



Adaptation to Climate Change Blueprint for a new, more ambitious EU strategy

1. CLIMATE CHANGE IMPACTS - THE NEED TO ACT

Climate change impacts are here and now. Global and European temperatures have repeatedly broken long-term records in recent years. The last five years were the hottest on record, with heatwaves, droughts and wildfires across Europe. The string of record-breaking heatwaves made July 2019 the hottest month ever recorded. Recent projections estimate global warming of up to 4°C by 2100 under current climate policies, and around 3°C if all countries meet the Nationally Determined Contribution targets of the Paris Agreement.

The impacts on people, planet and prosperity are already pervasive but unevenly distributed. In 2018, most of the natural hazards affecting nearly 62 million people globally, were associated with extreme weather and climate events¹. Out of 17.2 million new displacements associated with disasters in 2018, 16.1 million were weather related². Between 2000 and 2016, the number of people exposed to heatwaves globally increased by around 125 million over previous averages³. At the global level, least developed countries and small island states are particularly vulnerable to the impacts of climate change and have the lowest adaptive capacity, while at the same time contributing the least to greenhouse gas emissions. The changing climate has reduced oxygen levels in the oceans by ~1-2 % since the middle of the last century⁴, while increasing ocean temperatures have resulted in habitat shifts for species and coral bleaching (causing worldwide reef degradation).

Moreover, even stopping all greenhouse gas emissions would not stop the climate impacts that are already occurring, and which are likely to continue for decades. Temporary decreases of greenhouse gas emissions, like those caused by the 2008 financial crisis (or the current economic disruption from the Covid-19 pandemic) have little effect on the evolution of the planetary climate (and emissions can bounce back quickly). The Intergovernmental Panel on Climate Change (IPCC) published a Special Report on Global Warming of 1.5°C⁵ (SR1.5). The report demonstrated that even in a best-case scenario of sustained emissions limitations there will be large stress on agri-food systems, infrastructure, ecosystems, and human health (Figure 1).

The 1.5C Report also shows the global benefits of action to limit climate change: a best estimate of cumulative discounted damages is USD 69 trillion⁶ (EUR 63 trillion) by 2100 for a 2°C temperature increase scenario, decreasing to “only” USD 54 trillion (EUR 49 trillion) if we keep to 1.5°C of warming. Avoided impacts expected to occur between 1.5°C and 2°C warming would make it easier to achieve a number of Sustainable

¹ https://library.wmo.int/index.php?lvl=notice_display&id=20799#.XmIqSKhKjb0

² <https://www.internal-displacement.org/sites/default/files/publications/documents/2019-IDMC-GRID.pdf>

³ https://www.who.int/health-topics/heatwaves#tab=tab_1

⁴ <https://portals.iucn.org/library/node/48892>

⁵ IPCC, 2018: Global Warming of 1.5°C. Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways. <https://www.ipcc.ch/sr15/>

⁶ <https://www.ipcc.ch/sr15/chapter/chapter-3/>

Development Goals, such as on poverty, hunger, health, inequalities, water and sanitation, cities, oceans and ecosystems. Conversely, failure to limit climate change will hamper the achievement of these goals and of the 2030 Agenda as a whole.

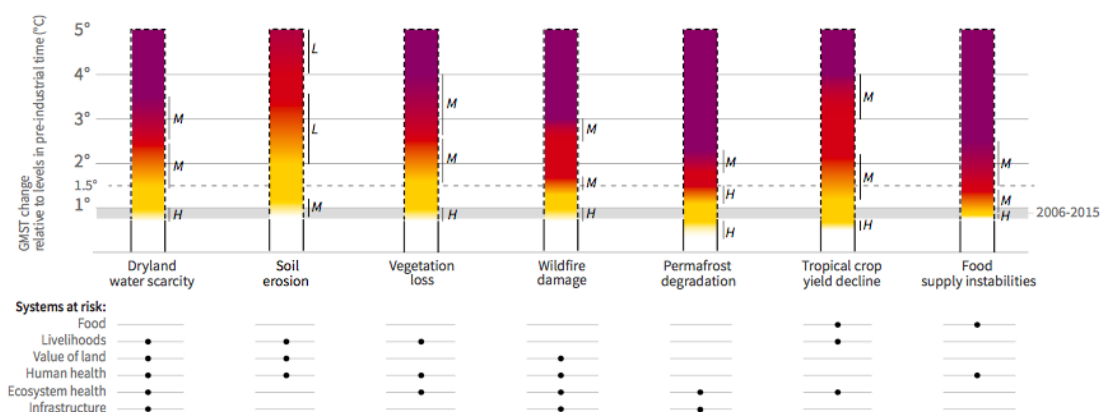


Figure 1 - Risks to humans and ecosystems from changes in land-based processes because of climate change, SR15, IPCC 2018. Climate change affects processes involved in desertification, land degradation and food security. Changes in these processes drive risks (indicated by colour coding in increasing intensity) to food systems, livelihoods, infrastructure, and health (indicated by the bar/dot). H, M, L indicate high, medium and low confidence levels

