

FORESIGHT



Mission Area: Adaptation to Climate Change, Including Societal Transformation

Foresight on Demand Brief in Support of the Horizon Europe Mission Board



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European Commission Directorate-General for Research and Innovation Directorate G — Policy and Programming Centre Unit G1 — R&I Strategy and Foresight Contact Jürgen Wengel Email juergen.wengel@ec.europa.eu RTD-PUBLICATIONS@ec.europa.eu European Commission B-1049 Brussels

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Foresight on Demand Brief in Support of the Horizon Europe Mission Board

Project Team: Technical lead: Manfred Spiesberger (ZSI) Administrative lead: Dietmar Lampert (ZSI)

Experts: Andrea Ricci (ISINNOVA) Klaus Kubeczko (AIT) Manfred Spiesberger (ZSI) Petra Manderscheid (Climate JPI) Simonas Gaušas (Visionary Analytics)

Support and Quality Control: Dietmar Lampert (ZSI) Tanja Schindler, Jana Lingrün (4strat) Matthias Weber (AIT) Klaus Schuch (ZSI)



Foreword

In 1969, the first human set foot on the moon. "A small step for a man. A giant leap for mankind" was what audiences across the world heard. The Apollo mission showed the world what directed science, research and innovation could make possible. It proved what humankind can achieve in not even a decade, by setting a clear goal, which manages to capture public imagination, and by investing the necessary resources into it.

The mission approach, directing and combining different resources and actors towards a common goal, is becoming a key element of transformative R&I policies in a world of increasing global challenges. The Commission introduced missions as a new instrument in Horizon Europe and appointed Mission Boards to elaborate visions for the future in five Mission Areas: Adaptation to Climate Change, Including Societal Transformation; Cancer; Healthy Oceans, Seas, and Coastal and Inland Waters; Climate-Neutral and Smart Cities; Soil Health and Food.

EU R&I policy missions are ambitious, yet realistic and most of all desperately needed in light of today's challenges. They endeavour to bring together policies and instruments in a coherent, joined-up approach, and tackle societal challenges by setting and achieving time-bound, measurable goals.

In September 2020, the Mission Boards handed over their reports to the Commission. Five foresight projects carried out in close interaction with the Boards supported their work. These projects provided advice on trends in the respective areas, elaborated scenarios on alternative futures, scanned horizons, and made aware of weak signals, and emerging new knowledge and technology, helping the Boards imagine how the future may evolve and how to shape it.

With the launch of the five Missions in Horizon Europe, we are making this valuable work available for the broader public. I am confident that the comprehensive material, creative ideas and exciting examples in the Mission Foresight Reports will prove useful to all those engaged in the Horizon Europe Missions.

Jean-Eric Paquet Director General Research and Innovation

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BACKGROUND AND ACKNOWLEDGEMENTS

Missions and Horizon Europe

The notion of "missions" as one of the novel cornerstones of Horizon Europe, the European Framework Programme for Research and Innovation 2021-2027, was introduced in the course of the programmatic debates about the orientation of the EU's future R&I policy, in particular through the Lamy Report. This report, which was presented in July 2017, recommended adopting "a mission-oriented, impact focused approach to address global challenges". Missions would serve as targeted and longer-term ambitions around which to build a portfolio of Horizon Europe research and innovation projects.

The idea of mission-oriented research and innovation was subsequently further specified through various studies and reports, in particular also by two reports by Mariana Mazzucato, which inspired policy debates at European as well as national level. In line with this preparatory work, missions shall have a clear R&I content EU added value and contribute to reaching Union priorities and Horizon Europe programme objectives. They shall be bold and inspirational, and have scientific, technological, societal and/or economic and/or policy relevance and impact. They shall indicate a clear direction and be targeted, measurable, time bound and have a clear budget frame.

As a result of debates at European level, the European Commission (EC) proposed five initial broad Mission Areas in autumn 2018. This initial list was subsequently adjusted in interaction between the EC and Member States, leading to five Mission Areas:

- i) Adaptation to climate change including societal transformation,
- ii) Cancer,
- iii) Healthy oceans, seas, and coastal and inland waters,
- iv) Climate-neutral and smart cities, and
- v) Soil health and food.

As spelt out in the specific request, these missions will be anchored in the pillar "Global Challenges and Industrial Competitiveness", but may well reach out to the other pillars of Horizon Europe.

Within each of these Mission Areas, a limited number of specific missions shall be defined in the context of the next framework programme, with a first set of missions to be launched in 2021. To this end, the EC has established Mission Boards of about 15 outstanding members for each of the five Mission Areas. Mission Board members were appointed in August 2019 and they started their work in September/October 2019. They presented their recommendations to the EC at the EU R&I days in September 2020. The titles and descriptions of the actual EU Missions launched by the European Commission are found here: <u>https://ec.europa.eu/info/research-and-innovation/funding/funding-</u> opportunities/funding-programmes-and-open-calls/horizon-europe/missions-horizoneurope en

Foresight on Demand

Against this background, a request for services with five lots was put out under the Foresight on Demand Contract (FOD) of DG R&I to support the five Mission Boards. The five projects started in autumn 2019. For around a year they worked for and with the Mission boards, providing foresight expertise and methodology. They were aimed to feed the reflections of the Mission Boards with future-oriented inputs on challenges and options in the respective areas.

With the launch of the missions in Horizon Europe, this valuable work is now public as a part of the Foresight Papers Series. The five mission foresight reports give a detailed overview of the alternative futures, and the future perspectives in science and technology in the five mission areas build part of the basis for the considerations of the Mission Boards.

They may serve as background material and a source for examples and ideas for coming mission activities.

Mission foresight project "Adaptation to Climate Change including Societal Transformation"

The foresight project "Adaptation to Climate Change including Societal Transformation" (Framework Contract 2018/RTD/A2/OP/PP-07001-2018-LOT1) was meant to complement the Mission Boards' deep and wide-ranging expertise by exploring longer-term time horizons, up to and beyond the year 2050. Building on existing future-oriented work, the project employed dedicated foresight methods, in particular workshops and a Delphi survey, to explore this time horizon in a systematic manner, and involving experts and stakeholders as appropriate.

Climate Adaptation refers to anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. It has been shown that well-planned, early adaptation action later saves money, lives, livelihoods, and biodiversity.

The foresight was based on the European Commission (EC) White Paper "Adapting to climate change: Towards a European framework for action" of 2009, and on the EU climate adaptation strategy adopted in 2013. At the time of the formulation of this strategy, the economic, environmental, and social costs of not adapting to climate change were estimated to range from 100 billion \in a year in 2020 to 250 billion \notin a year in 2050, for the EU as a whole. Meanwhile, the EC in February 2021 elaborated and adopted a new climate adaptation strategy, which focuses on developing solutions and implementation of adaptation measures.

Research directions: Climate change adaptation (CCA) including societal transformation covers a broad range of areas, such as agriculture, dealing with water resources, disaster prevention, migration flows, security issues, behaviour changes, urban areas, industry and trade relations, transforming the energy system and transportation. The thematic scope of the foresight exercise was defined in close collaboration with the Mission Board (MB) through the Mission Board Secretariat. Consequently, the Delphi survey implemented in summer 2020 was used to assess elements of the interim MB report, in particular items around risk management, financial risk protection, social infrastructure, health, water, food/agriculture, and ecosystems. All the work fed into the final report of the Mission Board "A Climate Resilient Europe - Prepare Europe for climate disruptions and accelerate the transformation to a climate resilient and just Europe by 2030" (2020).

MISSION AREA: ADAPTATION TO CLIMATE CHANGE, INCLUDING SOCIETAL TRANSFORMATION. FORESIGHT ON DEMAND BRIEF IN SUPPORT OF THE HORIZON EUROPE MISSION BOARD

1 INTRODUCTION

This final report summarises the results of the actions to support the Mission Board for "*Adaptation to Climate Change, including Societal Transformation*" with forward-looking evidence.

In accordance with the Request, the proposed services, approaches to be adopted, and the concrete nature and form of the outputs have been shaped and validated through close interaction with the Mission Board (MB) via the Mission Secretariat, run by relevant European Commission (EC) services, throughout the implementation of the action.

As a result of the interactions with the Mission Secretariat, the following actions were taken:

- 1. Preparing a short paper Input to Mission Board on scoping activities & tasks (Deliverable 1)
- 2. Analysing national and regional funding programmes of selected countries for projects on Climate Change Adaptation, and conducting interviews with selected Mission Board members in preparation of a foresight workshop.
- 3. Preparing an input paper for the foresight workshop *Input Document FoD CCA Workshop, 23 January 2020* (Deliverable 2).
- 4. Holding a foresight workshop (23 January 2020) with Mission Board members, European Commission representatives (Mission Secretariat), and foresight experts, and summarising the results of the workshop. The workshop served to identify barriers and solutions, enablers and impacts of climate change adaptation in a variety of thematic fields, including health, water, food and agriculture.
- 5. Developing and implementing a Delphi survey on assessing key aspects of the draft paper of the Mission Board. The survey addressed climate experts. They assessed future targets in thematic fields (e.g. financial risks, health, social infrastructure), and ranked related measures and R&I fields for importance.
- 6. Preparing and analysing the results of the Delphi survey: *Delphi Survey results, July/August 2020* (Deliverables 3 and 4).

The report is structured along these deliverables.

2 DELIVERABLE 1: SCOPING PAPER AND TASKS

The foresight expert group provided support to reflections of the Mission Board (MB) for Adaptation to Climate Change including Societal Transformation with foresight processes and forward looking evidence. Deliverable D1 was outlining various scoping options and how they could be implemented. In the following, we give a short overview of various scoping options that were under consideration, and an outline of the tasks that were performed for implementing the foresight exercise.

As discussed with the mission secretariat and included in the FOD offer, it was considered to apply a backcasting approach, which would identify a desirable scenario, and pathways, goals and possible bottlenecks towards reaching the scenario. During the implementation of the support project, these initial goals were modified towards a foresight workshop on barriers, solutions, enablers and impacts of climate change adaptation, and on conducting a Delphi survey to assess key aspects of the draft Mission Board paper.

Scoping options

We suggested starting the FOD work with analytical tasks, based on one or two items of the following list of **scoping options as an exploratory stage**:

- Assessment of selected national adaptation strategies (building on the Adaptation Preparedness Scoreboards carried out as part of the evaluation of the EU Adaptation Strategy), studying the actions proposed and the progress achieved in implementation, monitoring and reporting
- 2. An exploration of **national and regional projects on adaptation** among selected EU countries (in particular those funded by regional, cohesion or national funds).
- 3. Analysis of web platforms on adaptation supporting citizens and/or policy makers.
- 4. **Mapping of standards for adaptation**, incl. standards for climate services, and for climate proofing infrastructure.

It was agreed with the Mission Board and Secretariat to focus on option 2, the national and regional projects, as we saw here the most concrete material for analysis, as well as more relevance and input for our foresight study. The analysis was performed for a selected group of EU member states (MS) that had made good progress in Climate Chance Adaptation (CCA), as well as those that had been less active. Also, we aimed for regional balance over the EU. Countries to be considered were:

- Strong action on CCA: Austria, Czechia, Ireland, Spain, Sweden and The Netherlands
- Less activity on CCA: Latvia, Poland, Bulgaria and Croatia

Backcasting exercise

A backcasting exercise was discussed as possible option for implementing the foresight. The approach was to develop a vision on how a sustainable future can look like, where the adaptation challenges have been successfully tackled. This vision should include a broad range of dimensions such as equity, equality, wellbeing, health, governance, resilience, ecosystem, energy, food, water and a low-carbon economy.

