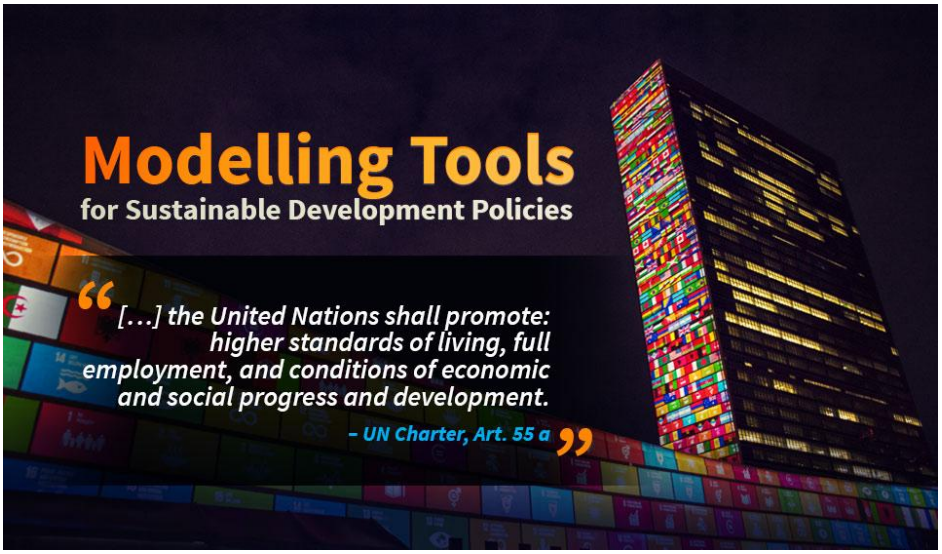


# Understanding the Contribution of Modelling Tools to Sustainable Development

## MODULE:

## THE 2030 AGENDA

The contribution of modelling to sustainable development policies

Group discussion

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# MODULE: THE 2030 AGENDA

# THE CONTRIBUTION OF MODELLING TO SUSTAINABLE DEVELOPMENT POLICIES

## GROUP DISCUSSION

All participants should have read the 2030 Agenda - The Reader that comes prior to this session.

### LEARNING OBJECTIVES

- Understand the challenges of designing integrated policies for the transformative changes of the 2030 Agenda of Sustainable Development.
- Understand what a mathematical model is and how can it be used to inform sustainable development policies.
- Understand the importance of the food, energy and water nexus for sustainable development policies.
- Appreciate the importance of retaining relevant sector details and having access to a suite of modelling tools to address policy questions.
- Appreciate the usefulness of developing capacity in countries to assess policies assisted by a suite of modelling tools.

## DIRECTIONS

The session will use the 2030 Agenda introduction – the Reader. Participants should make groups of four to five people and read a specifically selected section.

To facilitate the session, we have included a text that captures the main ideas of that section. It can be read in about five minutes.

After reading the text, participants will have a group discussion and later will report to a plenary session where they will make a brief presentation of their discussion in no more than three minutes.

**Discussions are guided by a list of questions, but deliberations should not be limited to the questions provided.**

### GUIDING QUESTIONS:

- What are the three strands of mathematical models useful for the 2030 Agenda?
- What are the three key insights provided by climate change models?

- What is the contribution of integrated assessment models to policy decision making?
- What is the strength of economy-wide models in addressing climate change?
- What are the potential contributions of mathematical models to public policy? Are they really needed?

READING:

## 1. THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT AND OTHER INTERNATIONAL COMMITMENTS

The international commitments adopted by countries in 2015 included the 2030 Agenda for Sustainable Development, the Addis Ababa Action Agenda at the Third International Conference on Financing for Development, the Sendai Framework for Disaster Risk Reduction and the Paris Agreement under the United Nations Framework Convention on Climate Change. These commitments together pose serious challenges for policy decision makers. They face the complex task of balancing global goals and targets with national development aspirations and development plans, while also balancing trade-offs across sectors, goals and targets.

