The National Research Council of Italy
Department of Biology, Agriculture and Food Sciences

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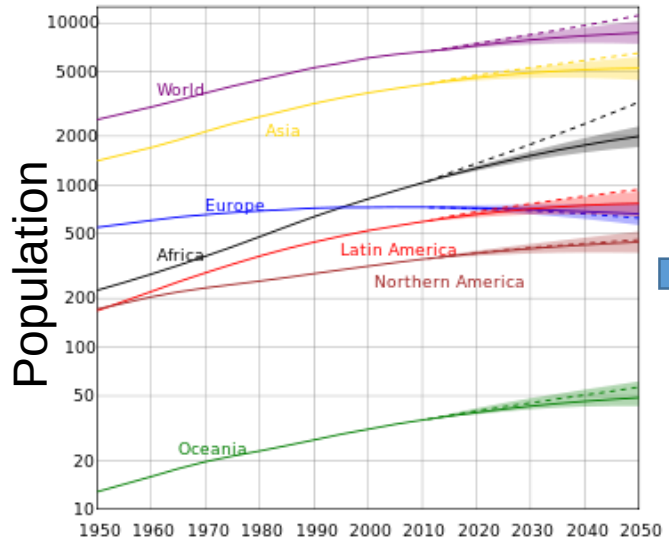
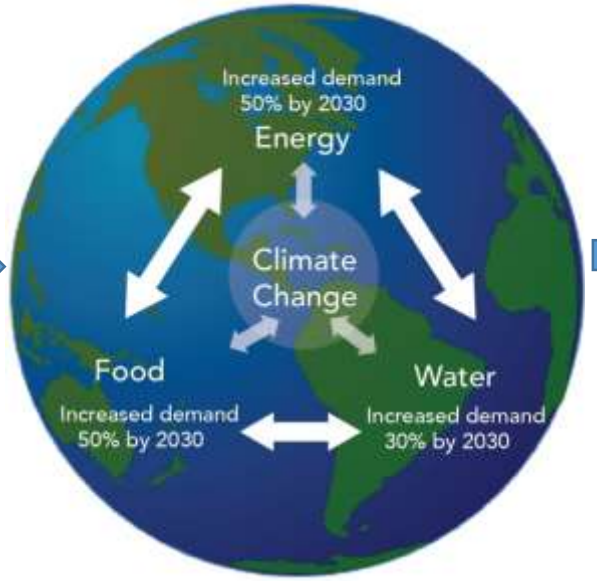
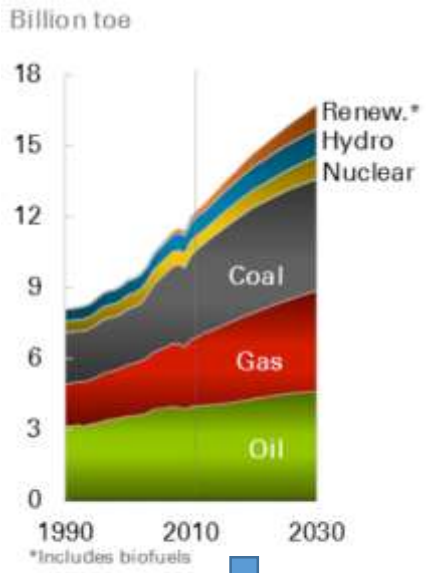
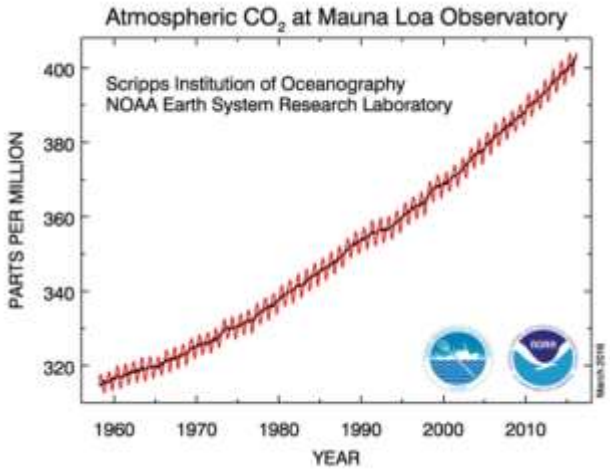
The problem – the drivers – the nexus