This initial approach was abandoned, and instead a Delphi survey conducted on key elements of the Mission Board report "A Climate Resilient Europe". We outline in the following, which steps were taken to arrive at the Delphi survey.

Literature and project review, interviews

In the next step of the project, we agreed with the Mission Board and Secretariat to organise a foresight workshop, and tackle the exercise from the thematic angle of health. Preparatory work of the workshop included the following activities:

- <u>Scientific literature</u> was suggested by health experts in the Mission Board, and analysed by the foresight experts. Current challenges of climate change adaptation and health were identified.
- <u>Scoping work was conducted on climate change adaptation projects</u>, which were funded at national and regional levels. Project databases were screened and analysed for relevant content.
- <u>A series of interviews</u> was conducted with selected members of the Mission Board. In the interviews we explored views of climate change effects on health (mortality and morbidity), specific country situations of CCA and health, behavioural change solutions and lessons to be learned from them.

Input paper for foresight workshop

The results of the literature and project reviews, as well as of the interviews were compiled in a scoping paper for input to a foresight workshop. This overview of findings of analytical work is presented in the next chapter of this report.

Foresight workshop

A Foresight Workshop was conducted on 23 January 2020, which involved about 50% of the Mission Board members, European Commission staff (MB secretariat), as well as the FOD experts. The foresight workshop allowed identifying barriers and solutions, enablers and impacts on CCA and behavioural change in the topic health and related fields (e.g. water, agrofood). The workshop results are integrated as chapter 4 of this report.

Delphi Survey

Based on the draft report of the Mission Board "A Climate Resilient Europe" and on the workshop results, a Delphi survey was set-up. It served to assess key elements of the MB report, with a focus on expected impact of measures, effort needed, and a time horizon of implementation of measures for reaching a climate resilient Europe. The Delphi survey was implemented over summer 2020; its detailed results are available in the Annex, and the analysis in chapter 5.

Tasks performed & timeline

The tasks that were performed by the foresight expert group were jointly defined by the MB, the Mission Secretariat, and the project team.

| Date | Activity | |
|--------------------------|---|--|
| M1 - 6 Nov. 2019 | 2 nd MB-meeting: | |
| | - D1: Scoping paper. Presenting & deciding on the scoping activities | |
| | - Discussion of main instruments considered for the foresight: | |
| | backcasting, participatory workshops, survey for assessing pathways | |
| | and measures. | |
| | - Nominating MB members to attending the workshop, for being involved | |
| | in the tailoring and refining of the foresight activities | |
| M1-3 - Nov 2019-Jan 2020 | - Analysis of nationally and regionally funded CCA projects | |
| | - Initial thematic focus on health specified with MB and MB secretariat | |
| | Interviews with MB members on health & CCA in preparation of the | |
| | foresight workshop | |
| | D2: draft scoping report for input to foresight workshop: overview of | |
| | findings of analytical work. | |
| M3 – 23 Jan 2020 | - Foresight Workshop, involving selected MB and Assembly members, | |
| | EC colleagues (MB secretariat & foresight unit), the FOD experts | |
| | - Identifying barriers and solutions, enablers and impacts on CCA and | |
| | behavioural change in the topic health and related fields | |
| M4-5 – Feb-Apr 2020 | - Summarising the results of the foresight workshop | |
| | - Agreeing on a Delphi survey to be implemented on key elements of the | |
| | MB paper on CCA and societal transformation | |
| M6-7 – May-Jun 2020 | - Preparing the Delphi survey: questionnaire design, preparing online | |
| | version, pre-testing | |
| M8-9 – Jul-Aug 2020 | - Implementation of the Delphi survey | |
| | Assessment of key elements of the MB paper, with a focus on | |
| | expected impact of measures, effort needed, and a time horizon of | |
| | implementation | |
| M10-11 – Sep-Oct 2020 | - D3: Survey results compiled and visualised through charts and other | |
| | graphics | |
| | - D4: Final report: Consolidated results of the foresight exercise. | |
| | including the Delphi survey analysis of quantitative and qualitative data | |

3 DELIVERABLE 2: INPUT PAPER FORESIGHT WORKSHOP

3.1 Introduction

The foresight expert group provided support to reflections of the Mission Board (MB) for *Adaptation to Climate Change including Societal Transformation* with foresight processes and forward-looking evidence.

The request for services of the European Commission to the foresight expert group stated, that "services concerns support to policy definition, in particular in the definition of missions in the implementation of Horizon Europe." According to Art 7 of the Council's Partial General Approach of the Horizon Europe Regulation, "3. Missions shall: (a) have a clear research and innovation content, EU-added value, and contribute to reaching Union priorities and Horizon Europe programme objectives."

Deliverable 2 served as input document to an FOD workshop with the mission board on 23 January 2020. The foresight workshop aimed at validating key drivers¹ and trends², developing a raw scenario of the future, and at identifying barriers, solutions, enablers, impacts, and R&I gaps in the health and related thematic fields. The results of this workshop were fed back into the overall process of the foresight expert group, in their support of the MB.

3.2 Driver & Trends Table³

| Drivers | Trends/impact |
|---|--|
| | |
| Heat - Steady increase and more, longer, hotter heat waves, less pronounced drop in overnight temperature | Mortality because of heatwaves Mental health, e.g. Night-time heat, projected to increase with climate change, is associated with poorer sleep, a cause and consequence of poor mental health |
| | |
| Higher temperatures | Pollen - Extended seasons and more allergenic neobiota Air Pollutants - Climate-induced increased effect of ozone, decrease in particulate matter |

¹ Drivers are defined as developments causing change, affecting or shaping the future.

² A trend is an emerging pattern of change likely to impact large social groups or even state government.

³ The drivers and trends table is based on the Austrian Special Report Health, Demography and Climate Change (2018) and on interviews with Mission Board Members. The citation of the report is: Haas, W., Moshammer, H., Muttarak, R., Balas, M., Ekmekcioglu, C., Formayer, H., Kromp-Kolb, H., Matulla, C., Nowak, P., Schmid, D., Striessnig, E., Weisz, U., Allerberger, F., Auer, I., Bachner, F., Baumann-Stanzer, K., Bobek, J., Fent, T., Frankovic, I., Gepp, C., Groß, R., Haas, S., Hammerl, C., Hanika, A., Hirtl, M., Hoffmann, R., Koland, O., Offenthaler, I., Piringer, M., Ressl, H., Richter, L., Scheifinger, H., Schlatzer, M., Schlögl, M., Schulz, K., Schöner, W., Simic, S., Wallner, P., Widhalm, T., Lemmerer, K. (2018): Austrian Special Report Health, Demography and Climate Change (ASR18) – Summary for Policymakers. Austrian Panel on Climate Change (APCC), Verlag der Österreichische Akademie der Wissenschaften, Vienna, Austria, 26 pages, ISBN 978-3-7001-8430-0, doi: 10.1553/asr18_summarys1

| | Food – Pathogens - Campylobacter, salmonella, E. coli & vibrio infections, mycotoxins |
|-----------------------|--|
| | Working environment - psychology, public health, safety issues, accidents - In particular for agriculture and construction workers, e.g. changing working hours, |
| | Permafrost loss – leads to increases in disasters, landslides |
| | Changing vectors of diseases: Malaria, Ticks, West-Nile Virus |
| | Sea Level Rise - Deaths of humans and animals |
| | |
| Sunlight exposure | Melanoma |
| | |
| Heavy precipitation & | Mortality |
| | Snow masses, |
| | mass movements, |
| | Water Pathogens - Giardia lamblia, E. coli, vibrio and cryptosporidium infections |
| | Migration |
| | |
| Storms/Thunderstorms | Increased and stronger whirlwinds and tornadoes – mortality, mental health, food shortages (e.g. islands) |
| | Threats on sea for shipping and sailing |
| | |
| Drought | Forest Fires - Deaths of humans and animals |
| | Crop failure, undernutrition, food shortages |
| | Migration |
| | |
| Cold | Frostbite, strain on the immune system, influenza, danger for the elderly |
| | |
| Horizontal issues | Behavioural change, e.g. for sunlight exposure |
| | Measures to achieve behavioural change: Information campaigns, regulation, incentives, |

What works⁴ – evidence based policy making, evaluation for getting better evidence and experimental techniques for improved public policy: E.g. Prompt treatment for adults with a first episode of psychosis reduces rates of hospital admission and relapse

Infrastructure – protecting and improving critical infrastructure for CCA purposes, e.g. Ireland: massive investments in water infrastructure required for preventing pollution of drinking water and related health risk

Low investment in CCA health

3.3 Key messages from interviews

Interviews with Mission Board members were held in preparation of the foresight workshop. Only those members participating in the workshop were interviewed. In the following we present key messages from interviews.

National differences regarding CCA and health were highlighted

- Some countries better prepared for disasters than others, e.g. UK versus Italy
- Mediterranean countries to some extent already developed strategies or running research on heat related health issues, e.g. Malta information strategies (billboards) for prevention of sunlight exposure/melanoma, Spain is funding R&I projects on heat and the effects on the working environment.
- Water pollution in Ireland as a result of sea level rise/precipitation and the necessity to adapt the water infrastructure (pipes, etc.) to it, whereas other countries are more exposed to forest fires and need to adapt forestry infrastructure (e.g. Croatia).

Several thematic fields in health have been mentioned repeatedly by experts

- Sunlight exposure melanoma
- Labour market/working environment especially in southern EU members
- Mental health anxiety of young generation as regards CC, migration (traumatised migrants), trauma because of disasters
- Water-health link: pollution of drinking water, adaptation of water infrastructure
- Changing vectors of diseases: malaria, west nile virus, pollen
- Behavioural change as horizontal issue over all topics

Behavioural change - comments

- From an individual perspective, the behavioural changes that will have the greatest positive impact are increased awareness of existing relevant risks and appropriate adaptation and resilient measures.
- At the health and social care system level, the behaviour changes that will be relevant is understanding the risks and providing services that support vulnerable populations. This includes working with related organisations and facilities managers to enhance

⁴ <u>https://www.gov.uk/guidance/what-works-network</u>

awareness of health impacts and available services, and providing services (e.g., access to cooling facilities) needed to minimise exposure and vulnerability.

- Step from awareness of CC to intended behaviour and action is very difficult. What do we need to do to get people acting. Extreme situations trigger changes collect more information about improved awareness of risk, flood hazard risk how people behave and what they do to protect themselves. Augmented reality can help here, e.g. weather forecast with augmented reality!
- Incentivising behavioural change with benefits, carrots/sticks. More effort is needed for achieving behavioural change, and work with psychologists and sociologists is required. A positive framing of messages is more effective than frightening messages.
- Good practice examples information campaign for behavioural change interventions such as melanoma – slip slop slap SunSmart Campaign⁵
- Dietary changes (less meat) and changes in clothing are required
- Use the lens of health for better understanding of behavioural change, what can we learn from health for behavioural change, e.g. from successful campaigns on nicotine, etc.
- What behaviour change/ societal transformation measures are available to you to use to mitigate and adapt to CC? The problem here is that the most serious health effects may not be preventable, whereas some of the less serious health effects may be easily preventable through a relatively simple behaviour change intervention.
- How effective are those behaviour change interventions in terms of:
 - Outcome = reduction in mortality/ morbidity and over what time period
 - Cost-effectiveness = gain in health outcome per EURO spent
 - Who will benefit? And is this equitable throughout society? i.e. will affluent groups disproportionately benefit thereby leading to an increase in the country's health inequalities?

