Climate Change and Economic Growth

If you can't measure it, you can't manage it, and you can’t improve it!

Professor Phoebe Koundouri

Athens University of Economics and Business (AUEB) and Technical University of Denmark (DTU)

Director ATHENA Information Technologies RC

Chair UN SDSN Global Climate Hub and European Hub, Chair AE4RIA

Member World Academy of Art & Science, European Academy of Science, European Academy of Science Technology

President European Association of Environmental and Resource Economists

President World Council of Environmental and Resource Economists

ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

DTU Technical University of Denmark

ATHENA Research & Innovation Information Technologies

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK A GLOBAL INITIATIVE FOR THE UNITED NATIONS

WAR
BIODIVERSITY COLLAPSE
CLIMATE CHANGE
Energy CRISIS
FOOD CRISIS
The top 1% controls 46% of world's wealth. —Oxfam
1%
...STILL NOT ENOUGH...
WORLD POPULATION GROWTH
SUSTAINABLE DEVELOPMENT GOALS
ECONOMY
SOCIETY
BIOSPHERE

AE4RIA
Alliance of Excellence for Research and Innovation on Aephoria

www.ae4ria.org

200	100	150	543	500M
PEOPLE	PROJECTS	CONFERENCES ORGANIZED	PUBLICATIONS	FUNDING

Professor Phoebe Koundouri
Founder and Scientific Chair

RESEARCH INSTITUTIONS	ACCELERATORS	ACADEMIES,NETWORKS, ASSOCIATIONS
ATHENA Research & Innovation Information Technologies – Sustainable Development Unit	SDSN Global Climate Hub	Sustainable Development Solutions Network – A Global Initiative for the United Nations
ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ – Athens University of Economics and Business; ReSEES Research laboratory on Socio-Economic and Environmental Sustainability	eit Climate-KIC Hub Greece – Funded by the European Union	SDSN Europe; SDSN Greece
Stochastic Modeling and Applications Laboratory – ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ – Athens University of Economics and Business	MENA Maritime Accelerator	EAERE European Association of Environmental and Resource Economists
ICRE8 International Centre for Research on the Environment & the Economy	BRIGAID CONNECT	Academia Europaea ~1988~; World Academy of Art and Science
DTU – DTU Management Department of Technology, Management and Economics	Water Europe Technology & Innovation; Nexus Cluster	iap Science Health Policy – the interacademy partnership

AE4RIA

Alliance of Excellence for
Research and Innovation on Aephoria

Interdisciplinary Thematic Priorities

SDGs – ESG
measurement

Sustainable Finance

Sustainable Pathways
Climate Neutrality

& Resilience

Sustainable Pathways for
Seas and Oceans

Sustainable Pathways
Land Use &

WEFB Nexus

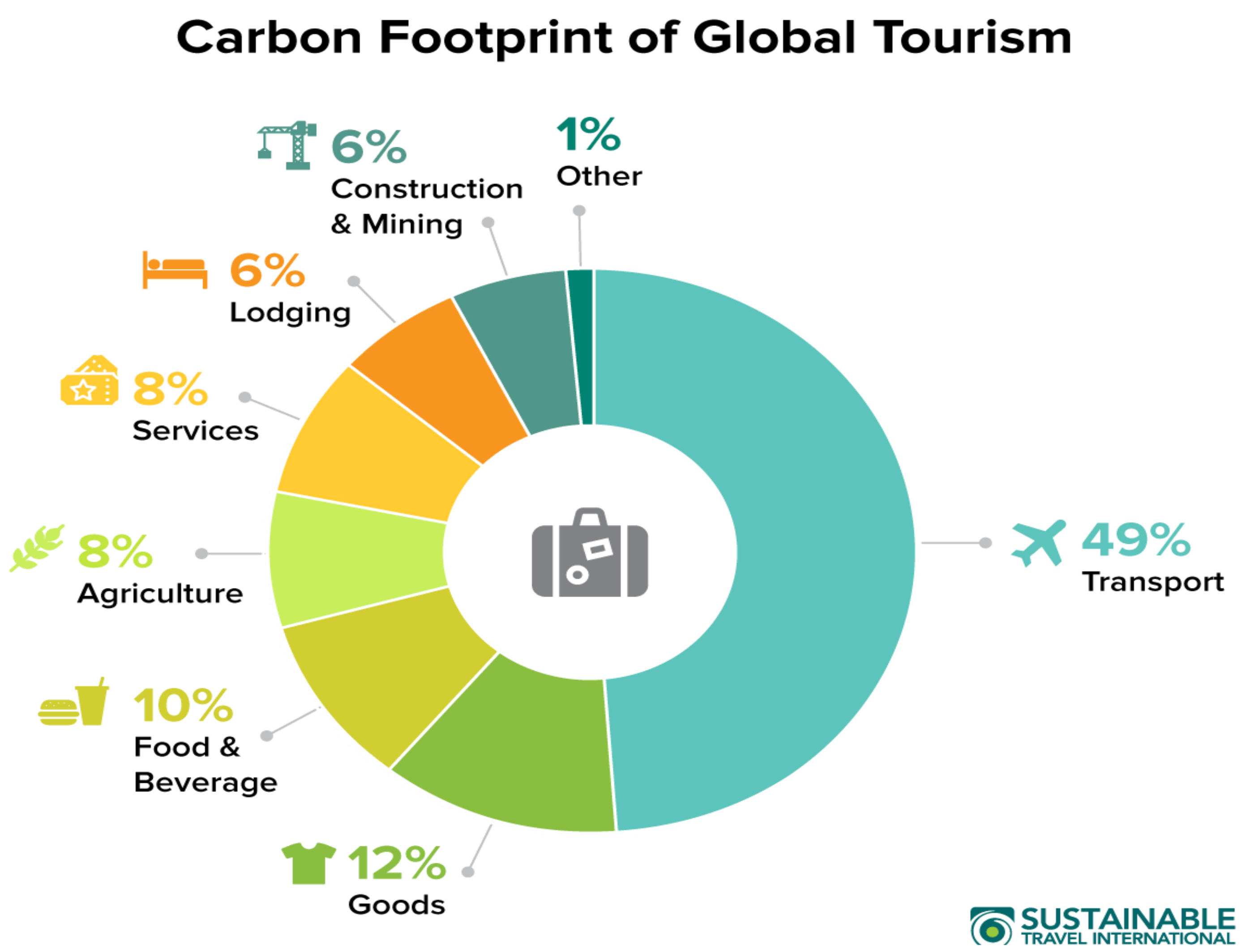
Innovation Acceleration

Education

Upskilling/Reskilling

Summary of the Policy Framework for the transition to sustainability

Παγκόσμιο Τουριστικό Αποτύπωμα Άνθρακα 2018



Πρωτοβουλίες της ΕΕ

- 2019: 10% του Ευρωπαϊκού ΑΕΠ – 23 εκατομμύρια Θέσεις Εργασίας

- 2022: **Οδός Μετάβασης για τον Τουρισμό**

  - Πράσινη & ψηφιακή μετάβαση ↔ Ανθεκτικότητα του Τουριστικού Οικοσυστήματος
  - Ένταξη των Τουριστικών Υπηρεσιών στο Πακέτο **Fit for 55**
  - Βελτίωση της πρόσβασης σε δεδομένα για την κατάρτιση επίσημων **Στατιστικών & Δεικτών Βιωσιμότητας**
  - **Οριζόντιες Συνέργειες με Οικοσυστήματα - Κλάδους**

    Αγροδιατροφικός, Κατασκευαστικός, Ψηφιακά Συστήματα, Πολιτισμός

Η Διπλή Πρόκληση για τον Τουρισμό

Συμμετοχή στις Εκπομπές CO2

8% παγκοσμίως

Τρωτότητα λόγω Κλιματικής Αλλαγής

Τουρισμός & Κυκλική Οικονομία

Χρήση συστατικών τοπικής προέλευσης με χαμηλό περιβαλλοντικό αποτύπωμα

Μείωση της σπατάλης τροφίμων στον κλάδο της φιλοξενίας

Μείωση και διαχωρισμός συνολικών αποβλήτων

Αύξηση της απόδοσης χρήσης ύδατος & Μείωση ρύπανσης των υδάτινων πόρων

Πυλώνες Ανθεκτικού Τουρισμού

Διαφοροποίηση και Εξέλιξη Τουριστικού Προϊόντος

Υπολογισμός του **Ρίσκου** με χρήση Επιστημονικών Μεθόδων

Συνεργασία όλων των Φορέων

Σύγχρονες **Υποδομές**

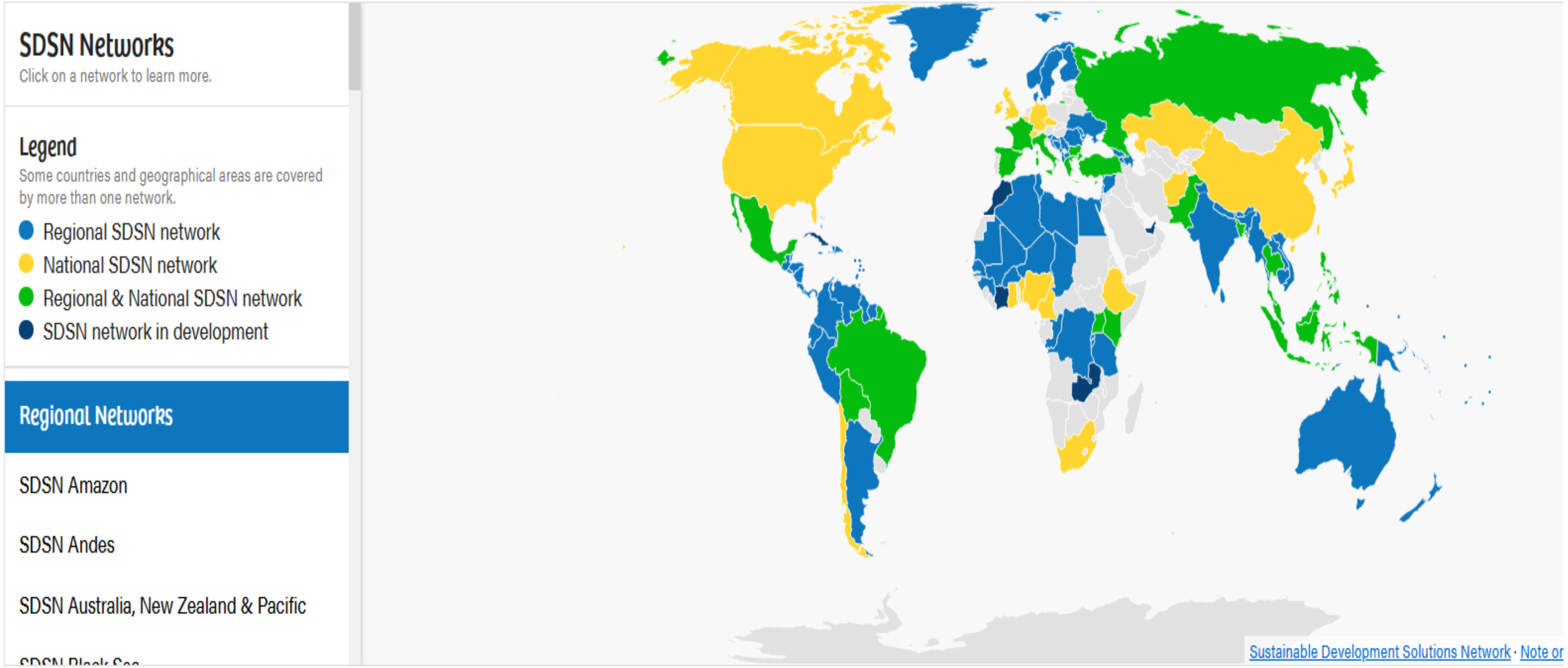
Προσαρμογή στην Κλιματική Αλλαγή μέσα από ευέλικτες Στρατηγικές

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS
Global Climate Hub

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

ATHENA Research & Innovation Information Technologies

ACADEMY OF ATHENS



In collaboration with national governments and respective SDSN National Hubs (2000 institutions globally) we *co-design national and sub-national pathways for the transition to a* ***climate neutral and resilient*** *world.*

Optimal Dynamic Mixture of

- *Technologies*
- *Policies*
- *Fiscal & Financial Instruments*
- *Socio-Economic Narratives*

UN SDSN Global Climate Hub

https://unsdsn.globalclimatehub.org

	2023	2030
Decent Work Sustainable Economic Growth SDG8		

	2023	2030
Climate Action SDG13		

Life on Land SDG15

Life Below Water SDG14

Affordable & Clean Energy SDG7

- Climate Data Platforms and Digital Applications
- Atmospheric Physics and Climatology
- Climate & Energy Modeling
- Climate, Land Use, Water-Food-Energy-Biodiversity Nexus Modeling
- Climate and Health
- Innovation Acceleration for Climate Neutrality and Resilience
- Just Transition: Policies, Finance, Labor Market
- Transformative Participatory Approaches: National Living Labs and Systems Innovation
- Education, Training, Upskilling and Reskilling

Climate Data Platforms and Digital Applications

Head

Team

Mission: Collect, Aggregate, Connect and Visualize Data relative to the objectives of the GCH

Collaborations

Association for Computing Machinery ACM, the world's largest educational and scientific computing society, delivers resources that advance computing as a science and a profession.

