Water-Energy-Food Nexus: an approach to advancing climate action in The Arab region

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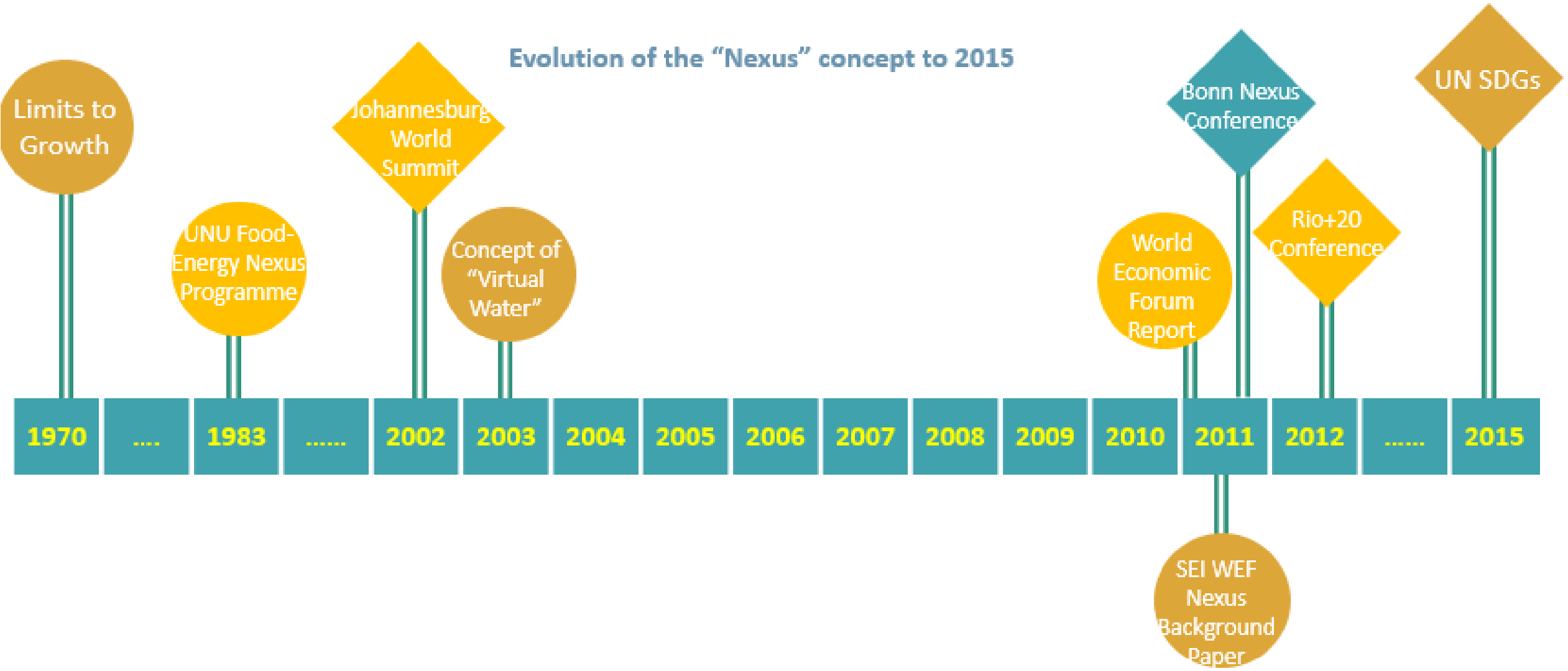
Outline

1. Nexus Definition
2. Mainstreaming WEF Nexus in the Arab region : Case studies
   a. Institutional framework conditions
   b. Tools for decision making
   c. Climate proofing
3. Concluding remarks