3.4 Key messages from analysis of national & transnational projects

Upon request of the MB, the foresight expert team conducted an analysis of recent publicly (co-) funded national – and transnational – research projects to find out which topics are covered, which measures they suggest in terms of societal transformation, and which drivers they address.

The analysis considered the following sources:

- national level: Austria, Croatia, Ireland, Italy, Latvia, the Netherlands, Sweden
- transnational level: ERA-NET ERA4CS, JPI Climate

The analysis of national and transnational research and innovation projects in the selected countries has shown that health and its link to climate change adaptation is rarely a specific topic. The following topics, which are related to health and CCA have been identified:

⁵ <u>https://www.sunsmart.com.au/tools/videos/past-tv-campaigns/slip-slop-slap-original-sunsmart-campaign.html</u>

| Dimension | Research or innovation topic |
|-----------------|--|
| | |
| Extreme | hydrogeological instability (floods, landslides), |
| weather effects | manage dynamics in flood hazards and risk mitigation, |
| | development of flood relief investment programmes |
| | |
| Infrastructure | resilient infrastructure, e.g. critical infrastructure, |
| | energy efficiency and resilient energy supply infrastructures, |
| | energy efficiency & heat resistant housing, commercial and public |
| | buildings, |
| | water and wastewater infrastructure, |
| | adaptation of health infrastructures |
| | • |
| Food | resilient agricultural system, |
| | sustainable and resilient fishery, |
| | soil treatment |
| | |
| Mobility | sustainable transport, |
| - | transition to electric vehicles (esp. public buses), |
| | charging infrastructure to cater for the planned growth of electric |
| | vehicles, |
| | infrastructure for active modes of transport |
| | |
| Ecosystems | vulnerabilities and solutions in coastal areas, |
| | focus on coastal ecosystems and development of climate services in |
| | marine ecosystems, |
| | development of techniques and tools for treatment of alien species |
| | |
| Energy | energy source diversification (wind, wave, solar, biomass, biofuels, |
| transition | biogas, and hydrogen) |
| | |
| Economy | sustainability and adaptation of tourism |
| | |
| Horizontal | understanding societal transformation (increase societal resilience, |
| issues | required institutional settings, |
| | new perspectives of public and private sector responsibilities), |
| | research for innovation in adaptation practices, |
| _ | |
| Behavioural | social pressure to drive change, |
| cnange/societal | transformation of governments (as facilitators or enablers of |
| u ansi u mation | transformation), |
| | implement programmes that actually contribute to the SDGs, |
| | challenge policy-makers to act, |
| | coherent and highly integrated investments |
| | investment in infrastructure (new technologies), |
| | consistent application of maintenance standards for infrastructures, |
| | effective mix of incentives, opportunities, and regulations, |
| | implement early warning systems, |
| | introduction of new standards, |

3.5 Key messages from the literature

Heat⁶

- Populations aged 65 years and older are particularly vulnerable to the health effects of climate change, and especially to extremes of heat.
- From 1990 to 2018, populations in every region have become more vulnerable to heat and heatwaves, with Europe and the Eastern Mediterranean remaining the most vulnerable. Overall, Europe remains the most vulnerable region to heat exposure (followed closely by the Eastern Mediterranean region), due to its ageing population, high rates of urbanisation, and high prevalence of cardiovascular and respiratory diseases, and diabetes.

Cold⁷

- Populations across Europe still experience significantly more deaths in winter than non-winter months. The immediate cause of most excess winter death is cardiovascular or respiratory diseases including seasonal respiratory infections, particularly in older people and those with chronic health problems
- Higher excess winter death rates are generally seen in European countries with less severe winter climates 'paradox of excess winter mortality.

Mental Health⁸

- Hot days and heatwaves are particularly concerning because of their prevalence and danger, and the statistical effect size of hot days on population mental health approximates that of unemployment.
- Night-time heat, projected to increase with climate change, is associated with poorer sleep, a cause and consequence of poor mental health, and some psychoactive medicines become ineffective during heatwaves
- Climate change may stretch already inadequate mental health services
- Extreme weather events attributable to climate change can also lead to mental health risks if they provoke migration, whether people are forcibly displaced, resettled or choose to leave
- Increase of the numbers of individuals exposed to extreme events and, therefore, to subsequent psychological problems such as worry, anxiety, depression, distress, loss, grief, trauma and even suicide.

Extreme weather events, diseases, pollution

• Direct effects result from changes in the intensity and frequency of extreme weather events like heatwaves and floods.

⁶ The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate, <u>https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32596-6/fulltext</u>

⁷ Tom Fowler, Rosamund J. Southgate, Thomas Waite, Ruth Harrell, Sari Kovats, Angie Bone, Yvonne Doyle, Virginia Murray (2014). European Journal of Public Health, Vol. 25, No. 2, 339–345.

⁸ Helen L. Berry, Thomas D. Waite, Keith B. G. Dear, Anthony G. Capon and Virginia Murray (2018). Nature Climate Change, Vol. 8, 282–290.

- Indirect effects can be felt through changes in the incidence of diseases transmitted by insects (i.e. vector borne diseases caused by mosquitoes and ticks), rodents, or changes in water, food and air quality.⁹
- Humans will experience loss of life—but potentially unequally. Women and children are 14 times more likely than men to die during natural disasters, which are likely to intensify or become more frequent because of climate change. The elderly and infirm are also at higher risk.¹⁰

Undernutrition – global scale¹¹

Undernutrition will be the greatest health risk of climate change:

- Declining agricultural productivity, particularly in drylands in Africa and high mountain regions of Asia and South America
- Increasing concentrations of CO2 will reduce the nutritional quality of most cereal crops
- The combined effects of climate change and the rise in CO2 concentrations are projected to result in a 20% reduction in the global availability of protein by 2050
- Global fish stocks are set to further decline, with an additional 10% of the global population facing micronutrient deficiencies as a result.

EU and key health-CC issues – the Lancet Countdown 2018 Report: Briefing for EU Policy Makers¹²

Recommendation on Heatwaves - Threats to health from increasing heat are becoming more frequent and more dangerous.

1. Ensure each Member State develops a National Action Plan for Climate, Health, and Wellbeing to address climate-related health impacts including heat illness.

Recommendation on Professional Education - A widespread understanding of climate change as an increasing health threat is vital to delivering an accelerated response.

2. Encourage Member States to ensure rapid inclusion of climate change and health in the curriculum of all medical and health sciences faculties in the EU.

Recommendation on Infectious Disease -: The Baltic Sea region has seen an increase in the transmissibility of *Vibrio* infection.

3. Make *Vibrio* cases reportable diseases in every country around the Baltic sea to facilitate close epidemiological surveillance and provide early warning of possible outbreaks, and develop a dedicated pan-European *Vibrio* network.

⁹ <u>https://climate-adapt.eea.europa.eu/eu-adaptation-policy/sector-policies/health</u>

¹⁰ World Economic Forum. The Global Risks Report 2020.

¹¹ Pihl, E., Martin, M.A., Blome, T., Hebden, S., Jarzebski, M.P., Lambino, R.A., Köhler, C., Canadell, J.G., Ebi, K.L., Edenhofer, O., Gaffney, O., Rockström, J., Roy, J., Srivastava, L., Payne, D.R., Adler, C., Watts, S., Jacobsson, L., Sonntag, S. (2019). 10 New Insights in Climate Science 2019, Future Earth & The Earth League, Stockholm.

¹² <u>http://www.lancetcountdown.org/resource/2018-briefing-for-eu-policymakers/2018-lancet-countdown-policy-brief-eu/</u>

Recommendations on Electricity - Coal power is responsible for a disproportionate share of air pollution-related deaths and greenhouse gases and must be phased out as soon as possible.

- 4. Maintain the EU's financial support for renewable energy schemes across its membership, and provide additional support in accelerating coal phase-out for a number of countries, including Poland, Bulgaria, Czech Republic and Romania.
- 5. Encourage Member States to commit to phasing out existing unabated coal power generation in their jurisdictions, and to a moratorium on new traditional coal power stations without operational carbon capture and storage capacity within their jurisdictions.

Recommendation on Air Pollution – Air pollution continues to be on a high level, in particular in urban agglomerations

6. Air pollution from all sources should be reduced to the lowest possible levels so as to minimize its effects on human health. Ensure all European Union Member States meet EU commitments with respect to air quality.

Recommendation on Communication - Media coverage of climate change and health is increasing, but higher levels would be helpful in terms of framing climate change as a public health issue.

7. Ensure consistent, pro-active external communications by health bodies pointing out the links between climate change and health impacts in real time as events which have been shown to be increasing due to climate change occur.

UN Environment Adaptation Gap Analysis report 2018

The adaptation gap in health can be characterized as the difference between the climaterelated health outcomes under actual adaptation efforts and the climate-related health outcomes that would occur under desirable levels of health adaptation efforts.

- Unless adaptation efforts are strengthened considerably, heat and extreme eventrelated morbidity and mortality will continue to rise.
- There are few robust global estimates of the health impacts caused by weather extremes, climate-sensitive infectious diseases and undernutrition.
- There is limited information on the costs of adaptation in health
- International climate finance for health has been negligible

BRIDGING THE ADAPTATION GAP IN HEALTH

Efforts related to enhancing the climate resilience of health systems

- Climate proofing health systems.
- Investing in capacity-building and preparedness.
- Integration of health into broader policy frameworks.

Efforts related to broader development action.

- Improving basic measures in water, sanitation and hygiene.
- Scaling up proven interventions to avoid malnutrition.

Efforts related to early warning, monitoring and building the evidence base.

- Building effective early warning and monitoring systems.
- Expanding the evidence base for climate related health risks.

3.6 R&I gaps – some examples

Cold

• The extent to which excess deaths can be attributed to sudden extremes of weather, rather than the more general impact of lower temperatures throughout the Winter period, is not yet well understood and represents a specific area for further investigation.

