

Resource Guide for Educators



# EUROPE GOES GREEN?

## ENERGY, ENVIRONMENT, POLITICS, & SECURITY IN THE EU

**AUGUST 17TH, 2021**  
**9:00AM-5:00PM PT**

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Co-funded by the  
Erasmus+ Programme  
of the European Union



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MODULE 1

# Europe's Twin Transitions

CLIMATE NEUTRALITY & DIGITAL  
TRANSFORMATION

**Dr. Max Lemke**

HEAD OF INTERNET OF THINGS (IOT) UNIT, EUROPEAN  
COMMISSION'S DIRECTORATE-GENERAL FOR  
COMMUNICATIONS NETWORK, CONTENT & TECHNOLOGY



# Introduction to Session Speaker



**Dr. Max Lemke** is the Head of Internet of Things (IoT) unit in the European Commission's Directorate-General for Communications Networks, Content and Technology. He is responsible for Horizon 2020 programmes on the digital transformation of key industrial sectors, including in particular in agri-food, smart energy and mobility. In the new Horizon Europe and DIGITAL programmes, he coordinates the developments on the next generation IoT as well as on data spaces and digital industrial platforms for the above sectors.

**In his previous roles at the Commission,** Max Lemke had a leading role in developing and coordinating the Digitising European Industry strategy, and was involved in the development of the European Strategy for Artificial Intelligence. He was responsible for embedded and cyber-physical systems, advanced computing, and ICT for manufacturing (Industry 4.0). for Manufacturing SMEs) initiative. He was co-responsible for the joint technology initiative ECSEL (Electronic Components and Systems for European Leadership) and the public-private partnership Factories of the Future. In the latter context, he has gradually built the I4MS (ICT Innovation

**Max has a scientific background in numerical mathematics,** high-performance computing, and software engineering. He holds diploma in Mathematics and Computer Science, as well as a Doctorate in Natural Sciences. In 2020, he conducted a study on "The digital industrial ecosystems in the Pacific Northwest" and taught a course on "Geopolitics of innovation: The US, the EU and China" as a European Union Fellow at the University of Washington in Seattle.

# Key Terms

**European Union:** international organization comprising 27 European countries and governing common economic, social, and security policies. Originally confined to western Europe, the EU undertook a robust expansion into central and eastern Europe in the early 21st century. The treaty was designed to enhance European political and economic integration by creating a single currency (the euro), a unified foreign and security policy, and common citizenship rights and by advancing cooperation in the areas of immigration, asylum, and judicial affairs.

**European Commission:** an institution of the European Union (EU) and its constituent entities that makes up the organization's executive arm. The EC has legislative functions, such as proposing new laws for the European Parliament, and judicial functions, such as finding legal solutions to business and trade issues between countries within the EU.

**Council of Europe:** organization of European countries that seeks to protect democracy and human rights and to promote European unity by fostering cooperation on legal, cultural, and social issues. The Council of Europe addresses issues of common concern to its members, including human rights, crime prevention, drug abuse, environmental protection, bioethical issues, and migration. To manage these affairs, the council has devised more than 160 international agreements, treaties, and conventions that have replaced literally tens of thousands of bilateral treaties between various European states.

**Digital Revolution:** The Fourth Industrial Revolution heralds a series of social, political, cultural, and economic upheavals that will unfold over the 21st century. Building on the widespread availability of digital technologies that were the result of the Third Industrial, or Digital, Revolution, the Fourth Industrial Revolution will be driven largely by the convergence of digital, biological, and physical innovations.

**Zero-Energy Building:** Also called net zero-energy building, any building or construction characterized by zero net energy consumption and zero carbon emissions calculated over a period of time. Zero-energy buildings (ZEBs) usually use less energy than traditional buildings as well as generate their own energy on-site to use in the building; hence, many are independent from the national (electricity) grid.

**Climate Neutrality:** Climate neutrality can be achieved if CO<sub>2</sub> emissions are reduced to a minimum and all remaining CO<sub>2</sub> emissions are offset with climate protection measures. If climate-damaging greenhouse gases are completely avoided or if gases that have already been emitted are saved elsewhere, this is referred to as "climate-neutral"

# Learning Objectives

1. Students will be able to identify, analyze, and discuss the impact of climate change on European nations, including efforts to mitigate the impact of climate change on local, national, and regional communities.
2. Students will be able to identify and explain the European Union's strategy to achieve climate neutrality and accelerate digital transformation through green technologies.
3. Students will be able to identify and evaluate the role of digital technology and infrastructure development projects, including the Digital Europe Programme, to address environmental issues across the EU.
4. Students will be able to explain components of the EU's Destination Earth (DestinE) program, including its efforts to create a digital twin of the Earth, and evaluate its role in Europe's Green Deal.
5. Students will be able to identify and explain how collaboration among European Union members will accelerate efforts to mitigate climate change issues.
6. Students will be able to identify, analyze, and discuss their potential role in addressing climate change and environmental sustainability through individual and collective action.

## Guiding Questions for

### Educators

- How does this topic fit into the context of your curriculum? Strategies for bringing this into the classroom?
- What enduring understandings do you want your students to learn from this topic/issue? Key concepts, skills, and ideas?
- Application to 4 pillars of global competence?



# Climate & the Digital Future



## [Destination Earth](#)

Destination Earth (DestinE) aims to develop a high precision digital model of the Earth to monitor and simulate natural and human activity.