Evolution of the "Nexus" concept to 2015
Limits to Growth
UNU Food-Energy Nexus Programme
Johannesburg World Summit
Concept of "Virtual Water"
World Economic Forum Report
Bonn Nexus Conference
Rio+20 Conference
UN SDGs
SEI WEF Nexus Background Paper
1970
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1983
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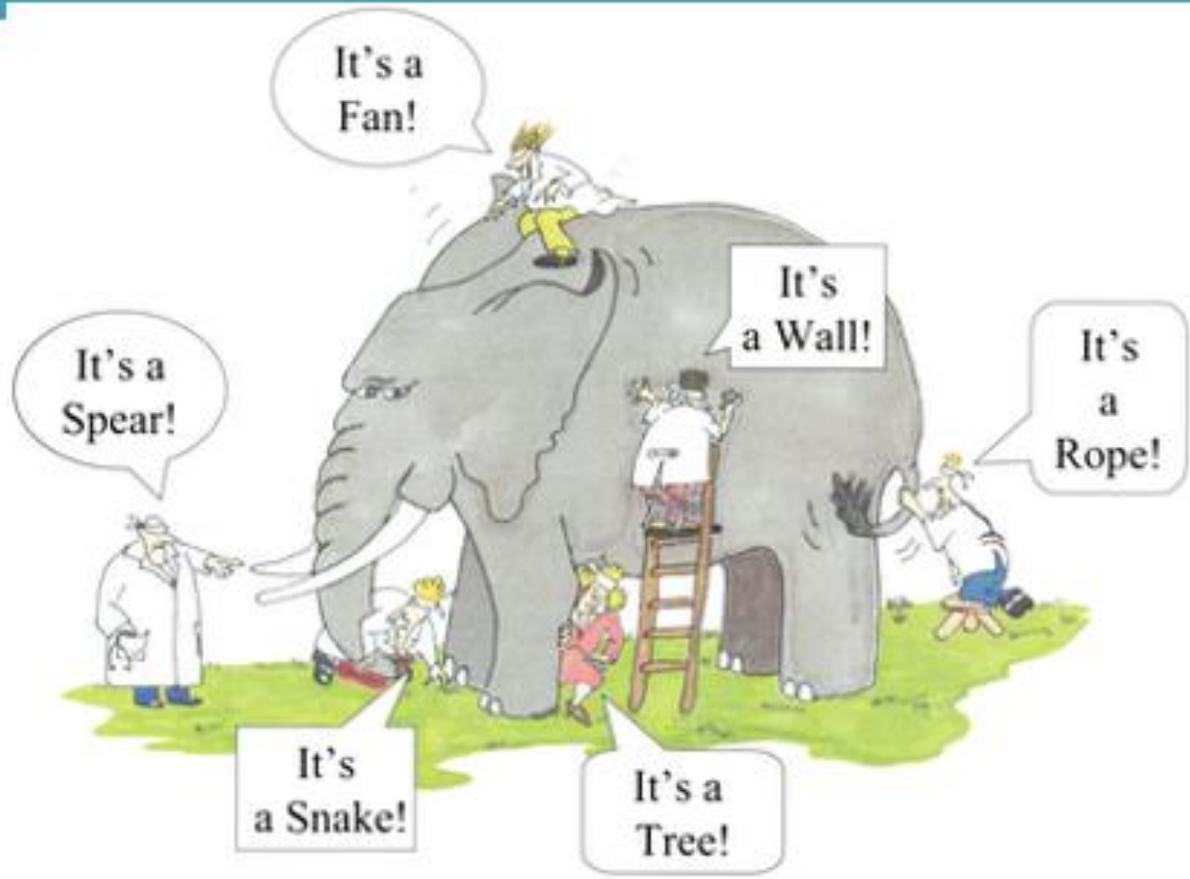
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
.....
2015

WEF Nexus is an application of a system approach to development complexity and uncertainty

Definition of System

A system is a set of interrelated **Elements** organized to serve a particular **Function** or to seek a particular **Goal**.

By fixating on the parts of a system, we miss understanding the whole

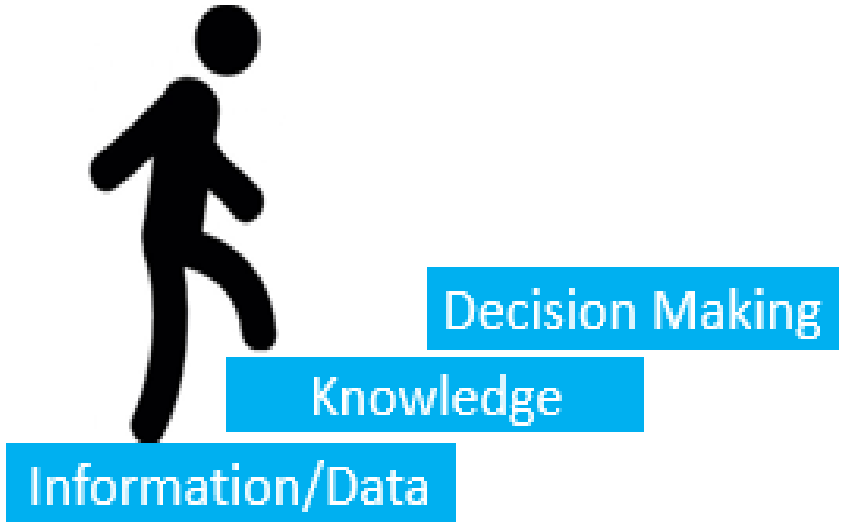


The nexus approach is a decision making framework which employs systems thinking to identify cross-sectorial impacts (externalities), explore feasible trade-offs and help policy makers achieve greater policy coherence.