Mental health

- research agenda is needed that is researcher-led and developed jointly with policy actors, civil society and service providers
- Measuring the burden of disease and how it is changing over time: Experimental epidemiology, with intervention studies at levels from the individual to national (and, ideally, eventually international) is needed to gather insights and creative ideas for long-term climate change adaptation that can evolve as circumstances change, including for target sub-populations and locations.
- Understand the component parts of the climate change and mental health system
- Initiate small, prototype-testing group-level intervention studies to promote well-being and to improve prevention and early intervention in climate change-related mental health and wellbeing

Several issues from interviews

- Epidemics that are rare in frequency and the preparedness of systems to such health threats
- Exposure to diseases currently not present in the EU
- air pollution & water pollution there is far less preparedness than in other fields (e.g. for heatwaves)
- critical infrastructures, grid, water infrastructure, forestry and fire infrastructure important for health, is infrastructure already resilient/up to the task of CCA?
- Understanding of the complexity and interdependencies of drivers that impact on human health (both physical and mental) are important to understand, building on the single drivers of change (e.g. heat, precipitation, extreme events)
- Malaria: is coming back to Europe. It is a huge topic for Europe in a long term perspective, more people will die from Malaria. A mission could be eliminating Malaria.
- Behavioural change: How to compare one behaviour change intervention to another in an objective and systematic way particularly if they address different health effects (for example, how are you going to compare the number of melanomas prevented through a 'Slip-Slap-Slop' campaign (plus associated cost) with the number of cases of malaria prevented through introducing a behaviour change vector management programme (plus associated cost))

4 RESULTS FORESIGHT WORKSHOP CCA, 23 JANUARY 2020

4.1 Introduction

The foresight expert group organised a workshop on 23 January 2020, which involved Members of the Mission Board, Members of the Mission Secretariat, and the foresight experts. The workshop tackled the broad field of climate change adaptation from the thematic angle of health. From this angle it reached out to other thematic fields such as water, and agriculture and food. Barriers to climate change adaptation were identified and categorised into:

- Knowledge barriers
- Governance barriers
- Societal barriers

4.2 Vectors of Disease

| | | ColorScheme | |
|---|--|-------------|----------|
| Anowledge barriers | | Solutions | Impacts |
| Knowledge | | Enablers | Barriers |
| WHO/WMO global knowledge available | | | |
| But how to break the knowledge down? | | | |
| Training medical staff | | | |
| Trade offs between habitat restoration and creating ecosystems for vectors | | | |

The lead question is how to meet novel, vector-borne diseases coming into Europe in the context of a connected world that is working towards eradicating diseases like Malaria, having strong vaccination programs etc.

Key barriers around knowledge at several levels throughout society are

- in terms of healthcare providers, the ability of private care providers to diagnose symptoms of diseases they might not have seen before,
- treatment services in terms of hospitals, and
- knowledge in terms of how to have adequate surveillance systems for foreign diseases we haven't necessarily seen before;

On the community and individual level knowledge in society,

- having the awareness of protecting yourself against bites from vectors that might not have previously been there before,
- being aware of things like having stagnant water in your garden,
- not keeping water baths which aid the accumulation of mosquitoes,
- huge amounts of knowledge that you can galvanise at the individual level.

There are broader things like local planning policy, i.e. how you plan residential dwellings not to be near reservoirs, or aspects of planning that were previously not considered in countries in the northern hemisphere that actually might need become part of our steps or knowledge base.

Governance barriers

| | Governance |
|--|---|
| Need for cooperation among countries -> centre for disease control | Barriers / Enablers Institutionally - Cross- country/regional cooperation - European emergency plans - Interministerial cooperation - Including cooperation with MET services - campaigns |
| | Institutionally: - Capacity to treat (quarantine) disease cases - Infrastructure to scale up - Emergency system - Become more preventive (less reactive) |

Governance barriers: institutional capacity, which comes back to infrastructure – investing in surveillance systems, investing in capacity, how do we ensure business continuity as normal in a hospital whilst dealing with potentially high numbers of incoming cases. In the different healthcare systems that exist in European countries, to the extent that they may be publicly funded or privately funded, we have a growing health inequality. We know that climate change is likely to magnify health inequality. More on these issues is provided in the section about societal barriers.

Societal barriers Society Enablers: Societal Transformation A culture of health (...?) Education / Public between European countries Reluctancy to vaccination Free healthcare in Europe Societal Responsibility Worsening health inequalities -Most vulnerable most affected Ethical Issue Trade off medical service, where to invest most? Affordable Medication **Equality Aspect** Marginalization of Groups

The governance barriers go hand in hand with the *health inequality* issue. We know that, particularly in the UK, there are growing health inequalities; we know that climate change is likely to magnify these health inequalities, which also applies to vector-borne diseases. Consequently, the worst impacts of vector-borne diseases affect the poorest in society, which will perpetuate the situation, which is why *health inequality* is a significant barrier. On the positive side, and this is both a barrier and an enabler, the health sector and the planning sector are already cooperating to some extent, but improving this cooperation and having management plans to meet vector-borne diseases will be crucial.

<u>Good practice</u>: When educating the general public, we should focus on not creating too much fear around it, so that we do not incite huge amounts of anxiety whilst at the same time communicating the seriousness of the issue and the effect to health.

Key enablers

People in Europe have access to a decent level of healthcare. Another key enabler is transferring the breadth of global knowledge that already exists to Europe and implementing it effectively. For instance, the WHO and other organisations have huge amounts of literature on what works in terms of managing vector-borne diseases.

| 4.3 Water Stress | | | Color Scheme |
|--|---|---|--------------|
| | | Solutions | Impacts |
| Knowledge barriers | | Enablers | Barriers |
| | Knowledge | | |
| Awareness Not informed public perception Transfer of knowledge | Lack of Awareness of Water useage | Mitigation of extremes Behavior Changes Agriculture Changes Other Water Basin Approact | h |
| | Members of Public: - Lack of awareness of economizing and water recycling - Lack of awareness of health | Lack of awareness: Not knowing the water footprint of - Food - Goods - Services / Activities | |
| | risks associated with novel or rising pathogens as well as declining quality | Non-Water intensive cooling systems | |
| | Knowledge Barriers: Tailor-made Climate risk knowledge delivered is made accessible to specific users | Poor irrigation infrastructure innovation / knowledge | |

There is a lot of unawareness in terms of the public not being informed, this particular point about

- the lack of knowledge transfer,
- the lack of awareness on how to conserve and recycle water, or
- the lack of awareness of dangers as a result of climate change and how pathogens can affect health.

As regards solutions, there is a strong need for tailor-made climate risk knowledge for people so that they really understand. Like we understand our carbon footprint, we could understand our water footprint: what food we are eating, what clothes we are wearing, what services we are accessing, and what impact that is having on water. For example, we have cooling systems and heat, but what about non-water-intensive or non-energy-intensive systems.

Governance barriers

| | Governance | |
|--|--|--|
| Water Loss from pipes Lack of investment | Critical Infrastructure Adaptation -> Waste Water Treatment Plants | Overuse of pesticides |
| Desalination is too Energy intensive Lack of regulatory mechanisms around water wastage / improper use | Outdated infrastructure -> Sanitation | Maintenance of Ecological Zones -> Water Table No Change in agricultural behavior and policy |
| Digital competence, conservatism (traditional farming) -> SMART METER | No embedded policies (throughout public policy) Re: Water conservation | Perverse incentives / Lack of incentives regarding water reservoir management - > protection of wetlands -> protection of aquifiers -> effective use of water in agriculture |
| nfrastructure old and wasteful, e.g. Pipes | Water stress is a result of poor governance of water | H2O Stress: |
| Building Regulations? | Water authorities #Model (Revenue Raising Capacity) | Social inequality Waterway Transport Energy (cooling) |
| Aging infrastructure Perceptions of water services to be provided for free Inefficient allocation | Cross Border /Boundary Agreement Soll degradation | Agriculture (food) Health due to low water quality Economic downturn Ecosystem Collapse |
| | Lack of cross border communication Water Basin Management | Animal Health Disaster Risk Management Recreational Restrictions Tourism Restrictions |

Governance barriers

- Archaic and very poorly managed infrastructure we have infrastructures that are, in certain parts of Europe, very archaic and very poorly managed. Take water infrastructure, for instance, where we are in need of <u>digital competence</u> to understand what is happening to water and where (e.g. by using smart meters), which requires having access to the capacity to understand what we need to do with that data when it comes out, and by having <u>punitive measures for the abuse of water</u>. This applies to critical infrastructure as well as for waste water. Waste water plants are quite efficient but in many parts of Europe they are not: How to start to make them conserve and recycle waste water?
- Overuse of and overreliance on pesticides there are parts of Europe now that are suffering as a result of overuse of pesticides in that water becomes unavailable. We have to look at that and at agricultural behaviour and policy that can actually deal with it.
- Building regulations are not reflective of the fact that all new buildings should be conserving water, have green roofs, should be able to capture water from the sky (massive rainfalls or floods) and store it so we can deal with droughts.

<u>Overall message</u>: water stress is a result of poor governance, we actually have enough water but we are not using and governing it properly. We could manage water as a resource by raising its own taxes, by funding the system so the system can invest in itself and then have state of the art water conservation and clean-up. An aging infrastructure is an inefficient infrastructure.

Societal barriers



We need a massive behavioural change (180 °) because we are consuming too much.

- We are resisting change, even simple things like the hose ban in summer to conserve water water is a resource we have to manage.
- Behaviour changes are not rapid, people are changing slowly. Farmers are one group that needs to be educated on how to preserve water.
- We also need to understand how we reuse water at the household level and at the business level.
- We need accounting, how do we account for water?
- Society is not valuing ecosystems ecosystems can play a huge role not only in conserving water but also in supplying high quality water.

There is a social inequality with water, i.e. if you are poorer you may actually not have access to clean water, which might be a consequence of poor water management; if you have enough money and can pay for the infrastructure you have access to clean water; again, if you do not, you may be excluded.

4.4 Heat and Mental Health

Vision: By 2030, citizens are resilient to heat waves and mental health impacts.

Heat affects health and mortality, homelessness, urban health risk, non-communicable diseases, and poverty and energy. With regard to mental health, it can cause anxiety, poor sleep, suicide, and civil unrest. Heat and heat waves can cause trauma and migration. Governments need to increase the overall preparedness level.



A huge amount of knowledge is in principle available, but we need to increase it among citizens, e.g. from basic rules on what a thermometer is and what it measures and where you cite it. This has been a huge problem. Also, how to make cooling system choices. And there is limited knowledge about the <u>impact of heat waves on health</u> (lack of surveillance) or the <u>polarisation of vulnerable groups</u> that are affected. How are we going to bring that together to know what the risks are? We lack knowledge about the renovation of the housing stock; quick fixes can cause large transformations.

Success factors:

- early warning is critical: forecast of heat waves must be available and accessible
- architectural adaptation is needed it is already being done in other parts of the world, why can't we do it in Europe?
- understanding of "what works" is required; see UK example: <u>https://www.gov.uk/guidance/what-works-network, https://whatworks.blog.gov.uk/</u>

Governance barriers

| | Governance | |
|---|---|--|
| Global Heat Health informatuion network GHHIN | Education of Medical personel | Vision by 2030 citizens are resilient to heatwaves and mental health impacts |
| Existing Buildings and infrastructure not prepared for heat | Coordination with MET officers to translate forcast to concrete advice Capacity in hospitals preparedness | Consequences of heatwaves: Mortality rises, Livelihood impact outdoors, homeless, urban health risks, NCD, |
| Building code / Rules (ie. Mandatory green roofs) | Green infrastructure | poverty, energy |
| Renovation of the housing stock (quick | Existing infrastructure in urban areas | Institutional recognition of impact of heatwaves |
| Working hours concide with peak heat (Northern europeans do not have siestas) | exposed to heat, No governance to protect against heat (No welfare) | Stronger relation / links between ministries of ENN/CCI & Met office employment |
| 1.2007 | | Social service preparedness level |
| | | Governance legislation on right of ppl to have free access to weather info alerts |
| | | Partnership with 4: Met Services, Health, Age, Shocks |
| | | Migration trauma |
| eat and Mental Health | | |
| onsequences of Mental health Anxiety Poor Sleep | | |
| Suicide Rate Civil Unrest | Public Awareness campaigns | |
| oor Adaption Choices | Recreational space for cooling | |
| olation & Morbidity lental health scial cohesion | Fight against prejudice regarding mental tilness | |
| rop Failure / Cascading & Complex azards | What works | |

