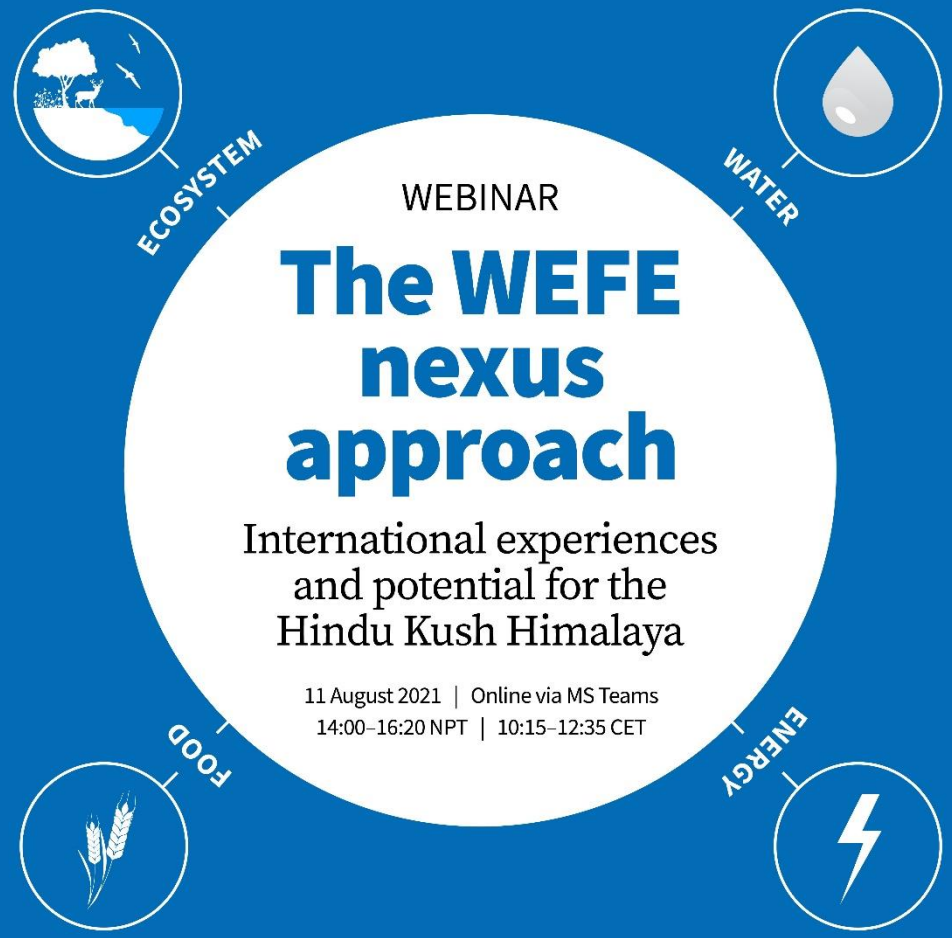

Implementing the WEFE Nexus and Achieving the Sustainable Development Goals

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Date: 11/August/2021

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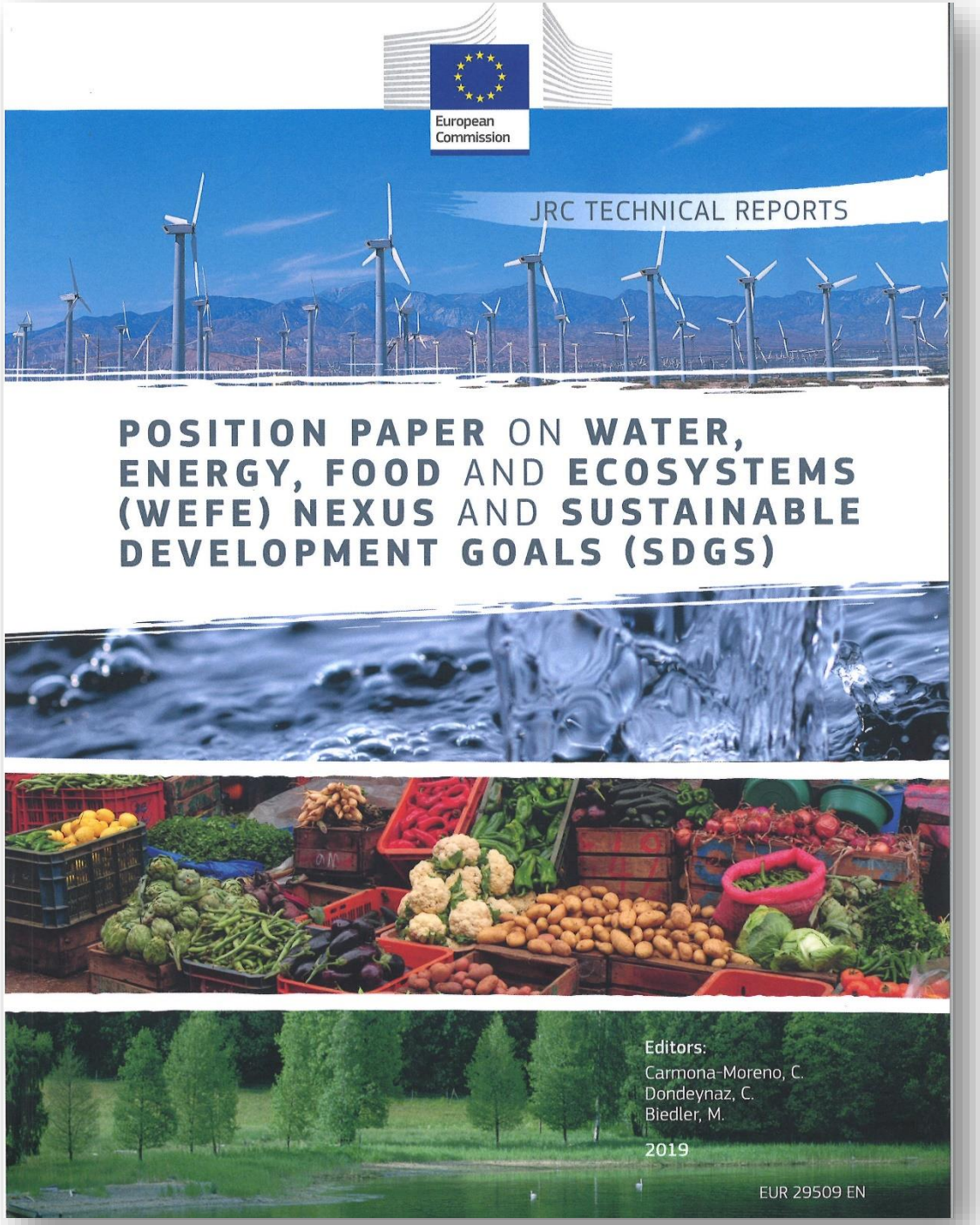
WEFE NEXUS Fundamental Principles

The WEFE NEXUS DEFINED

- **WEFE NEXUS** is an **approach** that *integrates management and governance* across the multiple sectors of food, energy, water and ecosystems.
- **WEFE NEXUS approach** is a way of ensuring *more integrated and sustainable use of resources* that both reaches beyond the traditional silos and can be applied *at all scales*.

Key Principles

- Recognise the interdependence between water, energy, food and ecosystems.
- Understand the Interdependence of resources within a system across space and time.
- Identify integrated policy solutions to optimize trade-offs and maximize synergies across sectors.
- Ensure coordination across sectors and stakeholders.
- Value the natural capital of land, water, energy sources and ecosystems.



