Understanding the Contribution of Modelling Tools for Sustainable Development

MODULE:
CLEWS GLOBAL MODEL

Assessing climate, land, energy and water systems with a global model

Group Discussion A

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GROUP DISCUSSION A: ASSESSING CLIMATE, LAND, ENERGY AND WATER SYSTEMS WITH A GLOBAL MODEL

GROUP DISCUSSION

All participants should have read the global CLEWS introduction prior to the session.

LEARNING OBJECTIVES

- Understand the challenges of designing integrated policies for the transformative changes of the 2030 Agenda for Sustainable Development.
- Understand a mathematical model and how can it be used and not used to inform sustainable development policies.
- Understand the importance of the food-energy-water nexus for sustainable development policies.
- Appreciate the importance of retaining relevant sector details and having access to a suite of tools as well as addressing policies with the most adequate tool.
- Appreciate the usefulness of developing capacity in countries to assess policies assisted by, for example, a suite of modelling tools.

DIRECTIONS

The session will use one section of the 2030 Agenda Concept Paper. Participants should make groups of four to five people and read the selected section.

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

After reading the text, participants will have a group discussion, and later will report to all participants in a small presentation of no more than three minutes.

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

GUIDING QUESTIONS

- Why is important to study the food-energy-water nexus?
- What are the key concerns for sustainable land management?
- Why is the management of water becoming an urgent policy issue?
- Which are the interlinkages between land and water management?
- Which are the interlinkages among land, energy and water management?

3. INTEGRATED ASSESSMENT AND NATIONAL SUSTAINABLE DEVELOPMENT POLICIES

"De-fossilizing" economies is key for setting the world on a sustainable development path. But this poses daunting challenges. It implies doubling energy investments, fostering technology development in non-fossil sources, and refurbishing a good part of the productive and social infrastructure of the economy. As challenging as it is, full de-fossilization is not by itself enough to achieve sustainability. Eradicating poverty, leaving no one behind, and the whole spectrum of objectives, goals, and targets contained in the 2030 Agenda also need to be achieved. An array of models and quantitative methodologies can assist in the formulation of policies. We briefly preview the suite of modelling tools that are part of this training course.

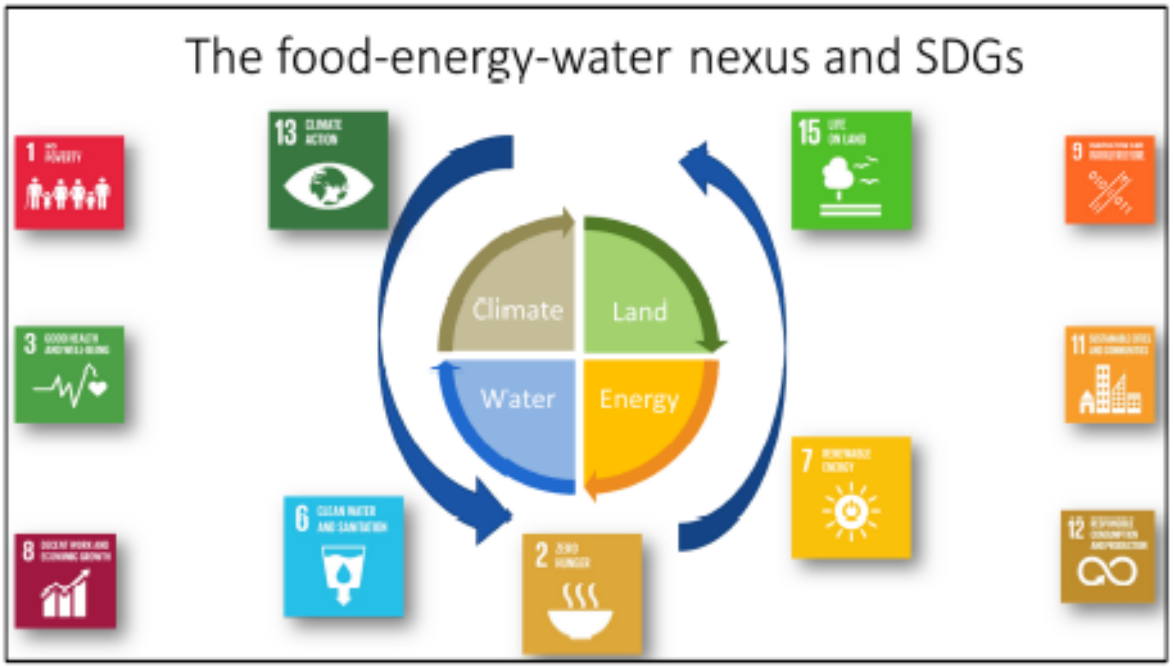
CLEWS AND INTEGRATED ASSESSMENT

A good starting point for gathering evidence to inform sustainable development strategies is to build national integrated assessment models capable of directly looking at energy, water, land use, climate change and emissions. Ensuring adequate energy infrastructure for development and energy security and making the national energy matrix sustainable are policy concerns ranking high in most if not all countries. Countries, for example, looking at increasing reliable and affordable electrification access might consider a range of sustainable energy policies – e.g., clean electricity, clean fuels in transport, and energy efficiency policies, including changes in transport systems, retrofitting buildings, sustainable consumption, etc.