Barriers

- building codes/rules are not up to date to include adaptation (e.g. mandatory green roofs)
- lack of investment in green infrastructures
- no governance to protect against heat, especially in urban areas (vulnerable groups are affected the most)
- non-existing right of people to free access to weather information alerts
- water ownership

Solutions

- recreational space for cooling
- fight against prejudice regarding mental illness
- become aware of what works
- invest in green infrastructure
- educate medical personnel
- coordinate with meteorological services to translate forecast to concrete advice
- stronger relation between meteorological service and health personnel and agriculture
- tap into GHHIN (Global Heat Health Information Network)
- adjust working hours to heat peaks

Societal barriers

| | Societal Transform | ation |
|---|--------------------|---|
| Risk education of citizens | | Mental health of migrants increasing when coming to Europe |
| Societal: - Awareness campaign w Recommendations - Education, starting in so | ith behavioral . | Lack of cultural preparedness to cope with Heat (North Europe) |
| the families through the | students | Cooling Systems Heatwave impacts |
| Cultural habits of socializ | ing | 1.00 |
| Change in eating habits a (fashion) | ind clothing | Polarization Vulnerable groups more affected |
| Societal Transformation | | Good lessons from tropical countries |
| mental disease | eat induced | Migration Trauma |
| What Works | | |
| Increasing number of pe | ople living alone | |

Barriers

- Citizens do not understand the impact of heat waves
- Cultural habits still adapted to traditional seasons
- People do not understand cooling systems and how they can protect their homes
- Polarisation of vulnerable groups (more affected)

Solutions

- learn from tropical countries
- risk education of citizens
- start education in schools and educate families through the students
- change eating and clothing habits
- official recognition of heat-induced mental disease
- change working hours to accommodate heat
- spread "What works"

| Enablers | |
|--|------------------------------------|
| Heatwave plans implemented and reviewed | Sustainable and affordable cooling |
| Change working hours to avoid heat | Green infrastructure |
| Designing new common public spaces | |
| What works | |

Enablers

- heat wave plans across Europe they must be implemented and at a lower administrative level
- available sustainable and affordable cooling
- available green infrastructure
- heat/health information network (WHL/WML): GHHIN

4.5 Crop Failures and Nutrition

<u>Vision</u>: Europe is resilient to crop failure by 2030; if this is not managed, people will go hungry. The consequences of crop failure in the context of health are food shortages, malnutrition, dependency on imports, social unrest, rural collapse, more inequalities between urban and rural areas, demographic challenges, mental health, expensive food, to name but a few.



Barriers

- lack of knowledge on the growth of draught risks and crops for example,
- the lack of diversification and the need for diversification for crops,
- many knowledge barriers within the health system, e.g.
 - it does not understand crop failures, in particular the hazards and complex cascading risks and the impacts of crop failure associated with ecosystem failure,
 - it fails to evaluate change of food crops and nutritional values and consequences;
- lack of understanding of effective crops, where the new seeds are, where the new farming methods are in Europe,
- poor knowledge of mental health issues of European people but also in other groups, like farmer suicide (common in other, unfortunate parts of the world),
- lack of understanding and access to relevant climate information climate services for agriculture are very advanced in Africa, for instance, but not that much in Europe; we lack a systemic approach
- lack of knowledge of suitable crops and how to grow them to protect themselves from new pathogens that come with increased heat.

Governance barriers

| | Governance | |
|---|---|---|
| | Vision: resilience to crop failures 2030 | |
| Cross institutional engagement lacking | Lack of Water (Flood management infrastructure to protect crops) | Food inequality by who owns land for food agriculture |
| De privatization of industrial agriculture Failure to share evidence of crop failure Lack of access to relevant knowledge | Dependency on small number of crops Resistance to change in ag. Practices Diversification | Lack of changes in legislation -> financial support of wrong crops -> water consumption, fertilization |
| Failure to engage across institutions Seed manufacturers (industry) + food retailers | Food Banks Food insecurity has poor institutional mechanisms Famines are not a priority of Ministries | Missinformation Slown institutional response |
| Food waste - long distribution chains | Disease Resistance of pathogens to tratment -> pesticides | Barriers to adressing crop failures -> governance ->institutional / funding schemes not supporing diversity of farming and healthy |
| Social Protection Policy instruments for populations most vulnerable | Consequences: Food shortages Malnutrition Dependence of exports Social costs Rural collapse Demografic challenge Mental health | ecosystems -> perverse incentives |

Barriers

- existing food inequality related to who owns the land for food and agriculture, i.e. dominance of industrial agriculture, privatisation of food,
- lack of a cross-institutional engagement (cross-sectoral issue) necessary to solve the food inequality,
- failure to share the evidence of crop failure and lack of access to the relevant knowledge, both are institutional issues,
- failure to engage across institutions, e.g. between seed manufacturers, food retailers, consumer groups, and government officers,
- not enough social protection and policy instruments for populations vulnerable to food shortages,
- dependency on a small number of crops and a lot of institutional path dependencies in Europe, we still think that famines are in the past;
- lack of water and flood management infrastructure to protect crops
- lack of management of disease resistance of pathogens and treatments, pesticides, etc.;
- slow institutional response,
- existing misinformation,
- the lack of policies like food banks or protecting the poor,
- famines are not a priority of ministries in Europe.

Societal barriers

| | Society | |
|---|--|--|
| Loss of food crops Coffee Chocolate Banana | Human diet narrow - Social rejection of certain foods - Lack of knowledge of nutritional value of alternative foods | Behavior Changes (Lack) Consumer producer |
| Food cultures (lessons from history) | change of diet | Changing Diets |
| Monocultures | | Revival of ecological agriculture |
| Farmers - Social exclusion - Succession failure | Impact around cropfailure & Behavioral change | |
| Loss of ecosystems and biodiversity | | |
| Lack of water conservation Lack of biodiversity | | |

Barriers

- persisting food cultures (although lessons can be drawn from history),
- monocultures,
- farmers suffer from social exclusion and experience succession failure (knowledge loss of traditional sustainable agricultural practices; rural areas are being depopulated),
- lack of water conservation,
- lack of biodiversity,
- human diet is narrow as societies reject certain foods and because there is a lack of knowledge about the nutritional value of alternative food,
- society resists change.

| | Enablers | |
|-------------------------|----------|---------------------------------------|
| | | |
| Innovation for lab made | protein | Lessons from the developing countries |
| Precision food | | experiences with crop failures |
| | | |
| Food as medicine | | |

Enablers

- revival of ecological agriculture
- lab-made protein
- food as medicine
- lessons from developing countries experiencing crop failures

5 DELIVERABLES 3 & 4: DELPHI SURVEY AND ANALYSIS

On the basis of the draft paper of the Mission Board and based on the foresight workshop results, a Delphi survey was set up. It was used for assessing the approach of the MB paper (preparing Europe, building resilience, accelerating the transition) and the targets for key systems (social infrastructure, health, water, agriculture and food, and ecosystems). The survey was prepared in spring 2020 and implemented during summer 2020. The Delphi survey results are annexed to this report, and the analysis is provided in the following:

Delphi Survey results, July/August 2020

In this short paper we summarise the results of a Delphi survey conducted in July/August 2020 for the EU Mission Board on Adaptation to climate change including societal transformation. The Delphi survey uses the knowledge and experience of experts for assessing future developments, which are still uncertain. We have used in our case a real-time Delphi survey, which was implemented in one round. A discussion element among experts is built in the real-time Delphi: experts having filled in the survey, could see then the consolidated voting results of the other survey respondents and could revise their own assessment. The survey included matrix questions, drag & drop rankings, and open free text questions. All information provided by survey participants remained anonymous.

The survey was sent to a selected group of experts working on climate issues, primarily in research organisations. Experts were contacted, who are involved in Joint Programming Initiative (JPI) Climate and projects funded under this programme, COST Actions and H2020 projects related to climate issues, Climate Knowledge and Innovation Community (KIC), as well as other selected experts. 337 experts have accessed the survey, and 94 of those experts (or 28%) have answered at least one or more questions.

The survey results were analysed first automatically with the help of the online Delphi survey tool provided by our partner 4strat. These detailed survey results are annexed to this report. The FOD experts refined the graphical visualisation,¹³ and analysed and interpreted the survey results.

Results of quantitative expert assessments

The survey covered the **main sections of the MB paper** (preparing Europe, building resilience, accelerating transition), and its **key systems** including social infrastructure, health, water, agriculture/food, and ecosystems. Experts were asked for assessing eight statements on **time perspective** for implementation of targets (2025 to beyond 2050), on **effort** required for implementation and on expected **impact** (minimal to very high).

The following spider charts indicate trends for the items questioned in the survey. The grey shaded triangles show the average over the responses to all eight main statements of the survey, while the red lines give the average per single statement.¹⁴ We can see that

¹³ Visualisation in this chapter was done by partner ZSI.

¹⁴ For making the visualisation in the spider charts more explicit, we have removed the "minimal" answer option in categories "effort" and "impact". The minimal option was selected only by few outliers. For the category "year realised" we have weighted the answer options by the number of responses received per option (2025, 2030, 2040, 2050, 2050+).

ecosystems require longer time periods (2050), effort and impact (both high) for halting their degradation and for getting restored. On the other extreme, in the health field epidemiological surveillance and modelling tools can be achieved quicker, with less effort but also reaching less impact than the average.



The fields of **Water** and of **Agriculture/Food** show similar patterns, in that **water efficiency and protection gaps** can be identified and reduced, and a **shift towards healthy diets** be achieved quicker than the average, while they both need more than average effort and can reach high impact.



The response patterns over **renovation of public buildings and social housing** and to an **accelerated transition process** are close to the previous two items of water and healthy diets. Effort and impact were assessed as very high, while time perspective of realisation was expected to be longer: at the average for renovation, and close to 2050 in the case of accelerated transition to a future we want.

Public buildings and social housing renovated

Transition to the future we want accelerated



Finally, we can group together the items **comprehensive risk management plans adopted** and **protection gap closed and financial resilience built**. Both were expected by the experts to require a very high effort, but achieving less impact than the average. In terms of timing, experts assessed that risk management plans can be achieved before 2040, while closing the protection gap and financial resilience would take significantly longer.



None of the items and their goals can be considered a low hanging fruit, i.e. that it can be realised with a limited effort and fairly soon, and with a high impact. Instead, it seems that most goals require a lot of effort but that their impact is not universally high. As regards the year by which the goals can be expected to be implemented, the responses for each of them are fairly similar (between 2040 and 2050), with the exception of **accelerated transition to a future we want**, and **land degradation halted and degraded ecosystems restored** (close to and beyond 2050). Understandably so, as ecosystems do take time to recover after the underlying destructive force has been removed, even though their recovery is actively being helped through human intervention.

The sparkline charts below offer greater detail, as the response categories are fully represented with responses to each option. The average number of assessments amounts to 35 (N \approx 35) for each of the eight main items of the survey (dimensions). As is obvious, the results are not as uniform as the previous visualisation with spider charts suggests. In two extreme cases, the consulted experts seem to disagree whether the impact or effort is considerable or

whether it is very high. This concerns the impact of the land degradation halted and degraded ecosystems restored item, and the effort involved in realising the protection gap closed and financial resilience built.

