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FOREWORD



In order to produce excellent science, Europe needs to access the latest research from around the globe, and team up with the world's best minds. That is why international cooperation in research and innovation is a strategic priority for the European Union. This will allow us to tackle global societal challenges more effectively, to create business opportunities in new and emerging markets, and to make science diplomacy a driving force in external policy. In order to achieve these objectives, the EU's research and innovation funding programme, Horizon 2020, is "Open to the World": it is open to the participation of researchers or organisations, wherever they are.

The European Union is one of the world's leading regions in research and innovation. With 7 % of the world's population, it accounts for 20 % of the world's total spending on research, and produces one-third of the world's high impact publications and patent applications. However, as more and more knowledge is created outside the EU, Europe must remain an attractive destination for scientists and a partner of choice for international cooperation.

The EU is leading many global partnerships to ensure that the results of our research and innovation contribute to the implementation of important international commitments. For example, for the

UN's extremely ambitious framework for achieving sustainable development, the 2030 Agenda, the EU will be a frontrunner in reaching its Sustainable Development Goals. Horizon 2020 addresses these goals head-on, and aims to mobilise at least 60 % of its budget for sustainable development.

The EU-funded projects presented in this booklet illustrate how international cooperation in research and innovation is successfully tackling some of the most pressing global issues of our time. The case studies range from supporting research that will enable more precise monitoring of the Arctic, to research harnessing the Earth's and the Sun's potential for green energy; from the environmentally friendly production of new chemical compounds for health and industry applications, to understanding the mechanisms that make poverty persist in developing countries.

All projects highlighted in this publication include international partners, showing that no single country or region can face global challenges alone.

Carlos Moedas
EU Commissioner for Research,
Science and Innovation

INTRODUCTION

his booklet looks at six areas in which international projects under the EU's Seventh Framework Programme for Research and Technological Development (FP7) and Horizon 2020 funding programmes have found innovative solutions to societal challenges, including those relating to health and the environment. The projects demonstrate the solutions achieved through international cooperation.

It starts with the issue that perhaps typifies the need for coordinated international action – **climate change and sustainable resource use**. The 2015 Paris Agreement on Climate Change (COP21) shows that there is a global commitment to make progress. The EU-funded projects outlined in this section illustrate how international collaboration makes it possible to turn this commitment into concrete action.

EU funding brings together leading specialist researchers to develop the advanced monitoring systems and infrastructure needed to better manage climate change. Funding also enables the transfer of know-how between countries so that regions can quickly develop policies for conserving resources and protecting their environment.

The second section provides examples of projects focused on developing the potential of underused **bio-based resources**. Ingredients from plants and animals can improve food security, provide new drugs, make industry more sustainable and create opportunities for jobs and growth.

Through international collaboration, scientists gain access to a huge range of living organisms that could contain useful substances. This access increases the chances of finding alternatives to polluting fossil-fuel-based chemicals, for example. It also allows researchers to explore life across vast geographical areas, such as oceans and seas.

One of the largest resource challenges is the need for **sustainable energy**. The third section outlines examples of international cooperation projects to adapt proven solar technology to new climates and to make sustainable energy sources more cost-effective. These projects are part of a wider drive to develop renewables, de-carbonise the economy and boost energy efficiency.

Section four focuses on collaborative, multilateral research to advance **health-science** and **tech-nology**. Multilateral research often produces results faster than single-country research, whether for the prevention, diagnosis or cure of diseases. This is especially relevant for rare diseases and diseases that disproportionately impact the world's poorest people. Collaboration can also produce ground-breaking research on global trends such as drug-resistant diseases and personalised medicine, leading to better treatments and outcomes for patients. The section gives two examples where leading expert institutions are finding solutions for difficult-to-treat conditions and diseases.

Section five examines **transport**, another research area that benefits from cross-border collaboration. Societies and economies depend on well-organised transport systems. Demand outside Europe is also rising, which increases emissions, oil dependency, accidents and traffic congestion.

It is in everyone's interest for countries to jointly develop cleaner, more integrated and more resource-efficient systems. Projects in this section demonstrate the value of sharing best practices to give cities and regions quick access to proven policies and technology, and of sharing highly-specialist skills to develop more efficient technologies.