The global temperature averages hide even more extreme regional impacts. An average of 3°C or 4°C global rise in temperature means temperature increases above 5°C or 6°C for some regions (and Europe heats faster than the average). The 2020 State of the European environment report concludes that climate change has substantially increased the occurrence of climate and weather extremes. This ranges from unprecedented forest fires and heatwaves above the Arctic Circle to increasingly devastating droughts in the Mediterranean region; and from accelerating coastal erosion on the Atlantic coast to more severe flooding and decimated forests in Central and Eastern Europe. Without drastic emission abatement measures, continued climate change will increase the likelihood of severe, pervasive and irreversible consequences such as the decline or collapse of natural ecosystems (Arctic and Antarctic ecosystems, coral reefs, the Amazon forest), the erosion of global food security or displacement of people⁷. Extreme sea level events and floods will occur more frequently, with severe damages to Europe’s coastal communities.

These extremes are having far-reaching effects. For example, water shortages in the EU have at times hindered economic activities as diverse as agriculture, aquaculture, tourism, power plant cooling, and cargo shipping on rivers. Moreover, Europe is affected by indirect climate impacts occurring outside the Union in multiple ways, such as trade, spread of infections and supply chains, threats to international stability and security, or migration. When it comes to the economic effects of the current health crisis, we must “build back better” or “recover better”. The urgency of action in the short term must not deter from moving towards climate-readiness, and the recovery is an opportunity to increase the resilience of our society across the board, and especially in relation to climate impacts. Adaptation efforts are even more important against the background of the severe socio-economic consequences of the Covid-19 pandemic, to ensure that policies aim from the start at the mutually reinforcing objectives of social and environmental sustainability.

⁷ <https://www.eea.europa.eu/highlights/soer2020-europes-environment-state-and-outlook-report>

In the EU, economic losses from weather and climate-related extremes are on average already EUR 12 billion per year. The Joint Research Centre of the European Commission recently estimated economic impacts on the EU in a few hazards and sectors where economic impacts can be convincingly monetized (e.g. forest fires, river floods, coastal floods, agriculture, droughts, and human mortality). The analysis shows that exposing the present EU economy to global warming of 3°C would result in an additional annual loss of at least 170 €billion (1.36% of GDP). Even restricting warming to 1.5°C would still lead to an additional loss of at least 40 €billion/year (0.3% of GDP). Several other reports (with different assumptions) estimate even higher losses (e.g. The Economist Intelligence Unit finds 3% of GDP loss in Eastern Europe and 1.7% in Western Europe in 2050). On average, only 35% of the climate-related economic losses are insured, with proportions as low as 5% or less in Southern and Eastern Europe, Total insurance losses for weather-related events reached 0.1% of GDP in 2018 and are likely to start increasing as a share of GDP.

2. ADAPTATION – WHAT WE CAN DO

The ultimate goal of climate action is to protect people, planet and prosperity against the impacts of climate change. By promoting global adaptation action together with accelerated emissions reductions, the EU can help ensure the welfare of EU citizens, safeguard our natural environment and cultural heritage, and shield our economic investments and assets. Moreover, in a society that is increasingly interconnected and vulnerable to systemic shocks, increasing resilience and ensuring inclusiveness globally is a priority.

Adaptation is about understanding, planning and acting to prevent the impacts in the first place, minimise their effects, and address their consequences. The benefits of adaptation actions extend beyond the avoided human, natural and material losses. They have many positive and significant socio-economic effects, with high cost-benefit ratios (Figure 2):

- environmental and social benefits accompany many adaptation actions (e.g. nature-based solutions for flooding that also clean the air and waters and restore habitats to support biodiversity);
- reducing climate impacts on vulnerable groups and countries enhances social cohesion;
- adaptation actions targeting better management of natural resources can reduce tensions between communities and support conflict prevention efforts;
- effective adaptation helps secure EU strategic autonomy (as it provides the stability required to progress on emission reductions, security, migration, sustainability);
- enhanced financial and budgetary stability, and economic growth (as it reduces vulnerability to climate-related macroeconomic shocks and contingency pay-outs after disasters);
- avert, minimise and address population displacement associated with the adverse effects of climate change;
- competitiveness in the growing global adaptation industry (a market worth ~EUR 280 billion in 2016, growing at ~6% per year);
- increased resilience and sustainability in EU firms' operations and supply chains;

- a sense of empowerment to citizens, by demonstrating that preventing and managing climate impacts can be achieved, and that they can be engaged in it..