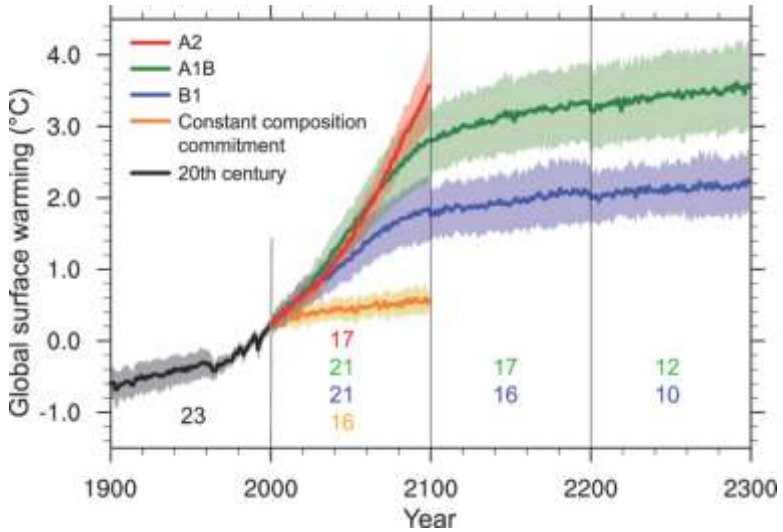




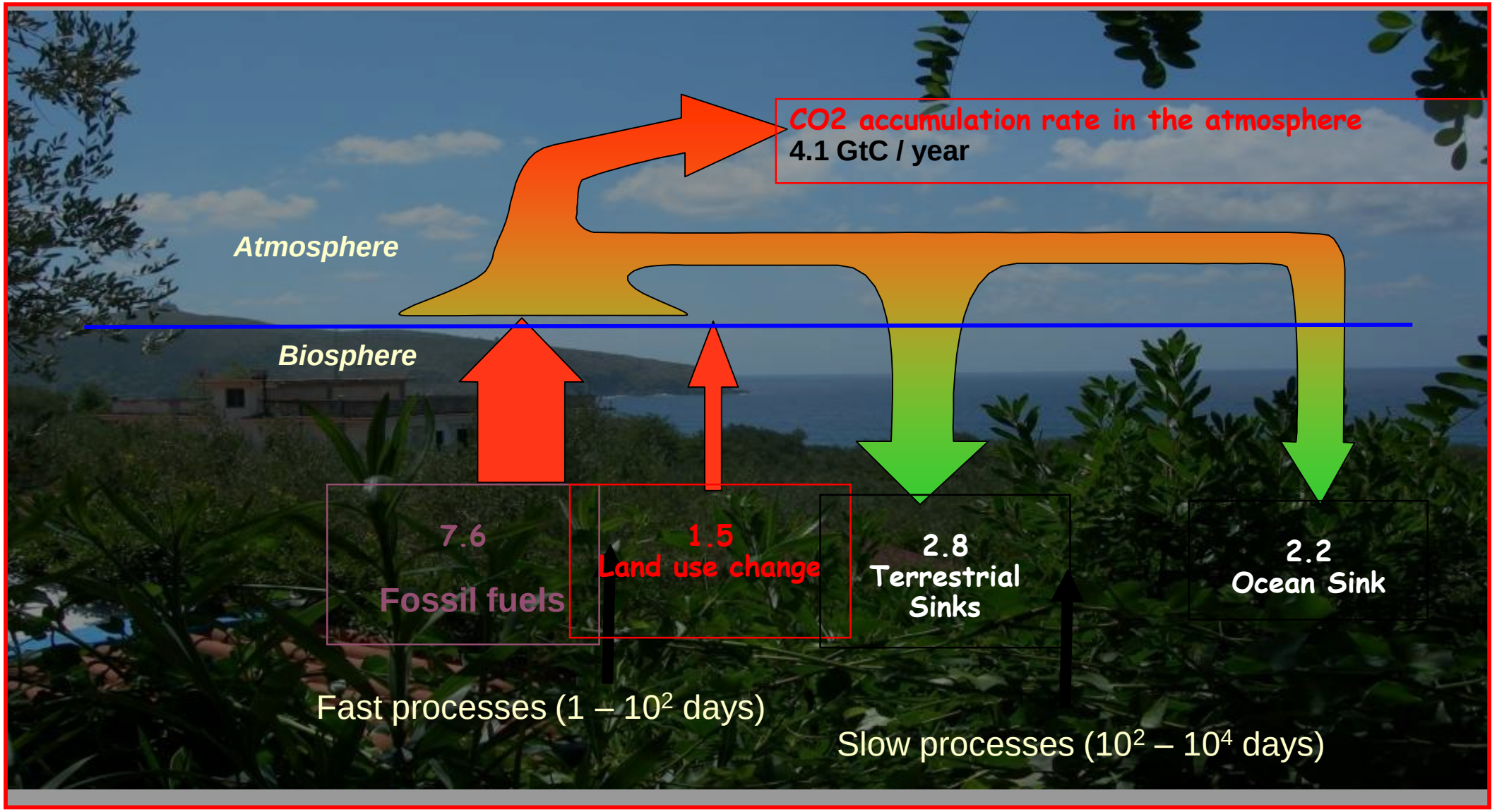


Energy Outlook 2030
© BP 2013



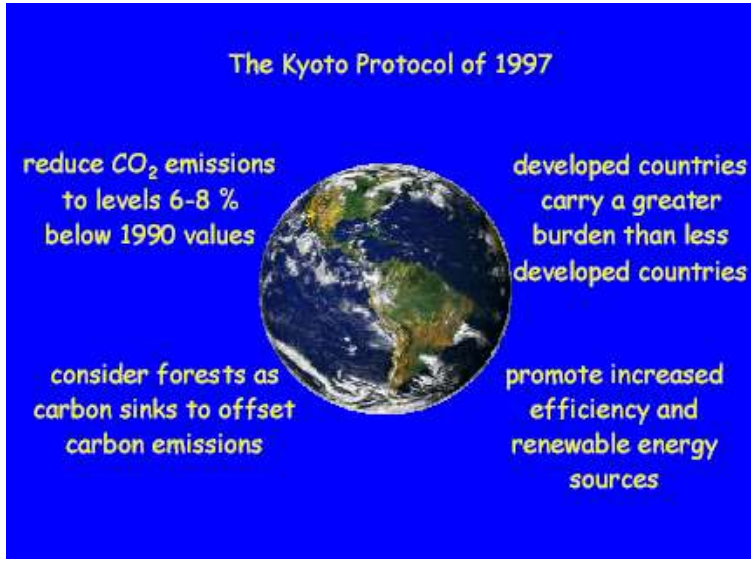


The problem – the drivers



Courtesy of G. Matteucci

The problem – main political steps



The Paris Agreement - 2016

THE KEY ELEMENTS OF THE PARIS AGREEMENT

A text with universal scope, adopted by 195 countries

The aim: to keep the increase in global average temperature to well below 2°C and to 1.5°C if possible.

The objective: to level off greenhouse gas emissions as soon as possible.

