

NEWSLETTER 04

JULY 2018

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MEDEAS RESULTS

The main outcomes and results of the first half of the third year of the MEDEAS project are briefly presented below.

RELEASE OF MEDEAS WORLD MODEL IN PYTHON FREE SOFTWARE: PYMEDEAS_W

This deliverable presents the development path of the python-based MEDEAS_world (pymedeas_w) model, the design concepts implemented in this application, and the data processing tools used to represent the results.

It provides key points of the pymedeas_w model step-by-step development of the code using the python freeware tool. It also defines the general terms for the testing and logging of the testing information and contains information on key programming elements of the code. Special attention is given to the issues related to the code itself and how it was applied to the MEDEAS_w model.

The beta version of the pymedeas_w is now available for downloading [here](#). The python model comes with a manual and documentation on how to use and install the software and explains the main capabilities and structure of it. A Visual User interface has been implemented to quickly visualize the outputs.

World beta version of the pymedeas (MEDEAS in python) is the first of the four models that we will release in MEDEAS.

MEDEAS EUROPEAN MODEL (MEDEAS_EU)

The MEDEAS_eu model is an integrated energy - economy - environment assessment model based on systems dynamics.

The model, which has been programmed with the Vensim software, uses the results of the MEDEAS_w model as input and both models are linked. The structure of both models is similar and consists of 7 modules: Economy, Energy, Infrastructures, Materials, Land Use, Social and Environmental Impacts Indicators and GHG Emissions. Among the main novelties of this model are the integration of input - output matrices, feedback between variables of the environmental, economic plus energy modules and the estimation and feedback of the EROI. The adaptation to the regional European level includes in particular the representation of trade (at both final goods/services and primary energy level) with the rest of the world, as well as a simplified representation of the land-use system.

The MEDEAS_eu Model is being translated to python software and it will be available for downloading from our [website](#) in September 2018.

MEDEAS WEB DATABASE MANAGEMENT SYSTEM

The MEDEAS web database management system allows to store, retrieve and manage the data generated within the MEDEAS project.

The data are stored in a database management system, on a web application that includes a public

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section and an administrative section. The public section of the application allows open access to view and download the data of the MEDEAS project and to generate graphs. The user can select specific variables, enter criteria for units-region-period and retrieve data in different forms (data table, graph, excel). In addition to these attributes, the administrative section is a restricted area, where authorised users can manage the database entities (view, edit or create objects) and upload new data using excel files.

The MEDEAS web database management system is available [here](#).

ONLINE PORTAL-FORUM

MEDEAS online forum has been created to support MEDEAS models users.

The forum is administered and moderated by the MEDEAS consortium who will provide answers to users' questions.

MEDEAS forum is a support tool for the models operation designed to help MEDEAS and pymedeas_models users and to receive feedback. The aim of the forum is to exchange information with users on applications/improvements, as well as with developers on general issues and questions.

Access to the forum is granted after registration to all stakeholders (policy makers, scientific community, researchers, etc.).

The MEDEAS forum is available [here](#).



Antonio García-Olivares, Jordi Solé and Oleg Osychenko, MEDEAS partners from the Institute of Marine Sciences (ICM), Spanish Council of Scientific Research (CSIC) have published a scientific article in the Energy Conversion and Management Journal.

This study reviews the technologies and systems that are being proposed or proven as alternative to fossil-fuel based transportation, and the prospects for their entry into the post-carbon era, from both the technological and energetic viewpoints. It also provides estimations of the energy costs for such transition under conservative assumptions.

A 100% renewable transport providing the same service as global transport in 2014 would demand about 18% less energy. The main reduction is expected in road transport (69%), but the shipping and air sectors would notably increase their consumptions: 163% and 149%, respectively. This is derived from the need to produce natural gas from electricity to power the engines of planes and boats and assuming an airplane transportation reduction of 50%.

Energy End Use	Final Energy in 2014 (PJ)	Future Final Energy (PJ)
Road	82725	25293
Rail	2195	1386
Shipping	10383	27255
Air	11556	24614 / 28774 / 48150 *
Pipelines/Fuel transport	114	97
Total Transport	101585	78646 / 82806 / 102182 *

Estimated energy used for the present and future transport, by sector.

* The three values correspond to the use of hydrogen, methane and jet fuel, respectively, as the main fuel for the aircraft.

According to this study, a set of measures to anticipate the possible risks in the transition is recommended. Such measures should be supported and fostered by governments and the civil society:

- Substitution of most of the current inter-urban land transport, which is based on trucks and private cars, by electric trains for freight and passengers.
- Use of EVs (Electric Vehicles) only for short-distance transport between cities with no public transport alternative.
- Limited use of EVs, which translates into a relatively small fleet. The same size as the present one could be considered an upper limit, but it would not solve congestion problems in cities, could increase prices of important metals such as Ni and Li, and could put in danger their availability for other industrial applications. Priority should be given to electrified public transport.
- Use of fuel cells only when the autonomy and power requirements of the vehicle demand it.
- Reduction of aviation fleets in favour of (i) rail systems and (ii) marine transport, in this order.
- Reorganization and reduction of marine traffic, as cargo vessels are major consumers of fuels (to date) and hydrogen and biogas fuel cells (in the future).
- Optimization of logistics and work to reduce travel demand.
- Shifting transport 'modes' from high to low energy intensity. Appropriate parameters to quantify this intensity and prioritization modes would be kWh per passenger-km and kWh per Tm-km.