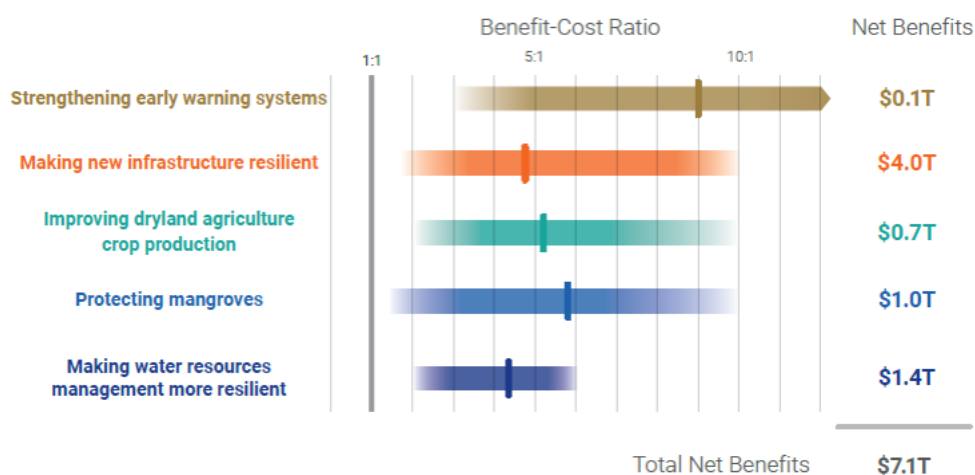


Figure 2 - Benefit estimates in trillions of USD for some key adaptation measures (from the “Adapt Now” report of the Global Commission on Adaptation)

Challenges linked to maladaptation (i.e. adaptation that induces net environmental harm) need to be carefully assessed and avoided, even when direct, immediate benefits of adaptation are significant. These include energy-intensive solutions (e.g. cooling systems that greatly increase greenhouse gas emissions), highly polluting technologies (e.g. water desalination producing toxic waste), or technological infrastructure that displaces the problem elsewhere (e.g. some hard sea defences, which, while protecting coastal infrastructure often deflect problems to neighbouring areas).

There is a global increase in recognition of the importance of adaptation. Climate impacts are an almost constant presence in the media, and their increased intensity and frequency has sprung to the top of the public agenda. This has prompted the World Economic Forum to list extreme weather and climate-change policy failures as the gravest threats⁸ for several years in a row. Moreover, this growing attention is echoed by international actors like the World Bank⁹ and the International Monetary Fund¹⁰. The 2015 UN Sendai Framework for Disaster Risk Reduction also points to climate change adaptation as a key vector of disaster risk reduction. Moreover, in 2018, a Global Adaptation Commission was launched to raise visibility and encourage the international development of measures to manage the effects of climate change through technology, planning and investment.

A climate emergency has now been recognised by the European Parliament, several Member States and more than 1000 cities worldwide¹¹. Moreover, according to the latest special Eurobarometer on climate change¹², 93% of Europeans believe that climate change is a serious problem, and they are ready to take action to tackle it: 70% of Europeans agree that adapting to the impacts of climate change can have positive outcomes for citizens. Bridging awareness and action, however, rests on skills development and behavioural change, hence high quality education that takes into

⁸ <https://www.weforum.org/reports/the-global-risks-report-2020>

⁹ <https://www.worldbank.org/en/news/press-release/2019/01/15/world-bank-group-announces-50-billion-over-five-years-for-climate-adaptation-and-resilience>

¹⁰ <https://blogs.imf.org/2019/12/02/straight-talk-the-adaptive-age/>

¹¹ <https://climateemergencydeclaration.org/climate-emergency-declarations-cover-15-million-citizens/>

¹² Special Eurobarometer report 490: Europeans attitudes on climate change

account, already at primary and secondary level, the changing climate and sustainable development.

Box: Adaptation pays off in concrete terms:

People: Heatwaves are the deadliest form of climate extreme, but awareness raising, early warning and other adaptation measures make a huge difference. The death toll in France from the 2019 summer double heatwaves (with record-breaking temperatures) was ~10 times lower compared to the single heatwave in 2003, following actions taken on adaptation, including opening public parks and swimming pools during the night, and rescheduling national examinations.

Planet: Nature-based solutions for adaptation (e.g. the restoration of natural floodplains, the greening of cities for cooling) have multiple co-benefits in addition to their primary adaptation functions. They preserve and enhance our natural carbon sinks, restore ecosystems and the services they provide, protect biodiversity, and are often more effective and low-cost than technical solutions. Copenhagen started creating green-roofs on buildings to reduce cooling costs, increase water retention and help biodiversity.

Prosperity: Climate-proofing investments means making sure that new infrastructures help (or at least not hinder) mitigation efforts but also that they are resilient against current and future changes to climate, as the projected damage to infrastructure from climate change will be EUR 34 billion per year by end-century. After climate proofing their initial plans, Lisbon increased the diameter of its new EIB-funded flood protection draining sewers by 1 metre to account for projected climate extremes.

3. TOWARDS A “EUROPEAN GREEN DEAL” ADAPTATION STRATEGY

2.1. Building on a wealth of experience towards increased ambition

The EU was an early actor on adaptation, with the adoption in 2013 of a Strategy on adaptation to climate change preceded by a Green Paper¹³ and a White Paper¹⁴. That strategy aimed to enhance the preparedness and capacity of all governance levels to respond to the impacts of climate change and make Europe more climate-resilient. It has been welcomed by the Member States and positively evaluated in 2018¹⁵. Its objectives (i.e. promoting action by Member States, better-informed decision-making, and adaptation in key vulnerable sectors) are still relevant.