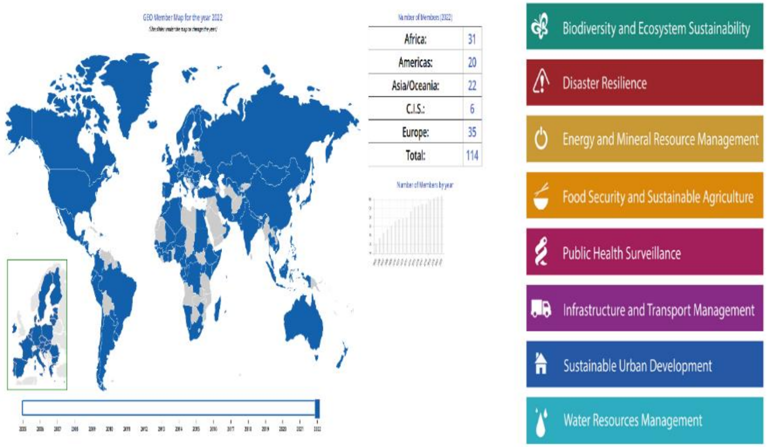
TRENDS Thematic Research Network on Data and Statistics

OpenAIRE

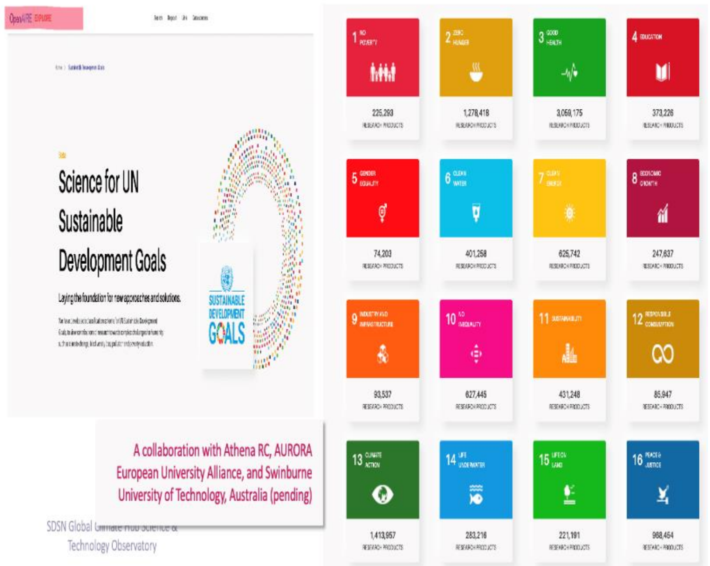
Geospatial Data

GEO GROUP ON EARTH OBSERVATIONS

GEO is a partnership of more than 100 national governments and in excess of 100 Participating Organizations that envisions a future where decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations.



Socio-Economic and General SDGs-related data



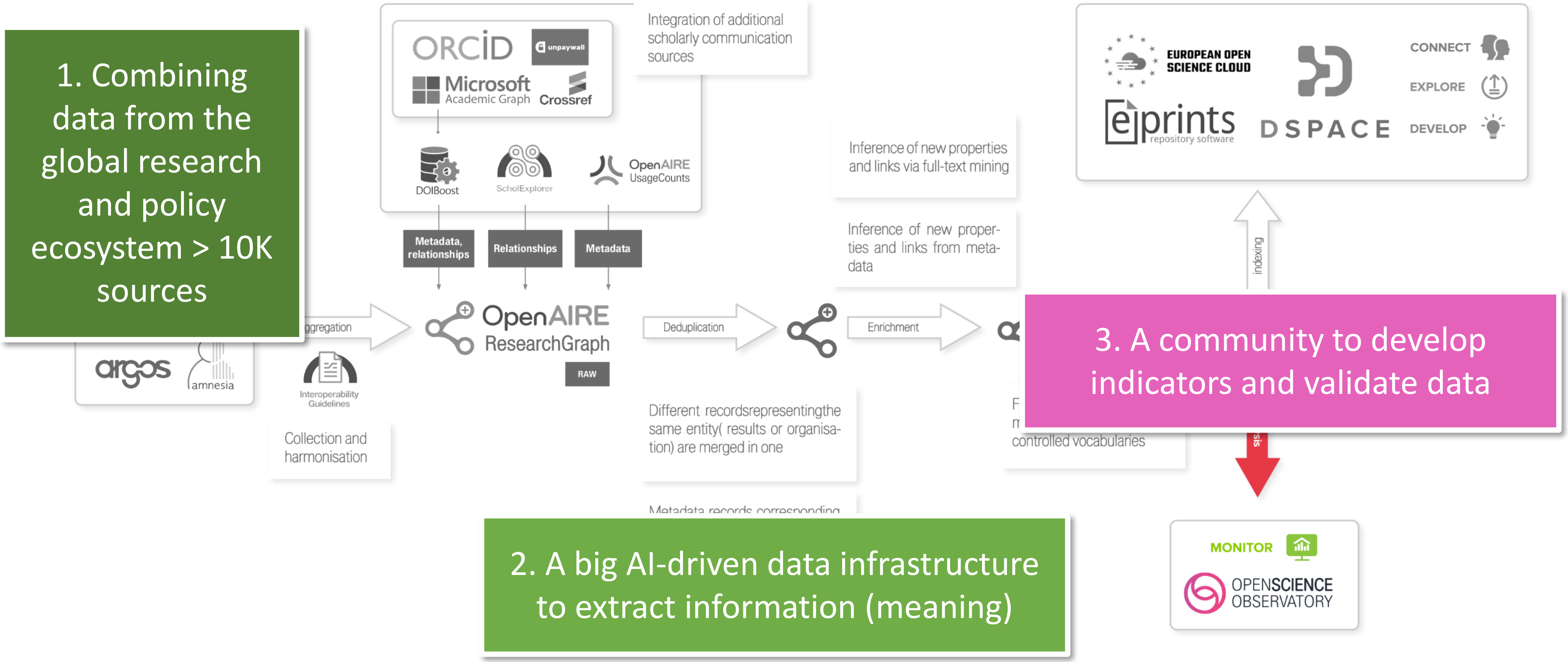
Supporting Projects

HOW? The power of an operational AI-Driven data infrastructure

1. Combining data from the global research and policy ecosystem > 10K sources

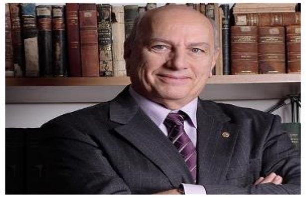
2. A big AI-driven data infrastructure to extract information (meaning)

3. A community to develop indicators and validate data



Atmospheric Physics and Climatology

Head **Team**



Mission

Climate model simulations, analyses, and methods combining multiple lines of evidence focused on improving understanding of **human influence on a wider range of climate variables**, including weather and climate extremes – IPCC reports

Study of climate fluctuations in any period
Study of the observations related to the upper layers of the atmosphere
Collation and processing of observations related to air pollution

Supporting projects

Collaborations

Climate & Energy Systems Modeling

Team

Mission

Climate and Energy Systems modelling will use system dynamics and stochastic modelling techniques to develop decarbonization pathways of the energy system at the national and regional levels.

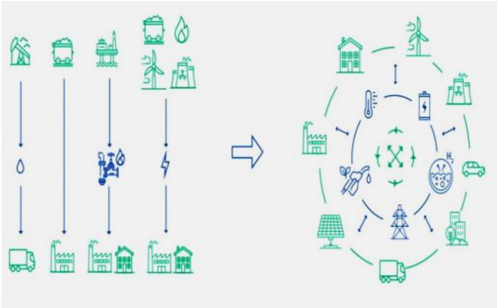
Energy supply: mapping power generation plants along with their associated fuel, including coal, oil, gas, renewables, bioenergy, nuclear and new zero carbon.

Energy demand by economic sector (transport, households, buildings and industry) recorded along with their associated greenhouse gas (GHG) emissions.

Climate policy, such as carbon pricing, Fit for 55, etc calculate their effect on GHG emissions and temperature

Simulation of the scenarios providing detailed values for all relevant variables, along with the resulting temperature increase.

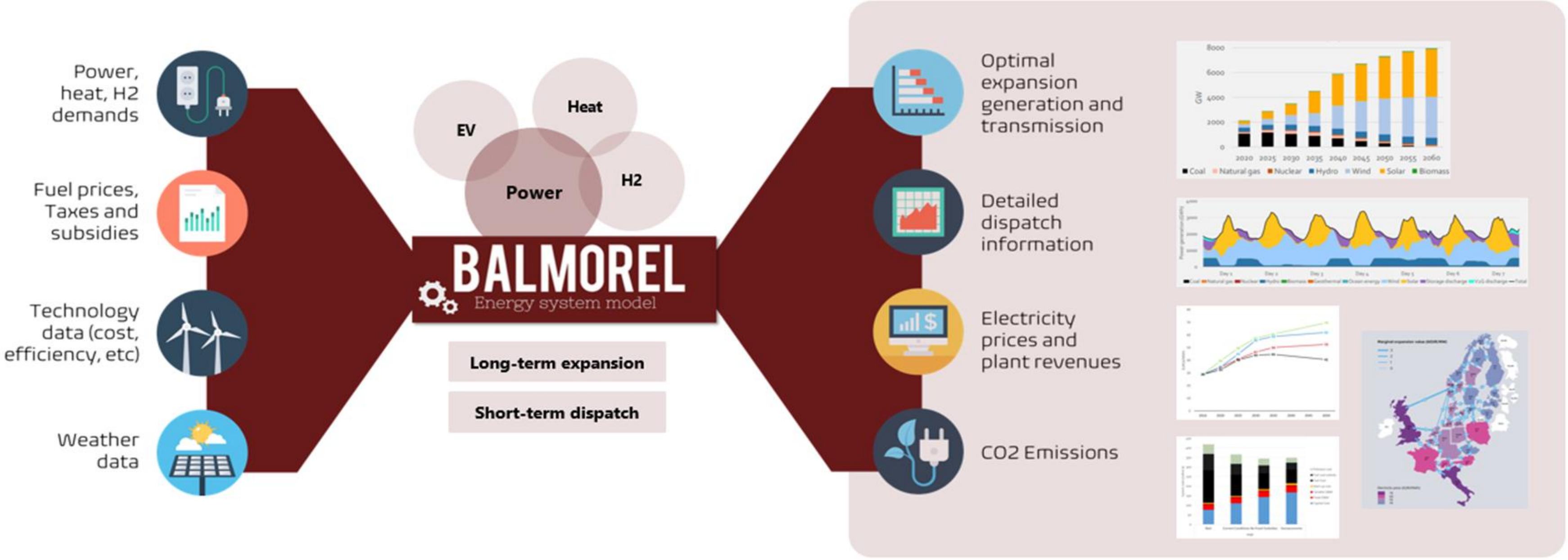
Model: Balmorel Energy-System model



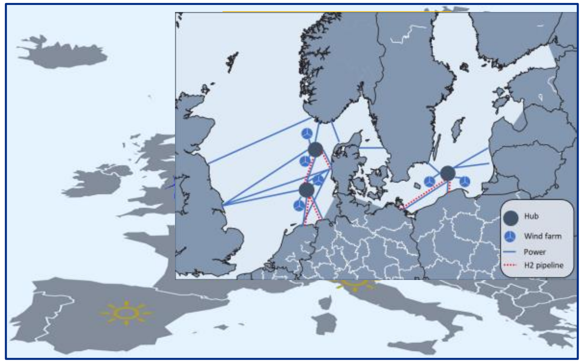
Collaborations

Supporting Projects

Integrated energy system modelling in Balmorel

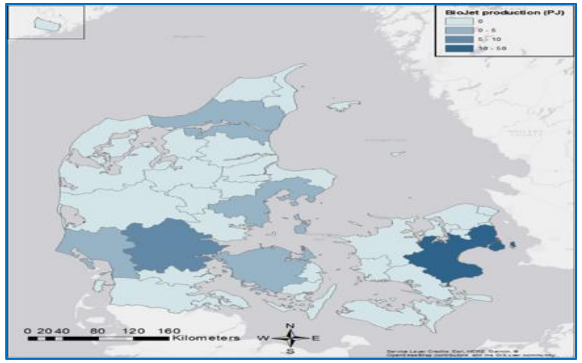


European decarbonization pathways



Regional decarbonization pathways

National decarbonization pathways



Model renewable fuels and Power-to-X (renewable to electricity) production European scale

North European countries

- Large potentials for offshore wind
- District heating
- Cheap onshore wind
- Biomass availability