- Improvement of energy efficiency not only by using the best technologies available but also by acting on urban and public transport infrastructures. TaaS (Transport as a Service) fostering and car-sharing have great to decrease the demand for energy and materials for road transport.

Another conclusion of this study is that a renewable transport system is feasible but not necessarily compatible with the usual exponential growth of resource consumption. We are entering an age where the investments required in the next few decades will involve the use of large fractions of the reserves of important metals such as Cu, Ni, Li, Pt and Pa. Some of these metals (e.g. Pt and Pa) have specific physical properties that make them essential. Therefore, any policy for the necessary renewable transition may no longer be based exclusively on prices and incentives but must also consider geological reserves and material scarcity. In the next 50 years, the lack of elasticity of metal reserves will probably hasten the necessity for designing a post-capitalist economy, which will use new economical tools. Some of these tools would be the use of geophysical and sustainability indicators, abandonment of GDP as the main indicator of economic success, incorporation in the economy of long-term planning and scientific environmental assessment and, most importantly, introduction of new mechanisms which may create prosperity without necessarily increasing the consumption of resources and materials.

The complete article can be found [here](#).

17TH ANNUAL SCIENCE, TECHNOLOGY AND SOCIETY STUDIES CONFERENCE IN GRAZ



On May 8, 2018, Martin Černý from the Department of Environmental Studies, Faculty of Social Studies, Masaryk University, member of the MEDEAS project, presented a paper on the 17th Annual Science, Technology and Society Studies Conference, which took place in Graz on May 7 and 8, 2018.

The paper was entitled “Exploring post-carbon futures through participatory input-output modelling” and was prepared by Martin Černý, Christian Kimmich, Christian Kerschner and Klaus Hubacek (MU). The paper was presented during the session “Smart energy systems innovation: What do we learn from niche experiments?”. The focus of the paper is to identify the country-level socio-economic implications of the post-carbon transformation (inspired by European Union’s energy roadmap and its goal to cut greenhouse gas emissions by 80–95% by 2050), especially distributional employment effects, to gain a better understanding of the system and guide our policy choices and actions at the present.

The research focuses on methodological challenges that need to be addressed when coming up with such research design and on modelling changes in the sector of electricity production, based on a participatory process bringing together technology oriented experts and policy-oriented experts with niche experience in implementing steps towards the post-carbon economy. Their estimations are translated into the logic of alternative input-output models for 2050, representing the structural effects of different transformation pathways and underlying scenarios. The questions that are posed during the participatory modeling relate to the lifespan of renewable (solar and wind) energy producing devices; the share between capital costs (costs necessary for construction) and variable costs (costs of operation and maintenance) and its expected developments and the developments in prices of inputs, etc.

MEDEAS_W MODEL WORKSHOP AT THE UNIVERSITY OF BARCELONA

A seminar was conducted at the University of Barcelona by Jordi Solé using the MEDEAS world model. The workshop has been part of a series of workshops that analyze different strategies to face climate change. Thus, the pymedeas_w software acquainted the students with the different issues to deal with during the Renewable Transition.

The seminar attendees were undergraduate students of Environmental Sciences (two groups of

approximately 20 students). The workshop was structured in two parts:

- 1) Introduction of the MEDEAS World model in python (pymedeas_w). Modules and basic simulations. The focus was mainly on the outputs of the model for the Business-as-usual scenario (BAU).
- 2) The students ran the model and modified the input file to change the basic (BAU) scenario. While changing parameters, such as population growth, desired GDP or labor rate, the lecturers discussed with them about the different goals and policies to implement the foreseen changes in the key variables of the model.

All in all, the students showed great interest in the model and they reported a very positive feedback with the intention of learning more about the model in the future.



15TH CONFERENCE AND TRADE FAIR OF GREEN BUILDING IN AÍNSA



Margarita Mediavilla and Iñigo Capellán-Pérez from the University of Valladolid, members of the MEDEAS project, attended the 15th Conference and Trade Fair of Green Building (“15ª Jornadas y Feria de Bioconstrucción”).

The Conference was held during May 18, 19 and 20, 2018 in Aínsa, Huesca, Spain and it was organized by the Spanish Institute of Green Building (“Instituto Español de Baubiologie”). Margarita and Iñigo gave a presentation about the holistic management of energy and natural resources; they also spoke about the results obtained from the MEDEAS models and held a discussion with the attendees.