Quantitative Nexus Assessment

Evaluation of scenarios

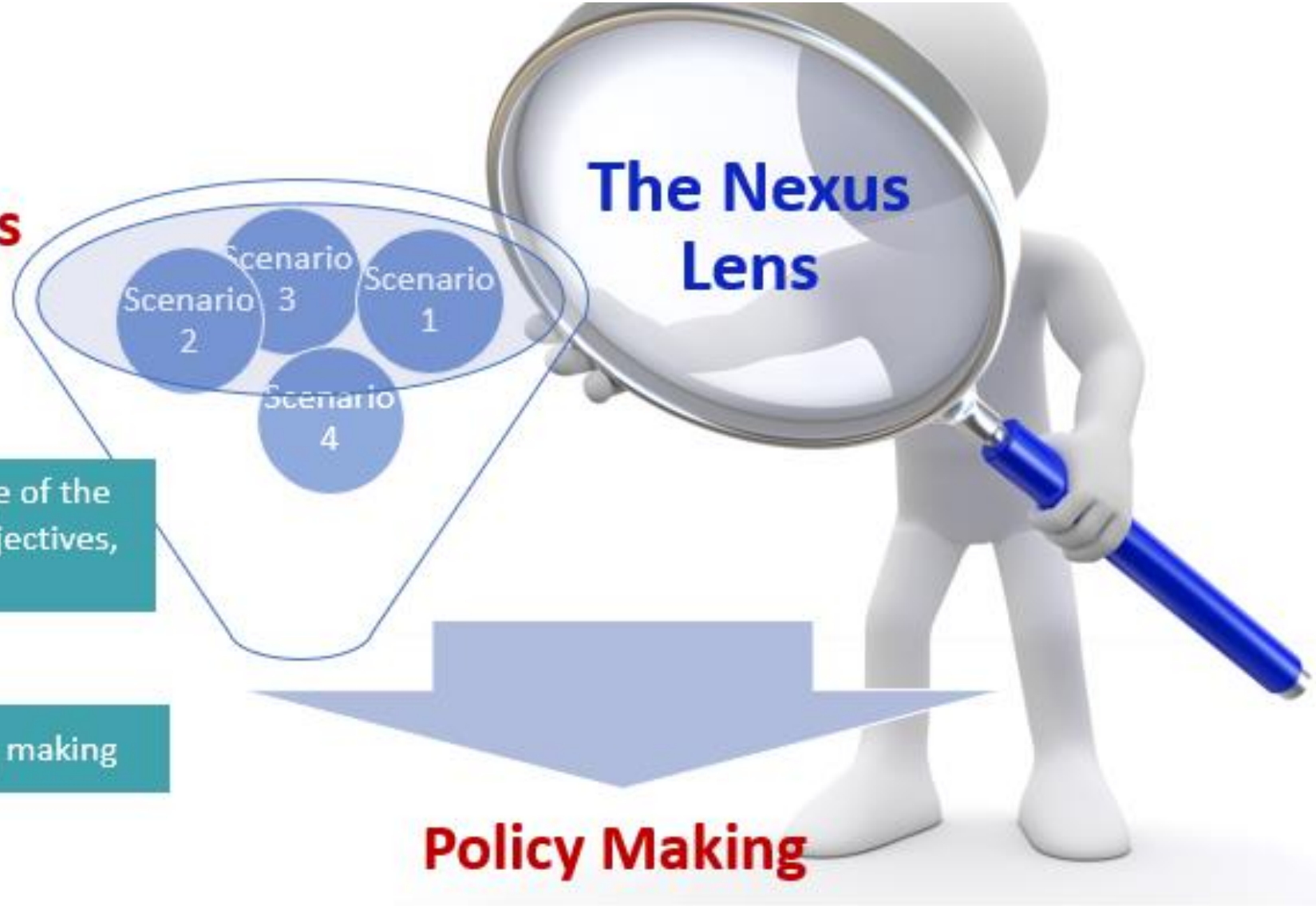
Comparison of scenarios



Pool of Solutions Across Sectors

Developing models requires knowledge of the system being modelled, the client's objectives, goals and information needs

