

# Research Brief:

## SDGs in the global MAGNET model for policy coherence analysis

### HIGHLIGHTS

- Adopted by 193 country members of the United Nations, the Sustainable Development Goals (SDG) provide a sound framework for analysing the coherence of simulated policy mixes.
- The MAGNET model (CGE) has been adapted for the simulation of bioeconomy scenarios towards 2030. The impacts of such scenarios can be assessed through the lense of SDGs, identifying synergies and contradictions among economic, social and environmental objectives.
- Composite indicators and correlation indices could help to handle the complexity of dealing with the multiplicity of scenarios, SDGs and regions at stake.

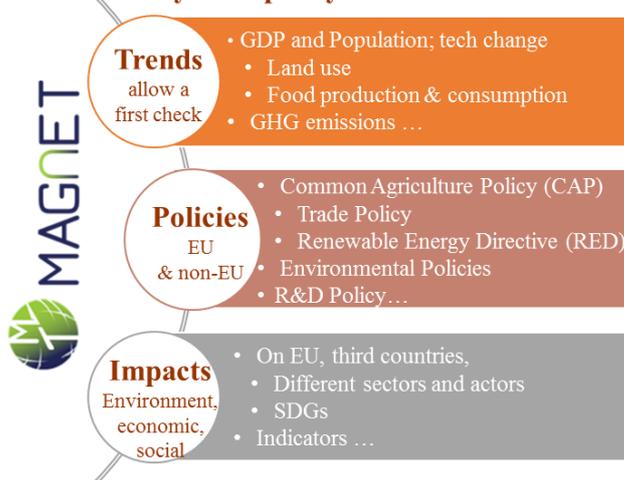
**Policy coherence** aims to **minimise contradictions** and **build synergies between (EU) policies**.

### The SDGs as a framework for defining areas for improvements by 2030

- United Nations' Sustainable Development Goals (SDGs) are universally agreed
- They provide a comprehensive list of economic, social and environmental areas of development
- The SDGs' areas of development can be impacted by one or more sectoral or regional policy



### Analysis of policy mixes based on



### MAGNET, a modelling tool to analyse possible policy settings

- The MAGNET model (Modular Applied GeNeral Equilibrium Tool) is a global general equilibrium model which is a derivative of the well-known Global Trade Analysis Project (GTAP) model.
- It is developed and applied at Wageningen Economic Research (WEER) and is also employed by the Thünen Institute (TI) and the Joint Research Centre (JRC/D).
- Its broad coverage of policies and indicators can help to identify contradictions and synergies between simulated policies.

**Applied to the Bioeconomy**, the MAGNET model gives insights into the development of various SDGs



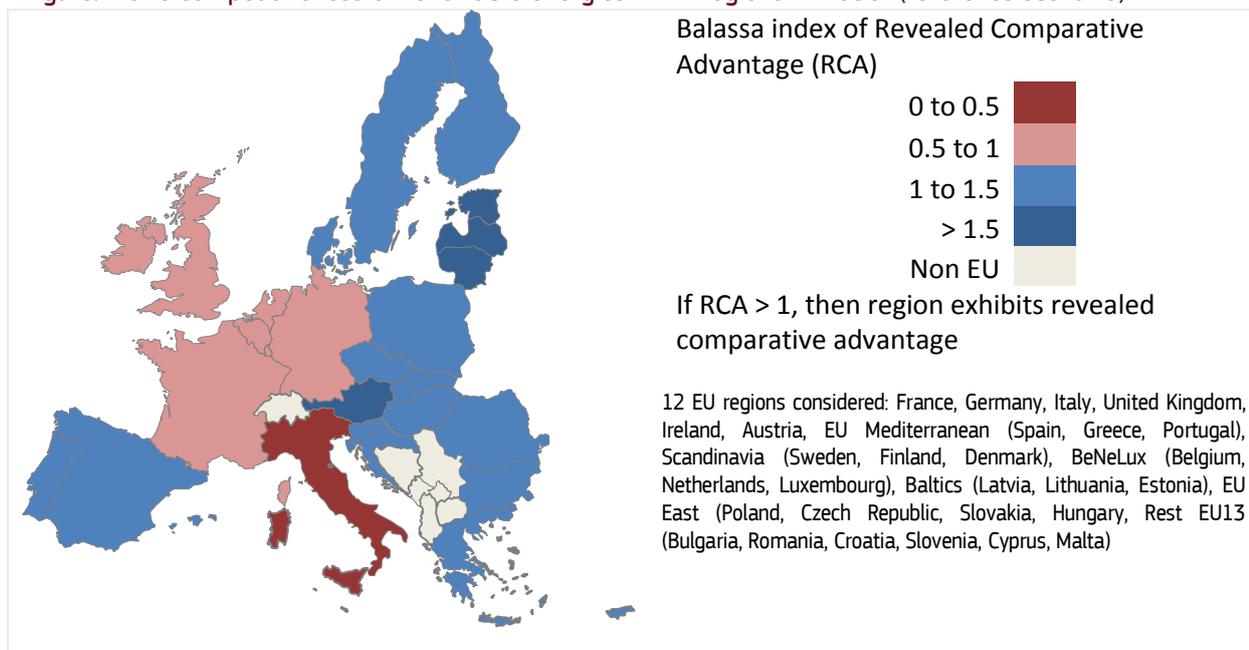
**MAGNET for observing the path of reference scenario:**  
Between 2015 and 2030