There are three goals that were considered by the majority of consulted experts as high or very high on impact and effort, namely major shift towards healthy diets, public buildings and social housing renovated, and transition to the future we want accelerated. The majority of experts expected them to be realised by 2040. The transition to the future we want accelerated was actually expected to take somewhat longer but, more strikingly, the effort required to realise this goal was the only one gauged as high as land degradation halted and degraded ecosystems restored. In short, it is costly but very worthwhile to pursue.

Another goal that was expected to have an impact almost as high as the above-mentioned three goals and that should be pursued sooner rather than later concerns water efficiency and protection gaps identified and reduced. It will take time and efforts until the desired effects have been brought about.

| dimension | year | impact | effort |
|--|--|--|---|
| | 2005 2000 2000 2000 2000 2000 | numui nuolente tugh very lagh | nutrinet moderne nutri Nutri Nutri Nutri |
| Comprehensive risk management plans adopted | \wedge | \sim | |
| Land degradation halted and degraded ecosystems restored | ~ | \sim | / |
| Major shift towards healthy diets | \sim | ~ | |
| Protection gap closed and financial resilience built | \sim | \sim | \searrow |
| Public buildings and social housing renovated | \sim | \wedge | / |
| Robust epidemiological surveillance and modelling tools in place | \sim | | ~ |
| Transition to the future we want accelerated | | / | |
| Water efficiency and protection gaps identified and reduced | \land | ~ | 1 |

Measures, Research and Innovations were suggested in the survey for each of the eight main items. For response options, we relied on elements from the foresight workshop and from the input paper. The options were ranked through drag & drop by the respondents. The top ranked options were **financing** (e.g. for renovation, restoration of ecosystems), **awareness**

raising campaigns and behavioural change measures (e.g. for water saving, reduced meat consumption), and **strategies/monitoring/surveillance** (e.g. epidemiological surveillance). In the following table, the three top ranked options per survey section and key system are presented:

| Risk management plans | Water |
|--|--|
| Social and cultural processes that shape how risks and | Behavioural change campaigns on water saving |
| uncertainties are perceived and responded to | |
| Assessment of compound and cascading risks | Water treatment technologies and reuse of treated wastewater |
| Access to fast track climate risk assessments (e.g. from | Adaptation and investments in water infrastructure |
| the Copernicus Programme, Galileo, Climate-Adapt | (pipes, etc.) |
| platform) | (P.P.C.)) |
| | |
| Financial risk protection strategies | Food/Agriculture |
| Climate risk assessment plans for LAUs/NUTS2 regions | Awareness campaigns on the environmental cost of |
| | meat production and consumption |
| Innovative financing tools for climate proof community | Awareness campaigns on the health benefits of |
| infrastructure | reducing consumption of meat and animal proteins |
| Good practice exchange with frontrunner regions | Nature-based solutions to control soil erosion, |
| | pollution, pest and diseases |
| | |
| Social infrastructure | Ecosystems |
| Devising innovative financing tools for renovation | Devising financing tools for restoration of degraded ecosystems |
| Engaging the local communities through citizen science | Robust monitoring of ecosystems recovery in all EU |
| and crowdsourcing for co-designing solutions | climate regions |
| Good practice exchange with frontrunner regions on | Strategies and technologies for ecosystem restoration |
| renovation | |
| R&I into energy efficient renovation of public buildings | |
| (e.g. hospitals) and social housing | |
| | |
| Health | |
| Robust epidemiological surveillance for assessing | |
| impact of extreme events and disasters | |
| Early warning systems for extreme weather events | |
| Engaging actors beyond the public health sector such | |
| as private health care providers and city planners | |

Key messages from qualitative comments

Comments provided by the respondents to the survey were analysed and clustered around the following key messages:

 Too much focus is put on the means (e.g. strategies) of climate adaptation, but not enough on its ends, the implementation and the impact. The implementation of strategies and application of technologies are more critical than the development of new ones.

<u>Citation:</u> We have very relevant and plentiful scientific knowledge on the actions we need to take from a technological and policy point of view, but we are not being successful in implementing them fast enough.

2) The importance of **societal transformation**, and of other **soft measures such as citizen engagement and improved governance** for climate change adaptation have been underlined as success factors by the respondents. Citation: This time truthful citizen engagement and inclusiveness is needed.

Resilience, justice, public engagement and open dialogue, responsibility and responsiveness - all these should be in the focus of the processes of conceptualising and designing the pathways for transformative adaptation.

3) **Regulation and ambitious goals** will be necessary for advancing on climate change adaptation, and policy makers must take bold decisions on measures such as introducing CO2 taxes.

<u>Citation:</u> The EU does not need another toothless endeavour. Be bold! Include concrete goals, make it ambitious, act with confidence, demand that expectations are met, severely sanction those that do not fall in line, but provide support where needed.

Introduce CO2 and other taxes at EU level that support climate friendly behaviour.

4) **Modifications to our economic model** are inevitable for adaptation. Circular economy, resilience goals, and more frugal consumption patterns are needed and have to be tackled.

<u>Citation:</u> Nobody gets away with prospering by unsustainable exploitation of natural resources. Circular economy is a must have for economic success in the future, else we fight ourselves more than we fight climate change.

Adaptation to climate change in business and labour force requires in particular a focus on flexibility, and a partial shift from effectiveness to resilience goals.

5) Education has been highlighted repeatedly as an important element for adaptation.

<u>Citation:</u> For sure, we have to invest much more in society education on the importance of achieving this transformation as fast as possible, and to financially support (and check) the needed actions to be more resilient, especially for disadvantaged communities. We still have to work hard to translate scientific knowledge on all these [climate adaptation] topics into accessible information for all.

6) Spatial planning and organisational capacity have to be considered.

<u>Citation:</u> There is a need to think about different climate adaptation strategies and measures depending on the spatial context. It makes a difference whether you are affected by climate change on the coast or in the mountains.

Building organisational capacities and capabilities is a major measure to be taken; this includes a quick upgrading of digital sensors, measurements, data storage and management, etc.

ANNEX: DELPHI SURVEY RESULTS

Final Results 2020-09-07

Welcome to this Delphi to support the work of the Mission Board on 'Adaptation to climate change including societal transformation'.

The Delphi is based on an interim report of the Mission Board: Accelerating the Transition to a Climate Prepared and Resilient Europe (link).

EU missions are a commitment to solve major societal challenges in five mission areas. One of the mission areas is on '*Adaptation to climate change including societal transformation*'. Each EU mission will have a specific time frame and budget, according to their degree of challenge. They will go beyond research and innovation (and beyond the upcoming Horizon Europe programme), and will spark innovation across sectors to deliver effective solutions.

This Delphi invites you to assess selected future statements related to the area of the Mission Board on *Adaptation to climate change including societal transformation*.

Of **particular value is your input on additional measures, research & innovation** and that are essential for making the respective statement a reality. Options will be presented for you to rank but we kindly ask you to use the possibility to suggest further options.

If you are interested in the results of the Delphi, you have the possibility to share your e-mail address with us in the send off page.

We thank you in advance for your kind cooperation and look forward to your answers and suggestions.

Statistics Number of questions: 20 Number of participants: 337

Finished: 39 (12%) Not participated: 243 (72%) Participated: 55 (16%)



1. Introduction

1.1. The Mission

EU missions are a commitment to solve major societal challenges in five mission areas. One is on 'Adaptation to climate change including societal transformation' (CCA). EU missions will have a specific period and budget, according to their degree of challenge. They will go beyond research and innovation (and beyond the Horizon Europe programme), and will spark innovation across sectors to deliver effective solutions. Your contribution, together with the input from the other participating experts, will inform the Mission Board and support their effort to further refine the presented visions and ambitions. Please click the "Next" button below to continue.

CCA Mission background: The global climate crisis is an existential threat to the environment, human health and the economy (EUCO 23/19. European Council meeting (17 and 18 October 2019) -Conclusions). The world is on a trajectory of 3 •c to 4 •c warming by 2100. Pursuing this trajectory further can unleash irreversible climate tipping points that could set off unstoppable global warming. Already now, climate change has contributed to making weather and climate related extreme events more frequent and severe in some regions in Europe. In a world of increasing and mutually reinforcing climate disruptions and socio-economic and environmental challenges, the vision of this Mission is to turn the urgent challenge of adapting to climate change into an opportunity to make Europe more resilient, climate prepared and fair. By 2030, the Mission will: (i) Prepare Europe to deal with climate disruptions, and assist all citizens, communities and regions in better understanding, preparing for and managing climate risks such as heatwaves, forest fires, droughts, floods, storms and diseases; (ii) Accelerate the transition to the future we want, supporting 200 European communities and regions in co-creating a vision and innovation pathways, as well as developing solutions and enabling conditions for transformative adaptation within safe planetary boundaries; (iii) Build deep resilience by scaling up actionable solutions triggering societal transformations through 100 deep demonstrations of resilience across a number of European communities and regions. For more information about the CCA mission, head to the EC Mission webpage.

1.2. Delphi instructions

Answering the survey takes about 20 minutes. Using the overview structure on the left, you can navigate freely between statements. Please choose the statements and questions you are most interested in and skip the others. You will be able to assess each statement along three dimensions, i.e. likelihood, effort, and impact via a slider that you can drag with your mouse. Please note that each slider changes its value when you move it from the default answer to a different value, e.g. likelihood shows the year by which you think the statement will become a reality. Once you have saved your response to a statement or question you will be able to see the response of other participants. Before finishing the current Delphi session, you can continue to assess statements you skipped or modify your responses as often as you like. If you are done with the Delphi, please navigate to the Send oft section (at the bottom of the navigation structure to the left) and make sure to click the Finish Real-time Delphi to submit your final responses to our database.



1.3. Which stakeholder group do you primarily belong to?

2. Risk Management

2.1.STATEMENT - All Local Administrative Units (LAUs) and regions (NUTS 2) in the EU have adopted comprehensive risk management plans on climate adaptation, based on accessible risk assessments.

Regions and Local Administrative Units refer to EU regions according to the NUTS2 classification (281 EU regions; 239 without the UK). The Local Administrative Units (LAU) [2] are the building blocks of the NUTS and comprise the municipalities and communes of the EU. Please note that you can *hold & drag* the slider of each dimension below the statement to different values, which are shown as mouse-over. Move the slider of each response dimension until you are satisfied with the option.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | considerably |
| How much effort is required by the regions and communities to make this statement a reality? | high |

Comments

Anonymous 390

Question 1 is rather narrowly formulated. Given that some countries have thousands of municipalities, there will always be a few who do not have comprehensive climate risk management strategies. Therefore, the 'correct' answer to this question will be 'never'. I would have preferred a more realistic question, such as 'More than 95% of the population live in municipalities that..."

I find question 2 ambivalent. Are you referring to the socio-economic costs of these efforts, their benefits or both?

Anonymous 498

Since it is unrealistic to assume that every NUTS2 unit is capable of adopting a comprehensive plan, I interpret this statement such that all units that actually are capable will adopt such a plan. As regards impact, the adoption of a plan is not impactful per se the implementation is (if done right). If they are serious about this measure, they will need to monitor both the implementation and the impacts.

2.2. Measures, Research & Innovations

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought to be added to this list.



Comments

Anonymous 43

Social and cultural change towards recognizing and adopting climate justice considerations.

Anonymous 281

Science for society supporting and enhancing citizen movements as driving force of change.

Anonymous 407

Teaching citizens how to become resilient and what resilience means.

Anonymous 390

I placed the most important item at the top. I hope this was the intention, as I missed unambiguous guidance. In this context, I do not understand what the "Stacked index chart" shows. Intuitively, I would expect that the wider bars are the more important ones.