The last section of this booklet provides examples of EU-funded projects on reducing inequality and social exclusion to achieve **inclusive societies**. The UN's 2030 Agenda constitutes an ambitious framework for achieving sustainable development and the EU is fully committed to being a frontrunner in achieving its Sustainable Development Goals. The examples here look at new approaches to poverty and the challenges of urbanisation – both long-term issues around the world. They illustrate how international collaboration in social sciences and humanities ensures that policymakers take account of the 'people dimension' when making decisions.

ALL EYES ON THE ARCTIC



he Arctic is already under close watch from different European and international organisations. The INTAROS project is bringing many of these together to develop a single, sustainable Arctic observing system.

A unified system can integrate data more closely. This strengthens the role of the Arctic region in societies and economies – particularly in key sectors such as local communities, shipping, tourism and fisheries – as decisions are based on better information and processes are documented more accurately. Better data also supports maritime and environmental policies in the EU strategy for the Arctic.

INTAROS is a truly international and multidisciplinary endeavour. Tools for integrating data are being provided by institutions in Europe, Russia, North America and Asia, while technologies are from atmosphere, ocean, cryosphere and terrestrial sciences. And the view on the Arctic is as broad as possible, including ground-based, space-based and other remote monitoring systems, along with local community-based observations.

PROJECT NAME: Integrated Arctic observation system

WEB: www.nersc.no/project/intaros

REFERENCE NUMBER: 727890

COORDINATOR: Stiftelsen Nansen Senter for Miljoog Fjernmaling, Norway

TOTAL COST: EUR 15490000

EC CONTRIBUTION:

EUR 15490000

START/END: December 2016 –

November 2021

PARTICIPANTS:

Belgium, Canada, China, Denmark, Finland, France, Germany, Greenland, Ireland, Italy, Poland, Portugal, Russia, Spain, Sweden, United Kingdom, United States

● ● CLIMATE

OUR ENVIRONMENT AND ITS RESOURCES NEED CAREFUL MANAGEMENT TO LAST. WITH PARTNERS WORLDWIDE, EU-FUNDED PROJECTS ARE DEVELOPING INFRASTRUCTURE. SYSTEMS AND TECHNOLOGY FOR SUSTAINABLE LIVING.

MANAGING AFRICA'S E-WASTE



rbanisation and rising technology use in Africa are increasing the amount of electronic waste countries have to collect and process. The EWIT project has developed an electronic toolkit supporting African towns and cities to develop recycling sectors that can process e-waste safely.

Efficient e-waste collection and processing boosts economies and jobs, while protecting the environment and public health. EWIT's researchers have made it easier for industry and decision makers to find processes and legal tools they can use to improve recycling.

From their analysis of data on e-waste management in four African metropolitan areas, the team, made up of African and European researchers, developed an online portal – the 'E-waste implementation toolkit' – to provide direct access to the most useful information. In effect, it is a huge set of guidelines for e-waste management, from collection to recycling and reuse of critical raw materials. The online interactive help tool adapts recommendations to recycling capacity, making it relevant to local authorities in any country.

PROJECT NAME: Developing an e-waste implementation toolkit to support the recycling and secondary raw material recovery strategies in metropolitan areas in Africa

WEB: ewit site

REFERENCE NUMBER: 641660

COORDINATOR: Consorzio Remedia,

Italy.

TOTAL COST: EUR 1641750

EC CONTRIBUTION: EUR 1641750

START/END: February 2015 -

February 2017

PARTICIPANTS:

Austria, Belgium, Côte d'Ivoire, Kenya, Portugal, South Africa, United Kingdom, Zambia

SOLAR TECHNOLOGY FOR DESERT CONDITIONS



ountries south of the Mediterranean have abundant sun but their hot, dry conditions damage existing solar power technologies. In the EUROSUNMED project, institutes, universities and SMEs from the north and south of the sea developed technologies that can resist these climates

Researchers targeted three areas vital to achieving this goal: photovoltaics, concentrated solar power and grid integration. In photovoltaics, they developed thin film-based solar cells

and modules; in concentrated solar power, they designed new heliostats and energy storage systems. They then investigated how to supply energy from both sources through Morocco's and Egypt's grids.

More work will be needed after EURSUNMED ends for its solutions to be used in energy systems. The project has therefore trained early-career researchers, shared its results with universities, engineering schools and energy stakeholders and proposed a roadmap to continue its fruitful collaboration.