## [The Environmental Impact and Potential of Digital Technology](#)

France has released a new bill that's goal is to “*reduce the digital world's environmental footprint.*” While an important bill in addressing energy concerns, it can be difficult to mark the environmental cost of technology. In many ways technology makes industries more efficient, reducing their impact on the environment and in other ways technology increases energy and resource use.

## [Towards a Green, Competitive and Resilient EU Economy: How can Digitalization Help?](#)

This paper, prepared for Germany's Presidency of the Council of the European Union, serves to inform EU member states' ministers of the environment on the rationale and prospects for aligning the EU's sustainability and digitalization agendas. It summarizes the main findings and policy recommendations of the European Policy Centre's (EPC) project 'Digitalization and Sustainability', which was commissioned by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and carried out between 2019 and 2020.



# Climate & the Digital Future



## [Breakthrough Climate Technologies](#)

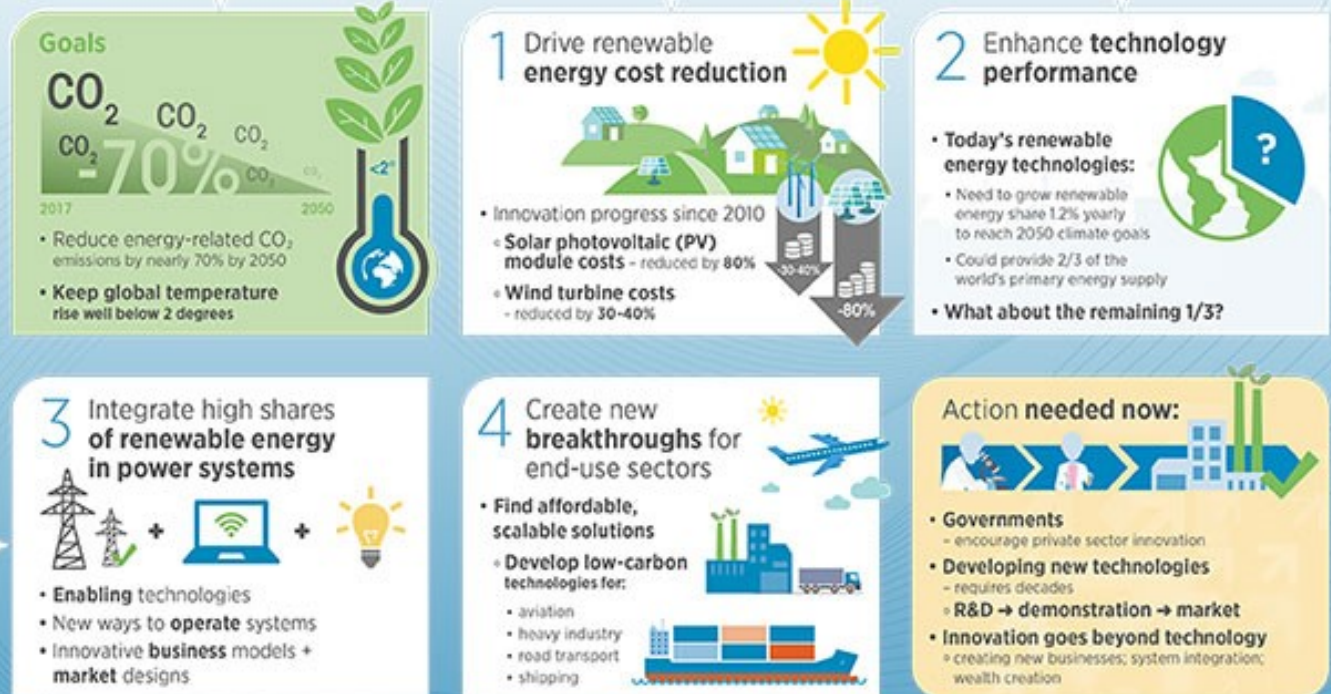
From carbon capture to hydrogen to climate intervention/geo-engineering to synthetic biology and more, exciting new tech, and new uses of established tech, are transforming how we work to slow and reverse climate change. *In this episode of the Techstars Climate Tech Podcast, host Cody Simms talks with Clay Dumas, Partner at Lowercarbon Capital, about the breakthrough climate technologies that have the most promise to address our climate crisis.*

## [On Climate Action, Europe must Learn from its Digital Mistakes](#)

The World Economic Forum states that in the digital revolution of the early 2000's, Europe mistakenly did not invest. As climate change transforms the world's economy in the coming years, Europe must become a leader in green energy and a sustainable economy. This may be a difficult feat, for while most Europeans believe in the reality of climate change, very few believe it could boost their economy.



## Innovation to Decarbonise the Energy Sector



To learn more, see [Perspectives on the Energy Transition](#)

# Climate & the Digital Future

## [EU Countries Commit to Leading the Green Digital Transformation](#)

26 Member States and Norway and Iceland have signed a declaration to accelerate the use of green digital technologies for the benefit of the environment. They will deploy and invest more green digital technologies to achieve climate neutrality and accelerate the green and digital transitions in priority sectors in Europe, for example by using the NextGenerationEU and InvestEU funds.



## [The Digital Europe Programme](#)

The Digital Europe Programme (DIGITAL) is a new EU funding programme focused on bringing digital technology to businesses, citizens and public administrations.

## [Shaping Europe's Digital Future](#)

The digital transition should work for all, putting people first and opening new opportunities for business. Digital solutions are also key to fighting climate change and achieving the green transition.