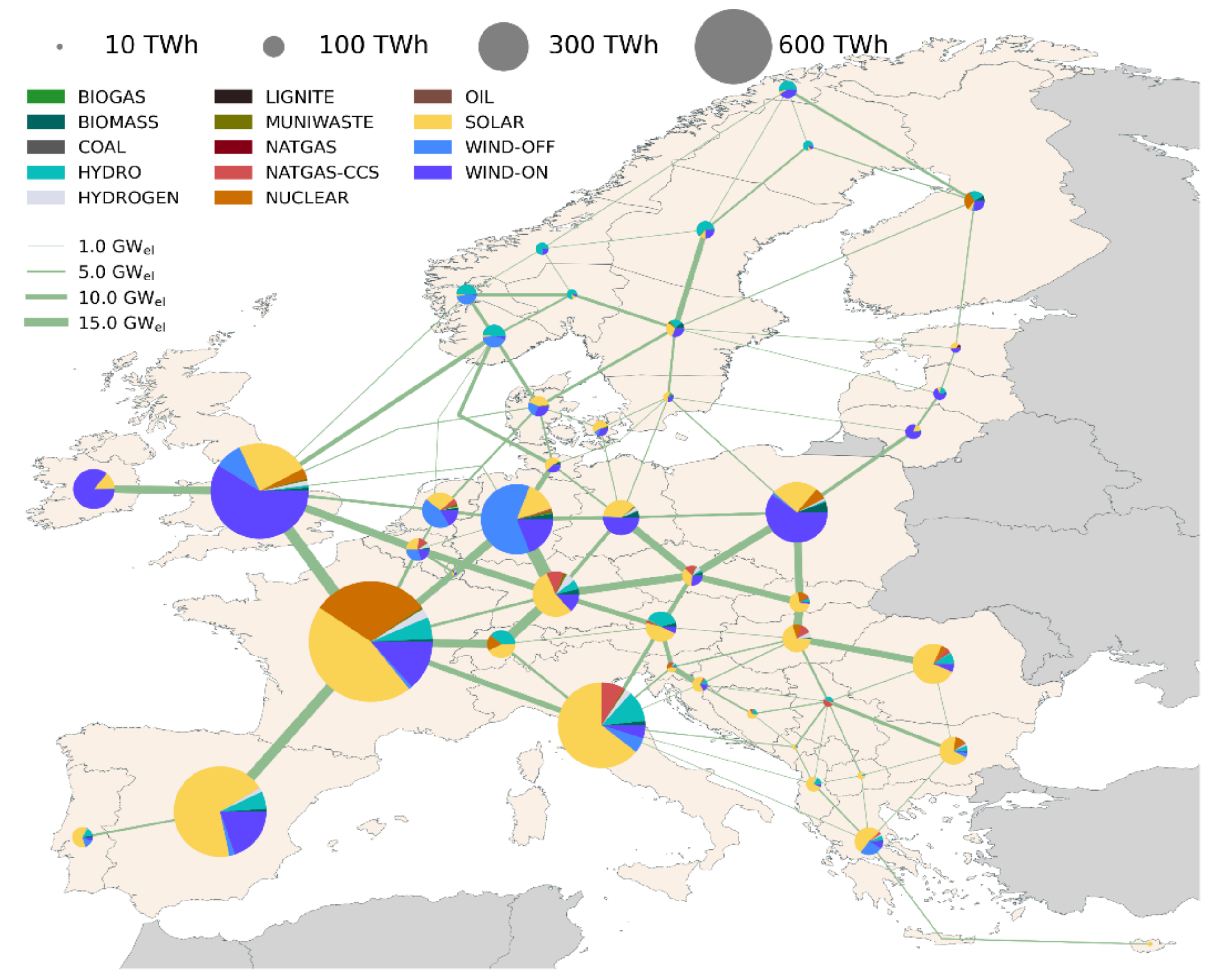
Central and south European countries

- Cheap solar PV
- Hydrogen industry

Hydrogen infrastructure in the future?

Hydrogen import from other regions?

Energy sources and hydrogen infrastructure, spatial distribution at European level by 2050



TO BE LAUNCHED AT COP28: EU-27, UK, THE BALKANS

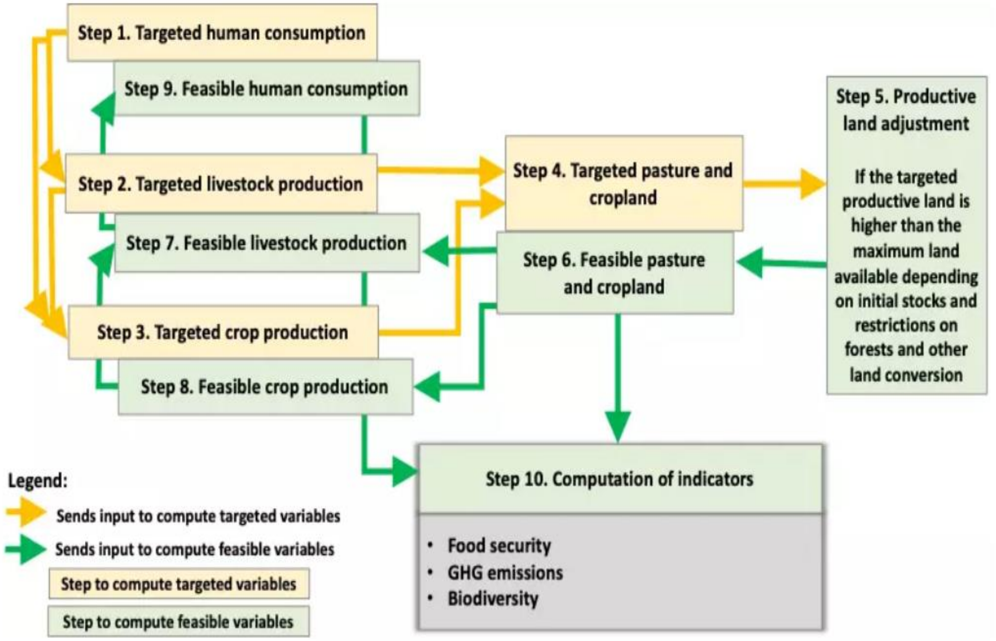
Team

Climate, Land Use, Water-Food-Energy-Biodiversity Nexus Modeling

The **FABLE Calculator** is :

an accounting tool used to study the potential evolution of food and land-use systems over the period 2000-2050.

It focuses on agriculture as the main driver of land-use change and tests the impact of different policies and changes in the drivers of these systems through the combination of a large number of scenarios.



Supporting Projects

Land Use Sustainable Pathway: In Need of an IPFSS Report!

> 1 billion Combination of Scenarios → Pathways

- **Current Trends**
- **National Commitments**
- **Global Targets**

Shifting diets, increasing crop and livestock productivity, and limiting agricultural land expansion, are the strongest drivers of positive change in global biodiversity.

Implementing these reforms in multiple countries would help put us on track to achieve global biodiversity, food security and climate mitigation goals by 2050.

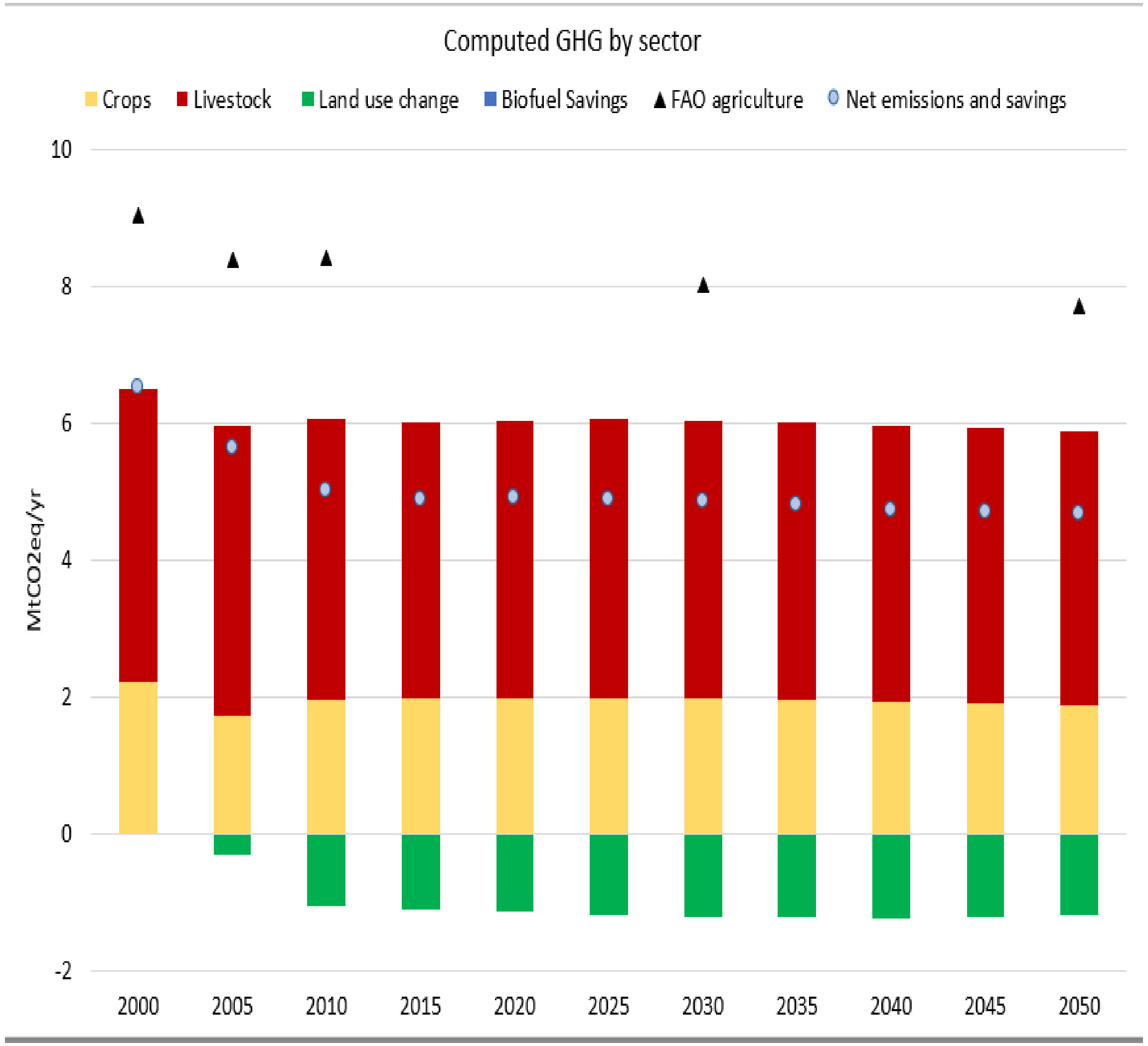
S.1	GDP projections		
SELECTION	GDP_SCEN	DESCRIPTION	GDP variation 2000-2050
x	SSP1	"*Sustainability*" - Medium high speed of economic growth for most advanced countries and high speed of convergence for other countries.	2.4
	SSP2	"*Middle of the Road*" - Medium speed of economic growth for most advanced countries and medium speed of convergence for other countries.	2.2
	SSP3	"*Fragmentation*" - Low speed of economic growth for most advanced countries and low speed of convergence for other countries.	1.1

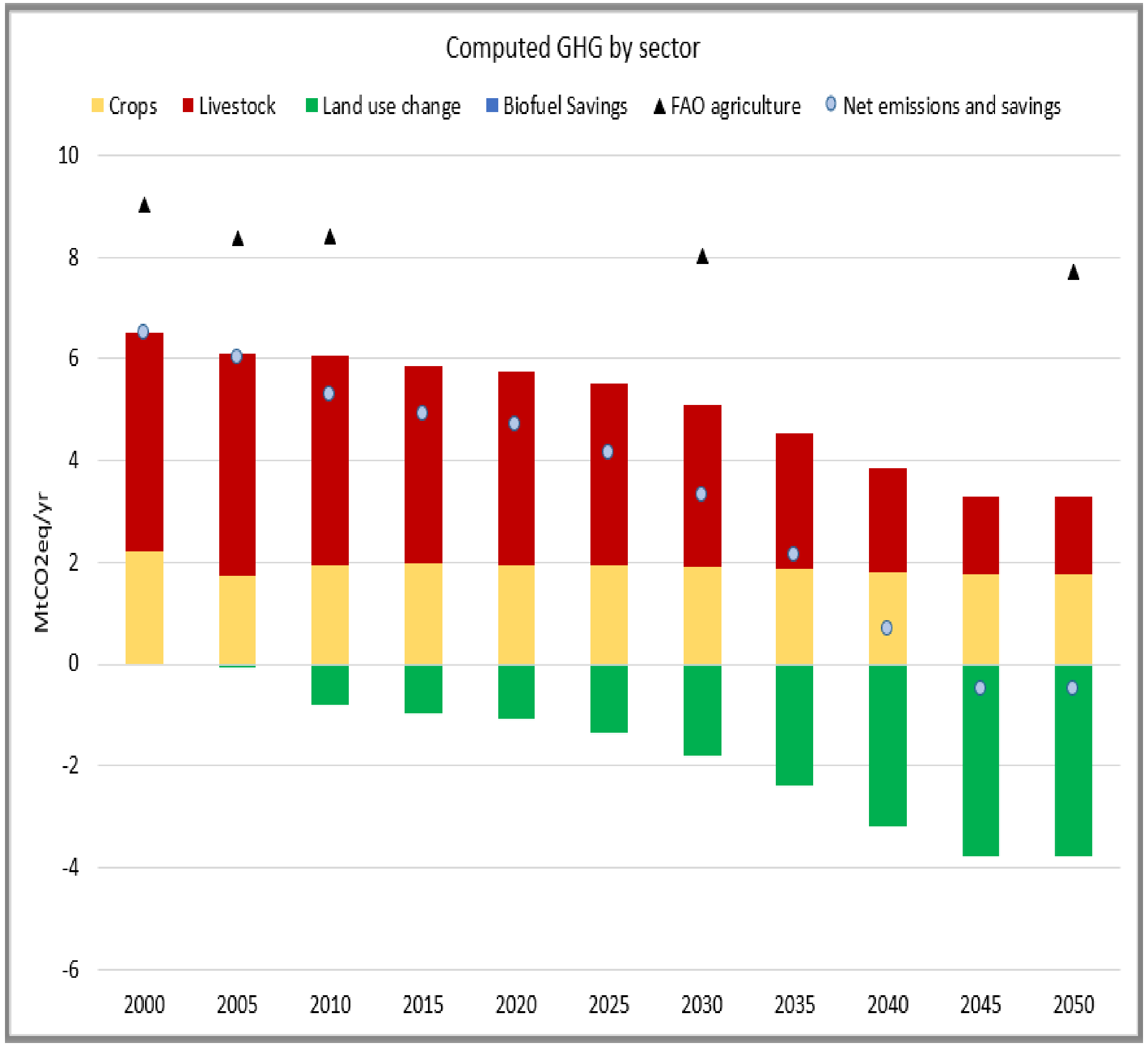
S.13	Choose the level of activity of the population		
SELECTION	ActivityScen	DESCRIPTION	Value
x	Low	Refers to sedentary lifestyle that includes only the physical activity of independent living.	
	Middle	Moderately active lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.	
	High	Active lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.	