The principal: to differentiate between developed and developing countries. Developed countries must lead the way for reduction of emissions and support developing countries in implementing this. Other countries with the ability to do so may also contribute their support on a voluntary basis to achieve this target.

The means: Countries must submit Intended Nationally Determined Contributions (INDCs) which are revised upwards every 5 years. The 1st report is due in 2023. North-South technology transfer.

The financing: from 2020, rich countries must contribute at least $100 billion per year. This amount will be reviewed in 2025.

The new mechanism: loss and damage. Measures must be taken to avert, minimize and address the concrete effects of climate change, in order to help the most vulnerable countries.

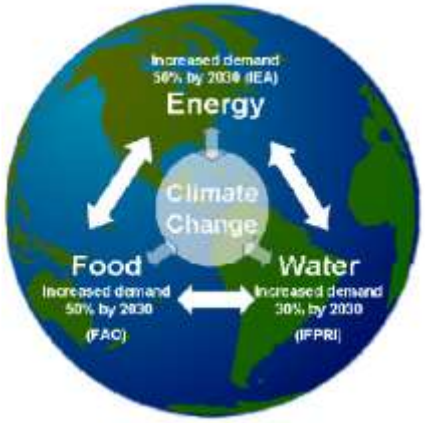
Entry into force: 2020 if the Agreement is ratified by 55 countries accounting for 55% of global greenhouse gas emissions.

Vision

DISBA and the planetary grand challenge:

To double agricultural productions, halving the use of resources

i) How to face increasing food needs due to raising population and changing dietary styles;



ii) How to reduce the use of limiting resources (water, energy) for the intensive agriculture;

iii) How to mitigate the global change, while producing sustainably food and feed resources with organisms adapted to the environment

Mission

The *mission* of the Department is to streamline fundamental and applied scientific and technological knowledge for the development and valorisation of a sustainable bio-economy, thereby contributing to tackle the global grand challenges of future earth, including the need to provide enough food, water, and energy to a growing population, through a sustainable use of limited natural resources.

AP1 - Sustainable intensification of agricultural and forestry productions

AP2 - Optimization of the use of natural resources by agriculture and forestry

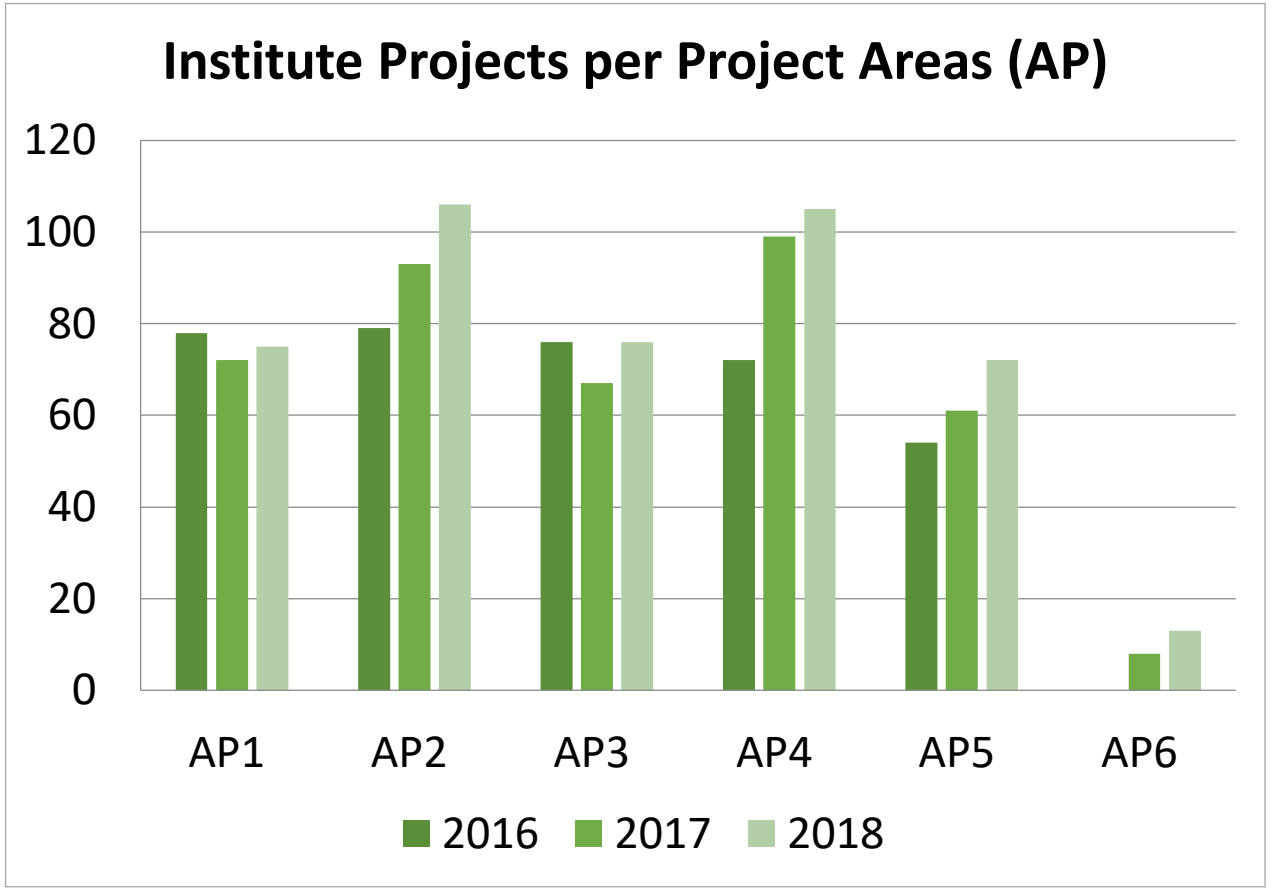
AP3 – Multifunctional use of agriculture, husbandry, forestry and wood production