# EUROPE'S ROLE IN TACKLING CLIMATE CHANGE

Debating  
Europe

## CLIMATE CHANGE IS A KEY CONCERN



Carbon dioxide  
emissions grew from

**9,200  
Kilotons**  
in the 1960s  
to  
**34,600  
Kilotons**  
in 2011



Over the past century,  
the global temperature  
has climbed

**0.7 °C**

almost 10 times faster  
than the average rate of  
ice-age-recovery warming



By 2050, the global population  
is expected to exceed

**9 Billion**

and the demand for energy  
and water will rise by over **30%**



Total demand for food  
in 2050 will grow by

**60%**



The area of available  
arable land per person  
may decrease by

**1,5% per year**

## EUROPEAN TARGETS

The EU climate strategy  
for 2020 includes:

- 20%** of energy to be produced  
by **renewables**
- 20%** lower **greenhouse  
gas emissions**
- 20%** increase in  
**energy efficiency**

## A New Global Agreement

## PARIS CLIMATE SUMMIT

195 countries signed the first  
**legally binding climate deal** in Dec. 2015

All countries committed to  
lower their **carbon emissions**

There was agreement to try and limit the  
**global temperature** increase to 1.5C

Progress will be reviewed  
every five years

## WHAT WILL BE THE CONSEQUENCES FOR EUROPE?



**Extreme weather**  
will affect Europe



The number of people affected by  
**flooding** annually by 2085 could increase  
from 775,000 to 5.5 million



Over 80% of Europeans are exposed to  
**particulate matter (PM) concentrations** in  
air, and will see their life expectancy go  
down by an average of nearly 9 months



Temperature-related cases of  
**Salmonella infection** could rise by 50%

## WHAT WILL BE THE CONSEQUENCES FOR THE WORLD?

By 2030, Europe and  
North America will be the only  
regions not experiencing significantly  
**reduced wheat, rice, and soy crops**



Demand for land leads to **deforestation**,  
and this will increase in Africa, Latin  
America, and the Caribbean



**Terrestrial biodiversity** will decline  
from 68% in 2010 to around 60 % in 2050



# European Green Deal



## [The EU's goal of climate neutrality by 2050](#)

The EU has committed to achieving climate neutrality by 2050. Reaching this objective will require a transformation of Europe's society and economy, that will need to be cost-effective, just, and socially balanced. The European Commission's European Green Deal communication sets out policy initiatives that aim to help the EU achieve its 2050 climate neutrality goal. The **Council** discusses legislative and other initiatives under the European Green Deal after they are proposed by the Commission.



## [The European Green Deal](#)

Ditte Juul Jørgensen, director general for energy with the European Commission, talks with Nikos Tsafos (CSIS) about the European Green Deal. This new roadmap provides a framework for the EU to be carbon neutral by 2050 and develops best practices to meet new energy targets and to maintain forward momentum for the energy transition across Europe (recorded in late February).



## [Climate Action Tracker](#)

The Climate Action Tracker, which evaluates global attempts at climate change mitigation strategies in relation to the Paris Agreement, has given the EU the rating "insufficient." Its assessment investigates the successes and remaining challenges of the EU's approach to climate action, and considers the policy projections for the future.





# European Green Deal



## [The European Green New Deal—A Commitment to Future Generations](#)

On 11 December 2019, the European Commission announced the European Green Deal to transform the European Union into the first climate neutral continent by 2050. Over the last year, the European Commission has been working on a significant number of fronts to achieve this overall objective. The EU's recovery from the coronavirus pandemic will be a green recovery.

