.g. batteries)	○	○	X	○	○
Hydrogen (produced in a carbon-neutral manner)	○	X	○	○	○
E-fuels derived from hydrogen	○	○	○	○	X
Other	○	○	○	○	○

* If other, please specify:

Text of 3 to 200 characters will be accepted

What are the biggest opportunities, including for the wider economy? What are the biggest challenges, including as regards public acceptance or the availability of land and natural resources, related to these future developments?

2000 character(s) maximum

Key technologies for low carbon society are nuclear power for baseload power production, district heating and cooling based on renewable bioenergy, hydropower for peakload generation, windpower and solar energy for distributed power production. It is very important that consumer participation in electricity markets is made possible by smart grids. Digital energy services improve energy efficiency, utilise consumers flexible loads and capacity for energy storage and delivers small scale power production to the electricity market. Cars and vans use extensively electricity, trucks and aeroplanes use biofuels. Industries use hydrogen produced by low carbon electricity. Using hydrogen instead of coal, steel can be produced without carbon dioxide emissions. Same goes for cracking processes in refineries and various chemical factories.

The role of Forests and Land Use

Today, EU's forests, agriculture and land absorb more CO_2 than they emit, which is referred to as the EU's sink. Forests and agriculture land produce renewable biomass that can be used to substitute other carbon intensive products or to produce bioenergy, which in turn reduce greenhouse gas emissions from fossil fuels and industrial processes. Depending on how this biomass is produced, this can impact the size of the EU's sink, as well impact other services delivered by agriculture and forest land including biodiversity and ecosystem services.

In the context of a long term strategy please rank each land-use activities in the table below from 1 (important) to 5 (not important) to indicate which are acceptable and can be important to reduce greenhouse gas emissions and increase CO absorptions (not all options need to be ranked):

2	1	2	3	4	5
Forest as a source for biomass for renewable energy	X				
Forest as a source of material for bio-based products		X			

4.1
0.2
018
14

Forest as a carbon sink storing CO_2	X
Agriculture as a source of feedstock for bio-based materials	X
Agriculture as a source for bio-energy	X
based on food crops	X
based on agricultural wastes	X
based on woody biomass (e.g. perennials, woody and herbaceous crops, short rotation coppice)	X
Protecting and enhancing soil carbon stocks on agricultural land	X

What should be the role of the land-use sector in reducing emissions and increasing absorptions emissions? For what purposes should biomass be used most to reduce greenhouse gas emissions? How and which sustainability concerns should be addressed?

1000 character(s) maximum

Forest residues, chips, bark and waste wood should be used in cogeneration of heat and power. Biomass should be used for production of biofuels for heavy transports and aviation. It must be made sure that forests are utilised in a sustainable manner so that they grow more than they are harvested and also biodiversity is protected.

Education, research and innovation

Considering the long time frame of the strategy, and the inherent magnitude of the decarbonisation transition, the central role of accelerating research and innovation for facilitating this transition will be crucial.

How best could awareness be raised to create the right attitude and values/ mind-sets?

at most 3 choice(s)

At school through education

Local and regional campaigning

National and EU wide campaigning

On which sectors should R&D efforts focus primarily in the coming decade to best support the low carbon transition?

at most 6 choice(s)

Energy

Industrial processes

Transport

IT
Agriculture
Other field

* If other, please specify:

Text of 3 to 200 characters will be accepted

On which cross-sectoral domains should R&D efforts focus in the coming decades? Is there a particular need for large scale deployment of certain innovative technologies? Is there a different role for authorities and private sector in support R&D and Innovation?

1000 character(s) maximum

Low carbon transition should be enhanced by R&D in particular energy systems. Through digitalisation of electricity system there are huge potentials to promote energy efficiency, renewable small scale power generation, energy storage systems and connections to modern building automation and electric car recharging systems. It is necessary to develope energy services so that consumers can take on active role in electricity market.

Financing

In many cases, the low carbon economy and energy transition needs high upfront investments with subsequent reductions in operating and fuel costs. In addition, this transition as well as climate change itself will most likely affect the value of existing investments and assets of companies. Finally, to achieve the transition efficiently, the viability and profitability of investments need to be ensured on the long-term. Most of these investments will have to be funded via private finance.

Will the sector that you are active in require significant additional investment in the context of a transition to a low carbon economy?

Yes
No
No opinion / I do not know

For the sector that you are active in, is there a financing gap for making the transition to a low carbon economy?

Yes
No
No opinion / I do not know

Should public sector be more involved in ensuring adequate financing for the low carbon transition?

Yes, through direct investment

Yes, through measures ensuring more low cost finance for sustainable investments

No because of the risk of prompting inefficient investment leading to stranded assets

No because of crowding effects on other sectors

No opinion / I do not know

Would you consider that, in your sector, companies are sufficiently transparent about the financial risks they face due to climate change and the low carbon economy and energy transition?