However, if the chart adds up the numbers on left, the more important actions are (in my interprettation) actually characterized by smaller numbers (i.e. I used "1" to characterize the most important option). In this case, the most important options would show up on top on the left side, but at the bottom with narrow bars on the right side.

In a nutshell, this prioritization exercise lacks unambiguous instructions, which may make its interpretation impossible. Unfortunately, the same applies to *all* prioritization questions in this survey.

Anonymous 386

Business sectors need to be given first priority as their transformation needs motivation most. Risks for businesses need to be made concrete for individual businesses. But also, the information on how much businesses are causing climate change is relevant to make the transformation urgency concrete and actions to start now.

Anonymous 515

Access to improved weather forecasts, including risks for extreme weather, floodings and high water level.

Anonymous 498

Create a positive, constructive environment to get civil society, businesses, citizens themselves, research, and policy makers together to come up with solutions.

Anonymous 362

Economic regulations (e.g. tax-based).

3. Financial Risk Protection

3.1.STATEMENT - All LAUs/regions (NUTS 2) in the EU have designed comprehensive financial risk protection strategies, e.g. via insurances, to become resilient against damage and losses from extreme climate events.

Regions and Local Administrative Units refer to EU regions according to the NUTS2 classification (281 EU regions; 239 without the UK). The Local Administrative Units (LAU) [2] are the building blocks of the NUTS and comprise the municipalities and communes of the EU. Please note that you can hold & drag the slider of each dimension below the statement to different values, which are shown as mouse-over. Move the slider of each response dimension until you are satisfied with the option.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | considerably |
| How much effort is required by the regions and communities to make this statement a reality? | high |

Comments

Anonymous 390

As commented before, a statement referring to "All regions" is almost impossible to answer, given that there will always be some exceptions.

Furthermore, in my view there are limitations to what insurances can achieve. They work best for rare risks with a somewhat unpredictable distribution. If the risks become too large, premiums may become excessive. If large risks are distributed unevenly, but somewhat predictable, insurance may become unattractive for those in low-risk regions/categories, driving up premiums further for those most at risk. **Anonymous 498**

Again, since it is unrealistic to assume that every NUTS2 unit is capable of devising comprehensive strategies, I interpret this statement such that all units that actually are capable will adopt such strategies.

Again, a strategy does not have any impact per so, its realisation has, hopefully.

3.2. Measures, Research & Innovations

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought be added to this list.



Stacked column chart (index)

Comments

Anonymous 281

Positive European competition between regions : "best adapted" raising awareness and attractiveness of region for investors, citizens, tourists

Anonymous 407

Examples of failures/bad practices are also useful - learning opportunities

Anonymous 435 null

Financial options

4. Social Infrastructure

4.1. STATEMENT - 30 % of public buildings and social housing in the EU have been renovated, making them energy efficient, healthy, and compliant with principles of circular economy.

Please note that you can *hold & drag* the slider of each dimension below the statement to different values, which are shown as mouse-over. Move the slider of each response dimension until you are satisfied with the option.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | highly |
| How much effort is required by the regions and communities to make this statement a reality? | high |

Comments

Anonymous 407

I find 30% to be a very low share of the total public building stock to be subject to renovation and refurbishment. In the following 10 years - until 2030 - 100% of the public building stock has to be renovated.

Anonymous 561

Response of norms are inadequate faced to climate change

RT2012 and RT2020 do not correctly calculate the summer comfort of houses! the calculations are not house specific. The technical solution proposed for Lille is the same as for Marseille !!!!!!! RT norms are for big suppliers to place their products

While building my own house, I realised how building norms are used by big companies to place their products in a sort of monopole status. In France, they use obligation of means instead of obligation of results to impose their products: concrete, high tech devices domotics (using more electricity), insulation products (monopole of polyurethane products instead of bioproducts). For treatment of domestic water, also... all those products cost too much for average citizens. Alternative building systems are not validated, in spite of the fact that they provide less costly efficient way of building, using more human power and less carbon power.

4.2. Measures, Research & Innovations

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought be added to this list.



Stacked column chart (index)

Comments

Anonymous 43

Providing finance within existing tools, supporting communities to apply for them

Anonymous 281

ambitious regulation on targets for existing and new buildings; focus on sense making and inclusion **Anonymous 407**

I do not think that we need a lot of R&I into energy efficient renovations on public building stock - we know both the problems and the technological solutions, what we need is to act, the sooner, the better. What is needed is to involve the communities at the design stage, and have working financial instruments in place - for which I also do not think that they have to be truly innovative.

Anonymous 292

Other: Regulation and carbon pricing

Anonymous 561

Again, there is a growing community of self-builders that provide low-tech cost efficient solutions using local resources (earth, stack, local wood) human intensive solutions, instead of carbon intensive solutions to create housing adapted to the climate changes in the future. Local knowledge from citizen about microclimates also provide an important source of information to build houses resilient to hazards, using energy passively (orientation, wind, water) and locally adapted

5. Health

5.1. STATEMENT - 100 EU regions have developed robust epidemiological surveillance and modelling tools for assessing and predicting health impacts (e.g. morbidity, mortality, or mental health) of extreme events and disasters associated with climate change.

Regions refer to EU regions according to the NUTS2 classification (281 EU regions; 239 without the UK). Please note that you can *hold* & *drag* the slider of each dimension below the statement to different values, which are shown as mouse-over. Move the slider of each response dimension until you are satisfied with the option.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | considerably |
| How much effort is required by the regions and communities to make this statement a reality? | considerable |

Comments

Anonymous 281

The current COVID crisis shall accelerate preparedness measures in relation to health.

Anonymous 407

I think all EU NUTS2 regions have to work in this direction.

Anonymous 561

When we see how the covid crisis was monitored in France and in Europe, there is no HOPE. No preparation lies about the masks, absence of help between European countries, closing of borders; there is no hope for a better world.

Anonymous 362

Socio-economic impact depends on how serious actions are taken as follow-ups.

5.2. Measures, Research & Innovations

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include

the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought to be added to this list.





Comments

Anonymous 281

Enhanced interregional collaboration on surveillance and assessment of impacts of extreme weather events - dialogue and simultaneous mutual learning.

Anonymous 407

Action at EU level to include all EU NUTS2 level regions.

Anonymous 561

For a start, we need to make every possible effort to reduce our carbon footprint on the planet. so what is the point to deal with epidemia and extreme climatic events if business as usual is going on(air plane traffic remains the same, if globalisation of the economy remains the same) it is like pouring water in a pierced bottle.

6. Water

6.1. STATEMENT - 100 EU regions under water stress, now or in the foreseeable future, have reduced water efficiency gaps and water protection gaps by at least 50%.

Regions refer to EU regions according to the NUTS2 classification (281 EU regions; 239 without the UK). Please note that you can *hold* & *drag* the slider of each dimension below the statement to different values which are shown as mouse-over. Move the slider of each response dimension until you are satisfied with the option.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | highly |
| How much effort is required by the regions and communities to make this statement a reality? | high |

Comments

Anonymous 561

Again, there is no hope of change today, as water is considered as a commercial good. Big systemic and cultural changes are required. Citizens are ready, but big commercial interests are pushing in the other direction. In France, authorities are discouraging people to use alternative water resources such as rainwater for the total supply of water. Agriculture infrastructure is not ready to change their crops for dry breed plants and animal because of the whole agrofood system.

6.2. Measures, Research & Innovations

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought be added to this list.

Stacked column chart (index)



Comments

Anonymous 43

Social and cultural change in affluent states and groups towards less water intense lifestyes (reduction of e.g. consumption of water intense foods, water intense gardening, pools,...).

Anonymous 281

Learning from other world regions under water stress (ex: South Africa: Cape Town campaign in 2018).

Anonymous 407

Water justice should be part of the measures.

Anonymous 418

Fixing by law target objective of reducing water footprint of every activity by 50% in 2050.

Anonymous 490

Other: stricter rules and regulations of water-intensive industries in water-scarce regions. In other words, I regard stricter measures than information campaigns as unavoidable.

Anonymous 561

The change must be systemic. before reusing water, SAVE water

Change the agriculture system (1st consumer of water) invest massively in rain water storage Invest massively in solutions using no water like dry toilets and invest in composting

Forbid the use of water for public or private gardens parks, except for trees in city (to mitigate warming), discourage strongly the private swimming pools.

7. Food/Agriculture

7.1. STATEMENT - A major shift towards healthy diets has been achieved, with an increase by 50 % of regionally produced, seasonal, and healthy agricultural products

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | highly |
| How much effort is required by the regions and communities to make this statement a reality? | high |

Comments

Anonymous 407

FOOD2030 strategy should be a priority for all NUTS2 regions - the systems approach.

Anonymous 390

It could have been helpful to be more explicit whether this benchmark refers to a 50 % increase (e.g. from 10% to 15%) or to a 50 percentage points increase (e.g. from 10% to 60%).

Anonymous 561

Encourage self-production of greens and fruits, encourage conversion of gardens into edible gardens, cities convert their green spaces into edible gardens.

7.2. Measures, Research & Innovations

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought to be added to this list.



Stacked column chart (index)

Comments

Anonymous 43

Regarding 6: What is precision farming? Some non-innovative but old measures could prove very useful, e.g. agroforestry. Regarding 2: More and tastier seasonal vegetarian and vegan cooking (in cafeterias, restaurants, TV, fast food, ...).

Anonymous 281

Regulation with higher incentives for sustainable agriculture and discourage environmentally impactful soil management.

Anonymous 407

Citizens should be part of the solution - citizen/consumer centric approach.

Anonymous 435

increase in the price the primary producer gets for the food, to make it possible to produce in a more environmentally sound way.

Anonymous 390

Tax measures and minimum standards to increase the price of meat and unsustainable agricultural practices compared to more sustainable food products.

Anonymous 292

Other: Regulation, pricing policies and food labelling.

Anonymous 362

Other: financial regulations / incentives to change consumption patterns and support for local production (e.g. greenhouses), tax regimes.

8. Ecosystems

8.1. STATEMENT - In the EU, land degradation has halted and at least 30 % of the most degraded ecosystems across land and sea have been restored.

Please note that you can *hold* & *drag* the slider of each dimension below the statement to different values which are shown as mouse-over. Move the slider of each response dimension until you are satisfied with the option.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2050 |
| How socio-economically impactful do you expect this effort to be? | highly |
| How much effort is required by the regions and communities to make this statement a reality? | high |

8.2. Measures, Research & Innovation

Please order the proposed items in terms of their importance to realise the statement. Drag the items to the right into the grey, shaded box to the left. Due to technical constraints, you will need to include the "other" option. Please <u>comment in the text box below</u> if you do have "other", additional items that you think ought be added to this list.

Stacked column chart (index)



Comments

Anonymous 43

How can we support local grassroots movements for ecosystem protection and restoration against economic (and resulting from this often political) interests? How do we engage local communities into ecosystem protection and restoration, delivering jobs and income for them?

Anonymous 281

Liability for land degradation and restoration.