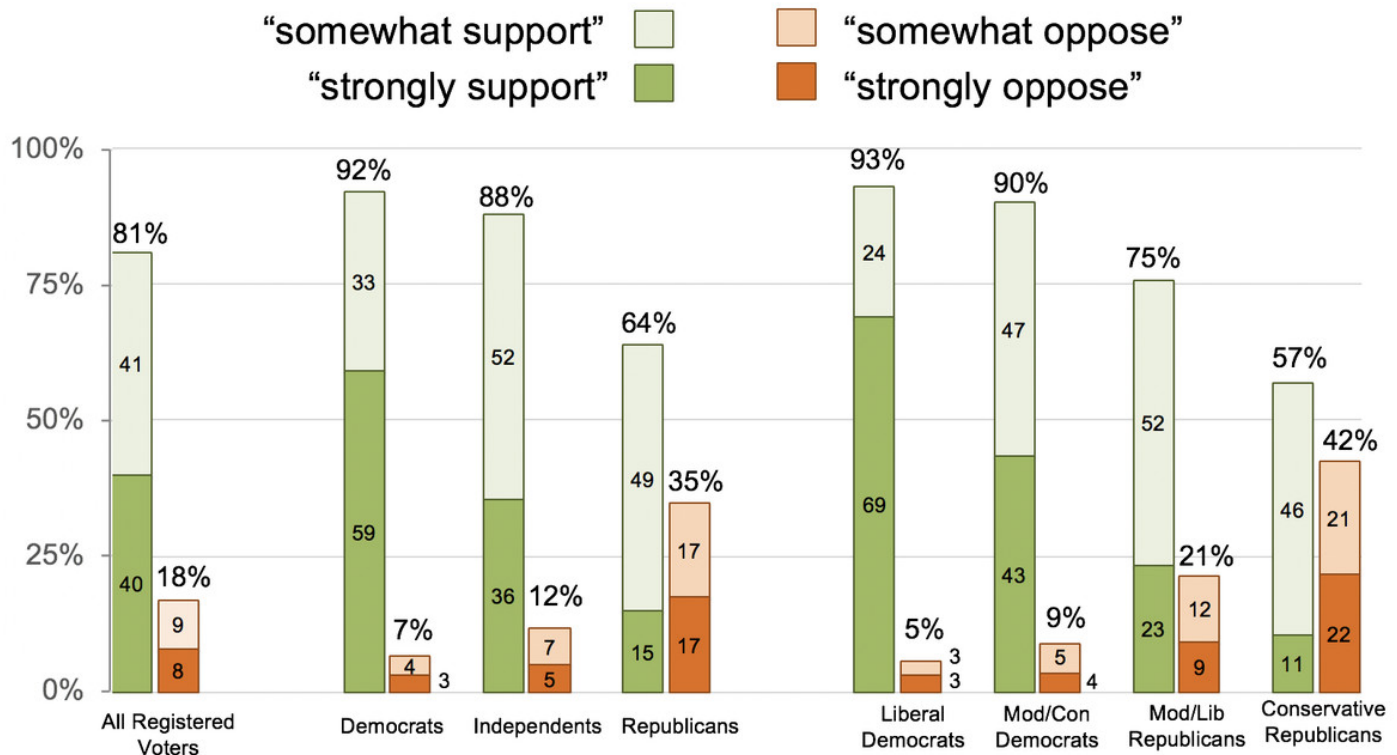


## [Europe's Green Deal, Unveiled](#)

New European Commission President Ursula von der Leyen presented on December 11 a plan to make the bloc the first climate-neutral continent by 2050. The Green Deal consists of a roadmap to address environmental challenges while, at the same time, promoting an efficient use of resources.



## Support for the Green New Deal among Registered Voters



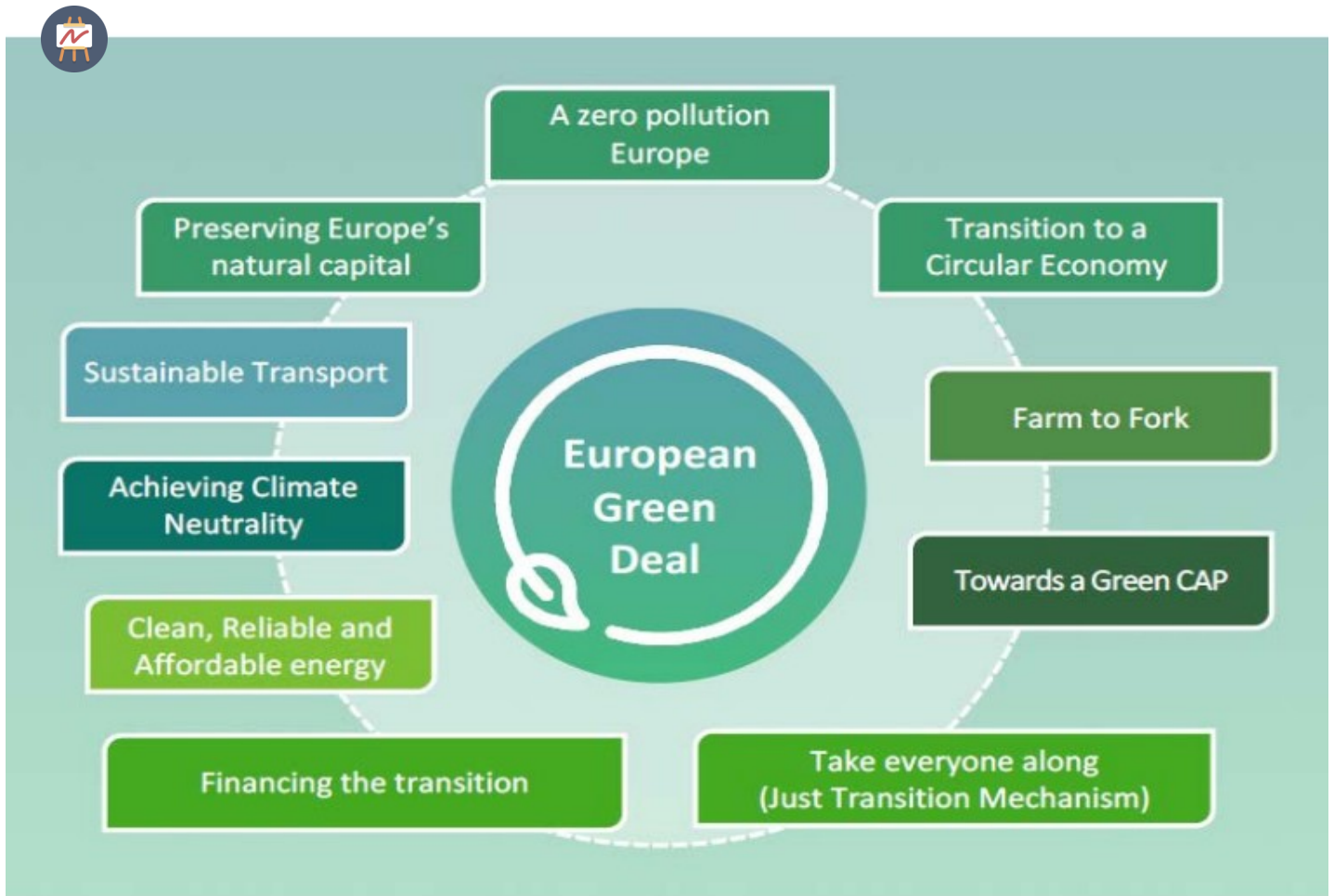
*“Some members of Congress are proposing a ‘Green New Deal’ for the U.S. They say that a Green New Deal will produce jobs and strengthen America’s economy by accelerating the transition from fossil fuels to clean, renewable energy. The Deal would generate 100% of the nation’s electricity from clean, renewable sources within the next 10 years; upgrade the nation’s energy grid, buildings, and transportation infrastructure; increase energy efficiency; invest in green technology research and development; and provide training for jobs in the new green economy. How much do you support or oppose this idea?”*

December 2018. Base: 966 registered American voters. Weighted to U.S. Census parameters. Due to rounding and non-response, sums may not equal 100%.