Today the speed of adaptation action varies across the EU, with all Member States having adopted national adaptation strategies or plans¹⁶. In EU Member States, most vulnerability assessments are made and adaptation options are identified in respect of agriculture, health, biodiversity, forestry, oceans and seas, and energy. At the same time, the main sectors in which national policy instruments promote adaptation are water, agriculture, biodiversity and forestry, whereas health and energy are lagging behind. The European Commission was recognised by the Global Commission on Adaptation¹⁷, as a pioneer in integrating considerations of climate risk into decision-making. However, the European Environment Agency concludes that even if the EU and some countries have started to monitor the implementation of adaptation activities, it is not possible to

¹³ COM(2007) 354

¹⁴ COM(2009) 147

¹⁵ COM(2018) 738

¹⁶ <https://climate-adapt.eea.europa.eu/countries-regions/countries>

¹⁷ <https://gca.org/global-commission-on-adaptation/report>

determine with any certainty whether decisive progress in increased resilience at EU level has been achieved by 2020.

The European Commission announced the future adoption of a new, more ambitious EU strategy on adaptation to climate change as part of the European Green Deal¹⁸. It was acknowledged as an essential element of efforts to increase the EU's climate ambition for 2030 and 2050, as climate change will continue to create significant problems in Europe and beyond in spite of the mitigation efforts. The European Commission's proposal for an EU Climate Law¹⁹ provides a framework for progress in pursuit of the global adaptation goal established in Article 7 of the Paris Agreement; the adaptation strategy will be designed to support the achievement of the objectives of the proposal.

To achieve this goal, the new EU adaptation strategy must build on, expand on, and share the wealth of experience accumulated thus far. It should aim to help all levels of government and stakeholders (the EU Institutions, Member States, the private sector, non-state actors, international partners and individuals) to:

- **improve knowledge** of climate impacts (e.g. through increased awareness, education, and better access to knowledge and fit-for-purpose data on individual and collective climate risks);
- **reinforce planning** and climate risk management (e.g. through risk assessments and management, and helping to close the climate protection gap via risk-transfer mechanisms);
- **accelerate action** with a focus on *solutions* (in addition to understanding), on deploying *innovation* (in addition to research), on *implementation* (in addition to planning), and on *prevention* (in addition to ex-post).

An ambitious and more proactive EU-level intervention is well warranted. Even when adaptation challenges are often local and specific (a strong argument for local-level adaptation policy), solutions are just as often widely applicable on a regional, national or transnational scale. There is a strong the cross-border dimension of many climate change impacts (EU macro-regions sharing common climate risks e.g. seas and river basins and Alpine mountainous areas). Moreover, there are also EU-specific impacts (e.g. threats to the Single Market, effects on EU budget and investments, trade deals, increasing migration, spread of infectious diseases and plant pests) or regions with specific vulnerabilities (e.g. EU's nine outermost regions in the Atlantic and Indian Oceans as well as Mediterranean countries and regions). Finally, solidarity and convergence across and within Member States have a key role to play for adaptation and ensuring a just transition and just adaptation, as highlighted in the Commission proposal for a European Climate Law.

Similarly, more EU support for international adaptation efforts is needed. Whereas all communities are at risk from climate change, it is the poorest that are more vulnerable and least able to cope. At the same time, addressing the impacts of climate change is also a vital opportunity for promoting the achievement of the Sustainable Development Goals in alignment with the goals of the Paris Agreement. In addition to localised impacts and repercussions on social and economic development, climate change impacts can propagate across borders through the social, economic, and environmental interconnections that exist in a global economy. They also represent a threat to peace and security at the national and regional levels, destabilising societies and prompting climate

¹⁸ https://ec.europa.eu/info/publications/communication-european-green-deal_en

¹⁹ https://ec.europa.eu/clima/policies/eu-climate-action/law_en

change-induced population displacement. The new adaptation strategy needs to provide an international framework to step up climate change adaptation and resilience in our partner countries: investing in climate resilience and adaptation generates a multitude of social, economic and environmental benefits and helps avoid devastating losses, now and in the future.

Efforts to measure (increased) resilience to climate change need to be continued and upgraded and linked to a more ambitious monitoring and evaluation system. The development of relevant indicators that help measure progress could be envisioned that are more comparable across countries, e.g. in case of similar types of climate hazards and related adaptation actions and policies. The 2013 strategy relied on a scoreboard to assess preparedness; the new strategy could use a dashboard to assess resilience, and subsequently monitor its trend over time, with regular progress reports on specific targets. At the same time, strengthening effective monitoring and evaluation tools for adaptation policies and measures in partner countries will continue to be of central interest in EU's international action and support.

2.3. Strands and building blocks for the new strategy

Work on climate adaptation should continue to influence public and private investments, including on nature-based solutions. As announced in the European Green Deal Communication, strengthening the efforts on climate-proofing, resilience building, prevention and preparedness is crucial. It will be important that across the EU and worldwide, investors, insurers, businesses, cities and citizens are able to access data and to develop instruments (e.g. climate services) to integrate climate change into their risk management practices.