PROJECT NAME: Euro-Mediterranean Cooperation on Research and Training in Sun-Based Renewable Energies

WEB: www.eurosunmed.eu

REFERENCE NUMBER: 608593

COORDINATOR: Centre National de la Recherche Scientifique (CNRS), France.

TOTAL COST: EUR 6301821

EUR 5261726

START/END: September 2013

to August 2017

PARTICIPANTS:

Belgium, Egypt, Italy, Morocco,

Norway, Spain

• • • ENERGY

RENEWABLES, DE-CARBONISATION AND ENERGY EFFICIENCY CAN MAKE OUR ENERGY SUPPLIES MORE SUSTAINABLE, SECURE AND AFFORDABLE. INTERNATIONAL PROJECTS ARE DEVELOPING THE TECHNOLOGIES FOR GREENER POWER.

GENERATING GREEN POWER FROM THE EARTH'S HEAT

eothermal energy is a source of energy with enormous potential as sustainable power. The DESTRESS project is testing techniques for creating enhanced geothermal system (EGS) reservoirs to tap this energy safely and cost-effectively.

In a geothermal reservoir, rocks contain hot water or steam that can be extracted via wells and used in heating systems or to generate electricity. DESTRESS's researchers are investigating ways to create reservoirs that have the right physical features to be economic and have minimal impacts on the environment.

The project team is testing environmentally-friendly treatments at various sites that represent typical geologies in Europe and Asia. Techniques are based on experience in previous projects or in other fields, mainly the gas and oil sectors, and on scientific progress in physics and earth sciences

Risk is an understandable concern. Lessons learned will be shared with the public and all steps studied are designed to be transferable to other sites, for a standardised procedure to develop EGS projects safely.



PROJECT NAME: Demonstration of soft stimulation treatments of geothermal reservoirs

WEB: www.destress-h2020.eu

REFERENCE NUMBER: 691728

COORDINATOR: Helmholtz

Zentrum Potsdam

Deutschesgeoforschungszentrum (GFZ),

Germany

TOTAL COST: EUR 25 072 511

EUR 10713408

START/END: March 2016

to February 2020

PARTICIPANTS:

France, Lithuania, the Netherlands, South Korea, Switzerland, United Kingdom

BERRIES: NATURE'S NATURAL CHEMICALS

erries are a natural source of phenolics, celebrated for health benefits and valuable in cosmetics, flavours and food colourants. The BachBerry project has discovered how to identify and synthesise these compounds using sustainable, cost-effective processes.

Each berry species produces its own versions of phenolics, making them a vast untapped source of high-value chemicals for medicines or consumer products.

In the project, researchers analysed 113 kinds of wild berry from around the world. Some are already used in traditional medicine, with multiple other useful phenolics possibly in store. As one type of berry can produce many phenolics, they set up a high-throughput screening system to speed up the search.

Results showed new compounds with medical potential or that could replace toxic chemicals in manufacturing. Industry uses larger volumes of chemicals than can be produced in lab. So in Bachberry's final stage, researchers designed bacterial cell factories to produce larger amounts of phenolics to make them attractive to industry.



PROJECT NAME: Bacterial Hosts for production of bioactive phenolics from Berry fruits

WEB: www.bachberry.eu

REFERENCE NUMBER: 613793

COORDINATOR: Danmarks Tekniske

Universitet, Denmark

TOTAL COST: EUR 9 547 792

EC CONTRIBUTION:

EUR 7297873

START/END: November 2013

to October 2016

PARTICIPANTS:

Austria, Chile, China, France, Germany, the Netherlands, Portugal, Russia,

United Kingdom

● ● FOOD, MARINE AND BIO-ECONOMY

OUR NATURAL RESOURCES FEED US AND PROVIDE MATERIALS FOR MANY
PRODUCTS. EU-FUNDED PROJECTS FOR BIO-BASED RESEARCH ENSURE THESE
RESOURCES ARE SUSTAINABLY USED TO ENSURE ECONOMIC GROWTH AND JOBS.

DRUGS FROM THE OCEAN

ife in ocean trenches contains unique compounds that until now have been too deep to obtain for research. Innovations from the Pharmasea project have helped scientists access these, opening the way to discover new chemicals with health and industry applications.