# European Green Deal



## [Metals Recycling in EU could collapse under new rule, companies say](#)

Europe's metals recycling industry could collapse under the European Commission's proposed changes to waste shipments that clamp down on exports to encourage recycling, members of the Bureau of International Recycling (BIR) have warned. The EU proposals aim to restrict the export of waste materials such as metals, plastics and textiles as part of efforts to increase recycling within the bloc and stop waste being shipped to emerging market countries where it may be dumped rather than recycled.

## [The EU's Deforestation Package: A Test for Taking the Green Deal Global](#)

The EU is preparing a new deforestation package with international dimensions. After failing to meet its target of halting deforestation by 2020, this time the union must be aggressively ambitious. That means changing business-as-usual strategic and geo-economic behavior.

# European Green Deal



## [Citizen Support for Climate Action](#)

A 2019 survey by the European Commission showed that 93% of EU citizens think that climate change is a serious problem, while 79% think it is a very serious problem. A large majority of respondents believe that political action on climate is important for improving the EU's economy, while 93% have already taken personal action to fight climate change. Surveys, statistics, and infographics on climate opinions from various EU member nations can be accessed.



## [Ready for the Green Challenge?](#)

An educational toolkit providing fresh ideas and background information for classroom sessions on sustainability issues is available for secondary school teachers. The toolkit was developed as part of the Green Trip campaign, promoting sustainable projects and lifestyles among young Europeans.



## [The Geopolitics of the European Green Deal](#)

The European Green Deal will have profound geopolitical repercussions, some of which are likely to have an adverse impact on the European Union's partners. The European Council on Foreign Relations published this paper with recommendations on how to mitigate any negative effects to improve international political relationships as well as global climate policies.

**"The European Green Deal is our new growth strategy – it is a strategy for growth that gives more back than it takes away. And we want to really make things different. We want to be the frontrunners in climate friendly industries, in clean technologies, in green financing.**

**But we also have to be sure that no one is left behind."**

**- European Commission President, Ursula von der Leyen**



# European Green Deal



## Developing a Sustainable Blue Economy in the European Union

The European Commission is proposing a new approach for a sustainable blue economy in the EU for the industries and sectors related to oceans, seas and coasts. A sustainable blue economy is essential to achieving the objectives of the European Green Deal and ensuring a green and inclusive recovery from the pandemic.

### **Blue Economy:**

a long-term strategy aimed at supporting sustainable economic growth through oceans-related sectors and activities, while improving human well-being and social equity and preserving the environment

## Building a Climate-Resilient Future— A New EU Strategy on Adaptation to Climate Change

The European Commission adopted today a new EU Strategy on Adaptation to Climate Change, setting out the pathway to prepare for the unavoidable impacts of climate change. While the EU does everything within its power to mitigate climate change, domestically and internationally, we must also get ready to face its unavoidable consequences. From deadly heatwaves and devastating droughts, to decimated forests and coastlines eroded by rising sea levels, climate change is already taking its toll in Europe and worldwide. Building on the 2013 Climate Change Adaptation Strategy, the aim of today's proposals is to shift the focus from understanding the problem to developing solutions, and to move from planning to implementation.

## The EU Green Deal

The European Green Deal is about **improving the well-being of people**. Making Europe climate-neutral and protecting our natural habitat will be good for people, planet and economy. No one will be left behind.