S.10	Alternative scenarios on afforestation target		
SELECTION	AFFOR_scen	DESCRIPTION	Value
	NoAffor	No afforestation/reforestation target	Define the afforestation target by 2050 for both scenarios in the green cells of S.10a: AfforTarget
X	BonnChallenge	Afforestation/reforestation target in line with Bonn Challenge commitment	

S.3	Diet		
SELECTION	DIET_SCEN	DESCRIPTION	Value
	SSP1	"*Sustainability*" - Future diets are considered to be more sustainable. First, to reflect the better management of domestic waste in developed countries, consumption per capita is in the regions assumed almost constant. Second, animal protein demand is reduced in regions and increases in developing ones to reflect diversification of diets, but keeping the consumption of red meat relatively low. For developing regions, more nutritious diets also materialize through a reduction of consumption in root and tubers.	Countries converge to 3300 kcal/cap/d. If animal conso > 75 g prot./cap/day, reduction to that level. If anim conso < 25 g prot./cap/day, increase to that level. Red meat decreased or capped at 5 g prot./cap/day for all. Root conso decreases in poor countries to 100 kcal/cap/day and is replaced by other products.
	SSP2	"*Middle of the Road*" - These future diets follow the projections from FAO at the horizon 2050.	
	SSP3	"*Fragmentation*" - as economic growth is much lower in developing region, the income effects alone leads to a significantly lower demand per capita in these regions	
	NoChange	same diet as in 2010	
x	EATLancetAverage	EAT-Lancet recommended diet (average values per food group)	
	FatDiet	Diet high in fat, sugar, and meat	
	MyDiet	Describe your scenario here	If you want to design your own diet scenario enter the targeted kcal/cap/day per food group by 2050 in the green cells in S.3.c: DietTarget

Decline in GHG Emissions by 2050 - GREECE





Climate & Health

Head

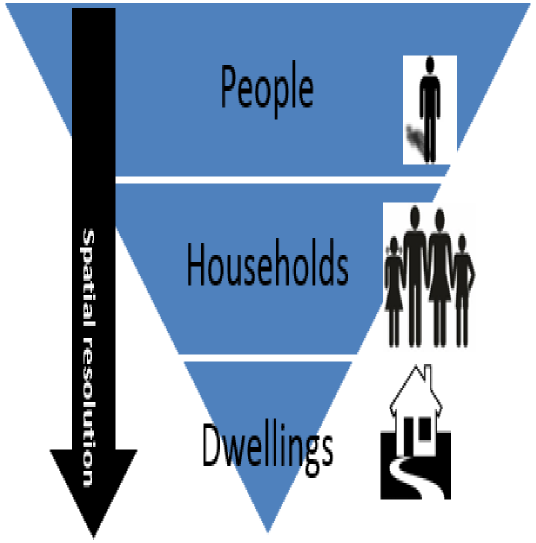
Team

Mission: Estimate Global economic burden of climate change indicator

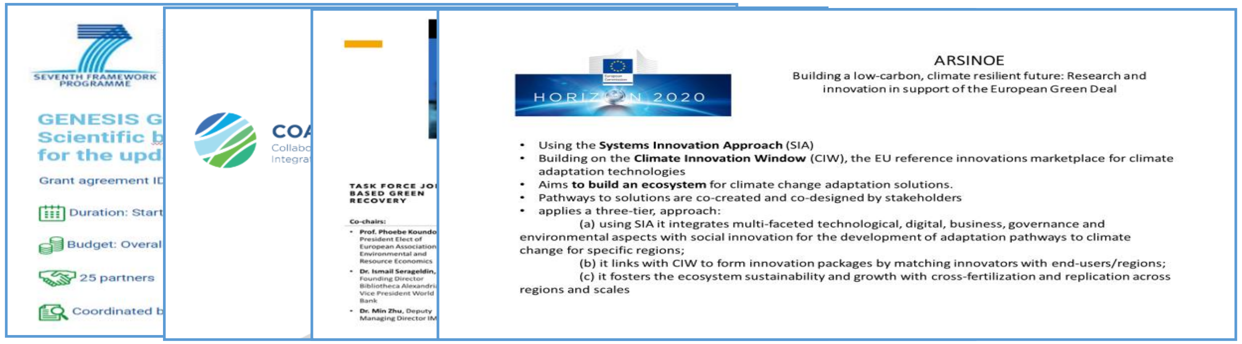
Climate change will have a huge impact on population health outcomes wrt morbidity, mortality, and disability for physical and mental conditions.

- Identify climate change risk factors for physical and mental conditions of interest (based on the WHO Environmental Burden of Disease Series)

- Estimate the disease burden resulting from a variety of climate change risk factors by region - Attribute economic cost



Supporting Projects



Innovation Acceleration for Climate Neutrality and Resilience

Head

Team

Mission: To meet the EU's 2050 climate neutrality objective, requires **supporting the mass deployment of sustainable innovations – technology, finance, socio-economic, governance**. Incremental innovation, but also disruptive or breakthrough technologies will be needed to accelerate the transition to a green economy and society.

Bring together partners from the business sector, academia, and the public and non-profit sectors to create networks of expertise, through which innovative solutions can be developed, brought to market and scaled-up for impact.

Collaborations

United Nations Climate Change

eit Climate-KIC Hub GREECE

Funded by the European Union

Technological Innovation MENA Maritime ClimAccelerator

PORTS & SHIPPING

30 start-ups

ClimAccelerator

MARITIME

Technological Innovation

Climate Innovation Window

130 start ups

The platform to connect innovators, end-users and investors

https://climateinnovationwindow.eu/

The MCA Process

ClimAccelerator MARITIME

Bootcamps

1

Online and in-person bootcamps at the beginning of each stage

Workshops

2

Interactive, online training sessions on different topics:marketing, financials, team building, etc.

Peer-to-Peer

3

Online sessions where startups receive feedback from other mentors and startups

Mentoring

4

Experienced mentors support the teams throughout the programme in regular one-on-one sessions

Networking

5

Stage 2 + 3 start-ups will be invited to participate to visits of the USA / Israeli ecosystems through our collaborators Kinisis Ventures and TheDocK.

Demonstration

6

Access to our large network stakeholders for technical support and the opportunity to demonstrate your technology in a safe environment.

Demo Day

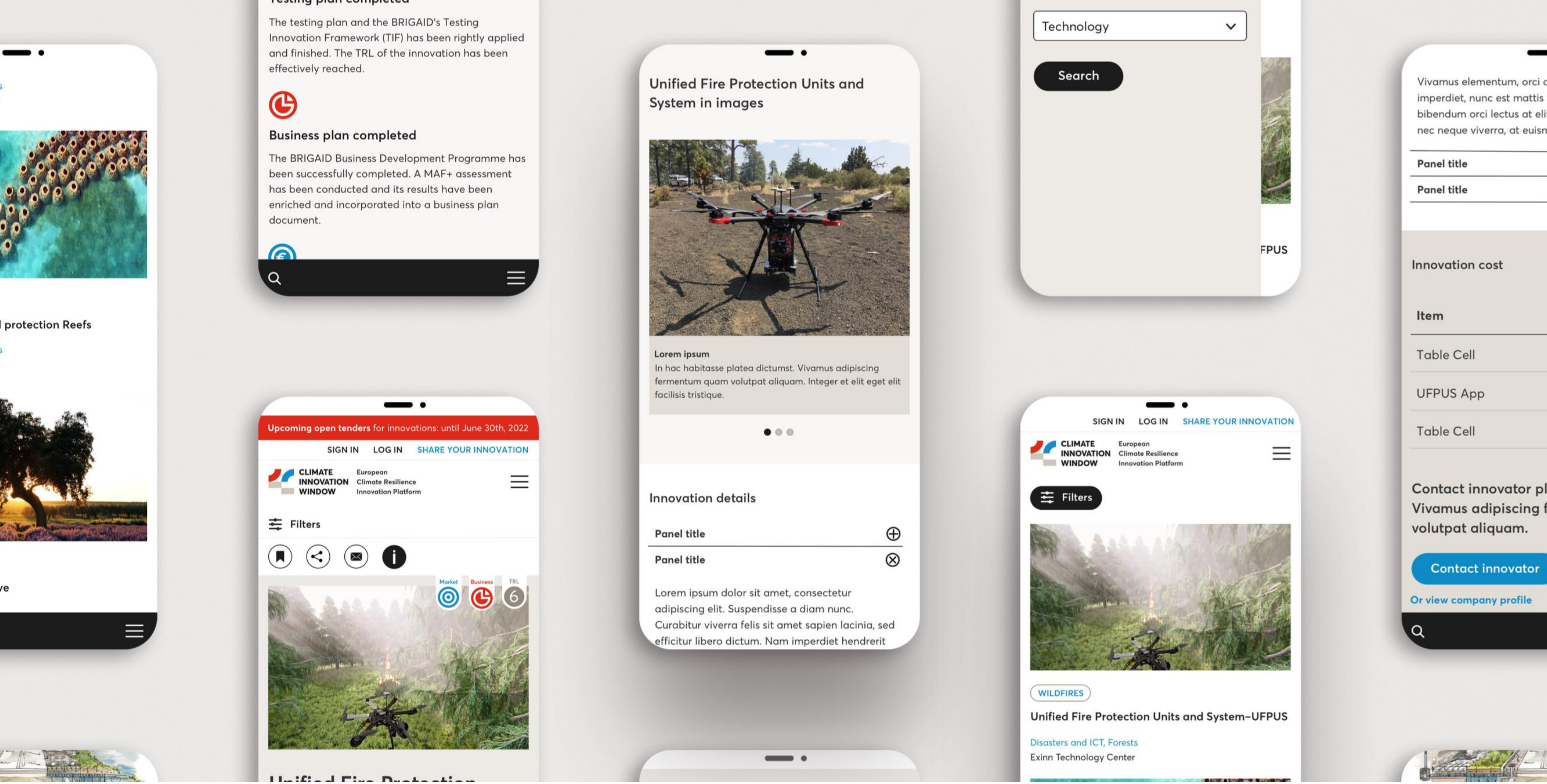
7

Startups pitch in front of investors, challenge owners and other bluetech stakeholders (in person if COVID allows)