Source: MAGNET – Bioeconomy scenario (forthcoming report)

## MAGNET for observing EU Member States

Figure: Trade competitiveness of renewable energies in EU regions in 2030 (reference scenario)



Source: MAGNET – Bioeconomy scenario (forthcoming report)

## The SDGs as a normative framework for policy analysis related to the "Bioeconomy":

Using the SDGs as a universal reading grid to compare different possible pathways implies crossing data for a high number of SDG-related indicators, at different regional levels and according to different possible pathways.

Heat maps can be used to visualise this complexity, as shown in the table below that presents the variation of a selection of indicators in four bioeconomy scenarios compared to the EU reference scenario in 2030 and for the EU28. The scenarios are: HT=High tech; NoM=No Mandate; RED2, BioE=only bioethanol in RED1. More details see Research Brief "Exploring bio-based futures in the EU – a MAGNET model based assessment".

Figure: % change of selected SDG-related indicators in four different scenarios compared to the EU reference scenario (EU region, 2030)

		HT	NoM	RED2	BioE
SDG7	EU expenditure by primary energy on biobased feedstocks	↓ -1.8	↓ -18.7	↑ 3.7	↓ -2.5
SDG7	EU renewable energy share in final energy consumption	↓ -4.0	↓ -50.2	↑ 7.2	↓ -5.8
SDG7	EU real price index of fossil energies	↓ -0.7	↓ -4.5	↓ -0.3	↓ -0.7
SDG7	EU real price index of renewables energies	↓ -2.1	↑ 0.1	↑ 0.1	↑ 0.3
SDG7	Land usage in 1st generation bioethanol	↑ 0.8	↓ -71.3	↓ -31.2	↑ 395.8
SDG7	Land usage in 1st generation biodiesel	↑ 0.1	↓ -97.5	↓ -46.8	↓ -99.9
SDG8	EU net trade value	↓ -0.5	↑ 0.6	↓ -0.2	↑ 0.3
SDG8	EU trade competitiveness of renewable energies	↑ 4.4	↓ -6.3	↑ 13.5	↓ -12.1
SDG9	CO <sub>2</sub> emissions per value added in the crop sector	↓ -0.7	↓ -3.6	↑ 0.0	↓ -0.7
SDG12	EU renewable energy share in final energy production	↓ -2.3	↓ -12.6	↑ 3.4	↓ -1.1
SDG13	EU production cost share in value added in agriculture	↑ 1.4	↑ 0.6	↓ -0.6	↑ 0.0
SDG13	EU production cost share in value added in bio-energy sectors	↑ 1.2	↑ 17.6	↓ -0.3	↑ 4.0

Note: Scenarios are presented in Philippidis et al. (2017). "Exploring bio-based futures in the EU – a MAGNET model based assessment". Research Brief. European Commission - Joint Research Centre.