AP 4 - Protection of productions and food/feed safety

AP5 - New frontiers of food and nutrition

AP6 – Cell biology and model systems

Total number of projects (PdGp 2018): 447



Core-business: Excellence in Science

700 ISI publications/year

Average IF of publications: 3.2

> 40% publications in top quarter specialist journals

Zona D., Gioli B., Commane R., Lindaas J., Wofsy S.C., Miller C.E., Dinardo S.J., Dengel S., Sweeney C., Karion A., Chang R.Y.-W., Henderson J.M., Murphy P.C., Goodrich J.P., Moreaux V., Liljedahl A., Watts J.D., Kimball J.S., Lipson D.A., Oechel W.C., Cold season emissions dominate the Arctic tundra methane budget 2016 **Proceedings of the National Academy of Sciences of the United States of America**

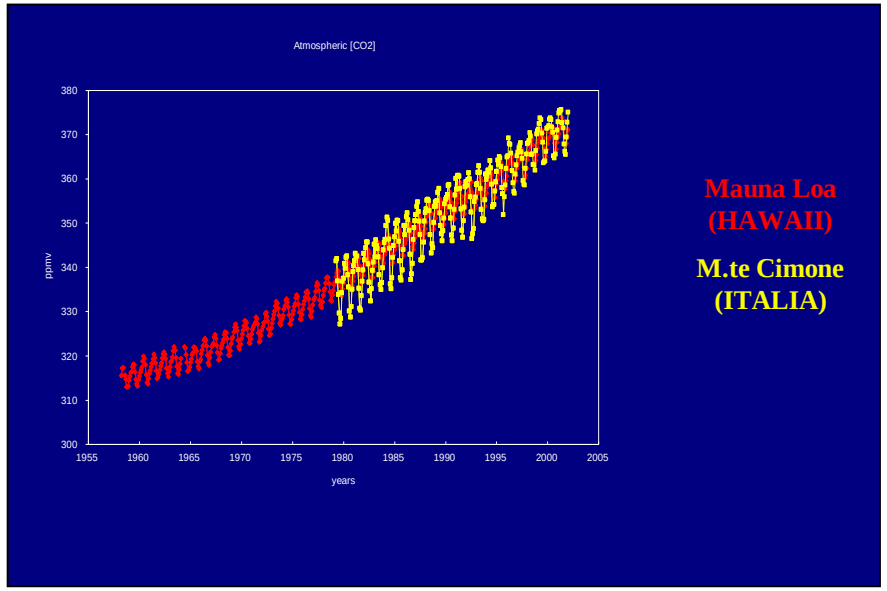
Watson-Lazowski A., Lin Y., Miglietta F., Edwards R.J., Chapman M.A., Taylor G., Plant adaptation or acclimation to rising CO2? Insight from first multigenerational RNA-Seq transcriptome 2016 **Global Change Biology**

Frank D., Reichstein M., Bahn M., Thonicke K., Frank D., Mahecha M.D., Smith P., van der Velde M., Vicca S., Babst F., Beer C., Buchmann N., Canadell J.G., Ciais P., Cramer W., Ibrom A., Miglietta F., Poulter B., Rammig A., Seneviratne S.I., Walz A., Wattenbach M., Zavala M.A., Zscheischler J., Effects of climate extremes on the terrestrial carbon cycle: Concepts, processes and potential future impacts 2015 **Global Change Biology**

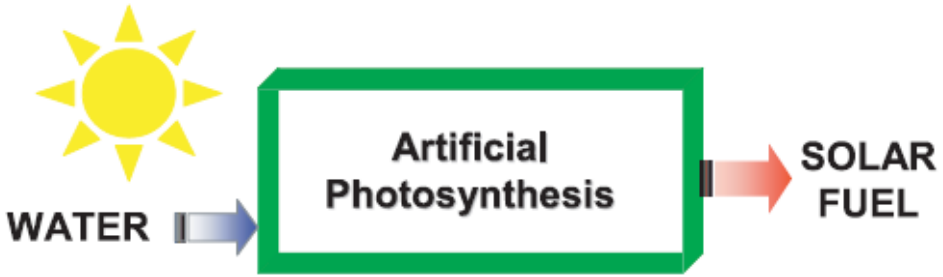
Mayol M., Riba M., González-Martínez S.C., Bagnoli F., de Beaulieu J.-L., Berganzo E., Burgarella C., Dubreuil M., Krajmerová D., Paule L., Romšáková I., Vettori C., Vincenot L., Vendramin G.G., Adapting through glacial cycles: Insights from a long-lived tree (Taxus baccata) 2015 **New Phytologist**

The problem – possible solutions

Solution 1: Increase natural sinks (Natural Photosynthesis)



Solution 2: Decarbonize the planet
(Artificial Photosynthesis / Direct Conversion)