Funding*

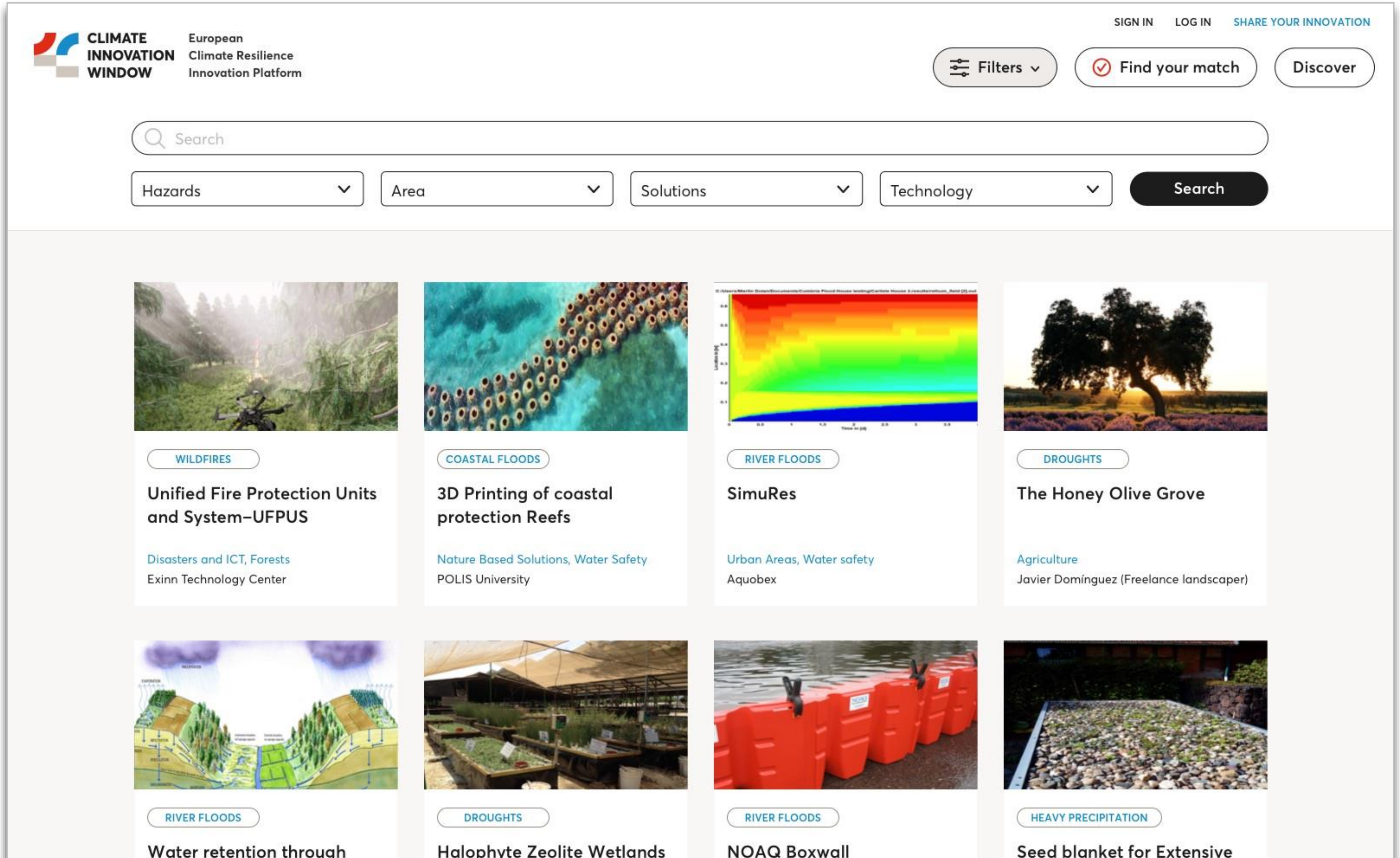
8

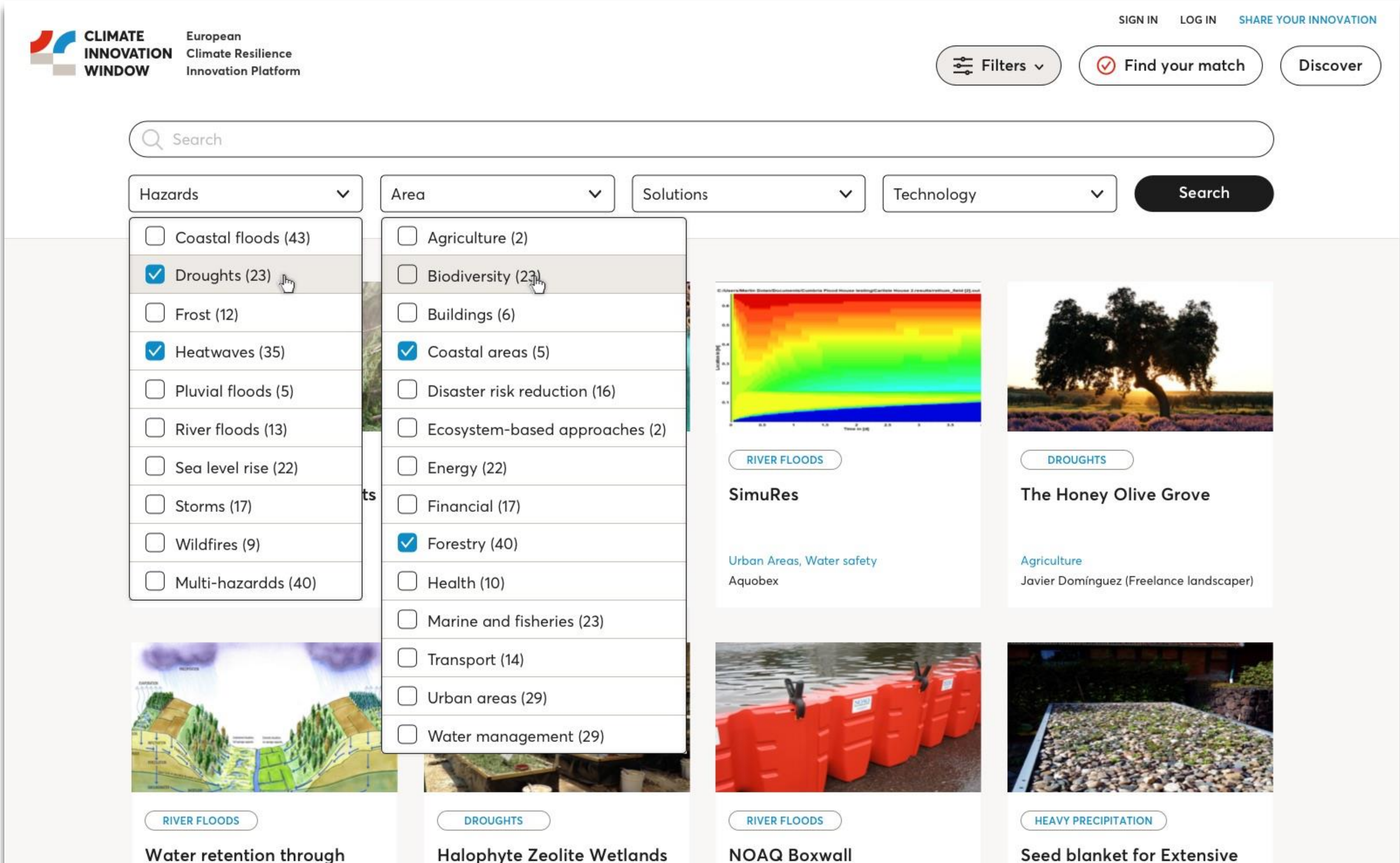
Stage 1: 5.000 – 10.000 €
Stage 2: 20.000 – 100.000€
Stage 3: >200.000€



BRIGAID CONNECT

ARSINOE
CLIMATE RESILIENT-REGIONS THROUGH SYSTEMIC SOLUTIONS AND INNOVATIONS


CLIMATE INNOVATION WINDOW
European Climate Resilience Innovation Platform
SIGN IN
LOG IN
SHARE YOUR INNOVATION
Filters
Find your match
Discover
Search
Hazards
Area
Solutions
Technology
Search
WILDFIRES
Unified Fire Protection Units and System–UFPUS
Disasters and ICT, Forests
Exinn Technology Center
COASTAL FLOODS
3D Printing of coastal protection Reefs
Nature Based Solutions, Water Safety
POLIS University
RIVER FLOODS
SimuRes
Urban Areas, Water safety
Aquobex
DROUGHTS
The Honey Olive Grove
Agriculture
Javier Domínguez (Freelance landscaper)
RIVER FLOODS
Water retention through
DROUGHTS
Halophyte Zeolite Wetlands
RIVER FLOODS
NOAQ Boxwall
HEAVY PRECIPITATION
Seed blanket for Extensive


CLIMATE INNOVATION WINDOW
European Climate Resilience Innovation Platform
SIGN IN
LOG IN
SHARE YOUR INNOVATION
Filters
Find your match
Discover
Search
Hazards
Area
Solutions
Technology
Search
Coastal floods (43)
Droughts (23)
Frost (12)
Heatwaves (35)
Pluvial floods (5)
River floods (13)
Sea level rise (22)
Storms (17)
Wildfires (9)
Multi-hazardds (40)
Agriculture (2)
Biodiversity (23)
Buildings (6)
Coastal areas (5)
Disaster risk reduction (16)
Ecosystem-based approaches (2)
Energy (22)
Financial (17)
Forestry (40)
Health (10)
Marine and fisheries (23)
Transport (14)
Urban areas (29)
Water management (29)
RIVER FLOODS
SimuRes
Urban Areas, Water safety
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CLIMATE INNOVATION WINDOW
European Climate Resilience Innovation Platform

SIGN IN LOG IN SHARE YOUR INNOVATION

Filters | Find your match | Discover

Search

Hazards | Area | Solutions | Technology | Search

- [ ] Education (2)
- [ ] Engineering and built environment (23)
- [ ] Governance and social innovations (6)
- [x] Infrastructure (5)
- [ ] Models and tools (16)
- [ ] Nature-based (2)
- [ ] Services (22)
- [ ] Technology (17)

WILDFIRES

Unified Fire Protection Units and System–UFPUS

Disasters and ICT, Forests
Exinn Technology Center

COASTAL FLOODS

3D Printing of coastal protection Reefs

Nature Based Solutions, Water Safety
POLIS University

Urban Areas, Water safety
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DROUGHTS

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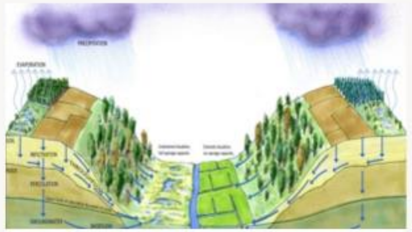

RIVER FLOODS

Water retention through

DROUGHTS

Halophyte Zeolite Wetlands

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European Climate Resilience Innovation Platform

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- [ ] TRL 1 (2) Basic research: basic principles are observed and reported
- [x] TRL 2 (2) Applied research: Technology concept and/or application formulated
- [ ] TRL 3 (12) Critical function: Proof of concept established
- [ ] TRL 4 (28) Laboratory testing of prototype component or process
- [ ] TRL 5 (13) Laboratory testing of integrated system
- [ ] TRL 6 (33) Prototype system verified
- [ ] TRL 7 (15) Integrated pilot system demonstrated
- [ ] TRL 8 (5) System incorporated in comercial design
- [ ] TRL 9 (20) System ready for full scale deployment
- [ ] Commercial (20) Already in the market


WILDFIRES
Unified Fire Protection Units and System–UFPUS
Disasters and ICT, Forests
Exinn Technology Center


COASTAL FLOODS
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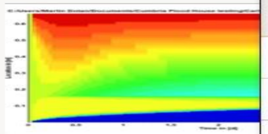

RIVER FLOODS
SimuRes
Urban Areas, Water safety
Aquobex

per)


RIVER FLOODS
Water retention through restoration [...] drained soils
Agriculture, Nature Based Solutions, Water Safety
Wetlands International

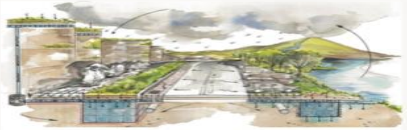

DROUGHTS
Halophyte Zeolite Wetlands (HZW)
Agriculture, Nature Based Solutions, Water Quality
Migal – Galilee Research Institute


RIVER FLOODS
NOAQ Boxwall
Water Safety
NOAQ Flood Protection AB


HEAVY PRECIPITATION
Seed blanket for Extensive Green Roofs
Urban Areas
De Boer Green


MULTI-HAZARD
Danube Living Labs Pilot application Potelu...
Agriculture, Urban Areas, Water Availability
Business Development Group


RIVER FLOODS
FLUTSCHUTZ DeichKADE
Water Safety
Bremen City University of Applied Sciences


MULTI-HAZARD
Green-skin permeable system for urban rain...
Nature Based Solutions
Sistemas Urbanos Drenaje Sostenible S.L.


DROUGHTS
SkyDowser
Agriculture, Water Availability, Water Quality
WaterMappers

Load more innovations

ABOUT SUPPORT CONTACT LEGAL

ARSINOE BRIGAID CONNECT

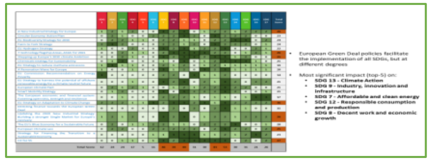
Just Transition: Policies, Finance, Labor Market

THE LANCET COVID-19 COMMISSION

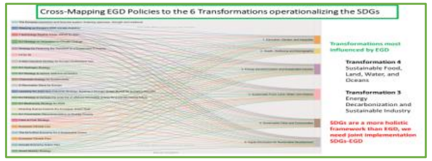
Key Sectors for Green Recovery

- Energy Sector - shift from fuels-based to minerals-based energy production, storage, and distribution system
- Agriculture and Food Sector - directly linked to the environment and the ecosystems
- Housing and Urbanization - Urbanization's growth should be managed sustainably
- Health Sector - invest COVID-19 recovery packages in strengthening health systems and increase regulation on risk-sources
- R&D for Geo-engineering - Removing CO2 from the atmosphere, blocking the sun, etc.