Models produce information for policy making



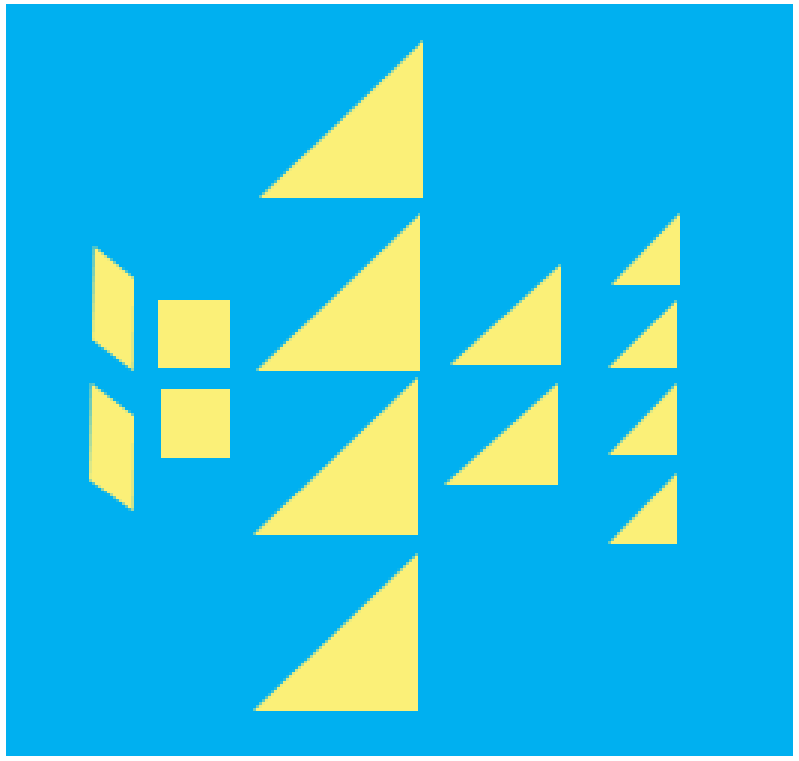
Integrated management approaches:

- Integrated Water Resources Management
- Integrated Energy Planning
- Integrated Land Use Assessment

Integration across sectors

Nexus Approach

Sectoral Data



Integrated information

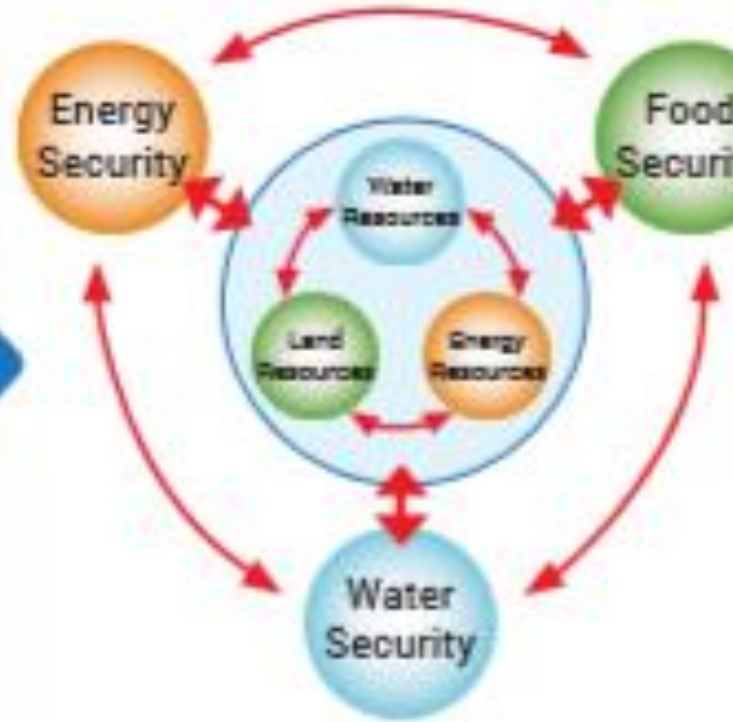
The WEF Security Nexus

Climate Change

Population Growth

Consumption Patterns

Economic Growth



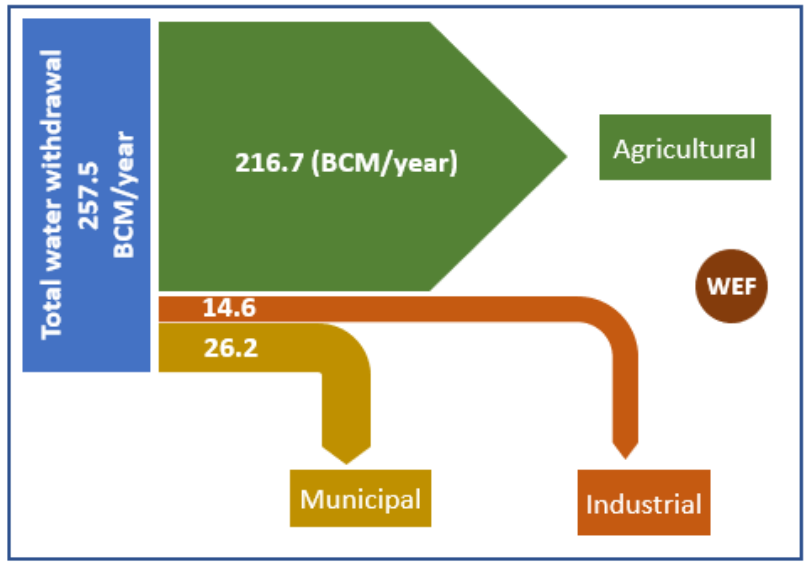
Interdependencies among resources, sectors and policy objectives