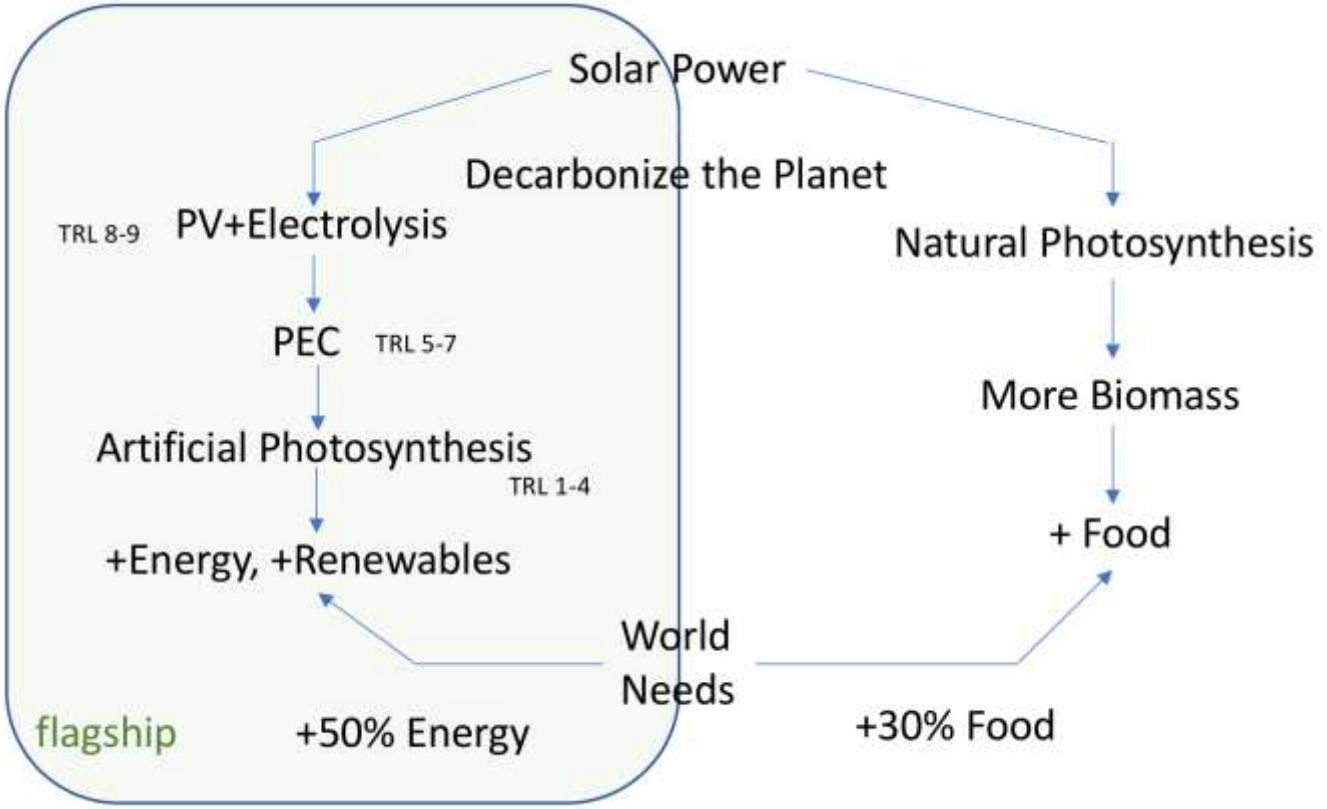


Streamlining international and national research for the future

Direct Conversion
(artificial *vs* natural photosynthesis)
COORDINATOR

SUNRISE
Solar Energy for a Circular Economy

CropBooster



SPRING
Sustainable Processes and Resources for Innovation and National Growth

CLUSTER AGRIFOOD NAZIONALE

food nexus

PRIMA
Partnership for Research and Innovation in the Mediterranean Area

PHOTOSYNTHESIS 2.0

Plant Power
for the Future

UK
- Queen Mary University of London
- Imperial College London
- University of Leeds
- University of Essex
- Lancaster University
- University of Nottingham
- University of Cambridge
- James Hutton Institute

Denmark
- University of Copenhagen

Sweden
- Umeå University

Finland
- University of Turku

Lithuania
- Vilnius University

Estonia
- Estonian University of Life Sciences

The Netherlands
- Wageningen UR
- VU University Amsterdam

Belgium
- University of Liege
- VIB

Germany
- Heinrich Heine University Dusseldorf
- LMU Munchen
- Forschungszentrum Jülich
- MPIMP Golm

Switzerland
- ETH Zurich
- University of Zurich
- University of Neuchatel
- University of Lausanne

France
- CEA Cadarache
- CEA Saclay
- CEA Grenoble
- INRA Montpellier
- CNRS

Czech Republic
- University of South Bohemia
- CEITEC
- ELI-Beamlines

Hungary
- Biological Research Centre
- ELI-ALPS

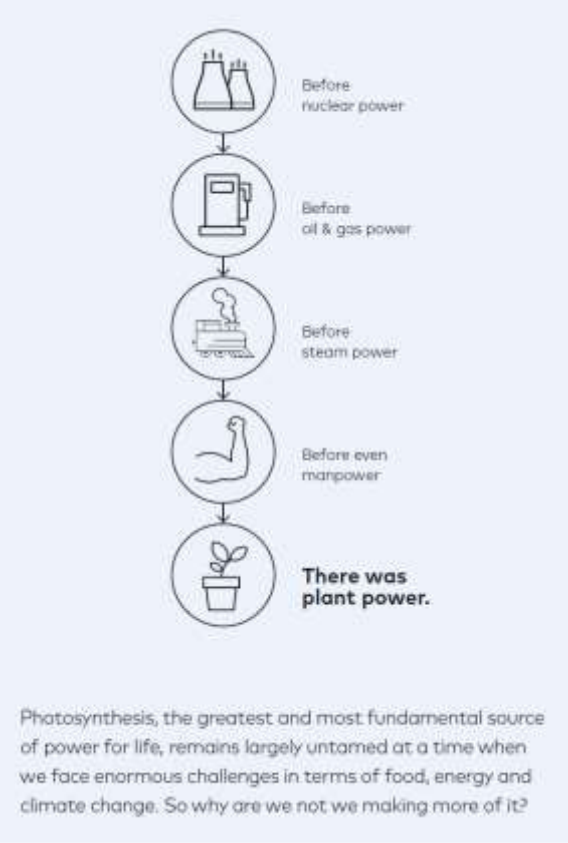
Portugal
- Universidade nova de Lisboa

Italy
- CNR
- University of Verona
- ENEA
- CREA
- Politecnico di Milano
- ITT
- University of Padua