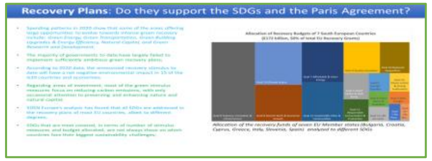
Machine Learning Textual Analysis
Does the EGD support the implementation of the SDGs?



Which of the 6 Sustainable Development Transformations are supported by the EGD?



Are the European Recovery and Resilient Plans SDGs-compatible?



Does the European Semester Process facilitate the implementation of the SDGs?

Sustainable Finance: Valuing Natural and Cultural Capital

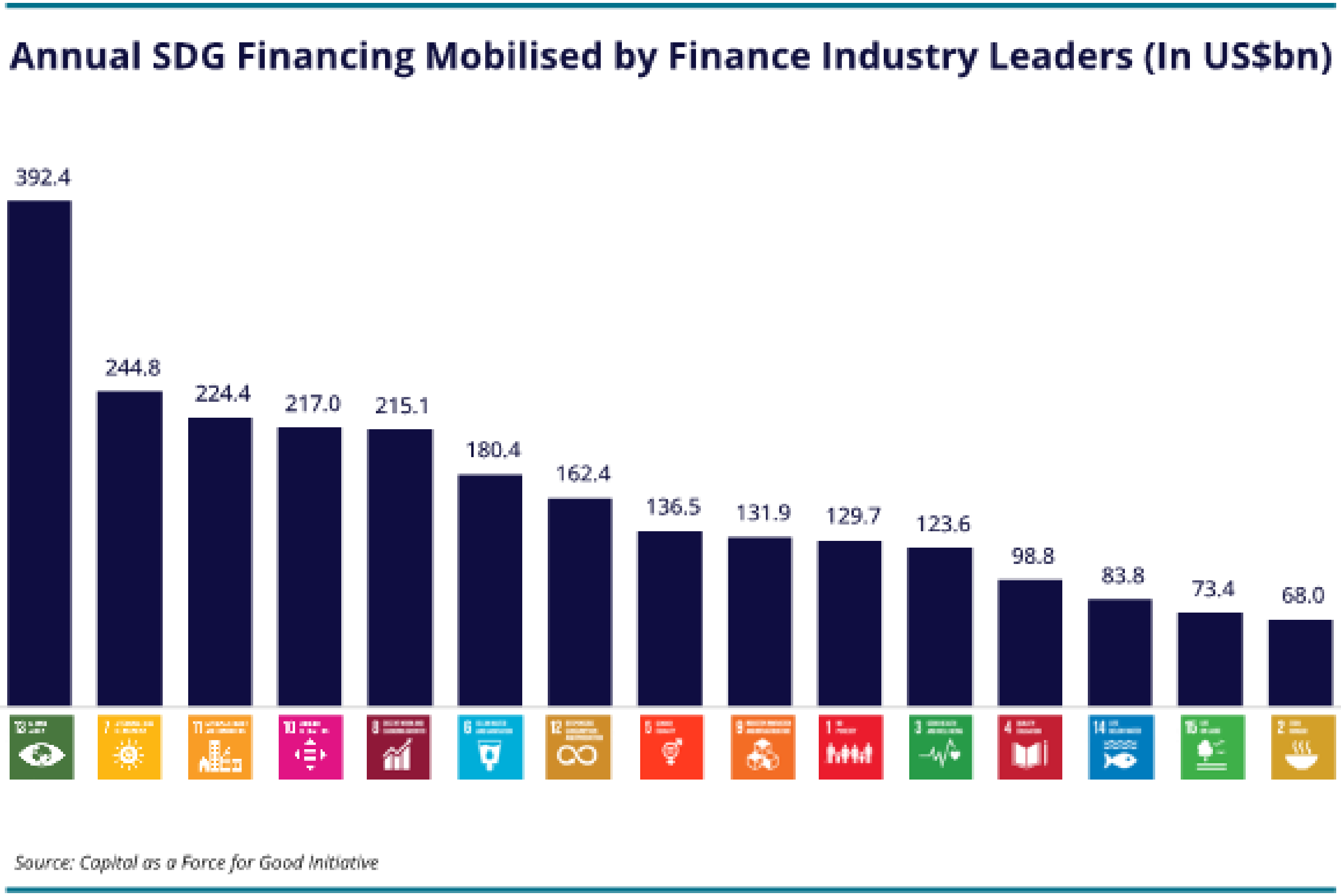
Fiscal Innovation: What are the distributional effects of Key EU climate policies?

Sustainable Private Sector

The Role of the Private Sector

- Private sector controls significant part of world's liquid assets: $275 trillion
- Importance of financial investments and strategic investment by private corporations
- Finance industry increased SDG aligned financing by 20% in 2021

Koundouri, Sachs et al, SDSN EGD SWG, 2023



Can virtual reality nudge towards green investing? An experiment with small business entrepreneurs, Koundouri et al, RBF, 2023

- Our findings indicate that, when risk and time preference parameters are controlled for, a virtual reality experience can nudge towards green-digital investment choices.

- Effect particularly significant among those who already exhibit a greater propensity to opt for green investments.

SDG Footprint – Companies

A Holistic Three-Step approach is necessary for Companies to create value and move beyond compliance-based codes

Identification

- Identify the important units in the value chain of the business – Mapping the value Chain of Company , Products and Services

Development

- Measure Company's ESG Performance – Specific ESG KPIs for each company/industry/Unit
- Link ESG KPI's to SDGs
- LCA an effective tool
- Hybrid metrics could be an ideal tool for businesses that help connecting and combining companies' social and environmental impact with standard measures of financial performance

Assessment & Monitoring

- ESG Management, Continuous assessment and monitoring of company's performance to help decide whether, when, where and how to intervene
- Ability to identify synergies
- Provision of systemic view and framework
- Enable creating value through operational cost reductions, increasing profits, better market positioning, competitive advantage, products and services quality enhancement, reputation improvement, etc.

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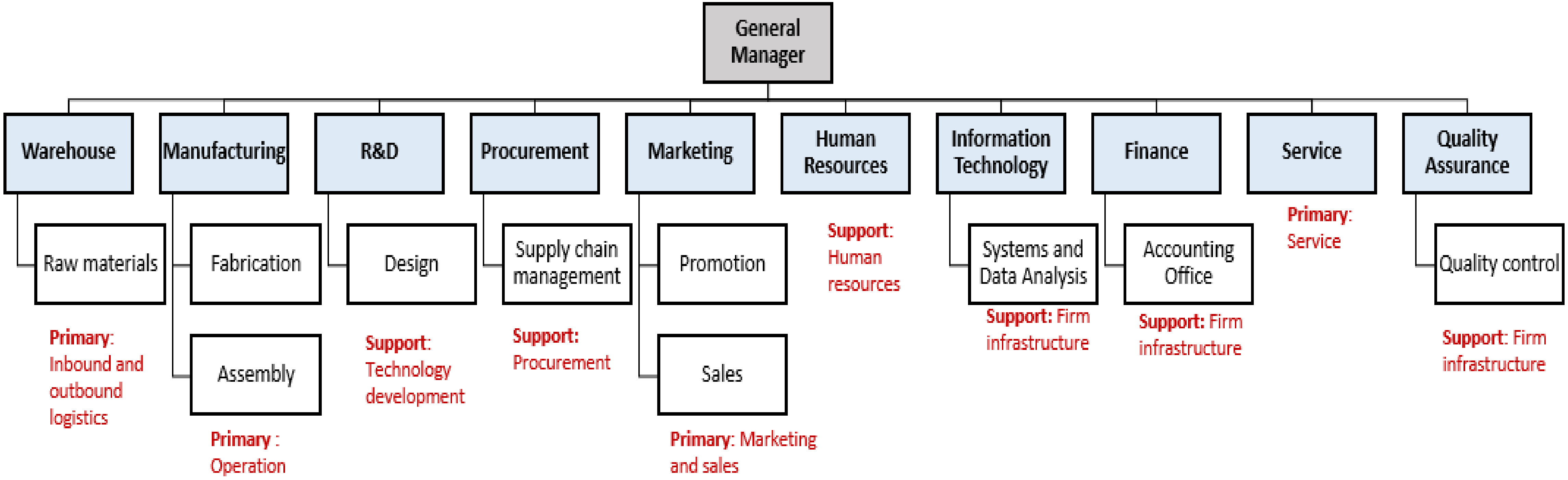
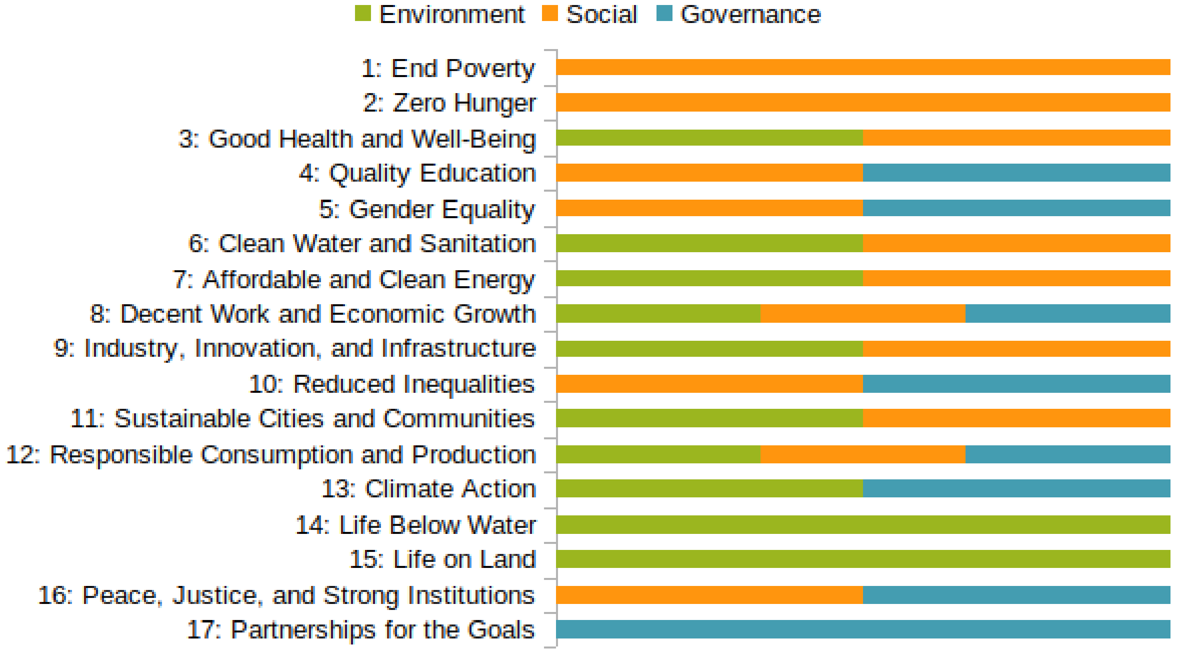
Mapping the value chain of Company, Services and Products



- Typical organization chart based on core business functions.
- Add additional layers depending on the company segmentation (e.g., product, geographical, customer).
- First-step in the three-step approach that adapts to each company's specific needs and business units.

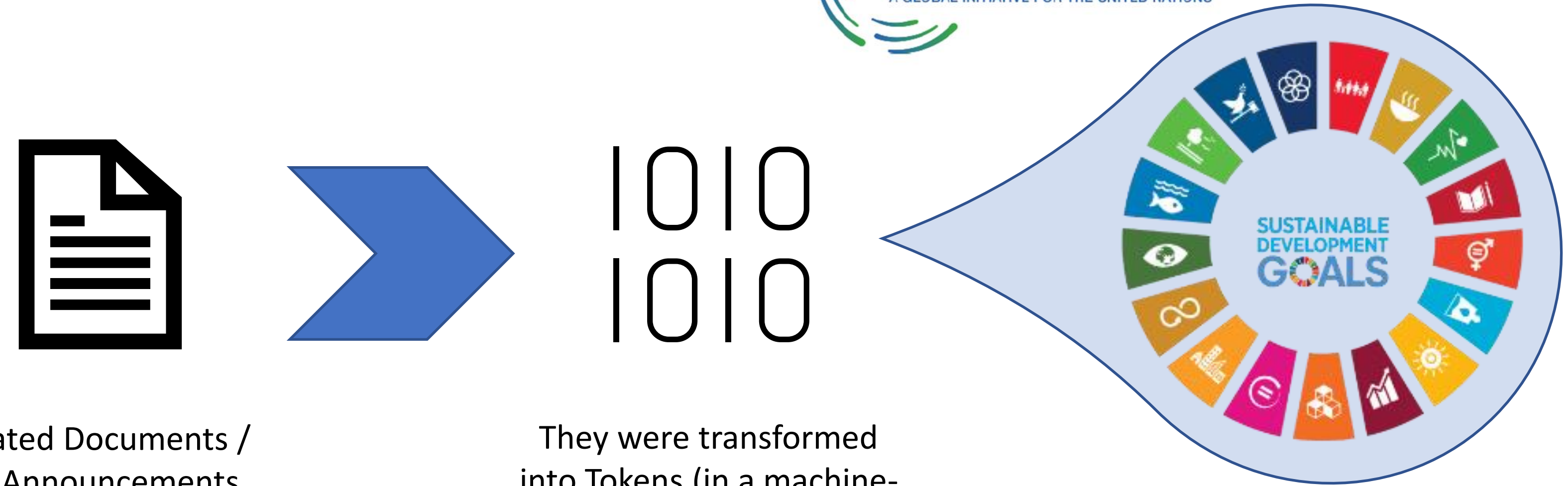
Corporate Sustainability Reporting: Mapping ESG to SDG Goals and Targets

- ***ESG KPI**s are mapped to SDGs Indexes.*
- ***Experts** Classification & **Machine/Deep learning** approaches to map ESG KPIs to the 232 Indicators of 17 SDGs.*
- **Targets** are set for SDG Indicators following the common **UN SDSN** methodology.