The nexus perspective considers three levels of interlinkages:

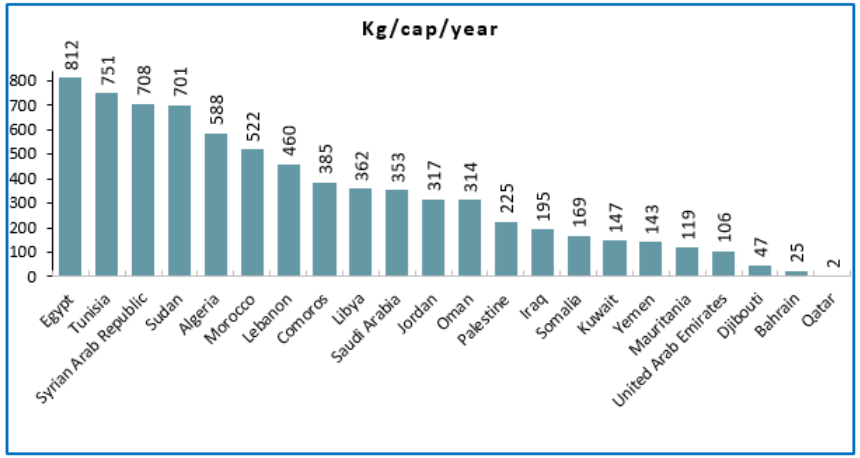
- water, land and energy resources as part of the ecosystem
- production of drinking water, energy and food depends on the same natural resources and ecosystem services
- each sector depends on services from the other sectors

Total water withdrawal by water use sectors in the Arab region (BCM/year)

- WE Water-Energy cross-issue
- WF Water-Food cross-issue
- EF Energy-Food cross-issue
- WEF Water-Energy-Food cross-issue
- N Not WEF cross-issue

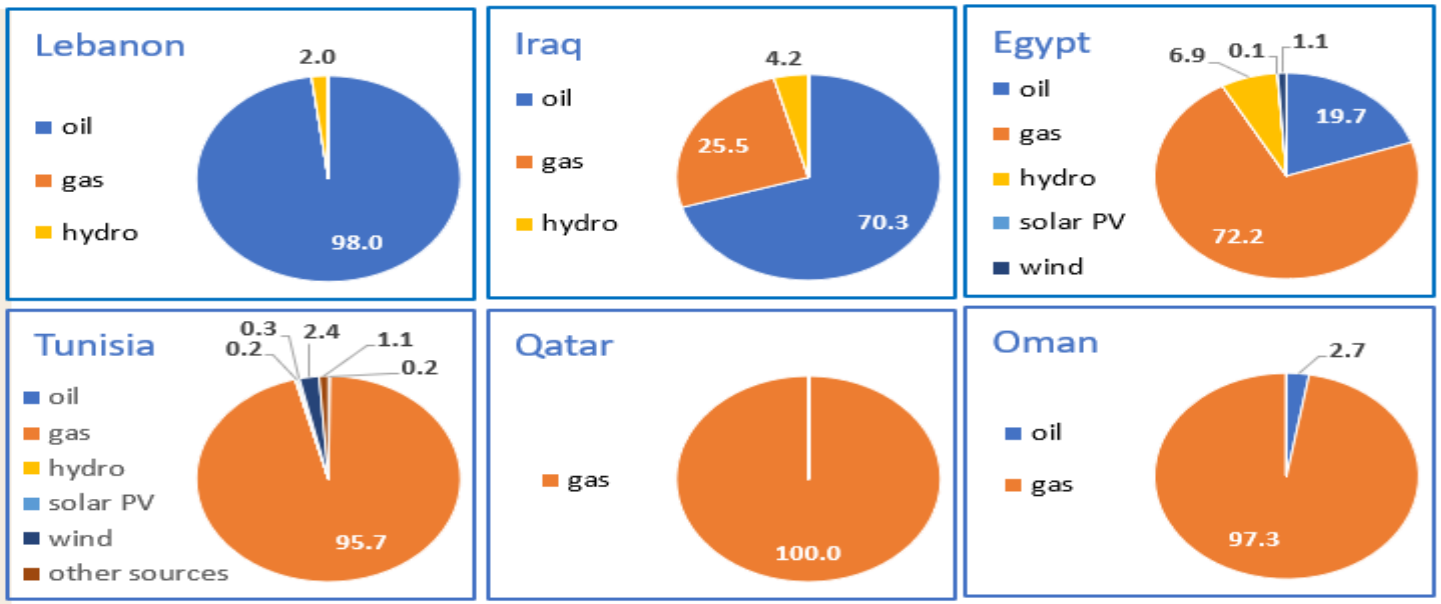


Crops production in 2016 (kg/cap/year)