9. Accelerate the transition

- 9.1. STATEMENT We accelerated the transition to the future we want by supporting 200 European regions in designing and implementing transformative adaptation within safe planetary boundaries. This includes further, more concrete targets (see description below).
 - 200 regions have developed their vision of and pathway for transformative adaptation.
 - 200 regions have access to data, knowledge, digital services, and actionable solutions for climate change adaptation.
 - 200 regions have built relevant skills and capacities needed by the workforce to transfer from declining sectors to growing sectors, and to adapt to new processes.
 - 200 regions have established inclusive and deliberative governance processes to design fair transitions required by climate change.
 - 200 regions have strengthened sustainable local economies, e.g. through plural forms of business entrepreneurship, new forms of social enterprises and community owned SMEs, and more dense local supply chains.

Spider chart



Table

| Rating criterion | Arithmetic Mean |
|--|-----------------|
| When is this statement likely to become true? | by 2040 |
| How socio-economically impactful do you expect this effort to be? | highly |
| How much effort is required by the regions and communities to make this statement a reality? | high |

9.2. Measures, Research & Innovations

This question differs from those above in that the focus lies on tapping into your experiences, insights, and ideas - hence the open question: Please capture in the text box below the <u>measures and</u> solutions, including and especially social transformation, that you think are impactful and vital in <u>making the above statement a reality</u>.

Table

| Identification | | Text |
|----------------|-----|--|
| Anonymous | 43 | The majority of European cities (>50%) have become significantly more climate resilient than today Measures: City planning and infrastructure planning adopt climate resilience as a top priority Financial and structural support of the most vulnerable quarters towards improving climate resilience Social coherence, improving access of poorer community members to richer community areas (better mixing of living areas, more greenspaces in downtown areas, less air pollution from combustion engines, etc.). |
| Anonymous | 281 | Transformational change requires innovative approaches; insights of Social Sciences and Humanities are essential to informing a positive transformation in the face of climate change; interdisciplinary collaboration is crucial; engagement of non-scientific societal actors in climate research is key to ensure impact and uptake of results; focus on operationalising knowledge key areas for research: governance and agency in societal transformations; operationalising scenarios for transformative change; social justice and participation in climate actions; sense making, cultural meaning and climate risk perceptions. |
| Anonymous | 224 | This time truthful citizen engagement and inclusiveness is needed. |
| Anonymous | 407 | Resilience, justice, public engagement and open dialogue, responsibility and responsiveness - all these should be in the focus of the processes of conceptualising and designing the pathways for transformative adaptation. |
| Anonymous | 304 | Responsible innovation, bottom-up, upstream engagement, empowerment, inclusive and diverse. |
| Anonymous | 384 | The task is a very comprehensive challenge, which requires new governance models including real collaboration of policymakers, innovators, industry, citizens, and other stakeholders. |
| Anonymous | 427 | Campaign to engage a broad diversity of stakeholder in concrete projects to address those challenges: raising awareness, engaging them in defining and conducting strategies, relevant science and technology development and implementation on the ground. Research funding aligned with priority gaps to achieve these goals. |
| Anonymous | 391 | Define and select actions which have rapid impacts which can convince public to act. |
| Anonymous | 245 | Transformative adaptation of 200 regions described in 9.1 statement builds on a very complex set of measures and solutions. Probably the only major solution we have to focus on right now for the sake of the bright future is resilience education that encompasses new, integrative way of educating our future humans. It should aim not for some separate specific skills (e.g. programming, entrepreneurship), but focus on traits that should make humans more resilient. Major aim is to educate humans in a way that they are mentally flexible yet emotionally balanced. Future trends (incl. climate adaptation) holds much of unknown for us. We do not know what to train for. However, we can train to be flexible and balanced to embrace more and more speedy change. This education should focus on building characters (e.g. grit, also 4Cs including critical thinking, communication, collaboration and creativity). Only strong characters can cope with climate adaptation that awaits us. We should focus on educating future citizens, as it will be extremely hard to change behavioural patterns of the current ones who think that they are still living in the planet with infinite resources. |
| Anonymous | 390 | It is important to connect (current and future) climate adaptation needs with current concerns of citizens and businesses, focusing on and emphasizing co-benefits. Where possible, adaptation considerations are nationally harmonized (e.g. through standards), in order to avoid that every region has to start from scratch. Fundamental changes in the |

| | | workforce are probably even more relevant in relation to climate change mitigation than adaptation (i.e. by switching from carbon-intensive industries and services to less carbon- intensive ones). Adaptation to climate change in business and labour force requires in particular a focus on flexibility, and a partial shift from effectiveness to resilience goals. |
|-----------|-----|---|
| Anonymous | 490 | Urban and spatial planning will be crucial for realising this goal. building organisational capacities and capabilities are a second major measure to be taken. This includes a quick upgrading of digital sensors, measurements, data storage and management, etc. citizen and stakeholder engagement are a third key measure. Without the support of citizens, this will never work. |
| Anonymous | 386 | Nobody get's away with prospering by unsustainable exploitation of natural resources . Circular economy is a must have for economic success in the future, else we fight ourselves more than we fight climate change. This message and the associated policy transformations are hard, but necessary With a firm announcement of Europe making this principal applicable globally on its own Markets could shift the balance towards combating climate change and not battling for positions in global economic competition. |
| Anonymous | 511 | We have very relevant and plentiful scientific knowledge on the actions we need to take from a technological and policy point of view but we are not being successful in implementing them fast enough. I believe we need to invest much more on education for all age groups on the importance of achieving this societal transformation in record time (say 15 years). We need to change our consumption patterns radically. To do so we need to provide funding for translating complex scientific information on climate impacts and adaptation needs into accessible easy to understand & implement actions for all of the society. |
| Anonymous | 561 | 1) This education should focus on building characters (e.g. grit, also 4Cs including critical thinking, communication, collaboration and creativity). 2) Become the quiet inhabitants of the earth, by reducing our impacts: reduce consumption per capita, reduce human population (stop encouraging nativity like in France!). |
| Anonymous | 604 | We have enough (despite not complete, so far) scientific knowledge on the actions we need to take from a technological and policy point of view; despite this we are not being successful yet. For sure, we have to invest much more on society education on the importance of achieving this transformation as fast as possible, especially in Mediterranean countries, and to f1nancially support (and check) the needed actions to be more resilient. Thus, we need to concurrently work on education and to provide funding for actions, especially to disadvantaged communities. Moreover, I completely agree that we still have to work hard to translate scientific knowledge on all these topics into accessible information for all. |
| Anonymous | 362 | We need to overcome private traffic through a long-term based strategy which does not make people feel insecure but which provides guidance. This requires anticipative and responsive governments (even if they change). Education is important too. Traffic-reduced spaces will lead to completely new city cultures, which have a potential for transformation. |
| Anonymous | 634 | A long-term European strategy should be developed based on the current achievements of knowledge, and the strategy should be flexible enough to incorporate the new important facts and ideas. To have a sustainable and long-term public support, the education must be a priority, too. Informed societies react wiser. |
| Anonymous | 564 | A transformative change would be feasible only from bottom-up. It is the decision of every single citizen to make the change happens. However, institutions should drive the change. In addition, the decoupling of GDP growth from resource use is fundamental. This includes as well limited use of plastics, limit pollution, limit soil consumption, sustainable transport (bicycles, walking), limit mobility, ecosystem protection, restoration and nature- based solution for climate adaptation. |

| Anonymous | 663 | Europe's contribution to climate change is higher than the world average. The indirect impacts of consumption behaviour should be evaluated. Moreover, the contribution to the adaptation in countries exporting to Europe should be improved by better market mechanisms. Economic, regulatory and enforcement mechanisms should be better known and deployed. |
|-----------|-----|---|
| Anonymous | 631 | Include CC issues into the curricula of our education systems starting with primary schools. Switch the official measurement of economic welfare from GDP to wellbeing indicators. Introduce C02 taxes at EU level. Public institutions from local to trans-national levels have to go ahead as role models. This regards rules of public procurement, the construction of public buildings, public mobility and food consumption in schools and other buildings. |

10. Other relevant targets, measures & solutions, research & innovation, activities or - more generally - new topics

10.1. Please feel free to suggest other relevant targets, measures & solutions, research & innovation, activities or - more generally - new topics addressing knowledge gaps on Climate Change Adaptation that ought to be closed and require actions in the EU.

| Identifica | tion | Text |
|------------|------|--|
| Anonymous | 43 | There is a limit to adaptation. If climate change is not mitigated dramatically, adaptation will fall short of the problems to come. Thus, EU should pull forward ambitious legal goals for climate change mitigation. |
| Anonymous | 281 | Need to integrate, assess and make climate adaptation knowledge available to support decision making in a structured manner structured dialogue at European level between regional leaders and communication towards the broader public connect implementation measures of the European Climate Pact to engage European citizens in the mission profiling the EEAS climate ambassador within Europe. |
| Anonymous | 407 | Society at large should be well aware and engaged in all processes of climate change adaptation measures. This is the main driver for success of the policy and the mission on climate change adaptation - make this the personal mission of every European citizen. |
| Anonymous | 391 | Identify where there are clear trade-offs and synergies with other policies / programmes to be even more efficient. |
| Anonymous | 245 | Resilience education. |
| Anonymous | 390 | Strengthen the EU agencies and bodies that already have experience in bringing together scientific experts, policy makers at different governance levels and other stakeholders related to climate change adaptation, thereby facilitating mutual learning, monitoring and evaluation of actions. Their budget is minuscule compared to the efforts needed (and compared to the budget of this mission). |
| Anonymous | 490 | There is a need to think about different climate adaptation strategies and measures depending on the spatial context. It makes a difference whether youare affected by climate change on the coast or in the mountains. |
| Anonymous | 386 | If we could attribute the change to individual businesses, we could put more speed in their efforts to do something about this change. A lot of European business has been able to prosper from natural resources exploitation that causes climate change. The awareness of this should make them humble and make them try hard to make up for it now. |
| Anonymous | 561 | How can we change from an economy based on growth and finance to an economy based on reduction of consumption, and better share of resources left? |
| Anonymous | 498 | Why do most statements lack concrete goals and therefore ambition? The EU does not need another toothless endeavor. Be bold! Make it ambitious, act with confidence, demand !hat expectations are met, severely sanction those that do not fall in line but provide support where needed. |
| Anonymous | 631 | Introduce C02 and other taxes at EU level that support climate friendly behaviour. |

Table

Getting in touch with the EU

IN PERSON

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

ON THE PHONE OR BY EMAIL

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

- at the following standard number: +32 22999696 or
- by email via: https://europa.eu/european-union/contact_en

Finding information about the EU

ONLINE

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

FU PUBLICATIONS

You can download or order free and priced EU publications from: https://op.europa.eu/en/publications. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/europeanunion/contact_en).

EU LAW AND RELATED DOCUMENTS

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu

OPEN DATA FROM THE EU

The EU Open Data Portal (http://data.europa.eu/euodp/en) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.

The EU introduced missions as a new instrument in Horizon Europe. Mission Boards were appointed to elaborate visions for the future in five Areas: Adaptation to Climate Change Including Societal Transformation; Cancer; Healthy Oceans, Seas, and Coastal and Inland Waters; Climate-Neutral and Smart Cities; Soil Health and Food. Starting in autumn 2019, five Foresight on Demand projects supported them with foresight expertise and methodology.

This report provides the work in support of the Mission Board on Adaptation to Climate Change Including Societal Transformation. The project explored longer-term time horizons, up to and beyond the year 2050, and built on existing future-oriented work. It employed dedicated foresight methods, in particular workshops and a Delphi survey, to explore this time horizon in a systematic manner, and involving experts and stakeholders as appropriate.

Studies and reports