These policies are sufficiently complex in themselves, yet they immediately call for policies in other sectors. Energy is closely interrelated with the use of water and, in some cases, with the use of land. Energy generation may compete with food production in the use of land and water, while food production itself usually requires access to energy. While water is used in varying degrees in the production of electricity, energy is essential for pumping water and for treatment of wastewater.

Energy, food (land use) and water often pull in different directions, leading to important trade-offs. All of these suggest that an integrated approach simultaneously looking at these resources (land use, water and energy) be applied, particularly in countries where water and land are under stress.

Figure 1: The food-energy-water nexus and the SDGs



A new breed of models for climate, land use, energy and water strategies, called CLEWS, has recently been developed to account not only for the individual food, energy and water systems of a country, but also for integrating and capturing the county-specific nexus among these systems (see figure 1). The model components (water, energy and land use) should be precise enough to capture these specific systems in the relevant geographical context, e.g., national, subnational, local and even transboundary. This means model components should use, to the extent possible, spatial data on land resources and use, energy generation and its demand, and water sources and extractions.

Like most models, CLEWS models make intensive use of data. For each county assessment, data must be gathered and incorporated into the model architecture from scratch. The ad-

vantage is that the few components of CLEWS models are modular and can have varying degrees of complexity. This is particularly useful when data are sparse. It allows analysts to get started with small data requirements and reduced complexity, and leave, for later stages, the addition of complex interlinkages when more data become available or when the fine-tuning of policies calls for the investigation of additional impacts. Above all, however, the CLEWS model requires capacity-building of national experts for:

a. Appreciating the nexus challenge
b. Understanding data requirements, and model set up and structure
c. Learning operational aspects
d. Interpreting results and policy formulation

Integrated assessment models do not allow for a detailed representation of water and land systems, for example, in terms of surface and undersurface water sources, agricultural productivity, water use intensity and biodiversity, as these differ greatly from one location to another. Yet decision-making at the national, subnational and village level requires information at relevant geographical locations, including information on current rates of access to modern energy, electricity usage, local energy resource endowments and flows, employment, income poverty and inequality, and budgetary and foreign currency constrains, among others. Integrated assessment and nexus models provide an integrated approach to sector issues, but cannot be a replacement for single sector models.

Beyond the food, energy and climate nexus, policy-makers need to make decisions that take full account of relevant details on, for example, electrification plans, including widening access to electricity, industrial and export promotion policies, employment generation strategies and other economic, social and environmental policies, such as universal education, effective health services, preservation of biodiversity, etc. Responding to these questions requires the use of sound analytical instruments to inform specific policy decisions.

Some of the key tools that decision makers might need are included in the suite of modelling tools for sustainable development policies featured in this training course. These tools

can address a wide variety of sustainable development policies within an integrated and comprehensive framework, while keeping sector relevance. Tools can be used in parallel or interlinked through soft and hard techniques. In addition to the CLEWS tools, the suite includes the following.

ECONOMY-WIDE MODELS

Economy-wide modelling uses national accounts data and builds on knowledge of behavioural patterns of economic agents to assess the direct and indirect effects of policies and shocks throughout the economy.

SOCIOECONOMIC MICROSIMULATION

Socioeconomic microsimulation probes detailed impacts of policies on issues related to social inclusion, with a focus on the distribution of impacts across households or individuals.

ENERGY SYSTEMS DYNAMIC MODEL

This tool uses linear programming to plan investments and energy generation configurations that minimize costs under alternative policy scenarios. It also helps to assess the effects on emissions and the impact of climate changes in the context of medium and long-term planning horizons.

UNIVERSAL ACCESS TO ELECTRICITY MODEL

The universal access to electricity tool uses geospatial data to find the lowest cost technology to give access to electricity to localities. The tool is useful to assess technical and economic options to fulfil the goal of energy for all.

CAPACITY DEVELOPMENT

Building national models to inform sustainable development policies is a first critical step that needs to be accompanied by building national modelling capacity. Developing abilities to use modelling tools to inform policy decisions is an iterative activity better accomplished

when countries have strong technical expertise within government offices, with the necessary skills to run the models, interpret results and communicate policy insights.