UPCOMING EVENTS

ENERGY MODELLING PLATFORM FOR EUROPE (EMP-E) 2018

MEDEAS as part of the cluster LCE21 of the four Horizon 2020 projects (SET-NAV, MEDEAS, REEEM, REFLEX) working on “Modelling and analysing the energy system, its transformation and impacts”,

participates in the organisation of the second conference of the Energy Modelling Platform for Europe (EMP-E) 2018 Modelling clean energy pathways.



The Conference is hosted by the European Commission DG Research & Innovation in Brussels on September 25 and 26, 2018. The programme of the two day conference is available [here](#).

MEDEAS organises a plenary session on September 25, 2018 on the “Modelling of behavioural aspects”. In this session, the most common modelling approaches employed to simulate (parts of) complex human energy systems will be introduced by three

experts on modelling human behaviours, including in energy systems. Each of them will bring the perspective of a different modelling approach, in particular Agent-Based Modelling, System Dynamics and Linear Optimisation Modelling. Presentations will be followed by a panel discussion where experts will be encouraged to take an “extreme” position to highlight the benefits of each approach and to create a real debate.

Moreover, MEDEAS also participates in the organisation of three focus group sessions on September 26, 2018 on “Open databases”, “Open energy system models” and “Modelling of behavioural aspects”. The project also has significant presence in the poster sessions of the event.

Further information and updates on the event are published on the [webpage](#).

SECOND MEDEAS BOARD OF STAKEHOLDERS MEETING

The second MEDEAS Board of Stakeholders meeting will be organised in November 2018, followed by a series of webinars.

Members of the Board of Stakeholder of the project will be invited to attend the second Board of Stakeholders meeting in a location in Europe in November 2018. The focus of the meeting will be to demonstrate the use of the MEDEAS models system and present the results of the model to stakeholders based on selected scenarios. The main purpose will be to discuss thoroughly the models with stakeholders and to obtain their feedback, guidance and insight regarding the MEDEAS models.

In addition to the second Board of Stakeholders meeting, a series of meetings in the form of webinars will be organised by the project. The focus and purpose of the webinars will be similar to the physical meeting and the aim will be to reach and receive feedback from as many stakeholders as possible.

More information on the meeting and the webinars will soon be available in the [news and events](#) section of the MEDEAS website.

SECOND GENERAL ASSEMBLY IN FLORENCE

The second MEDEAS General Assembly was organized between February 5 and 9, 2018 in Florence, Italy by the National Interuniversity Consortium of Materials Science and Technology (INSTM).

All MEDEAS partners attended the General Assembly and participated in the meetings with presentations on project activities and discussions on project outcomes and results. Additionally, all partners contributed in future project developments and decisions to successfully complete foreseen activities and tasks.

Side meetings among individual team members were organized on February 5, while the General Assembly officially started on February 6 with a welcome by INSTM; followed by an introduction to the hot topics of the meeting and presentations and discussions on the results of several project deliverables. Two interns working on the project also attended the meeting and presented their results. By the end of the meeting, a guided visit was organized

to the University of Florence Natural History Museum, where partners attended a presentation on whales by Ugo Bardi and had the opportunity to view the exhibits of the museum.

In addition, on February 7, the MEDEAS partner CSIC, organized a workshop for the demonstration of the MEDEAS model in Python (pymedeas), where all attendants had the opportunity to install, run the model and become acquainted with its features. During the last two days of the meeting, the focus was primarily on ongoing and future activities of the project with an emphasis on the acquisition of meaningful results. MEDEAS partners also had the opportunity to attend a Dissemination and Exploitation seminar organized by the META-Group under the Exploitation Support Services (ESS), common support services to boost exploitation of research results from the European Commission.



MEDEAS IN THE REEEM PROJECT WORKSHOP

On April 16, 2018, Ilaria Perissi from INSTM, member of the MEDEAS project, participated in the workshop of the REEEM project on “Carbon Leakage and Competitiveness: Macroeconomic Projections for EU until 2050”.

The workshop aimed to present and discuss the results obtained in the WP3 of the REEEM project, a member of the LC21-2015 cluster. WP3 deals with the socioeconomic scenarios that could arise for European Industries as a consequence of the world and EU decarbonizing policy. Moreover, it explores the role of carbon leakage on the competitiveness of industries in the EU, mainly in energy intensive industries and industries that use carbon not only as a source of energy but also as a resource for processing the products (for instance the steel industry). The issue explored is that industries could be tempted to move toward regions with a less restrictive decarbonization policy (referred to as the carbon leakage phenomenon), impoverishing the EU economy and risking emitting even more once outside the EU.

Participants of the workshop included the organisers, REEEM-WP3, Ilaria Perissi from MEDEAS, a participant

from the Set-Nav project and several stakeholders from industries, such as EUROFER - the EU Steel Association, CEMBUREAU - the EU Cement Association, InnoEnergy, EUROALLIAGES- Association of European Iron-alloy Producers and others. The officer of the European Commission, Ms Quinn also joined the workshop and made an intervention on developments in the field of regulations of the EU carbon market (the widest in the world).

The complete chronicles from the event can be found [here](#).