A Successful WEFE NEXUS Implementation

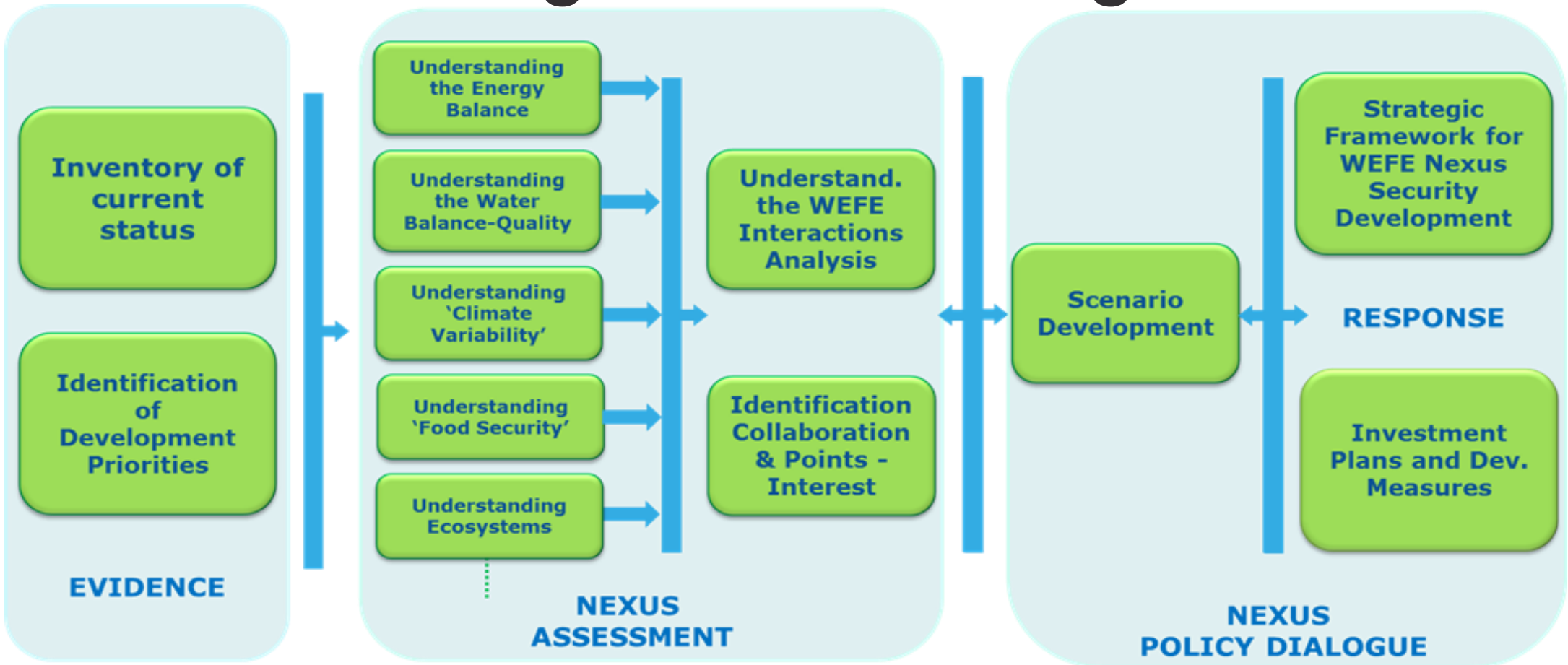
- Consider the heterogeneity of the actors involved but also the high level of dialogue requested;
- Consider the strong competences and skills of the professionals involved together with a high level of governance and **policy will to reach agreements**;
- Consider the complexity and heterogeneity of the ground context: bio-physical, socio-economic, institutional, political, ...;

- Identify and agree on the actual issues, priorities, opportunities and needs to be addressed; and,
- Well define and implement effective mechanisms for exchanging, managing and monitoring information and data that strongly influence decision-making processes.

THE WEFE NEXUS
The PROCESS IN PRACTICE

The WEFE NEXUS – The Data Flow Process

Feeding the NEXUS Dialogues



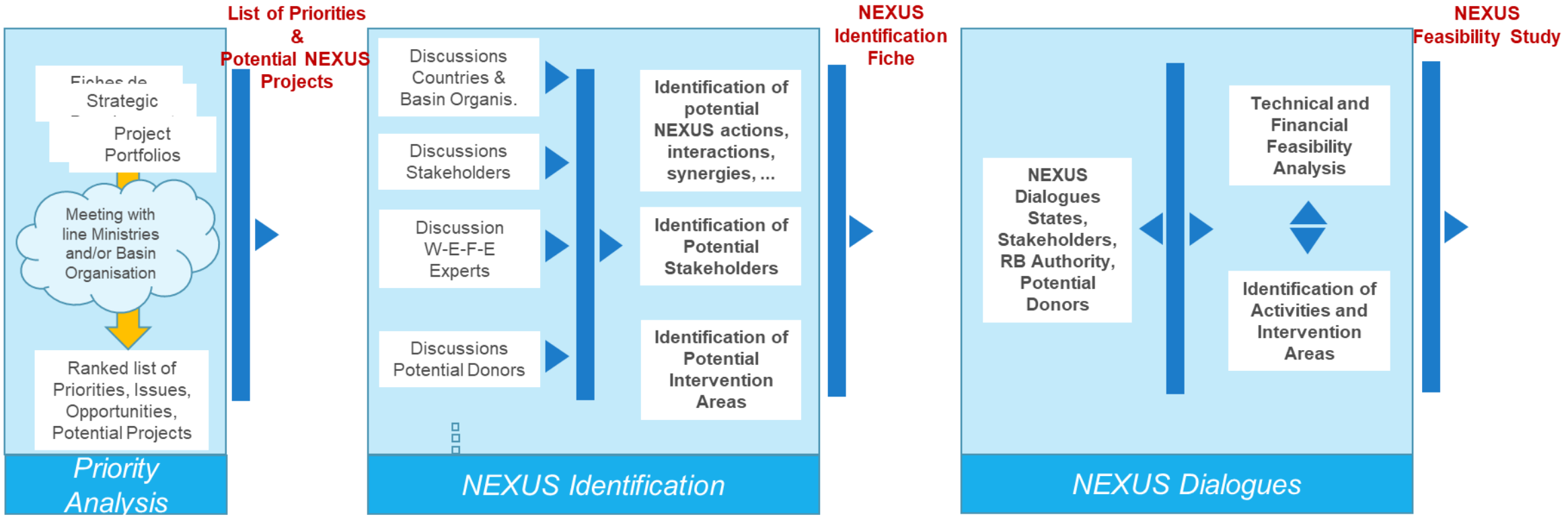
NEXUS Data Base: Gathering Information and Data