Source: MAGNET – Bioeconomy scenario (forthcoming report)

## How to assess and represent diverging scenario impacts at SDG level?

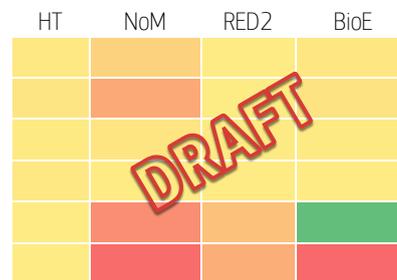
Research is on-going to objectively reduce the complexity. A possible methodological option is the elaboration of SDG correlation indices, or of composite indicators (e.g. at SDG level) after agreeing on the relative weight of each of sub-indicators.

The below table shows that sub-indicators of a given SDG can score differently, which makes difficult to attribute one single score to the SDG considered (here SDG 7).



Figure: % change of SDG7-related indicators in four different scenarios compared to the EU reference scenario (EU region, 2030)

- EU expenditure by primary energy on bio-based feedstocks
- EU renewable energy share in final energy consumption
- EU real price index of fossil energies
- EU real price index of renewables energies
- Land usage in 1st generation bioethanol
- Land usage in 1st generation biodiesel



Source: MAGNET – Bioeconomy scenario (forthcoming report)

Such an approach could also help linking the SDGs (universally agreed framework) with the societal challenges defined by the European Commission. That way, science-based evidence (here model simulations) can support policy analysis by providing a synthetic view of the expected impacts of a policy option portfolio, their adequacy to pre-defined strategic orientations (e.g. SDGs or EU societal challenges) as well as potential contradictions and synergies.

In the following figure a further simplified version including different SDGs is presented. Decisions on the colour-coding are rather complex and therefore are characterised as a draft only at this stage. More (composite) indicators and a weighting system are needed for a balanced decision.

Figure: Heat map scoring five bioeconomy scenarios with regards to SDGs and societal challenges

SDGs	Societal challenges	NoM	BioE	RED1	RED2	HT
 <b>2 ZERO HUNGER</b>	<b>Food Security</b> Prices for agfood products; production	Green	Yellow	Yellow	Green	Yellow
 <b>15 LIFE ON LAND</b>	<b>Environmental sustainability</b> Land use	Green	Orange	Yellow	Yellow	Yellow
 <b>7 AFFORDABLE AND CLEAN ENERGY</b>	<b>Less dependence on fossil oil</b> Share of bio-renewables	Orange	Yellow	Yellow	Green	Yellow
 <b>13 CLIMATE ACTION</b>	<b>Climate change mitigation and adaptation</b> GHG emissions, Carbon price	Green	Green	Green	Green	Green
 <b>8 DECENT WORK AND ECONOMIC GROWTH</b>	<b>Jobs &amp; Competitiveness</b> Number of jobs	Orange	Green	Yellow	Orange	Green

Source: MAGNET – Bioeconomy scenario (forthcoming report)

### Challenges ahead and general remarks:

- The MAGNET model has proved valid over time for scenario analysis in the fields of agriculture, trade, food nutrition and security, renewable energy and the bioeconomy. These areas relate strongly to food security (SDG 2), energy mix (SDG 7), jobs and growth (SDG 8), balanced territorial development (SDG 10), Greenhouse Gas Emissions (SDG 13) and land use (SDG 15). Thus, MAGNET can make a valuable contribution to the integrated assessment of different policy mixes in the light of the SDG framework.
- There is scope for further development of new and/or more precise SDG indicators in MAGNET that would better align with official SDG indicators. Such progress is even more interesting when a framework is concomitantly developed to handle the great complexity given by the variety of scenarios, regions, economic sectors, sustainability dimensions and indicators at stake.
- Next challenge will thus be to develop such a framework. It starts from the initial phase of designing scenarios well suited to answer specific policy questions. It also relates to the indicators themselves: weighing indicators within SDGs, building correlation indices, etc.

**Acknowledgement:** The work related to the further development of the MAGNET model and the SDG implementation has been co-funded by the European Commission's Directorate General for Research and Innovation as well as the Directorate General for Agriculture and Rural Development.

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### References and further literature



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**How to cite:** Shutes et al. (2017). "SDGs in the global MAGNET model for policy coherence analysis". Research Brief. European Commission-Joint Research Centre.

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