Source: compiled by the author using FAO data base - FAOSTAT for 2016

Electricity production sources (%)



Understanding the Nexus and Associated Risks

Summary
Water security, energy security and food security are inextricably linked in the Arab region, perhaps more than in any other region in the world. Generally, the region is known to be energy intensive, water scarce, food deficient, and one of the world's most economically and environmentally vulnerable regions to climate change. This strong interdependency between water, energy, food and climate change in the Arab region calls for the nexus approach and thinking when addressing the management of these three vital sectors; an approach that integrates management and governance across sectors, and where conventional policy and decision-making in 'silos' gives way to an approach that reduces trade-offs and builds synergies across sectors especially in light of the global UN Sustainable Development Goals (SDGs) and the COP21 Paris climate change commitments in 2015. Fortunately, this has been recently well recognized in the Arab Strategic Framework for Sustainable Development (ASFSD), adopted by the League of Arab States in 2013, aiming at addressing the key challenges faced by the Arab States in achieving sustainable development during the period 2015-2030. This new development has created unprecedented opportunities for fundamental policy changes in various economic, institutional, technological, and social systems, as well as boosting resource efficiency and productivity by addressing externalities across sectors. This policy brief - a first in a series of six - aims at providing a better understanding of the interdependencies of water, energy and food and their related challenges in the Arab region. Bes
intended to shed light on the risks and impacts posed by one sector on the o
through articulating a framework for determining trade-offs and synergies th
demand on resources without compromising sustainability.

Recommendations
Policy makers in the Arab countries need to ensure the integration of the po
the Water Energy Food (WEF) nexus through a set of measures which include

Nexus Challenges and Opportunities

Summary
The interdependency among water, food, and energy in the Arab region is strongly and closely interlinked, probably more than any region in the world. To make enough food to support a growing population, more water and energy are needed; to make water accessible and clean for human consumption demands energy; and producing energy will require water. These interlinkages are intensifying in the region as demand for resources increases with population growth, changing consumption patterns, and low management efficiencies in both supply and demand in these three sectors, and are expected to be further compounded by the impacts of climate change; attempting to achieve the security in one of these sectors independently without addressing trade-offs with the other two sectors will endanger their sustainability and security. The Water Energy Food Nexus approach is an integrated, holistic and pragmatic approach to address the supply risks of water, energy and food simultaneously and keep the resource base sustainable. Each security of supply shall not be achieved on the cost of the other. This can be achieved by creating intelligent synergies and fair trade-offs between them. Adopting a water-energy-food nexus approach in the Arab countries would provide an opportunity for innovation and learning to minimizing security risks and maximizing opportunities and enhancing resource efficiency and equity. It will serve the Arab region in moving towards the achievement of the global sustainable development goals (SDGs) and meeting the mandate of a low carbon economy as stipulated in the 2015 Paris Climate Summit.

Recommendations
To achieve sustainable development goals and beyond, it is imperative that the Arab world

Nexus Governance and the Role of Institutions

Summary
Water, energy and food security are central to the sustainable future of the Arab world. Arab countries' devised policies to tackle this security nexus challenge will set the tone for the sustainable development of the region for the years to come. While more integrated planning and management of resources may require new technologies, it can only be delivered through the appropriate and relevant institutions. This brief presents an overview of the existing national and regional institutions that govern the element of water, energy, and food (WEF) at the national and regional levels in the Arab region. The institutional framework governing the elements of the WEF nexus in the region needs strengthening mechanisms for effective resource management. Some countries succeeded in presenting different models of "integrated institutions," but their comprehensive and inclusive management of these interlinked priorities still need support, especially that the various institutions governing these sectors are themselves fragmented because of the existence of multiple and overlapping jurisdictions. Coordination and collaboration mechanisms among and between institutions, therefore, is a vital factor to adopt an "integrated nexus approach" to resource management in a new era of diminishing resource base and escalating risks and threats that associate with climate change risks. This situation could be the driver for institutional reform and policy integration of the nexus in the region. Enabling existing institutions could be more important and appropriate than establishing new institutions to achieve the targets for both the Sustainable Development Goals (SDGs 2015-2030) and the mandates of the Paris COP21 climate change Summit in 2015.