Why search so deep? The answer is in biology. Deep-water organisms have to produce chemicals that help them survive in dark, high pressure environments that are very cold or very hot. That makes them an interesting source of compounds not found on land.

Pharmasea's researchers developed innovative, low-cost equipment for sampling mud and sediment from deep ocean floors around the world. Back in the lab, they analysed bacteria and fungus found in these samples, learning how to work with their unique genetics and chemical structures. The effort has paid off. The project team has found new chemicals with antibiotic properties and other possible drugs.

Pharmasea has also suggested ways to address public policy and ownership issues in exploiting compounds from marine life, to allow further searches for the sea's gifts.

PROJECT NAME: Increasing Value and Flow in the Marine Biodiscovery Pipeline

WEB: www.pharma-sea.eu

REFERENCE NUMBER: 312184

COORDINATOR: Katholieke Universiteit

Leuven, Belgium

TOTAL COST: FUR 13 194 699

EC CONTRIBUTION: EUR 9 465 907

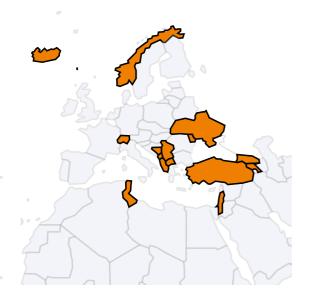
START/END: October 2012

to March 2017

PARTICIPANTS:

Austria, Chile, China, Costa Rica, Denmark, Germany, Ireland, Italy, New Zealand, Norway, South Africa, Spain, Switzerland, United Kingdom

FACTS & FIGURES



There are currently **16 countries**

associated to Horizon 2020:

Albania, Armenia, Bosnia & Herzegovina, Faroe Islands and Iceland, Georgia, Israel, the Former Yugoslav Republic of Macedonia (FYROM), Moldova, Montenegro, Norway, Serbia, Switzerland, Tunisia, Turkey, Ukraine.

SO FAR, APPLICANTS FROM



AND PARTICIPANTS FROM

148 COUNTRIES have been funded (including EU, associated and non-associated third countries).



1 in 12 Principal Investigators

who received **Horizon 2020 ERC** grants are nationals of a non-associated third country.



So far, entities from non-associated third countries

have participated

more than 2600 times

in Horizon 2020 grants.



1 in 4 researchers funded by Horizon 2020 Marie Skłodowska-Curie actions are nationals of a nonassociated third country.



have been directed to Horizon 2020 project participants from non-associated third countries.

Data: March 2017

BRAIN-BASED CLUES TO EPILEPSY TREATMENTS

pilepsy is a common disorder affecting people of all ages. About 30% of patients suffer uncontrolled seizures. The EpiMiRNA project is investigating the potential of recently-discovered molecules to shed light on the condition's causes and improve diagnosis and treatment.

Its research focuses on MicroRNA (miRNA), gene expression regulators that fine-tune the amount of protein in a cell. The project's researchers have found that miRNA in the brain of patients with epilepsy differ from those in people without epilepsy. In experiments, they also saw that changing the way miRNA works can stop an epileptic seizure and related damage.



EpiMiRNA combines academic researchers from various disciplines and SMEs looking for new treatments for drug-resistant epilepsy. The results of their shared expertise can explain better how miRNA is involved in seizure onset, and suggest ways to use the molecules to diagnose the condition, track, treat and prevent seizures and identify patients who respond to new, non-drug-based treatments, such as brain stimulation.

PROJECT NAME: MicroRNAs in the Pathogenesis, Treatment and Prevention of Epilepsy

WEB: www.epimirna.eu

REFERENCE NUMBER: 602130

COORDINATOR: Royal College

of Surgeons, Ireland.

TOTAL COST: EUR 15558303

EC CONTRIBUTION:

EUR 11586858

START/END: September 2013

to August 2018

PARTICIPANTS:

Brazil, Denmark, Finland, France, Germany, Italy, the Netherlands, United Kingdom, United States

● ● HEALTH AND DEMOGRAPHIC CHANGE

EU-FUNDED INTERNATIONAL RESEARCH COOPERATION PROJECTS ON HEALTH SCIENCE AND TECHNOLOGY OPEN NEW HORIZONS TO PREVENT, DIAGNOSE AND CURE DISEASES.

