



## **Open Tools for Integrated Modelling to Understand SDG development – The OPTIMUS program**

Mark Howells (1), Eduardo Zepeda (2), H.Holger Rogner (1), Marco Sanchez (2), Alexander Roehrl (2), Matrin Cicowiez (3), Dimitris Mentis (1), Alexandros Korkevelos (1), Constantinos Taliotis (1), Oliver Broad (1), and Thomas Alfstad (4)

(1) KTH, Department of Energy Technology, Sweden, (2) UNDESA, United Nations Division of Economic and Social Affairs, (3) University of La Playa, Argentina, (4) IAEA, International Atomic Energy Agency, Austria

The recently adopted Sustainable Development Goals (SDGs) - a set of 17 measurable and time-bound goals with 169 associated targets for 2030 – are highly inclusive challenges before the world community ranging from eliminating poverty to human rights, inequality, a secure world and protection of the environment. Each individual goal or target by themselves present enormous tasks, taken together they are overwhelming. There strong and weak interlinkages, hence trade-offs and complementarities among goals and targets. Some targets may affect several goals while other goals and targets may conflict or be mutually exclusive (Ref). Meeting each of these requires the judicious exploitation of resource, with energy playing an important role.

Such complexity demands to be addressed in an integrated way using systems analysis tools to support informed policy formulation, planning, allocation of scarce resources, monitoring progress, effectiveness and review at different scales. There is no one size fits all methodology that conceivably could include all goal and targets simultaneously. But there are methodologies encapsulating critical subsets of the goal and targets with strong interlinkages with a ‘soft’ reflection on the weak interlinkages. Universal food security or sustainable energy for all inherently support goals and targets on human rights and equality but possibly at the cost of biodiversity or desertification.

Integrated analysis and planning tools are not yet commonplace at national universities – or indeed in many policy making organs. What is needed is a fundamental realignment of institutions and integrations of their planning processes and decision making. We introduce a series of open source tools to support the SDG planning and implementation process. The Global User-friendly CLEW Open Source (GLUCOSE) tool optimizes resource interactions and constraints; The Global Electrification Tool kit (GETit) provides the first global spatially explicit electrification simulator; A national CLEW tool allows for the optimization of national level integrated resource use and Macro-CLEW presents the same allowing for detailed economic-biophysical interactions. Finally open Model Management Infrastructure (MoManI) is presented that allows for the rapid prototyping of new additions to, or new resource optimization tools. Collectively these tools provide insights to some fifteen of the SDGs and are made publicly available with support to governments and academic institutions.