Recommendations
Governance and institutional structures in the Arab region can be enhanced and strengthened for more effective and integrated resources management through:

- Analyze current national institutional arrangement for better understanding of the weaknesses and gaps that hinder implementing the WEF nexus approach in each Arab country.
- Empower and strengthen existing institutions already active in developing and implementing strategies/policies related to WEF sectors to develop a comprehensive WEF nexus national strategy; a key element of which is data homogenization and sharing.
- Enhance coordinating and collaborating mechanisms amongst institutions as a key for mainstreaming the WEF nexus approach at local, national and Arab regional levels, and not necessarily establishing new institutions for the WEF nexus.

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Implemented by

National report on mainstreaming the water-energy-food (WEF) security nexus into policies and institutions in Jordan

20 April 2017

Implemented by

National report on mainstreaming the water-energy-food (WEF) security nexus into policies and institutions in Egypt

03 March 2017

Implemented by

Monitoring & Evaluation and Dissemination Plan for the Project and Beyond the Project's lifetime

August 2017

Case study Morocco: Opportunities for nexus mainstreaming at national

Final Report

Mainstreaming the Water-Energy-Food Security Nexus into Sectoral Policies and Institutions in the Arab Region

The core objective

- To identify entry points, processes and partners for WEF nexus mainstreaming in the MENA region and value-adding to regional and national policies and institutions there while contributing to integrated SDG implementation and climate change adaptation and mitigation. Using a cross-sectoral (horizontally integrated) and multi-level (vertically integrated) approach the study worked at the regional and national levels.

At national level

- Three pilot countries were selected, namely Egypt, Morocco and Jordan.

- In close cooperation with various sectoral and cross-sectoral institutions, the study developed a network of partners, a Nexus Evidence Base and National and Regional Guidelines for nexus mainstreaming in policies and institutions.

Identification of Institutional and Governance Structures at the Regional and National Levels, with the Focus on Cross-Sectoral ("Bridging") Institution

- The identified institutional reform options for the League of Arab States include:

1. **Closer Cooperation of technical Secretariats** - secretariats nominate focal points for temporary joint body - member states second national WEF experts - joint vision / strategy by three thematic secretariats based on decisions by ministerial councils or ECOSOC

2**. Joint Work Program by Executive Bureaus on WEF Nexus** - agenda setting power (reporting to the secretary general) - monitoring & reviewing of member-state activities - member-state reports fed into economic outlook (quantifying WEF Nexus)

3. **Lead by Department for Sustainable Development** - Arab mechanisms for sustainable development mandated by summit - link to the 2030 Agenda - coordinates Arab regional report to High Level Political Forum (2018) - coordinates with national sustainable development focal points and reports to the secretary general.

Potential scenarios

Development of Guidelines for Policy Integration at the National Level

- Summary of the situation in Egypt and Jordan in terms of water, energy, and land resources, as well as their related human securities, their critical interlinkages, tradeoffs and synergies as identified in the Nexus Evidence Base

- Map of key institutions and policies and identification of entry points (processes and partners) for increased coordination and cooperation of national (sectoral) institutions in order to achieve nexus synergies and minimize trade-offs.

- Recommendations for nexus mainstreaming, capacity building and data harmonization.

Institutional Assessment Report and Capacity-Needs Assessment in Pilot Countries (Methodology)

- **A "Guidance Note", "Guiding Questions and Reporting Template" as well as a "National Capacity Assessment Questionnaire"** were developed and shared with all project partners, to ensure a common approach for the institutional and capacity-needs assessment in all three pilot countries.

- **National Consultation Workshops** were organized as a key part of the national dialogues in Jordan (November 2016) and Egypt (December 2016). In Morocco, consultations were held as side events to i) the MedCop in Tanger in July 2016, ii) COP 22 in Marrakesh in November 2016 and iii) the GIZ / 4C capacity building workshop in Rabat in March 2017.

- **The results of the workshops and consultations were used for further validation and mainstreaming throughout the remainder of the study**. - National debriefings to present the results and discuss the implications of their implementation took place with relevant stakeholders on 24th May 2017 in Amman and on 2nd and 6th July 2017 in Cairo