Yes

No

No opinion / I do not know

Meta trends

Do you think the following trends are important to reduce greenhouse gas emissions.

Economic transition towards a more circular economy?

Positive

Negative

Neutral

Digitalisation, including robotisation and artificial intelligence?

Positive

Negative

Neutral

Shared economy?

Positive

Negative

Neutral

Further interdependency of sectors across borders through globalisation?

Positive

Negative

Neutral

Actors

Local authorities such as cities and local communities, as well as other actors such as civil society and the private sector, can play an important role in achieving the energy transformation, reducing greenhouse gas emissions and adapting to climate change. Indeed thousands of cities, companies and citizens' organisations are implementing the low carbon economy and energy transition through projects covering energy, transport, food and waste management, often achieving important local co-benefits related to economic development, health and wellbeing.

Which of these non-state actors do you think will impact most your or your sector's contribution to delivering the EU's ambition to become a low carbon economy?

Regional government

Towns and cities

Businesses

Philanthropies

Civil society (NGOs, ..)

Religious groups

Do you have an example that you think is of particular importance to underline the role of such local and private sector actors in supporting the low carbon economy and energy transition?

1000 character(s) maximum

One example represents communities that invest in district heating and cooling networks connected with cogeneration of heat and power and cooling systems utilising heat pumps in recovering waste heat from buildings and sewage waters. Cogeneration boilers should use locally harvested biomass or waste derived fuels with fluidised bed technology with high efficiency and low emissions.

Adaptation

The adverse effects of climate change will increase in the coming decades unless strong mitigation policies are implemented globally. In your place of living, which of the following actions do you think will be necessary to prepare for the likely effects of climate change? Please rank each option in the table below from 1 (important) to 5 (not important) to indicate which, in your place of living, you think will be necessary to prepare for the likely effects of climate change (not all options need to be ranked).

	1	2	3	4	5
Scientific research on the local effects of climate change in the place where you live	○	○	○	X	○
Reinforcement of infrastructure (transport, energy, communication networks) to withstand natural disasters	○	○	X	○	○
Preparation for floods (water retention, dykes, designated flood plains /areas, restriction of activities in areas at flood risks, floating houses etc.)	○	○	X	○	○
Adaptation of agriculture to the changing climate (e.g. water efficient irrigation, selecting different crops)	○	X	○	○	○
Heat wave action plans	○	○	X	○	○
Increase of green areas in towns to cope with heatwaves / floods	○	○	X	○	○

Encouragement of water saving and reuse	○	X	○	○	○
Forest fire prevention (e.g. awareness raising campaigns, forest management...)	○	X	○	○	○
Reinforcement and protection of the seacoast	○	○	X	○	○
Early warning systems for natural disasters (heatwaves, floods, forest fires...)	○	○	X	○	○
Communication to the public about the need to adapt to climate change	○	○	X	○	○
Improved insurance products against damage from the effects of climate change	○	○	○	X	○
Better understanding of the security effects of climate change on the EU (e.g. flows of migrants, global water and food scarcity, agricultural trade)	○	○	X	○	○

Which adaptation measures are of particular importance for your sector and why? *1000 character(s) maximum*

Adoption is necessary against extreme wheather conditions in order to secure reliable energy supply.

Specific sectoral questions

These questions are focused on sector specific greenhouse gas reduction options, and as such are primarily directed to sectoral stakeholders.

Reducing industrial greenhouse emissions

Industry has a diverse set of greenhouse gas emissions sources, the majority are linked to energy consumption but also a significant amount of emissions comes from chemical processes, for instance in the steel, cement and chemical sectors.

Industry has a number of mitigation options to reduce its greenhouse gas emissions. These typically involve improved efficiency (e.g. using more efficient products and technologies, reusing waste heat, etc.) and fuel substitution (e.g. electrification of its processes). But it also includes feedstock substitution, be it with bio-material or by employing Carbon Capture and Utilisation (CCU) technologies that see CO_2 emissions being re-used in other production processes. These technologies also often benefit from further integration of energy and industrial sectors.

Please indicate for which sector you see any of the above or other mitigation options of particular importance. Please indicate what your view is in terms of mitigation potential, economic potential and technology readiness. Assess each option as High, Medium, Low or Zero for each criterion and indicate in which year you think the technology would be ready for large scale deployment.

	Industrial Sector	Technology option	Mitigation potential	Economic viability	Technology readiness	Year of large scale deployment
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Transport has a number of options to reduce its greenhouse gas emissions. While low- or zero-emission technologies are already successfully deployed for parts of the transport sector (e.g. cars and vans), the technological development is in earlier stages of development or deployment for other parts of the transport sector (e.g. long-haul trucks, aviation or maritime).