Spain
- Universidad de les Illes Balears
- Universitat Autonoma de Barcelona
- CREAF
- CSIC

Israel
- Hebrew University of Jerusalem

Streamlining research for the future:
The premium project 2016-2018 «Photosynthesis 2.0-Italy»



Project title: Photosynthesis 2.0 – Italy

Project sectors: Specialization area: AgriFood; ERC H2020 Area: Life Science

Project Coordinator: CNR-DISBA: Department Director: Francesco Loreto; Project Director: Franco Miglietta

Project participants/units

1) CNR – DISBA; 2) CNR – DTA; 3) CNR – DSFTM; 4) CNR – DSCTM; 5) SZN

ESFRI RI landscape

for harmonized and high precision scientific data on carbon cycle and greenhouse gas budget

for experimental manipulation of managed and unmanaged terrestrial and aquatic ecosystems

for Multi-Site Plant Phenotyping And Simulation for Food Security in a Chancing Climate by improving plants

for biological information, supporting life science research and its translation to medicine, agriculture, bioindustries and society

Continental to regional

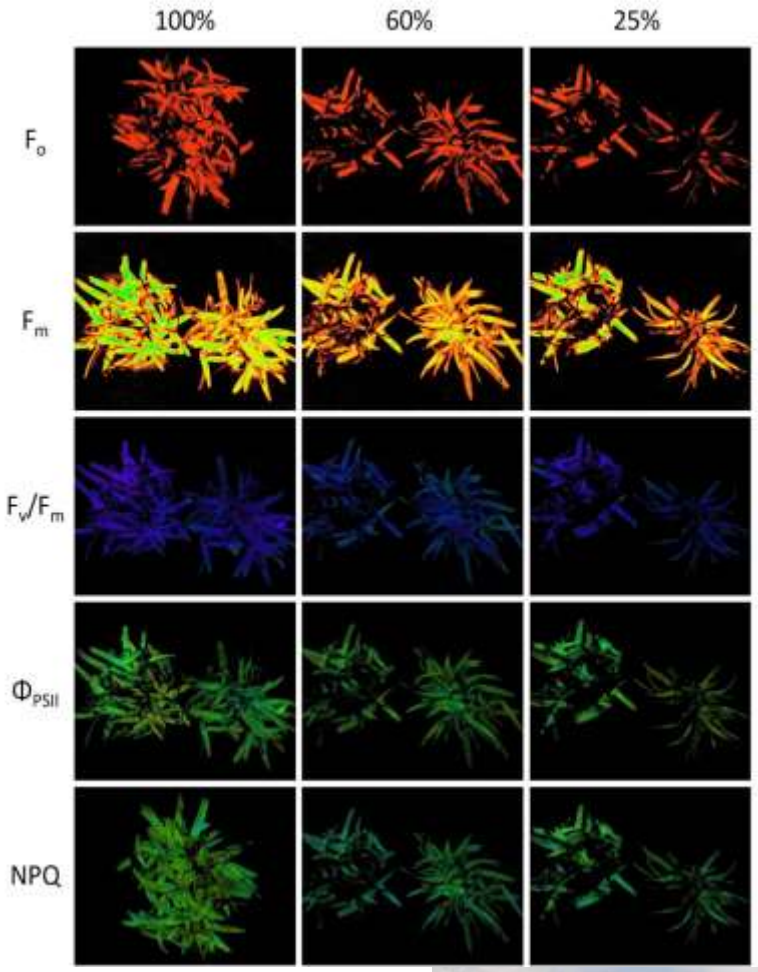
Regional to field (agroecosystem)