MODELLING PHASE - Understanding Cross-sector interactions and potential cross-sector collaborations

SCENARIO DEVELOPMENT - Feeding Policy Dialogues with Development Scenarios -> Strategic Development Docs.

The WEFE NEXUS

The Process for Intervention Project Identification



Analysis of the project portfolios, previous discussions and strategic development documents with a WEFE profile and establishment of a ranked list of priorities, issues, challenges and opportunities.

-Identification of potential Priority Intervention Areas
-Identification of potential activities, Approx. budget, ...
-Identification of past, current and future activities
-Identification of potential stakeholders in relation to the activities under consideration.

- NEXUS dialogues on potential activities with Stakeholders, States, RB Authority and Donors
- Identification of concrete activities in priority intervention areas
- Feasibility analysis of intervention actions

THE WEFE NEXUS
The e-NEXUS DSS Tool

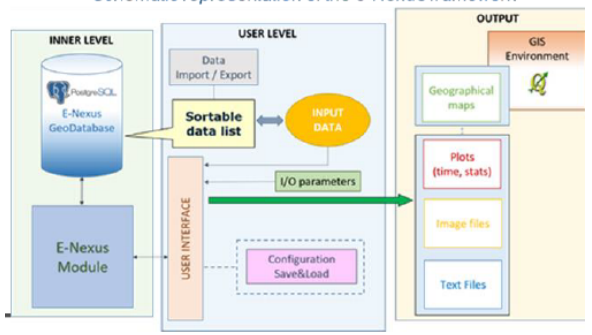
The e-NEXUS DSS Tool (1)

E-Nexus tool

WEFE NEXUS COMPONENT-SPECIFIC MODULES

Modularity: thematic models & MOO

Schematic representation of the e-Nexus framework



1. **Objective**: Different thematic modules to improve knowledge and identify gaps and opportunities in the different sectors.

	Climate Analysis Module	Hydrologic Module (https://swat.tamu.edu/)	Agricultural Module (http://epicapex.tamu.edu/)	BioEnergy Module
SCOPE	**Assessment of climate variability, frequency and return of extreme weather events**	**Quantify water availability in the catchment influenced by climate and management + understand the overall water quality pressure on aquatic ecosystems**	**Assess current agricultural productivity and simulate it under different scenarios, climate variability and management modes. Assess water and nutrient requirements. Identify spatially explicit agricultural strategies for fertiliser management and irrigation**	**Evaluate the potential of biomass (residues) for electricity production and analyse its impact on the WEFE**

OUTPUT - INDICATEURS	• recurrence of extreme events, related to precipitation and heat waves.
	• Return period for a given % precipitation excess;
	• Precipitation deficit for given return periods
	• yearly HWMI (Heat Wave Magnitude Index)
	• number of years within 1981 and 2017 with HWMI exceeding values of 4 (heat waves extreme or more severe)
	• User configurable SPI (Standard Precipitation Index) for different range of timescales and periods
		• Monthly and annual water availability at sub basin level
		• Water discharge along the river (daily/monthly/annual simulated data)
		• Reduction/increase of water availability across the river basin as affected by climate change, landuse change, crop management, water management
		• Water quality indicator related to soil and land management such as:
		• Nutrient (N and P) concentration, Sediment yields loss as erosion, Pesticieds
			• Annual crop productivity at 5' resolution scale
			• Crop specific Nutrients and fertilizer minimum requirement
			• Identification of limiting factors for crop growth
			• Reduction/increase of water and nutrient requirement as affected by climate change, landuse change, crop management, water management
			• Enviromental indicator (if relev.) such as optimal fertilization levels, Nitrate leaching in the rooting zone, nutrient losses to surface water runoff
				• annual and seasonal crop residues production
				• Bioenergy crop residue specific energy potential at regional level
				• Energy demand satisfaction capability by using bioenergy residues resources:
				  • Energy demand for irrigation (pumping and water movement)
				  • Households and farmers energy demands
				• To be included: Comparison with other renewable energy resources (PV and solar)