KPIs - ESG Related Reports – Deep Learning

- Deep Learning refers to extensive neural networks with many layers that allow computational models (composed of multiple processing layers) to “learn” representations of data with multiple levels of abstractions.



ESG Related Documents / News / Announcements from **Bloomberg** , **Reuters** and other sources were imported in html form

They were transformed into Tokens (in a machine-readable form)

The trained model calculates the probability of the relation of X Company/Asset ESG related document to the Y SDG.

- We have fine-tuned a pretrained BERT model using more than 15,000 text excerpts from the OSDG Database, each describing 1 of the 17 SDGs.
- OSDG is an open-source initiative that aims to integrate various existing attempts to classify research outputs according to Sustainable Development Goals, and to make this process open, transparent and user-friendly.

SDG Footprint Dashboard By Company/ Unit

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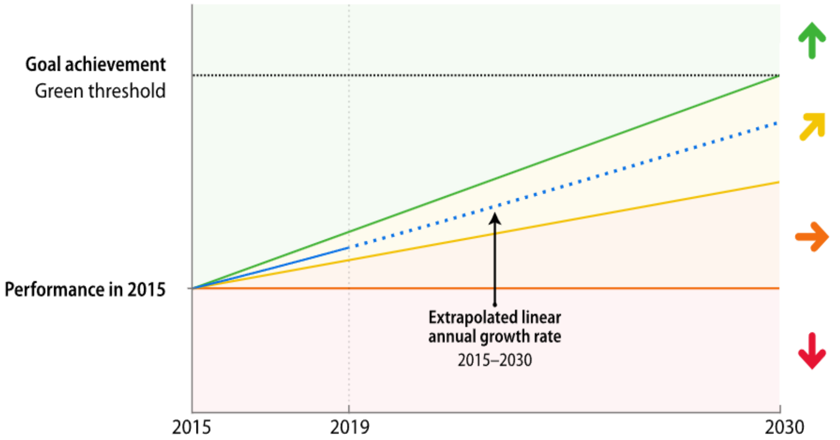
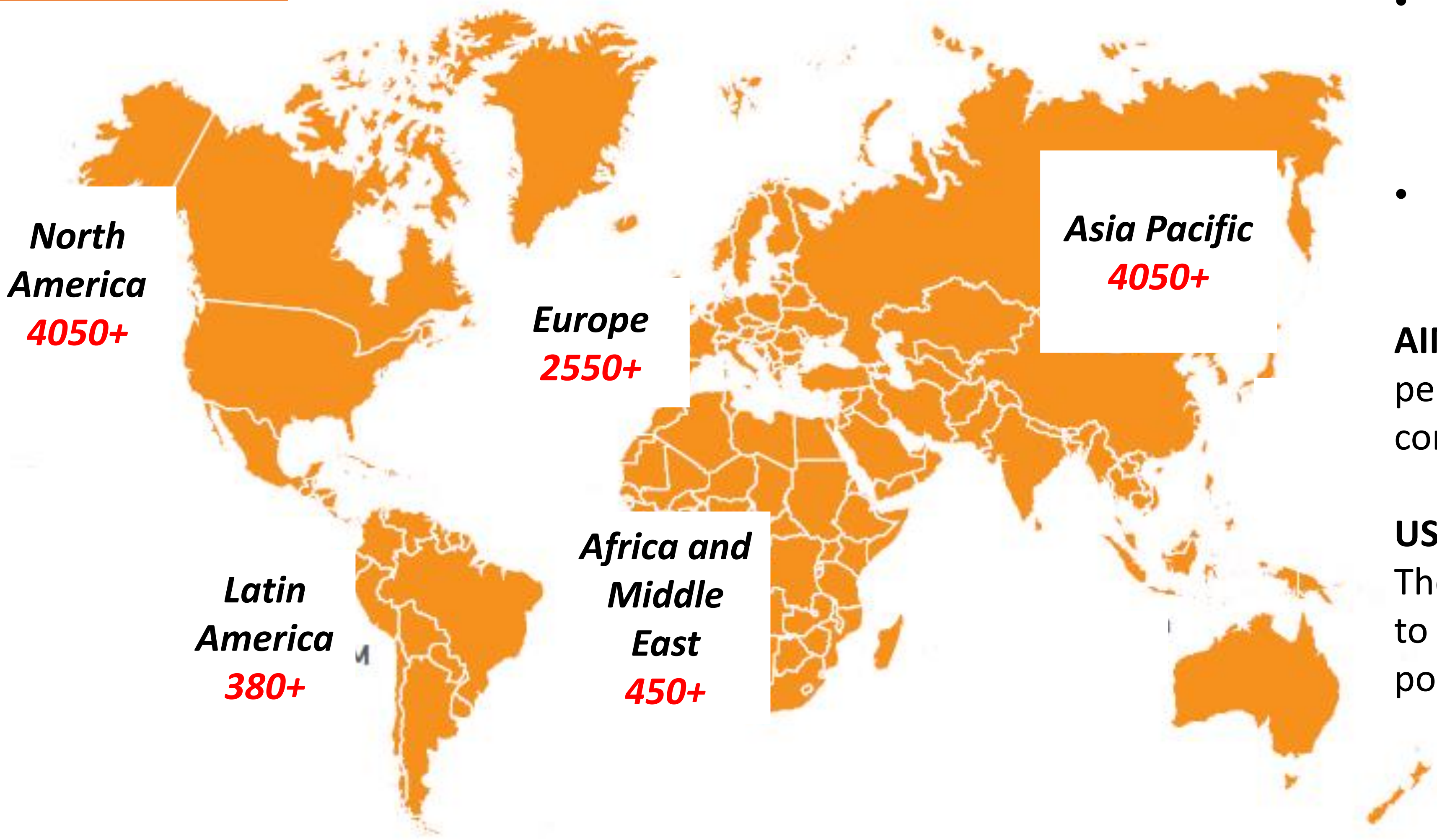
Dashboards: SDG achieved Challenges remain Significant challenges remain Major challenges

- Calculate Scores at any Level (Transformations/ ESGs / SDGs).
- Calculate the Company's **SDG Footprint** at a company/Unit/Product level.
- Calculate SDG **Trends/ Pathways** to 2030/2050.



SDG and ESG consistent Asset Pricing

Regional and Global Asset Pricing Models



- 11.400+ Companies In International Markets (**99% Of Global Market Capitalization**).
- > 600 ESG KPIs (reported by Thompsons Rauters)

AIM: Calculate ESG/SDG holistic performance indicator per company

USING: Arbitrage Asset Pricing Theory extend Fama & French to create ESG/SDG mimicking portofolios

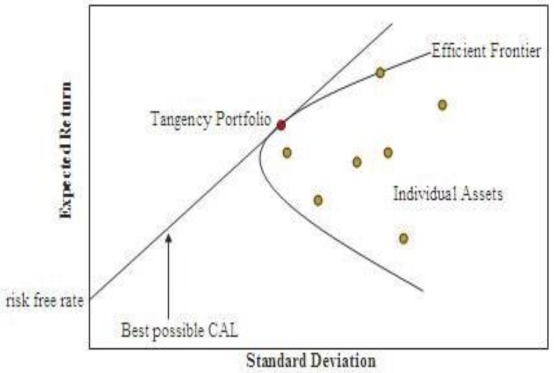
Portfolio SDG Footprint – SDG Pricing Model

- The Capital Asset Pricing Model (CAPM, Sharpe 1964) describes the relationship between systematic risk and expected return for assets: linear relationship between the required return on an investment and its risk.

$$r_{p,t} - r_{f,t} = \beta_0 + \beta_1 \left(r_{m,t} - r_{f,t}\right) + \varepsilon_t$$

- Fama and French (1992,1993) augmented the model to account for other sources of priced risk, that is size (market capitalization) of companies and their Value (book value: shareholder's equity to market capitalization ratio).

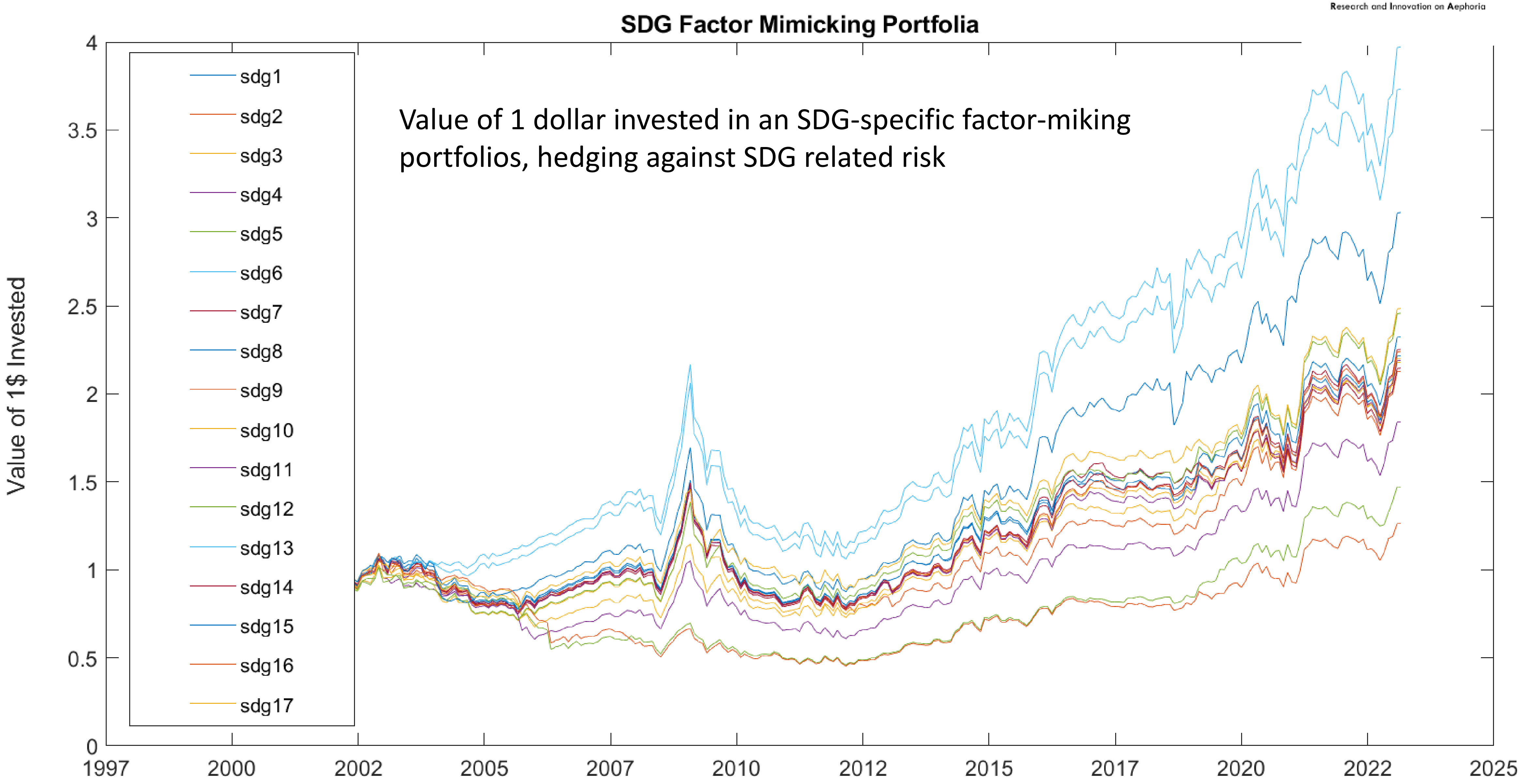
$$r_{p,t} - r_{f,t} = \beta_0 + \beta_1 \left(r_{m,t} - r_{f,t}\right) + \beta_2 \left(SMB_t\right) + \beta_3 \left(HML_t\right) + \varepsilon_t$$



