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A System of Systems Approach to the EU Energy System

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Around the world, measures to prevent dangerous climate change are being adopted and may change energy systems fundamentally. The European Union (EU) is committed to reducing greenhouse gas emission by 20% by 2020 and by 80-95% by 2050. In order to achieve this, EU member states aim to increase the share of renewables in the energy mix to 20% by 2020. This commitment comes as part of a series of other aims, principles, and policies to reform the EU's energy system. Cost-efficiency in the emissions reductions measures as well as strategic goals under the Resource Efficient Europe flagship initiative which would include a more prudent approach to other natural resources such as water and land.
Using the "System of Systems Approach", as from Hadian and Madani (2015), energy sources' Relative Aggregate Footprints (RAF) in the EU are evaluated. RAF aggregates across four criteria: carbon footprint, water footprint, land footprint, and economic cost. The four criteria are weighted by resource availability across the EU and for each Member State. This provides an evaluation of the overall resource use efficiency of the EU's energy portfolio and gives insight into the differences in the desirability of energy sources across Member States.
Broadly, nuclear, onshore wind, and geothermal are most desirable under equal criteria weights and EU average weighting introduces only small changes in the relative performance of only few technologies. The member state specific weightings show that most countries have similar energy technology preferences. However, the UK deviates most strongly from the average, with an even stronger preference for nuclear and coal. Sweden, Malta and Finland also deviate from the typical preferences indicating the complexity in play in reforming the EU energy system.

Reference
Hadian S, Madani K (2015) A System of Systems Approach to Energy Sustainability Assessment: Are All Renewables Really Green? Ecological Indicators, 52, 194–206.