The new adaptation strategy should continue and expand current efforts. Among the policy actions to be continued and expanded as under the 2013 Strategy:

- further mainstreaming and integrating adaptation in EU legislation and instruments
 - following up on where it has already been done (e.g. the Commission proposal for the EU Long Term Budget 2021-2027), and for any new initiatives, in particular those included in the European Green Deal;
- continuing to support, monitor and share Member State adaptation action and goals
 - including through the Climate Law, via Climate-ADAPT²⁰, reporting under the National Energy and Climate Plans and the Energy Union Governance Regulation, and through regular exchanges;
- continuing to encourage resilience building in cities
 - leveraging the current success of the Covenant of Mayors for Climate & Energy in the EU, and internationally with the Global Covenant of Mayors;
- closing further gaps in adaptation-relevant knowledge
 - through the regular programming of research and innovation activities under Horizon 2020 and its successor, Horizon Europe; and through trends and forecasts from e.g. Copernicus and EMODnet
- financially supporting adaptation actions, including cross-border
 - *inter alia* through continued support from EU funds,
- by fostering and incentivising private investment in adaptation

²⁰ <https://climate-adapt.eea.europa.eu/>

- in relation with the *Renewed Sustainable Finance Strategy* and the EU taxonomy (the first Taxonomy Delegated Act will focus on climate change mitigation and adaptation).

The new adaptation strategy should also tackle new priorities. The following are some of the additional priorities that the EU could pursue towards climate-resilience, in full synergy with the other strategic initiatives announced in the European Green Deal, such as on Biodiversity, on Farm to Fork, on Forestry, the Climate Pact, the Sustainable Built Environment, or the Renovation Wave. The building blocks in the following sections are only meant to illustrate how the new strategy would approach certain sectors out of the broad spectrum of actions that could be covered.

Other important sectors or areas of action could also be approached in the same manner, e.g. food production, private sector investments, supply chain disruptions, soil protection, urban resilience, broader ecosystem services, protective measures for vulnerable groups,. The following sections are therefore meant to exemplify the proposed new approach (i.e. improved understanding, reinforced planning, and accelerated action) in order to better protect people, planet and prosperity from the impacts of climate change.

2.3.1. More and better data

What is currently done

Environmental data in the EU is made publicly available through the INSPIRE Directive, which aims to create a European Union spatial data infrastructure for the purposes of EU environmental policies as well as, more generally, policies or activities which may have an impact on the environment. This enables the sharing of environmental spatial information among public sector organisations, facilitates public access to spatial information across Europe and assists in policy-making across boundaries. Moreover, all data from the Copernicus programme²¹ (the EU's Earth Observation Programme) is freely and openly available to users on a global scale. The European Marine Observation and Data Network (EMODnet) gathers over 100 organisations to disseminate marine data; its topographic map of the North Sea has already massively improved storm surge forecasts. At city level, the Urban Data Platform provides a wider set of data and indicators on various thematic domains to evaluate vulnerabilities and support local responses. Citizen science is increasingly widespread, notably to measure environmental problems like air quality, biodiversity (e.g. birds, pollinators and invasive species), water quality, or early warning (e.g. floods, forest fires).

What more needs to be done

Despite a large (and increasing) volume of data on the climate being available to all (including from Copernicus), these data are still very often ill-suited for practical actions or policy-making. What is needed are data and statistics that are timely, accurate, disaggregated, people-centred, accessible and user-friendly also for audiences with limited technical capacities. However, most data at local level is fragmented and insufficient, and does not allow for proper accounting of investments that may be at risk.

Businesses and the financial sector need access to more granular climate physical risk data to build capacity to respond to the new demands linked to the implementation of the sustainable finance action plan²² and to better adapt their business models to climate risk. Citizens need more decision-useful climate risk data to take decisions with regard to property, insurance, health etc. Cities need better access to data to make resilience

²¹ <https://www.copernicus.eu/en>

²² https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en

investment decisions. Member States lack decision-useful data to prioritise climate-resilience investments, protect people, critical public assets and nature, and manage financial risks to their economies. Climate-related risk and loss data is needed by public authorities at all levels in the Union and internationally (as many are currently “blind” to existing socio-economic impacts from climate-related disasters) in order to make properly informed decisions on investment in adaptation.

2.3.2. Deeper knowledge and faster deployment of solutions

What is currently done

The 2013 strategy sought to close identified knowledge gaps and to facilitate the sharing of best practices in order to better support decision-making. The EU has contributed to this through support by Horizon 2020 (and previous EU framework programme for research and innovation), research and modelling carried out by the Joint Research Centre, and the development of the Climate-ADAPT platform of the European Environment Agency.

What more needs to be done

The lack of access to actionable solutions is one of the top barriers to adaptation (along with awareness and resources). The new strategy would need to mobilise additional support for e.g. the development of better economic models for the impacts of climate change, sectoral interlinkages, and their (economic and non-economic) cost, a deeper understanding of health and environmental impacts, including on ecosystem services, and foster innovative uses of climate data. There remain large knowledge gaps that would still need to be bridged, such as on economic losses from climate change, cascading effects from simultaneous or sequential climate impacts, spill-over effects from outside Europe on the EU, or tipping points beyond which the human and natural ecosystems would not recover. Moreover, the diverse information sources on climate impacts in Europe (e.g. European Forest Fires Information System, European Drought Observatory) and internationally should be more federated to increase visibility and coverage, and to ensure comparability. Other sources of authoritative and easily accessible information need to be developed, such as on the nexus of health and climate change, which has come to the forefront in Europe also because of the Covid-19 pandemic and increased realisation of our society’s high vulnerability.