### **The EU will:**



Become  
climate-neutral  
by 2050



Protect human life,  
animals and plants,  
by cutting pollution



Help companies  
become world leaders  
in clean products and  
technologies



Help ensure a  
just and inclusive  
transition

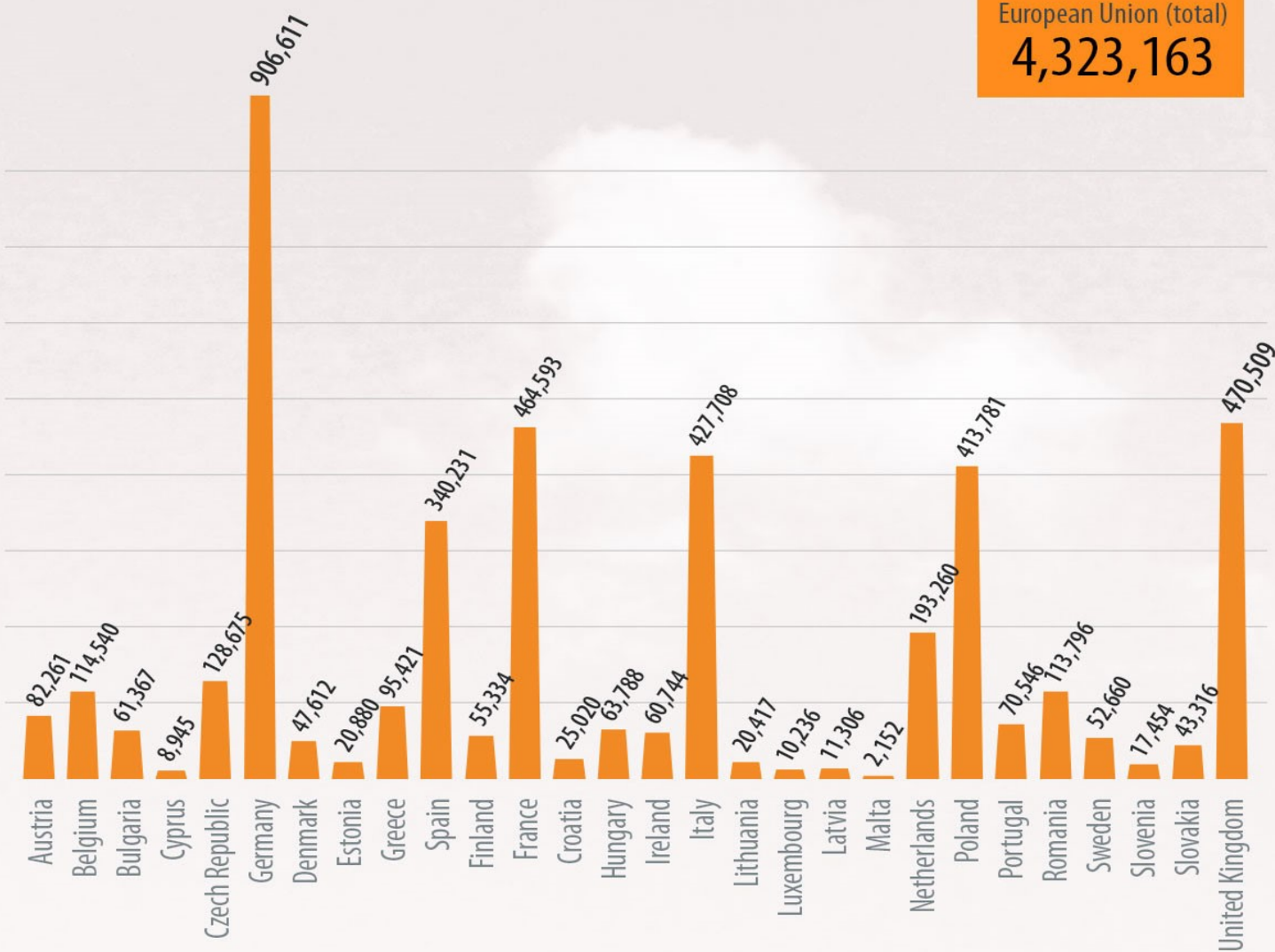




# Total greenhouse gases emissions\* per EU country in 2017

[kilotonnes CO<sub>2</sub> equivalent\*\*]

European Union (total)  
**4,323,163**

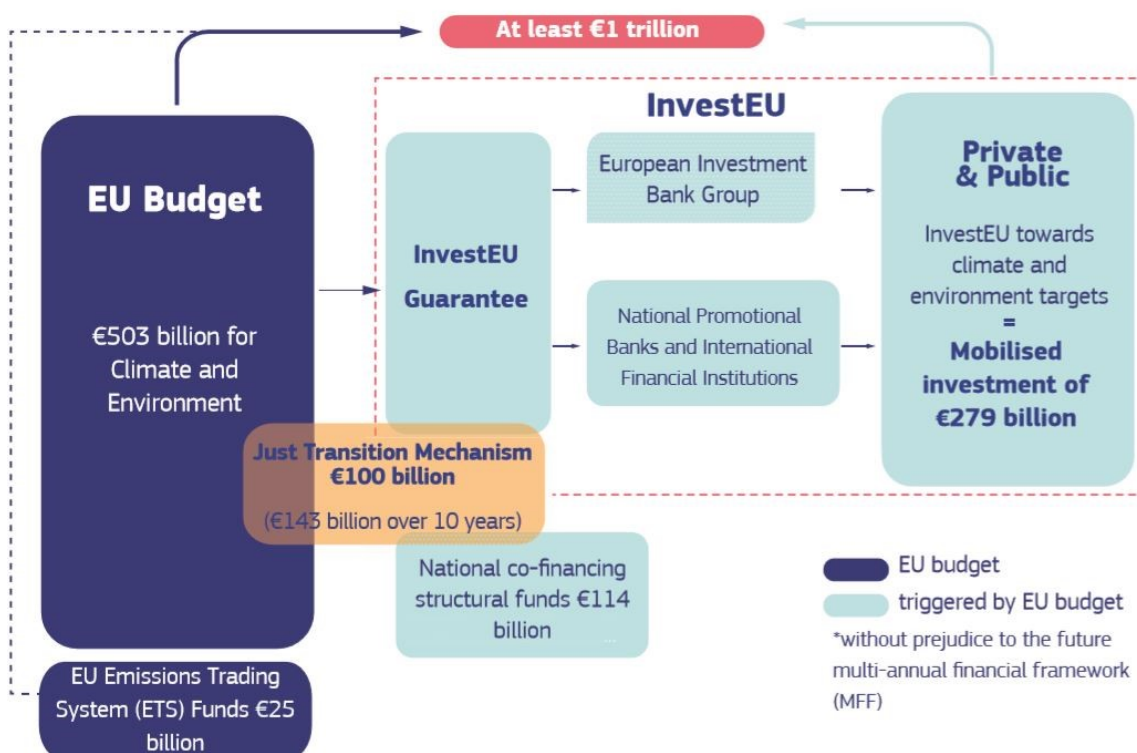


\* All sectors excluding land use, land-use change and forestry (LULUCF)

\*\* CO<sub>2</sub>, N<sub>2</sub>O in CO<sub>2</sub> equivalent, CH<sub>4</sub> in CO<sub>2</sub> equivalent, HFC in CO<sub>2</sub> equivalent, PFC in CO<sub>2</sub> equivalent, SF<sub>6</sub> in CO<sub>2</sub> equivalent, NF<sub>3</sub> in CO<sub>2</sub> equivalent

# European Green Deal

## WHERE WILL THE MONEY COME FROM?



\*The numbers shown here are net of any overlaps between climate, environmental and Just Transition Mechanism objectives.