Please indicate for which part of the transport sector you see particular mitigation options and their importance. Please indicate what your view is in terms of mitigation potential, economic potential and technology readiness. Assess each option as High, Medium, Low or Zero for each criterion and indicate in which year you think the technology would be ready for large scale deployment.

	Transport Sector	Technology option	Mitigation potential	Economic viability	Technology readiness	Year of large scale deployment
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

In addition, would you please indicate your choice for the following options that allow reducing the energy consumption and related CO2 emissions?

For freight transport, would you consider switching from road to alternative modes like rail, waterways or coastal shipping?

Yes

No, too slow or complicated

No, too expensive

No opinion / I do not know

For first/last mile logistics in urban areas, would you consider switching from road to alternative modes like (electric) cargo bike or similar zero-emission vehicle?

Yes, I am already doing it

Yes, in n the future

No, too slow

No

No opinion / I don't know

Reducing greenhouse emissions from agriculture

Several options exist to reduce greenhouse gas emissions in agriculture even though the mitigation potential of the agricultural sector, notably related to the sector's non-CO_2 emissions, is seen as more limited than for other sectors. Furthermore, agriculture is a sector that through its impact on land use also will affect how our natural sink, and thus the related CO_2 absorptions, will evolve.

Please indicate which mitigation options are of particular importance. Assess each option as High, Medium, Low or Zero for each criterion and indicate in which year you think the technology would be ready for large scale deployment.

	Agriculture sector	Technology option	Mitigation potential	Economic viability	Technology readiness	Year of large scale deployment
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Role of CO_2 removal

The objectives of the Paris Agreement are challenging and many scientists consider that it will be necessary at a certain point to remove a significant amount of CO_2 from the atmosphere in order to stay below 2°C and certainly in case the temperature increase should be limited to 1.5°C. There are a limited number of options to remove CO_2 from the atmosphere.

The removal of CO_2 can be accomplished by 1) capturing CO_2 via natural photosynthesis or artificial chemical processes, and then 2) storing CO_2 in long term geological sites or within biomass and (bio) materials.

Rank from 1 (important) to 5 (not important) on what role you think this removal and storage options can have in the EU to deliver negative emissions taking into account issues such as economic and technical feasibility, storage potential, environmental integrity and social acceptance.

Capture of CO_2 from the atmosphere

	1	2	3	4	5
Intensive afforestation	X	○	○	○	○
Forest and cropland residues	○	X	○	○	○
Woody perennial plantations	○	○	X	○	○
Direct Air Capture	○	○	○	○	X
Other	○	○	○	○	○

* If other, please specify:

Text of 3 to 200 characters will be accepted

Storage of CO_2

	1	2	3	4	5
Carbon capture and storage (CCS) with enhanced oil or gas recovery	○	X	○	○	○
CCS in onshore geological sites	○	○	○	X	○
CCS in offshore geological sites	○	○	X	○	○
Carbon Capture and Utilisation (CCU) (long lived products)	○	○	X	○	○

Increased permanent carbon stock in soils	X
Increased permanent carbon stock in plants	X
Other	○ ○ ○ ○ ○

* If other, please specify:

Text of 3 to 200 characters will be accepted

What main barriers do you see currently preventing the large scale deployment of CCS, including on how to use it to generate negative emissions? What are the particular challenges related to biomass CCS? What type of CCU (Carbon Capture and Utilization) would lend itself to create long term storage? Are there other technologies that should also be considered? What policies do you think the EU should pursue to better help development and deployment?

1000 character(s) maximum

Carbon capture and storage is commercially used in oil and gas fields. Those fields can also be used for offshore long term carbon dioxide storage. Carbon capture and use has great potentials in the future when using low carbon electricity for production of methane and synthetic fuels for vehicles.

Additional Comments

If you wish to add further information, comments or suggestions - within the scope of this questionnaire - please feel free to do so here:

1000 character(s) maximum

Technology Industries of Finland have taken note of the update of the technology assumptions of the PRIMES model with a view to using the model to create decarbonization scenarios for the expected 2050 strategy. Unfortunately, this update did not result in any changes in technologies or their data (incl. performance and costs) for bioenergy production. This is very unfortunate, as bioenergy represented 10% of the total energy in 2015 and 61,34% of the renewable energy used in the EU. We therefore have reservations as to how the PRIMES model will treat bioenergy when being used to create scenarios for the European Commission.

NB: Concerning Reducing Industrial Greenhouse Emissions, please see enclosed Excel File “Addendum overview studies pathways and technologies_FINAL” with tables on 3 sheets:
- Technologies
- Roadmaps Pathways
- Studies
Source: Alliance of Europe’s Energy Intensive Industries

In addition, you could also upload a document proving further information, comments or suggestions:

4.10.2018

The maximum file size is 1 MB