As Europe goes green, number crunchers map the ripple effects

February 10 2023, by Horizon Staff

A new tool will help predict numerous features of a low-carbon society. Credit: CC0 via Unsplash

The EU will soon be able to see more clearly the wider outcomes of its clean-energy drive. It is called "Model Explorer" and its scheduled

release in mid-2023 is being keenly anticipated. A new video game for screen-addicted teenagers worldwide? Not quite.

Behind the scenes

"Model Explorer" will mark the next advance in computer modelling for Europe's clean-energy ambitions, promising key insights into the impact on societies of the planned switch from fossil fuels to renewable power sources.

The EU is deepening cuts in greenhouse-gas emissions in a bid to become climate-neutral by 2050. The model will help determine what this goal means for everything from local jobs to global trade.

'Every decision you take has multiple ramifications,' said Nathalie Wergles, manager of the EU-funded LOCOMOTION project developing the model. 'Our tool is mostly to get a grip on the other effects of your policy.'

Wergles, an Austrian native based in Spain, belongs to an extensive network of researchers who work behind the scenes in the global climate drama. While the spotlight is usually on politicians announcing energy-policy shifts and companies touting electric cars, wind farms and other green projects, Wergles and her colleagues do crucial conceptual groundwork.

The research network is focused on "integrated assessment models," or IAMs, which unite socioeconomic, energy and environmental factors in a single framework for the benefit of policy makers worldwide.

The framework identifies both the paths to a specific goal and the broad consequences of taking any particular route. IAMs date to the 1970s and are used by organisations including the United Nations and the European

Commission.

Filling the gaps

Nonetheless, such models have sizeable gaps that LOCOMOTION will help fill, according to Professor Luis J. Miguel, the project coordinator.

The new model will have two main advantages, according to Miguel, who teaches at the University of Valladolid in Spain. The first is a broader geographical scope—35 regions worldwide. The second is an array of economic sectors—63 in total—including energy, raw materials, transport and agriculture.

These features will translate into a forecasting ability that covers a larger number of places and that provides more detailed information about likely scenarios in each. The scenarios are triggered by "what-if" policy questions.

'You propose a set of policies, then we try to guess what is going to be the pathway to reach the goals,' said Miguel. 'We can watch what is happening under a specific scenario in all the world, but also we can watch just Europe, just China, just North America and even each of the 27 EU countries.'

The new tool can capture all trade flows among the more than five-dozen sectors covered based on variables that number around 2 million.

'This gives you an idea of the complexity,' Miguel said.

"Model Explorer" will be a relatively user-friendly version of LOCOMOTION's model and is designed for non-governmental organisations and educational institutions. A more sophisticated type will be called "Model Analyser" and is meant for experts including

researchers.

The project includes 14 partners across the EU including the European Environmental Bureau, Europe's biggest grouping of green-focused citizens' organisations.

While it is unrealistic to expect politicians themselves to use any versions of its model, LOCOMOTION can help shape their climate decisions in Europe through the array of EU channels that support policy-making, according to Wergles, who also works at the University of Valladolid.

'We have to make ourselves a name, get a good reputation and make sure that people have trust in our model and in the data we deliver,' she said. 'This is the entrance to political decision-making.'

Timely tool

The work of LOCOMOTION, which is due to end in 2023 after four years, happens to be very timely.

EU lawmakers are nearing the end of negotiations begun in 2021 on a major package of draft climate legislation. It sets more ambitious targets for both reductions in emissions and increases in renewable energy.

While most of the stricter goals are for 2030, one is for 2035 and involves an EU plan to prohibit the sale of new cars with a combustion engine—part of a push to accelerate the development of electric vehicles in Europe.

LOCOMOTION can help assess the broader implications—called "feedbacks" by researchers—of this planned ban thanks to the model's wide coverage of sectors and ability to capture global trade flows in the affected industries, according to Miguel.

For example, a fully electric auto fleet in Europe will affect worldwide trade in materials such as lithium used for car batteries.

'Fossils fuels are going to run out one day, but renewable energies also have some limits related to the materials needed,' Miguel said. 'If the materials are scarce, probably the price will increase and not everybody who needs them for production will be able to have them. These kinds of feedbacks are rarely considered in other integrated assessment models.'

To highlight the range of policy questions that the LOCOMOTION model will help answer, Wergles offered some examples that users could ask the tool when it's ready later this year:

- How much would global greenhouse-gas emissions decline if worldwide consumption of meat was reduced by 10%?
- Which step would be more effective in reducing the concentration of atmospheric greenhouse gases: a worldwide reforestation programme or the electrification of 50% of ground transport?
- What energy-storage capacity would be necessary to ensure 100% renewable-electricity supply in Europe by 2050?
- What quantity of critical raw materials is needed for planned additional energy infrastructure in the EU?

Attention Madrid!

Gonzalo Parrado says LOCOMOTION's modelling work has been a big help to doctoral research he is doing on Spain's energy transition, including in road transport.

He stressed the importance of the model's geographical reach, which goes well beyond Spain and Europe, along with the large number of

industrial sectors it covers, including raw materials.

'Without LOCOMOTION, my study would be partial and would leave out topics like lithium supplies for electric-car batteries,' said Parrado, whose Ph.D. programme is at the University of Valladolid. 'The more holistic the approach is, the more complete the assessment is about the energy transition.'

Like all other EU countries, Spain will need to take numerous policy decisions to enact a range of new European climate commitments.

Research like Parrado's stands to be especially valuable because it harnesses global data collected by an EU project to give national policy makers a clearer picture of their choices and the broader effects.

Parrado said a signal of interest from the Spanish government in his work is a real possibility.

'Nobody has called me for now,' he said with a smile. 'But it's not unrealistic to expect a call at some point.'

More information: LOCOMOTION
The European Commission's 2050 long-term strategy

This article was originally published in Horizon, the EU Research and Innovation Magazine.

Provided by Horizon: The EU Research & Innovation Magazine