The e-NEXUS DSS Tool (2)

E-Nexus tool (MOO)

Modularity:
thematic models & MOO

2. **Optimization Module/s Objective**: identifying optimal solutions taking into account multi-objective optimisation - MOO

- **These optimisation modules are specifically developed according to local objectives, priorities and challenges of the WEFE**
- Modules requires specific: *i)* ***Setup***, *ii)* ***identification of objectives and constraints*** *for the optimization iii)* ***data for the area of interest*** *(Country, Subregion, Transboundary river basin, Continental scale)*

Module Optimization

SCOPE

a) **Evaluation of Bioenergy and WEFE NEXUS optimization of water and cropland.**

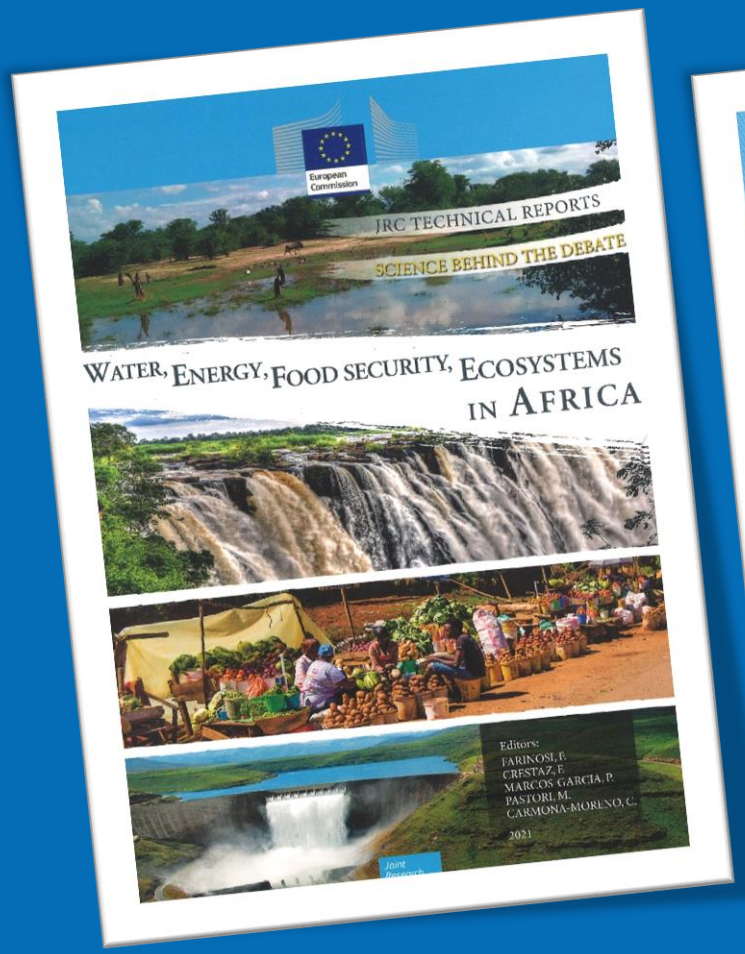
b) **Identification of optimal cropland allocation for food self-sufficiency**

c) **Assessing future development scenarios and the impact of additional water demands (irrigation, livestock, urban, industrial) on water availability.**

Conclusions

CONCLUSIONS

- Flexibility of approach: thematic models can be integrated for a thematic assessment;
- An ad hoc WEFE application can be developed by considering specific links between sectors according to identified priorities;
- The MOO methodology allows to provide answers and alternative solutions to policy makers by assessing long-term benefits with a long-term perspective on simulated indicators of crop productivity, energy production, water quality and quantity;
- A wide range of "optimal solutions" is proposed, allowing the final choice by decision-makers: these optimal solutions are of particular interest to feed the Policy Dialogue;
- MOO modules can benefit from other data and models providing results to integrate/complement/replace those already used by the system.



Thank you

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