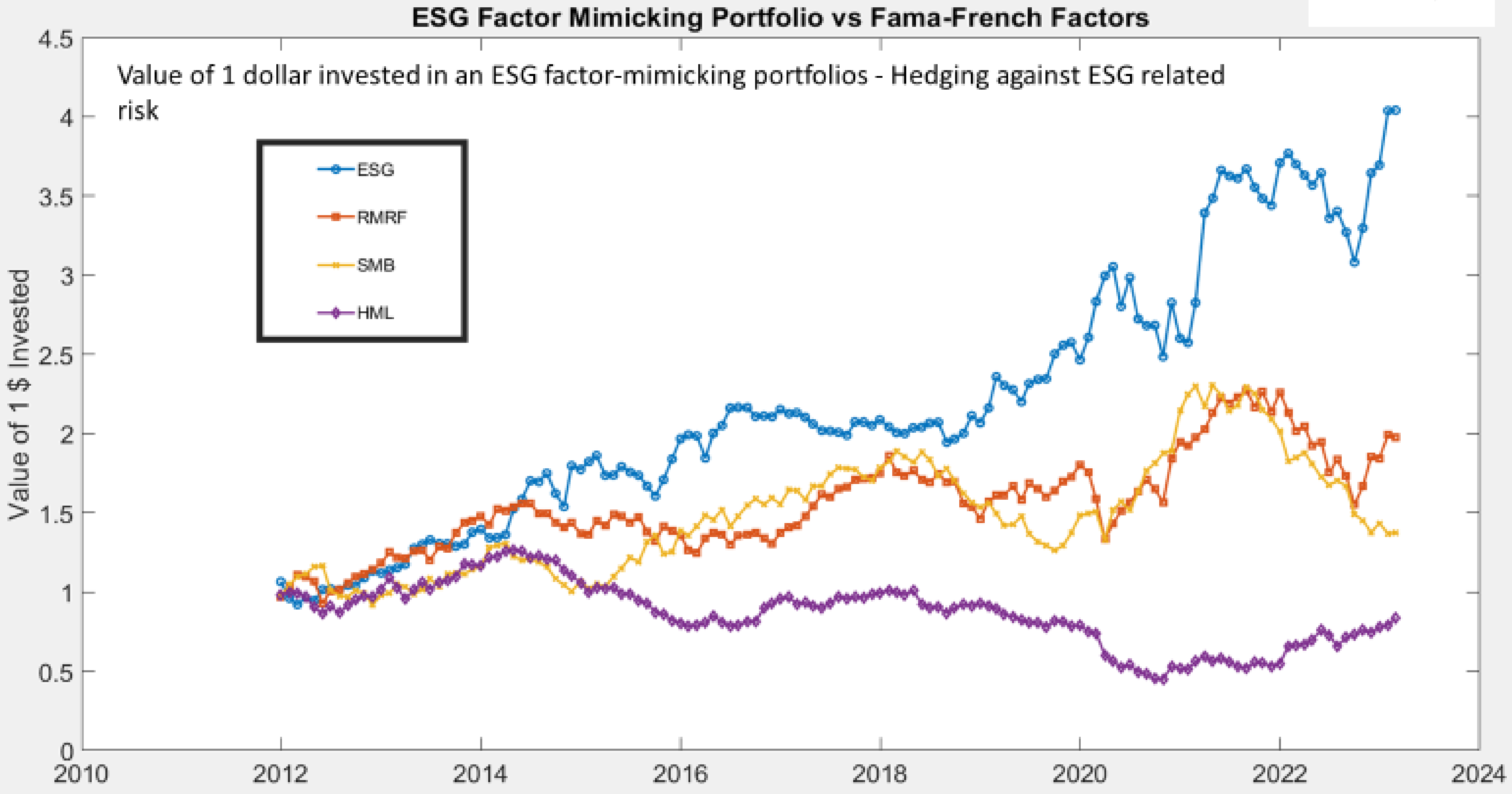
- **Expand Fama and French Methodology to calculate the exposure of portfolios to SDG related risks:**

$$r_{p,t} - r_{f,t} = \beta_0 + \beta_1 \left(r_{m,t} - r_{f,t}\right) + \beta_2 \left(SMB_t\right) + \beta_3 \left(HML_t\right) + \beta_4 \left(ESG_t\right) \sum_{i=5}^{21} \beta_i \left(SDG_{i-4,t}\right) + \varepsilon_t$$

AE4RIA's SDG Pricing Factors



AE4RIA's ESG Pricing Factors



Transformative Participatory Approaches: National Living Labs and Systems Innovation

Head

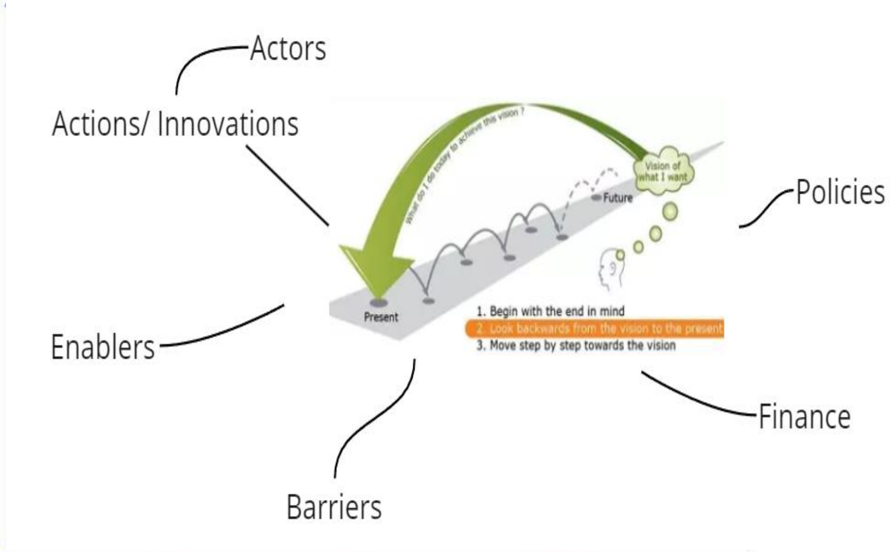


Team

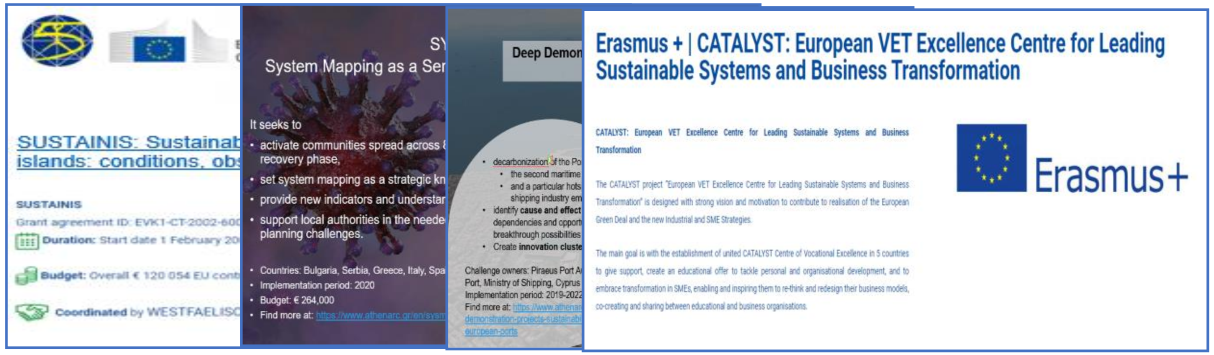



Models can provide the evidence, but people must make the decisions…

Our transformative and participatory approaches seek to bridge the gap between science, policy and society, by supporting key actors to utilize model outputs to make sustainable decisions.



Supporting Projects



Methodologies

- Transformative Living Labs
- System Innovation and Transition Management
- Innovation Pathways
- Foresight methods such as Backcasting
- key actions and policy recommendations
- Living Lab Modeler Tool

Education, Training, Upskilling and Reskilling

Collaborations

SDGs Academy

Mission

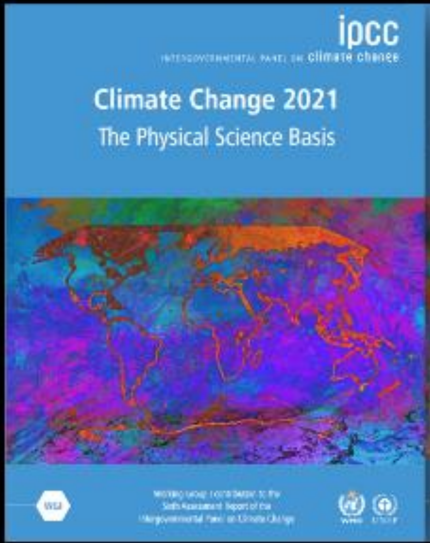
To support the green and digital transition by educating and training people, building skills ecosystems, which will also be aligned with national, regional, local and sectoral green strategies. The educational programs will be delivered under six themes corresponding to the Six SDG Transformations namely:

Supporting Projects

The State of Knowledge about Climate Change

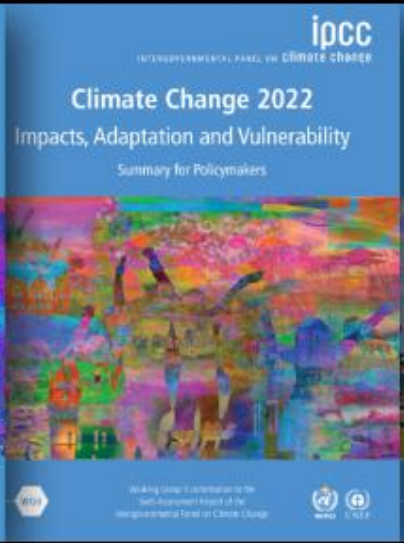
Explore avenues of collaboration in the run-up to COP 28, **towards developing the socio-economic narrative towards climate neutrality.**

WGI



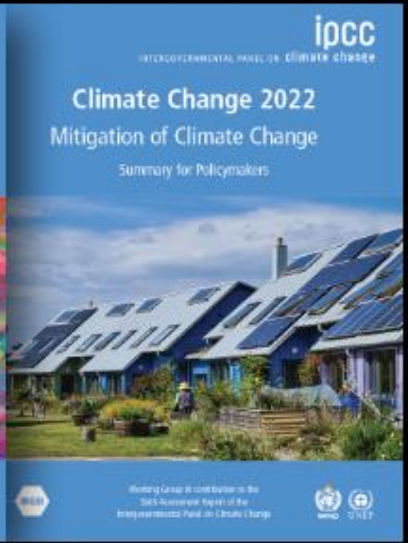
AR6 Climate Change 2021: The Physical Science Basis

WGII



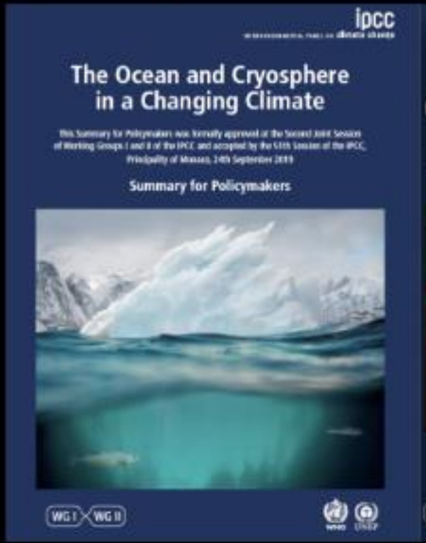
Climate Change 2022: Impacts, Adaptation and Vulnerability

WGIII

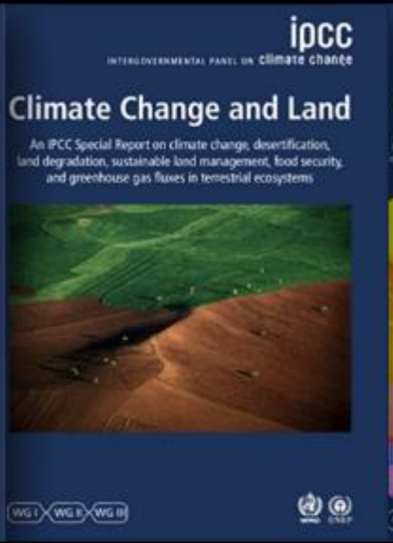


Climate Change 2022: Mitigation of Climate Change

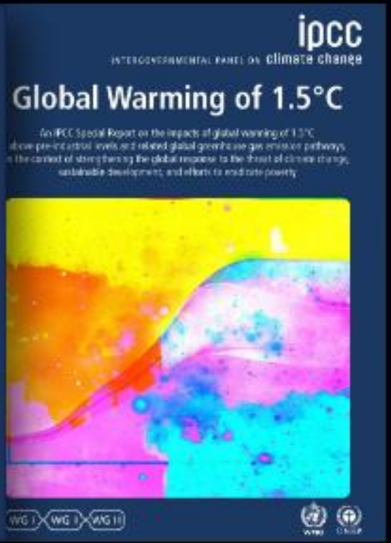
Special Report



Ocean and Cryosphere in a Changing Climate



Climate Change and Land



Global Warming of 1.5 °C