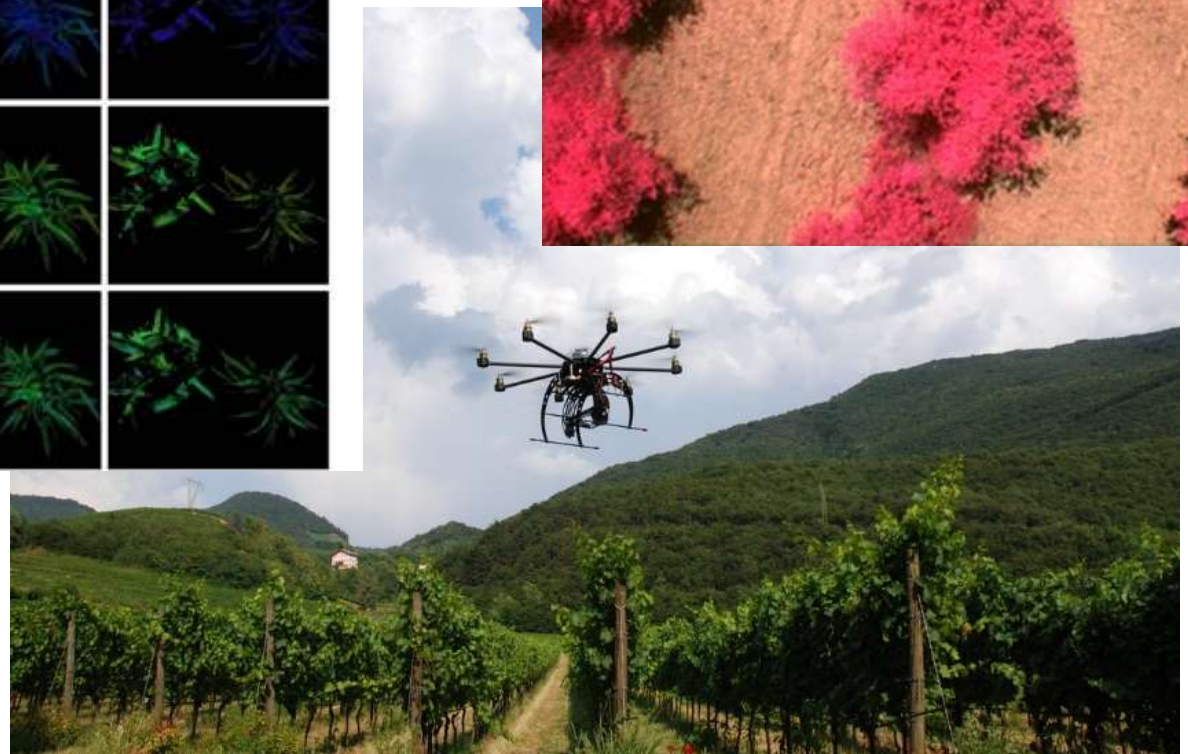
Phenotypes
Field – Plant – Tissue

Data
Plant - Tissue - Molecular

Phenotyping

The Genome x Environment x Management interaction





High-throughput

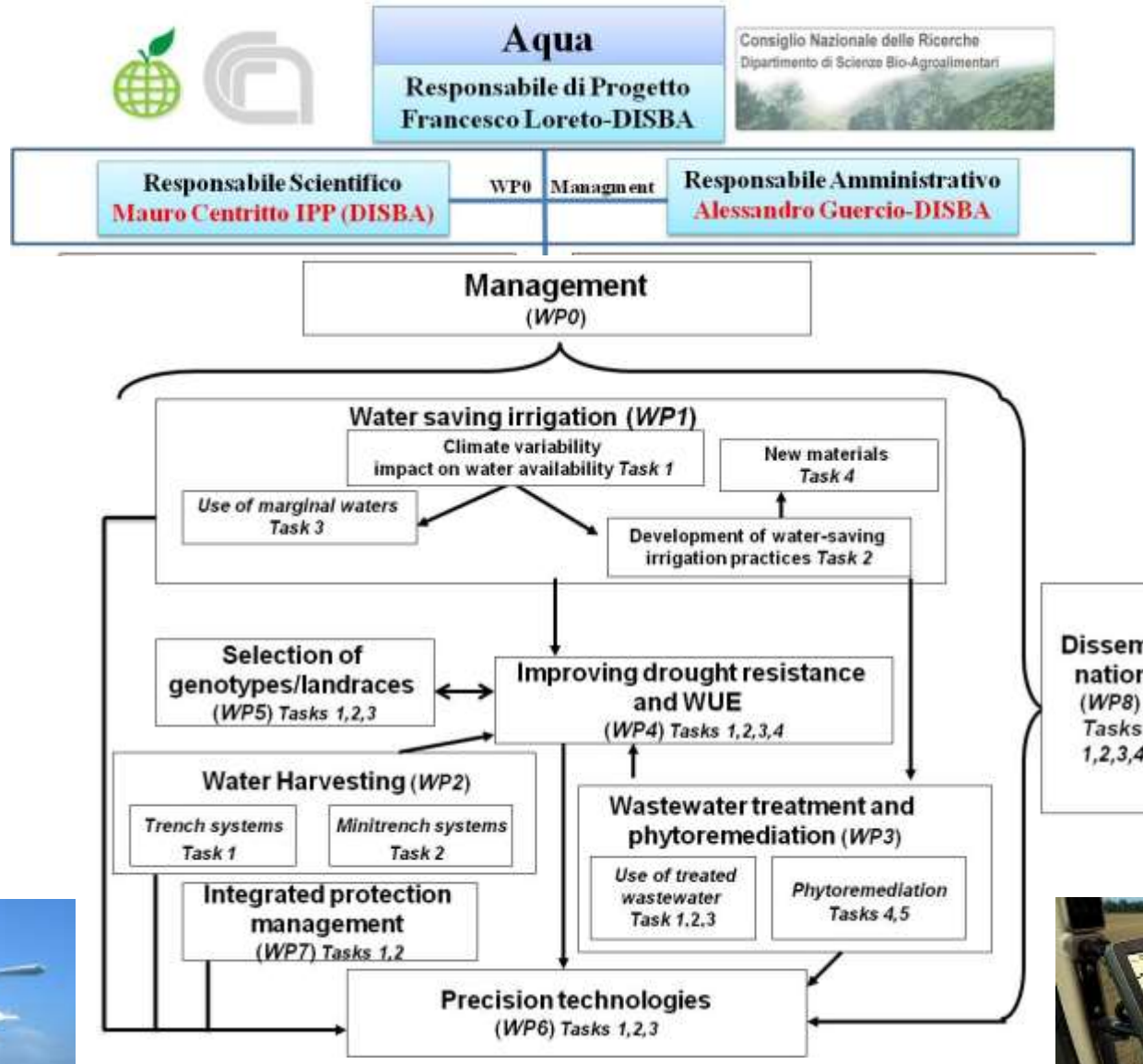
Non-destructive

Partnership for Research and Innovation in the Mediterranean Area (PRIMA Joint Initiative)

The PRIMA initiative identified eight operational objectives clustered in **three main thematic pillars.**

Pillar 1	Pillar 2	Pillar 3
Sustainable management of water for arid and semi-arid Med areas	Sustainable farming systems under Med environmental constraints	Mediterranean food value chain for regional and local development

Streamlining research for the future:
The premium project 2013-2015 «Sustainable use of water in agriculture»



Projects (Coordinator)

NEW!!!