There is increasing demand for translating the existing wealth of climate data and information into customised tools and products i.e. solutions. These tools are part of the backbone of the transition to a climate-resilient and low-carbon society, as they are needed to help decision-makers take informed decisions to boost resilience and adaptation capacity of their communities. More actions are needed to scale up local adaptation solutions through national and EU funding for regional development and innovation.

Research and innovation-inspired activities to help deliver large-scale solutions for climate adaptation are foreseen under the Mission on “Adaptation to Climate Change, including Societal Transformation”, which is part of the upcoming EU Research and Innovation Framework Programme, Horizon Europe (2021-2027). Climate change adaptation and disaster risk management will be a key priority for the European Regional Development Fund and the Cohesion Fund in the 2021-2027 period, with a place-based approach to improving the resilience of EU regions and cities.

2.3.3. *Closing the climate protection gap*

What is currently done

The term "climate protection gap" is mostly used in the insurance industry to measure the share of non-insured economic losses after climate-related disasters. Even so, they are lower bound estimates²³ that do not represent accurately the likely trends. This climate risk protection gap appears to be widening, affecting disproportionately those most exposed to climate impacts. A rough estimate shows that 1% increase in insurance coverage may reduce the global cost of climate-related disasters to taxpayers or governments by 22%²⁴. These costs and the associated shocks can have macroeconomic impacts, including on debt sustainability. Both the EU insurance industry and its supervisor, the European Insurance and Occupational Pensions Authority (EIOPA), have warned of looming insurability and affordability concerns in a climate-damaged world.

The 2013 strategy aimed to improve the market penetration of natural disaster insurance and to unleash the full potential of insurance pricing for risk-awareness prevention and mitigation and for long-term resilience in investment and business decisions. The strategy was also accompanied by a Green Paper on natural and man-made disasters insurance²⁵.

What more needs to be done

Climate change costs and risks should be incorporated into fiscal frameworks. Given the impact that increased adverse climate impacts may have on fiscal outcomes, a case can be made for incorporating specific provisions to manage arising risks to long-term debt sustainability, which may be affected by climate change through the direct physical impact of extreme weather events and the gradual transformation of the environment. Relief and reconstruction efforts after more frequent and intense extreme weather events will increase government expenditure, while effects on production capacity are likely to result in a temporary or permanent economic slowdown and increased social protection expenditure.

A review of climate risk allocation and financial resilience in the EU to ensure economic and financial stability and monitor the impact on the most vulnerable would be timely. At macro-economic level, economic and financial losses from climate-related events are distributed across different risk-owners (e.g. public finances; the (re-)insurance industry; businesses and individual citizens; certain investors in capital markets like "cat bonds", insurance-linked securities, or weather derivatives) and the distribution of losses across these risk-owners is organised differently across the Union.

There could also be a thorough consideration of the design of the EU's policies and instruments to ensure that disincentives to adaptation are removed and to include "build-back-better" requirements. Moreover, in order to accelerate adaptation action and to close the climate protection gap, new support avenues should be explored. These could include the collection of disaster loss data as well as supporting and de-risking the creation of public-private partnerships that could develop climate risk-transfer mechanisms for the more frequent and emerging risks (e.g. forest fires, flooding, and coastal erosion). Similarly, these could cover instances where insurance products are not available, in Member States with low insurance penetration or even on the EU market as a whole.

²³ The limitations include, among others: no losses to publicly held assets, business interruption captured only occasionally, no loss of human life, cultural heritage or ecosystem services.

²⁴ Lloyd's Global Underinsurance Report 2012

²⁵ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52013DC0213>

Similar actions should be developed in the context of EU international cooperation in order to support partner countries in preventing macro-economic and fiscal shocks that could have detrimental effects on global political stability and economic growth.

2.3.4. Preventing damage to infrastructure and beyond

What is currently done

The current climate vulnerability and risk assessment of infrastructure can be traced back to a staff working document that was part of the 2013 Adaptation Strategy package²⁶. The Commission has already mandated climate proofing for major projects funded by the European Regional Development Fund and the Cohesion Fund in the period 2014-2020²⁷. Moreover, in view of the next MFF, the Commission is proposing renewed guidance on the climate proofing of a wider spectrum of new infrastructures co-financed by the EU (through e.g., InvestEU, Connecting Europe Facility, the Just Transition Fund, or European Regional Development Fund and Cohesion Fund).

What more needs to be done

Climate proofing infrastructure will contribute to enhancing the resilience to climate change impacts and reducing greenhouse gas emissions during the lifetime of the infrastructure, and should be accompanied with social-proofing. Looking ahead, the climate proofing methodology can be enhanced and applied to address the climate resilience of existing infrastructure, in particular for critical infrastructures (i.e. those essential for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people), networks (e.g. transport, communication, and energy), and more broadly the built environment underpinning the functioning of the economy and society. The take-up of climate-proofing guidance must be as wide as possible for the climate resilience of new infrastructures in Europe and abroad. Moreover, we must develop our understanding of climate resilience in the built environment (closing knowledge gaps, and new data sources).