The 2015 agreements represent a comprehensive effort to cover a wide range of critical development issues and the acceptance of important global and national responsibilities for their implementation. The vision inspiring these agreements is the transformation of the world to a sustainable development path with no poverty and no one left behind. Countries are already committing to achieving national sustainable development objectives that call for important changes in the way economies and societies function. These commitments, notably those expressed in the national determined contributions under the United Nations Framework Convention on Climate Change, do not add up to the transformations envisioned in the 2030 Agenda and the curbing of emissions to avoid temperature increases greater than 2 degree Celsius. Moreover, most of the stated initiatives do not sufficiently specify the policies, actions and investments that will lead countries to achieve them. Policy design for transformative changes thus faces difficult challenges.

Countries formulating strategies to implement the 2030 Agenda and committing to emission reductions under the Paris Agreement face the formidable task of balancing across the three dimensions of development, and between national development objectives and national commitments or contributions to global goals. Global commitments do not provide clear guidance for national implementation. That is not their purpose. Nevertheless, the 2030 Agenda provides useful illustrations of the interlinkages across the various goals and targets.

## 2. MODELLING TOOLS AND THE 2030 AGENDA

Long before the advent of the 2030 Agenda, researchers developed analytical tools and mathematical models for the study of sustainable development and its underlying interlinkages. One strand of models, climate change models, linked changes in global temperatures and climate global patterns with human generated $CO_2$-equivalent emissions. These models provided the important insight that the world needs to control emissions to avoid potentially catastrophic consequences.[1]

**Models are a formal framework to represent ideas. Among other purposes, they can be built to:**

1. **Understand**
2. **Quantify**
3. **Visualize**
4. **Predict**
5. **Simulate different aspects of the world**

A second strand of research produced integrated models to simultaneously look at the various dimensions of development. They are known as integrated assessment models (IAMs) and include the word "assessment" to emphasize their important objective of assessing policy options. These tools evolved from energy systems models, an important class of models developed in the 1970s to design the re-configuration of national energy systems after oil price increases. IAMs bring together climate change models and energy-economy systems models using emissions and feedback

[1] G. N. Plass (1956). "The Carbon Dioxide Theory of Climatic Change." *Tellus* 8(2): 140–154. DOI:10.1111/j.2153.

loops as the transmission belt between the two modelling frameworks. IAMs have been instrumental in informing policy and decision-making on global sustainable development issues, including options for combating climate change.

A third strand of models, economy-wide models, has also been extensively used to calculate the cost of actions to avert an increase in emissions. Commonly known as computable general equilibrium or applied general equilibrium models, economy-wide models were developed to assess the direct and indirect effects of specific policies and external shocks. These models have been extensively applied at the national, regional and global levels. They can also be used at subnational and even at village levels.

Based on input-output tables – which record purchases and sales of commodities and services among economic sectors – these models also incorporate the behaviour of consumers, producers, investors, governments and other economic agents. Agents in these models react to changes in prices allowing the identification of the impacts of a given policy or external shock throughout the economy. Economy-wide models have been used to analyse tax, trade and environmental policies. In these cases, the models are often applied in a bi-di-

**Some reasons to apply a model:**

1. **Explain**
2. **Guide data collection**
3. **Illuminate core dynamics**
4. **Suggest dynamic analogies**
5. **Discover new questions**
6. **Promote scientific inquiry**
7. **Link outcomes to impacts**
8. **Illuminate core uncertainties**
9. **Demonstrate trade-offs**
10. **Suggest efficiency gains**
11. **Challenge prevailing theory**
12. **Test prevailing wisdom**
13. **Reveal the complexity of apparently simple things**
14. **Reveal the simplicity of apparently complex problems**

**Based on Epstein (2012). NEED IN REFERENCES**

rectional way, i.e., in analysing the impacts of economic activity on the environment as well as the impacts of environmental changes on the economy.

Similar to IAMs, economy-wide models use emissions as the "transmission belt" linking climate models and economic processes, typically using climate-related functions and including, in some instances, feedback links between economic activity and climate.

With the advent of the 2030 Agenda and the nationally determined contributions of the Paris Agreement in place, IAMs should be more extensively deployed to explore key intersecting systems and their interdependencies. These include the interlinkages of the energy, water and land (food) nexus as well as the enhancement and adaptation of the technological and institutional infrastructure needed to advance the 2030 Agenda. Economy-wide models looking at interactions between the economy and emissions reductions, sustainable energy investments and climate change need to be more extensively used to inform policy options.