VIROPLANT- VIROME NGS ANALYSIS OF PESTS AND PATHOGENS FOR PLANT PROTECTION

BEFORE - BIORESOURCES FOR OLIVICULTURE

MYCOKEY - INTEGRATED AND INNOVATIVE KEY ACTIONS FOR MYCOTOXIN MANAGEMENT IN THE FOOD AND FEED CHAIN

LEAF OF LIFE - PHOTOSYNTHETIC ENERGY BALANCE, CHLOROPLAST INTEGRITY, CARBON FLOW AND EPIGENETIC REGULATION OF ISOPRENOID BIOSYNTHESIS DURING LEAF DEVELOPMENT AND SENESCENCE

PONTE - PEST ORGANISMS THREATENING EUROPE

XF-ACTORS - XYLELLA FASTIDIOSA ACTIVE CONTAINMENT THROUGH A MULTIDISCIPLINARY-ORIENTED RESEARCH STRATEGY

Projects (Partner)

- CARISMAND - CULTURE AND RISKMANAGEMENT IN MAN-MADE AND NATURAL DISASTERS
- ENVRI PLUS - ENVIRONMENTAL RESEARCH INFRASTRUCTURES PROVIDING SHARED SOLUTIONS FOR SCIENCE AND SOCIETY
- TECH4EFFECT - TECHNIQUES AND TECHNOLOGIES FOR EFFECTIVE WOOD PROCUREMENT
- ADVANCE_ELTER - ADVANCING THE EUROPEAN LONG-TERM ECOSYSTEM, CRITICAL ZONE AND SOCIO-ECOLOGICAL RESEARCH INFRASTRUCTURE TOWARDS ESFRI
- E-LTER - EUROPEAN LONG-TERM ECOSYSTEM AND SOCIO-ECOLOGICAL RESEARCH INFRASTRUCTURE

Projects (Partner -2)

EMPHASIS-PREP - PREPARATION FOR EMPHASIS: EUROPEAN INFRASTRUCTURE FOR MULTI-SCALE PLANT PHENOMICS AND SIMULATION FOR FOOD SECURITY IN A CHANGING CLIMATE

HOMED - HOLISTIC MANAGEMENT OF EMERGING PESTS AND DISEASES

NEW!!!

LANDSUPPORT - Development of Integrated Web-Based Land Decision Support System Aiming Towards the Implementation of Policies for Agriculture and Environment

NEW!!!

B4EST - Adaptive BREEDING for productive, sustainable and resilient FORESTs under climate change

NEW!!!

Projects (Sub-contractor)

ABSTRESS - IMPROVING THE RESISTANCE OF LEGUME CROPS TO COMBINED ABIOTIC AND BIOTIC STRESS	Sub contractor
_FORFIRE "Integrated services and approaches for Assessing effects of climate change and extreme events for fire and post fire risk prevention" (ERANet for Climate Services)	Associated partner
MEDGOLD "Turning climate-related information into added value for traditional MEDiterranean Grape, OLive and Durum wheat food systems" (H2020).	Sub contractor
HEAT-SHIELD - INTEGRATED INTER-SECTOR FRAMEWORK TO INCREASE THE THERMAL RESILIENCE OF EUROPEAN WORKERS IN THE CONTEXT OF GLOBAL WARMING	Sub contractor

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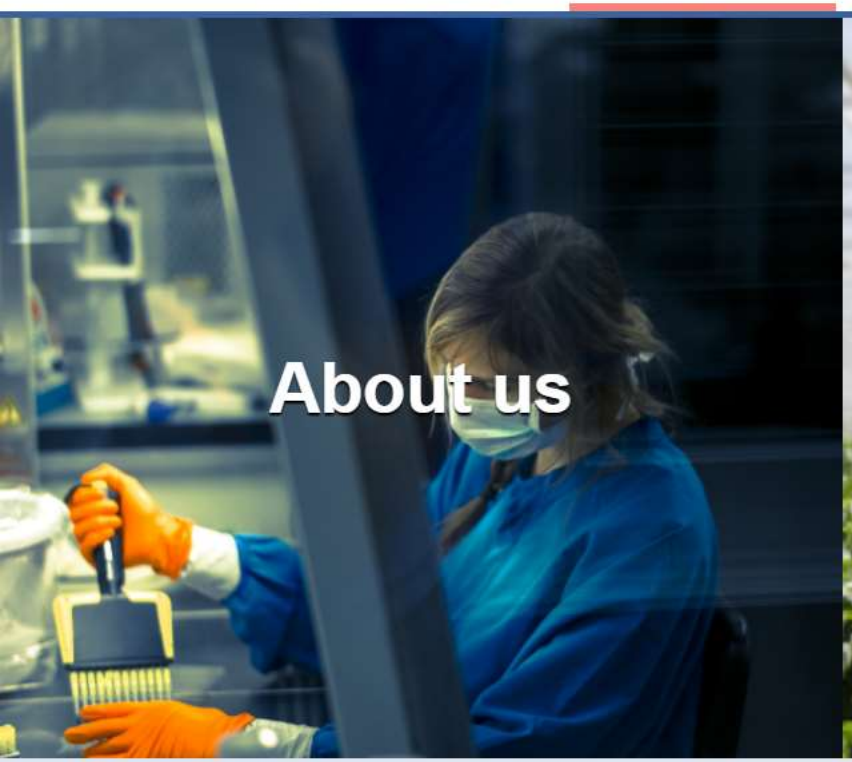

https://www.axa-research.org/en/projects

AXA Research Fund media gallery to discover the great work of our researchers!

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