In transport, for example, the EU-wide policy concept for infrastructure development will be revised under the European Green Deal. In this framework, increased importance will be attached to infrastructure requirements ensuring resilience to climate change impacts. It covers all transport modes across borders, and waterborne transport appears to be particularly vulnerable to climate change and to call for particular attention.

A key avenue for protection must be ecosystem- or nature-based approaches to adaptation: these so-called blue or green infrastructures, very often multipurpose, provide multiple co-benefits, and are “no regret”-type solutions. Their benefits must be better quantified and better communicated to decision-makers and practitioners at all levels to enhance their use.

Risk and vulnerability assessments are the primary tools to define the type and level of risk we face, to help us identify our priorities and plan the most appropriate measures in response. Ensuring high quality of these assessments is therefore crucial for an effective policymaking on risk prevention and management. Risk and vulnerability assessments need to be comprehensive, multi-sector and seriously consider changing risks dynamics. Moreover, in addition to analysing environmental impacts, they should also analyse the shocks on economic activities that relate to supply chain disruption and the whole life-cycle of products and services, whether shortages in initial production ‘(e.g. food) or

²⁶ SWD(2013)137

²⁷ Major projects in the meaning of Article 100 of the Common Provision Regulation (Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013), which undergo a specific appraisal procedure

supply chain disruptions. Until now, neither the EU nor Member States have managed to achieve such an all-encompassing approach to climate risk and vulnerability assessments even for critical infrastructures. Yet this is essential for adaptation policy (i.e. an assessment of risks the EU faces which takes into account climate change), not least for improving the baseline for measuring progress. The initiative on sustainable corporate governance under the Green Deal will require companies to identify and integrate sustainability and climate change-related risks, vulnerabilities and impacts into their strategies.

2.3.5. Adapting forests and other ecosystems for an adapting society

What is currently done

The vulnerability of forests and other ecosystems to climate change has been highlighted in a number of studies and reports, including from the European Environmental Agency and the Joint Research Centre.²⁸ The current strategy has promoted nature-based solutions to adaptation, which are cost-effective and have multiple co-benefits (e.g. restoration of natural areas for climate change mitigation, flood protection, preventing forest fires and cooling in cities), and the integration of climate projections in forest and ecosystem management. Crops may not be able to be sustainably cultivated under such changes, and a restructuring of the land use would be required. Healthy ecosystems are more resilient to climate change, give nature space to adapt and are vital for human adaptation through the services they deliver. The EU Natura 2000 network of protected areas has been recognised as a critical adaptation measure for maintaining or restoring protected species and habitats to a favourable conservation status.

What more needs to be done

Climate change is strongly affecting habitats for animals and plant species range. IPBES rates climate change as the third driver of land degradation²⁹. The boundaries of today's biogeographical regions will shift northwards and uphill, changing the potential natural vegetation and triggering important shifts in many habitats, including forest types and biodiversity across Europe and globally. Studies suggest that up to half of Europe's land area may experience such shifts during this century. Trees may not be able to keep up with such changes, especially when suitable habitats are fragmented, so a systemic approach is needed to help them "weather the storm".

Climate change is affecting forests and other ecosystems in direct and indirect ways:

- Extreme heat and drought are prompting plants and trees to operate closer to their limits, weakening them and increasing their vulnerability to plant pests, diseases or death; and are increasing forest fire risks, their frequency, intensity and severity, the length of the fire seasons, the area at risk, and the probability of extreme wildfire events.
- Climate change impacts on ecosystems and habitat characteristics is resulting in shifts in vegetation as well as in animal populations and plant pests moving into new and expanded habitats. They propagate rapidly in weakened forests and regions already under stress from climate change and accelerate forest dieback.

Water resources, forests and agricultural crops fulfil many critical productive and regulation functions upon which our societies depend such as clean drinking water,

²⁸ <https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016#tab-figures-used>; <https://ec.europa.eu/jrc/en/peseta-iii>

²⁹ IPBES Review of new scientific and technical information on biodiversity and climate change and potential implications for the work of the convention on biological diversity <https://www.cbd.int/doc/c/4dd8/71cd/eb688d50a44bd74738f074e3/sbstta-23-inf-01-en.pdf>

carbon sequestration, abundant food, wood and forest products, outdoor recreation opportunities and habitat. Ensuring waters, forests and agriculture can withstand a changing climate is critical to reaching many objectives, including preserving ecosystem services, and not least the carbon sequestration potential of forests.

2.3.6. Oceans

What is currently done

The current strategy stresses that coastal zones are particularly vulnerable regions, and also indicates that the EU's outermost regions are particularly vulnerable to sea-level rise and extreme weather events. The Staff Working Document on marine and coastal areas³⁰ that accompanied the 2013 Adaptation strategy provides an overview of the main impacts of climate change on coastal zones and marine issues, not only considering its impacts on the environment but also on economic sectors and social systems. Furthermore this document points out knowledge gaps and existing efforts of the EU to best adapt to the impacts of climate change on coastal zones and marine issues.