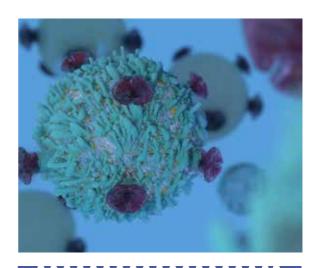
A VIRUS THAT COULD HELP FIGHT CANCER

uman papilloma virus (HPV) infection is already associated with cervical and anogenital cancers. Research from the HPV-AHEAD project has identified a connection to head and neck cancers (HNC), and possible new techniques for detecting and treating these cancers in time.

Every year, around 700000 people worldwide develop an HNC. While on the decline in Europe, the disease is a growing problem in low- and middle-income countries. Alcohol consumption, smoking and poor oral hygiene are linked to the disease – now HPV infection can be added to the list.

HPV-AHEAD's researchers studied a huge collection of HNC patient samples from Europe and India, which has a third of all cases worldwide. They found that some HNCs contained traces of HPV genetic material, and these cancers had better outcomes. They also discovered that HPV antibodies can be detected in future HNC patients many years before a tumour develops.

These results point to new screening techniques and targeted therapies for some HNC, to improve patients' survival chances.



PROJECT NAME: Role of human papillomavirus infection and other cofactors in the aetiology of head and neck cancer in India and Europe

WEB: hpv-ahead.iarc.fr

REFERENCE NUMBER: 282562

COORDINATOR: Infections and Cancer Biology Group, International Agency for Research on Cancer, World Health Organisation, France

TOTAL COST: EUR 4 192 381

EC CONTRIBUTION:

EUR 2999946

START/END: September 2011

to August 2015

PARTICIPANTS:

Belgium, Germany, Greece, India,

Italy, Spain

IMPROVED ANTI-POVERTY POLICIES

hy does poverty persist in developing countries? The NOPOOR project provides a better understanding of the phenomenon and evidence to develop policies to improve lives.

NOPOOR's researchers studied poverty reduction policies in developing and emerging countries in Latin America, sub-Saharan Africa and South Asia with teams from these countries. Through case studies, data analysis and modelling, they examined globalisation's impacts on trade, aid, foreign direct investment, migration and other factors that can lead to poverty.

Vocational training or industrial, labour and social policies could offset some of these adverse effects, the researchers suggest, although poverty's causes vary between countries and there is no single solution. Policies should be tailored to resource access, political regime, quality of institutions and governance, they advise.

NOPOOR has shared its results with local policymakers, trained young researchers in developing countries and supported a permanent network for National Institutes of Statistics



PROJECT NAME: Enhancing Knowledge for Renewed Policies against Poverty

WEB: www.nopoor.eu

REFERENCE NUMBER: 290752

COORDINATOR: Institut de Recherche pour le Développement, France.

TOTAL COST: FUR 9880619

EUR 8 000 000

START/END: April 2012 to March 2017

PARTICIPANTS:

Austria, Belgium, Brazil, Chile, Germany, Ghana, India, Luxembourg, Madagascar, Mexico, Peru, Senegal, South Africa, Spain, United Kingdom, Vietnam

• • • INCLUSIVE, INNOVATIVE SOCIETIES

AS GLOBALISATION, MIGRATION FLOWS, CULTURAL DIVERSITY AND HUMAN-TECHNOLOGY INTERACTIONS INCREASE, SOCIAL SCIENCES AND HUMANITIES AIM TO INCLUDE PEOPLE IN POLICIES FOR THIS CHANGING WORLD.

URBANISATION – A GUIDE FOR CHINA

hina's population is moving to urban areas rapidly, and on a massive scale. A China-Europe collaboration has developed scenarios and shared insights to guide this urbanisation up to 2050.

The UrbaChina project identified challenges to sustainability in China's evolving cities. Using scenarios the team aims to help Chinese policymakers design strategies for more sustainable urbanisation.

Pairs of Chinese and European researchers defined areas for policy, each working on one of four themes:

- institutional foundations of city creation
- land, property and real estate markets in cities

- environmental and health infrastructures and services
- traditions and modern lifestyles in cities.