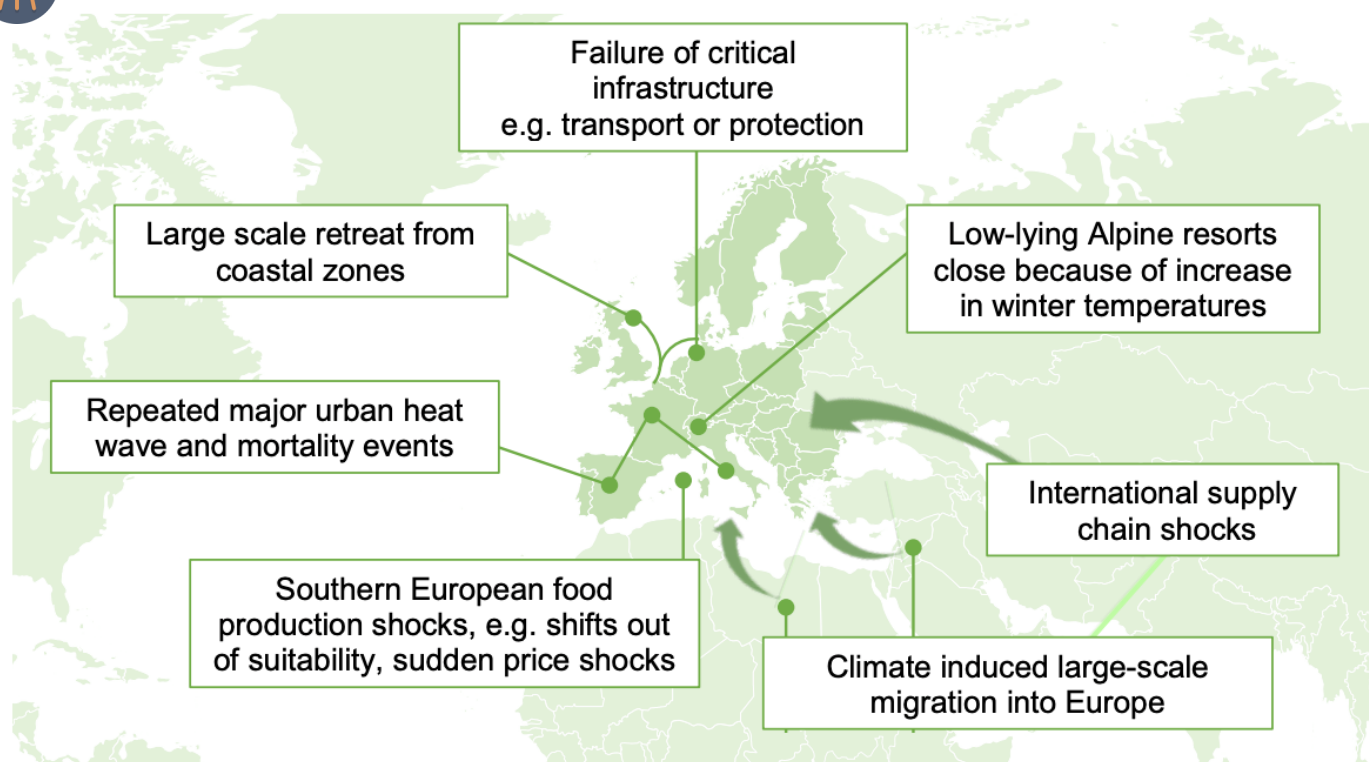
## The Economic Cost of Climate Change in Europe

The objective of the COACCH project (CO-designing the Assessment of Climate Change costs) is to produce an improved downscaled assessment of the economic costs of climate change in Europe that is of direct use to end users from the research, business, investment, and policy making community. To help inform the framing of the project and the first stakeholder workshop, the project has undertaken a review of the current knowledge on the economic costs of climate change in Europe.

## Lesson Plan: Teaching Opportunity Costs of Greenhouse Gas Emissions

Global warming due to greenhouse gas emissions from the burning of fuel, is an important aspect of climate change. This lesson plan will enable your students to apply their understanding of opportunity costs for the use of a greenhouse gas emitting fuel in product manufacturing. This resource will allow your students to experiment with individual/consumer choices and budget constraints for production decisions by trading emissions permits at a fixed market price in an interactive classroom experiment. Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in Economics.

# European Green Deal



## Illustrative Socio-Economic Tipping Points

### [Climate change will unevenly impact the European financial system](#)

Climate change will impact those parts of the financial system most exposed to its disruptive effects. This column analyses a new financial stability risk mapping for the EU financial system, linking financial exposures of thousands of banks, insurance companies, and investment funds to millions of firms subject to climate risk. It highlights a high level of risk concentration, both in European regions subject to climate hazards as well as economic sectors with diverse carbon emission intensities. Long-term scenario analyses suggest that the risks will be best addressed through proactive policies that directly contain global temperature rises.