What more needs to be done

The impacts on the environment (ocean warming and acidification, sea level rise, coastal erosion, changes in biological productivity and distribution) and the socio-economic implications (sectors such as fisheries and aquaculture, coastal tourism, transport and energy, ecosystems and their services) identified in the SWD on marine and coastal areas remain and require further action. Moreover, there remain important knowledge gaps, from bio-physical to social, economic and technical ocean issues³¹.

Global warming poses large risks to food security globally and regionally, especially in low-latitude areas dependent on fisheries. Future shifts in fish distribution and decreases in their abundance and fisheries catch potential due to climate change are projected to affect income, livelihoods, and food security of marine resource-dependent communities. Furthermore, the projected redistribution of resources and abundance increases the risk of conflicts among fisheries, authorities or communities. Challenges to fisheries governance are widespread under a high emission scenario with regional hotspots such as the Arctic and the tropical Pacific Ocean. The IPCC Special Report on the Ocean and the Cryosphere in a Changing Climate reveals the benefits of ambitious and effective adaptation for sustainable development and, conversely, the escalating costs and risks of delayed action³².

Examples of human-based adaptation measures include the promotion of cross-sectoral approaches (e.g. the creation of connected networks of Marine Protected Areas to enhance oceans resilience; Maritime Spatial Planning, Integrated Coastal Zone Management), the development of engineered measures (e.g. dykes, sand nourishment), the adjustment of management strategies (e.g. adjusting protected areas if the protected species and habitats move), infrastructure adjustment due to sea level rise (e.g. ports, but also combinations of traditional and green/blue infrastructure), and the promotion of nature-based solutions (e.g. restoration of damaged ecosystems such as wetlands) to moderate the impacts of sea level rise and extreme weather. The designation, expansion and interconnection of marine protected areas can also provide an opportunity to minimise impacts of climate change on the marine environment.

³⁰ SWD(2013) 133 final

³¹ NWP Scoping Paper – Adaptation of the Ocean, Coastal Areas and Ecosystems, 2019

³² IPCC, 2019: Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate

2.3.7. Reinforced global action for climate resilience

What is currently done

While building resilience and adapting to the impacts of climate change is a challenge for all regions of the world, it is the poorest and most vulnerable who are least able to adapt, both within the EU and at global level, because of e.g. limited resources, protracted crises, or violence. Therefore, enhancing resilience to climate change is a vital opportunity for promoting the achievement of the Sustainable Development Goals and is a key objective of the UN's Sendai Framework for Disaster Risk Reduction.

Globally, the EU and its Member States remain the largest contributor of international public climate finance for adaptation purposes to developing countries, in particular Least Developed Countries (LDCs) and Small Island Developing States (SIDS). The EU and its Member States are committed to scaling up their financial assistance further in the future. The share of EU climate finance targeted at adaptation is increasing, with particular focus on the most vulnerable countries. In 2018 alone, the EU, its Member States and the European Investment Bank provided EUR 21.7 billion in public climate finance, increasingly supporting climate change adaptation. Roughly 40% of the EU budget (excluding EIB and member States) was provided to projects and initiatives with a focus on adaptation, and an additional 40% for interventions addressing cross-cutting issues that treat adaptation and mitigation in an integrated, holistic manner. In addition, roughly 50% of international climate finance from the EU budget (excluding Member State funds) was dedicated to adaptation projects in the period 2014-2019.

What more needs to be done

The EU can support partner countries to adapt to the effects of climate change impacts at all levels: not only in terms of providing resources and prioritisation, but also in terms of improving effectiveness of action and support. At the same time, the EU can learn from others: many of our international partners have long been on the frontlines of climate change and have valuable experiences that could help European communities become more resilient.

The core of our international action on adaptation must be the translation of the economic and societal development model that the European Green Deal sets for the EU (based on resilience, planning, support for local actors, strengthening prevention, and well-informed risk management and decision making) into our development policy. We must strive to share our knowledge and deploy our support instruments to this end, including modelling tools, and data and geospatial information e.g. from Copernicus.

Adaptation efforts greatly benefit from the integration of local, indigenous and scientific knowledge. Gender-responsive planning and implementation are important for effective and efficient climate action.

Climate change multiplies threats to international stability and security, in particular affecting those in most fragile and vulnerable situations. Adaptation efforts can thus serve as conflict prevention and mediation tools, while also helping to identify entry-points for dialogue and confidence building. Conversely, when building resilience and supporting climate change adaptation, the adaptation strategies, programmes and projects should be designed in a conflict-sensitive way so they do not aggravate tensions.

Humanitarian and emergency response measures are a short-term way to react ex-post to the effects of severe climate-related events. However, systemic adaptation combined with disaster risk management can limit emergency response needs in the first place and help reduce risks, bolster preparedness, and anticipate and respond more effectively to the consequences of climate change.

Climate finance needs to be better targeted to those countries and communities that are particularly vulnerable to the impact of climate change and have less capacity to address them. Political leadership, collective international efforts and commitment to shift resources towards climate resilience, developing an enabling environment, and leveraging public funds to attract private investors are crucial.