Through historical analysis, methods from economic geography and anthropology and comparison with European urbanisation, the project built a comprehensive picture of urbanisation in China. The results have been shared with policymakers and ordinary citizens.

Future collaboration is possible. The project has created an <u>EU-China network that can continue the project's work</u>.

PROJECT NAME: Sustainable Urbanisation in China: Historical and Comparative Perspectives, Mega-trends towards 2050

WEB: www.urbachina.eu

REFERENCE NUMBER: 266941

COORDINATOR: Centre National de la Recherche Scientifique (CNRS), France

TOTAL COST: EUR 3 362 438

EC CONTRIBUTION:

EUR 2697060

START/END: March 2011

to February 2015

PARTICIPANTS:

China, Italy, Portugal, United Kingdom

SHARING IDEAS FOR BETTER TRANSPORT

and cities need greener transport solutions fast. The Viajeo PLUS project has helped cities in Europe, Latin America and Asia and non-EU Mediterranean countries learn from each other's most successful mobility policies and technologies.

Viajeo PLUS focused on ways to transfer solutions proven to reduce congestion and transport-related pollution and improve mobility.

Its team identified cities' best approaches in Europe, Latin America, China and Singapore and published these online in an open-access 'Virtual Best Solutions' collection. Direct expert exchanges were promoted through 'City Mobility Weeks' in the same regions – an opportunity for participants to try out solutions and share knowledge, information and best practices. For non-EU Mediterranean countries, a series of events in Istanbul promoted inter-regional transport research and development.

The project's city-twinning programme could continue the collaboration Citizens, industry and the environment all stand to gain.



PROJECT NAME: International coordination for implementation of innovative and efficient urban mobility solutions

WEB: viajeoplus.eu

REFERENCE NUMBER: 605580

COORDINATOR: European Road
Transport Telematics Implementation
Coordination Organisation - Intelligent
Transport Systems & Services Europe,
Belgium

TOTAL COST: EUR 2 107 152

EC CONTRIBUTION: EUR 1971921

START/END: May 2013 to April 2016

PARTICIPANTS:

Brazil, China, France, Germany, Italy, the Netherlands, Sweden, United Kingdom

● ● TRANSPORT

TRANSPORT IS A BACKBONE OF OUR ECONOMY AND SOCIETY. TO KEEP UP WITH GLOBAL CHANGE, IT MUST BECOME RESOURCE-EFFICIENT, GREEN, SAFE AND SEAMLESS. INTERNATIONAL RESEARCH AND INNOVATION PROVIDE SOLUTIONS.

FASTER DESIGNS FOR GREENER AIRCRAFT

ircraft design development can be slow and expensive. New design and optimisation processes from the AGILE project aim to significantly reduce costs and time to market, allowing manufacturers to more easily develop cheaper, greener aircraft.

specialists from many different disciplines and uses computer simulations from diverse fields, so more efficient teams and processes can find solutions more quickly than is currently possible.

The project is ambitious. It aims to cut the time to optimise an aircraft's design by 20 %, and the time to set up and organise a specialist team by 40 %. These savings could result in better-performing aircraft – up to 40 % more efficient for some large passenger aircraft, the team says.



At the heart of the project is the development of techniques and technologies for more efficient workflows, better performance from analysis tools and the smarter use of digitised information during the design process.

These techniques could save time and costs during the complex process of aircraft design. This is because the design process connects

PROJECT NAME: Aircraft 3rd Generation MDO for Innovative Collaboration of Heterogeneous Teams of Experts

WEB: www.agile-project.eu

REFERENCE NUMBER: 636202

COORDINATOR: Deutsches Zentrum fuer Luft- und Raumfahrt EV, Germany

TOTAL COST: EUR 8 965 932

EUR 7 074806

START/END: June 2015 to May 2018

PARTICIPANTS:

Belgium, Canada, France, Italy, the Netherlands, Russia, Sweden,

Switzerland

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The EU is leading global partnerships and the results of our research and innovation contribute to the development and implementation of important commitments such as the UN Convention on Climate Change (COP21), the Convention on Biological Diversity, the 2030 Agenda for Sustainable Development, and the Resolutions of the World Health Organization. These successes highlight the important value of implementing research and innovation through international cooperation.

Carlos Moedas EU Commissioner for Research, Science and Innovation

Research and Innovation policy