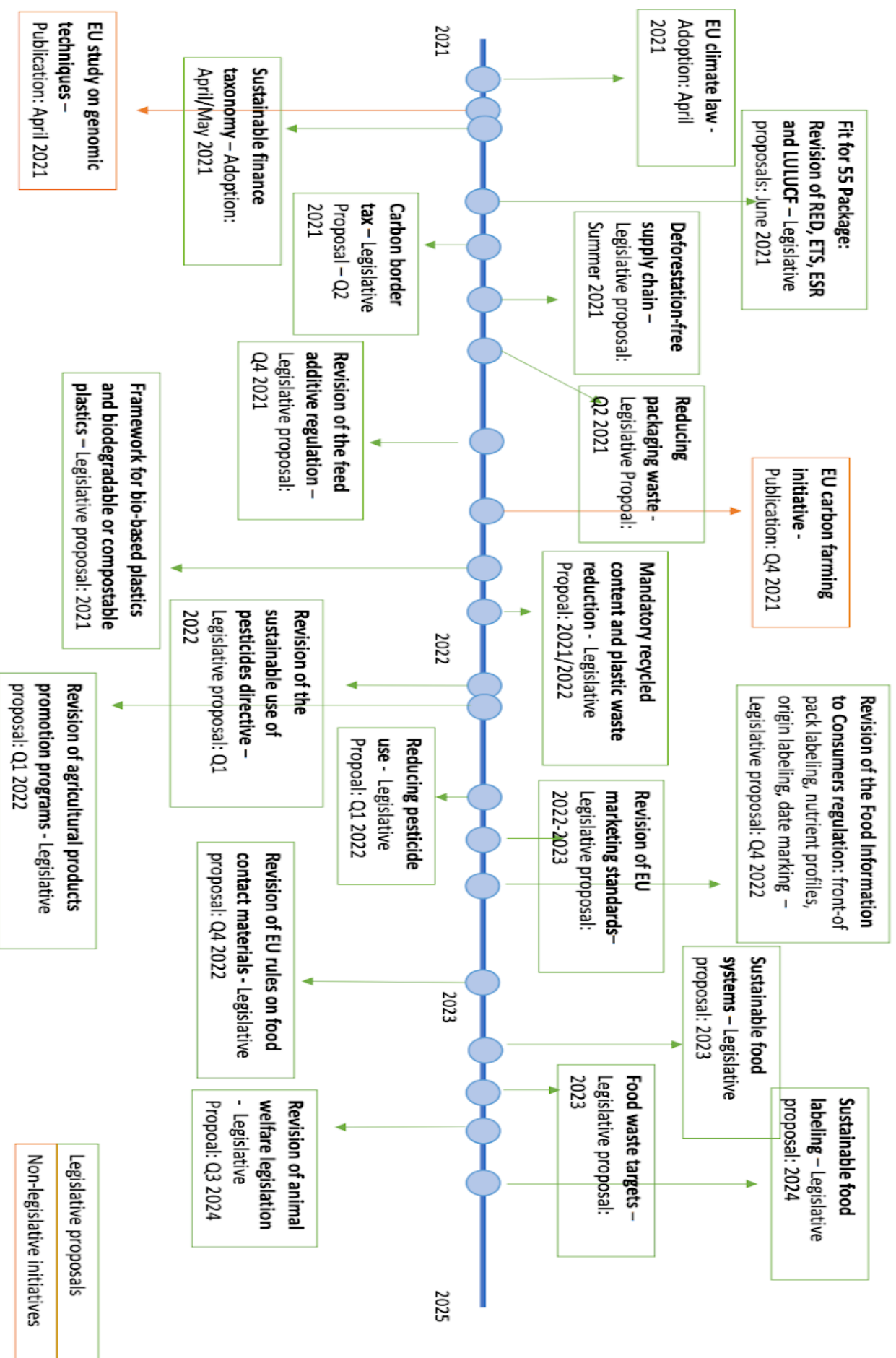


### [Green Taxation – in support of a more sustainable future](#)

The EU has adopted ambitious legislation across multiple policy areas to implement its international commitments on climate change. EU countries have set binding emission targets for key sectors of the economy to substantially reduce greenhouse gas emissions.



# EU Green Deal – Timeline of upcoming initiatives with potential trade implications



# Climate Neutrality



## [A Beginner's Guide to Climate Neutrality](#)

So you want to understand climate neutrality but don't know where to start? Let this beginners' guide help you get started. And while climate neutrality is something that countries, cities, organizations and individuals need to aim for, this guide focuses on organizations and individuals, so you can start taking the steps needed to help get the planet to net zero emissions.

## [2050 Long Term Strategy](#)

The EU aims to be climate-neutral by 2050– an economy with net-zero greenhouse gas emissions. This objective is at the heart of the European Green Deal and in line with the EU's commitment to global climate action under the Paris Agreement.

## [5 Facts About the EU's Goal of Climate Neutrality](#)

What does climate neutrality mean and how will the EU achieve this goal while promoting the wellbeing of its citizens? Here are five facts you need to know about the EU's climate ambitions.

## [EU Agrees To Be Carbon Neutral by 2050 on Eve of US-Led Climate Summit](#)

The European Union reached a tentative climate deal that should make the 27-nation bloc climate-neutral by 2050, with member states and parliament agreeing on the targets on the eve of a virtual summit that U.S. President Joe Biden will host.

### Thank You to Our Sponsors:

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