Overview of the policy framework related to the WEF Nexus in Jordan

Topic	Main Regulatory Frameworks, Strategies, Policies, Action Plans that Govern the Topic	Ministryr Agencies having Main Responsibility for the Topic at National Level	Other Organizations with Major Role in Shaping Policies in this Sector
Water Resources Development, Management and Use	• National Water Strategy (2016-2025) • Groundwater Management Policy (1998) • Water Utility Policy (1998) • Irrigation Water Policy (1995) • Wastewater Management Policy (1995). • Water Sector Capital Investment Program (2016-2025). • Water Demand Management Policy. • Energy Efficiency and Renewable Energy in the water sector Policy. • Water Substitution and Re-Use Policy. • Water Reallocation Policy. • Surface Water Utilization Policy. • Groundwater Sustainability Policy. • Climate Change Policy for a Resilient Water Sector. • Decentralized Wastewater Management Policy. • Action Plan to Reduce Water Sector Losses (Structural Benchmark).	• The Ministry of Water and Irrigation (MWI) • The Water Authority of Jordan (WAJ) • The Jordan Valley Authority (JVA) • The Ministry of Agriculture (MOA) • Ministry of Environment (MOENV) • Ministry of Health (MOH) • Ministry of Planning • Royal Scientific Society, Environmental Research Center • Water and Environment Research & Study Center, University of Jordan	• Jordan Environment Society (JES) • Royal Society for the Conservation of Nature (RSCN) • Badia Research and Developmental Center (BDRC)
Energy Production and Distribution, Energy Security	• Updated Master Strategy of Energy Sector in Jordan for the Period 2007-2020.%Ministry of Energy and Mineral Resources, 2007. • Renewable Energy & Efficiency Law Number 13.⁴ International Energy Agency, 2013. • Renewable Energy Country Profile: Regional Center for Renewable Energy and Energy Efficiency, 2012. • Nuclear Strategy: Jordan Atomic Energy Commission, 2011. • Nuclear Power in Jordan: World Nuclear Association, 2015. • Energy Efficiency and Renewable Energy Policy, MWI, 2016 • The National Energy Strategy 2007-2020 • The Renewable Energy and Energy Efficiency Law (REEL)	• Ministry of Planning (MOPIC) • Department of Statistics • Ministry of Energy and Mineral Resources • Natural Resource Authority • Ministry of Information and Communications Technology • Electricity Distribution Company (EDCO) • Energy and Minerals Regulatory Commission • National Electricity Company (NEPCO) • National Information Technology Center (NITC)	• Royal Scientific Society (RSS)
Agriculture, Land Use and Food Security	• The State of Food Security in Jordan: 2013–2014 (DOS), 2016 • Assessment of the Risks from Climate Change and Water Scarcity on Food Productivity (FAO), 2010. • Water Use Efficiency in Agriculture: Jordan Experience; National Center for Agricultural Research and Extension (NCARE): Baqa'a, Jordan, 2004. • Food Balance Sheet of 2008; DOS, 2008. • FAO Achievements in Jordan, 2011 • Assessment of the Agricultural Sector in Jordan, 2012	• The Ministry of Water and Irrigation (MWI) • The Water Authority of Jordan (WAJ) • The Jordan Valley Authority (JVA) • The Ministry of Agriculture (MOA) • Ministry of Agriculture - The Agricultural Credit Corporation: • Ministry of Agriculture - National Center for Agricultural Research and Extension	• Jordan Farmers Union • Cattle Associations • Jordan Poultry Production Association (JPPA) • Food and Drug Organization • Jordan Standards &

	• Food and Nutrition Security in Jordan Government of Jordan and UNDP, (2010). • Food Security Strategy (DOS), 2013 • Jordan response Plan for the Syria Crisis (Government of Jordan),2015 • Improving Food Security in Arab Countries (World Bank), 2009 • Land degradation Drought and Desertification - National Center for Agricultural Research (NCARE) - Ministry of Agriculture, 2007 • Review of knowledge resources (International Center for Agricultural Research in the Dry Areas), 2012 • Jordan, Food Security and Safety (FAO), 2012	• Ministry of Environment (MOENV) • Ministry of Planning (MOPIC) • Department of Statistics • Ministry of Information and Communications Technology • Ministry of Municipal Affairs • The Higher Council for Science and Technology (HCST) • Water and Environment Research & Study Center, University of Jordan	Metrology Organization • Poultry Farms and factories • Sheep, Goats, and Cattle Farms and Factories
Protection of the Environment	• Regional Master plans (Amman, Russeifah, Balqa, Petra) • Protected Areas policy • Jordan's First National Communication to the UNFCCC; GCEP (MoEnv), 1999 • Jordan's Second National Communication to the UNFCCC (MoEnv), 2009. • National Action Plan and Strategy to Combat Desertification (MoEnv), 2006 • Jordan's Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC)(MoEnv), 2009	• The Ministry of Water and Irrigation (MWI) • The Ministry of Agriculture (MOA) • Ministry of Environment (MOENV) • Ministry of Health (MOH) • Ministry of Planning (MOPIC) • Department of Statistics • Ministry of Energy and Mineral Resources • Natural Resource Authority • Ministry of Municipal Affairs • The Higher Council for Science and Technology (HCST)	• Royal Scientific Society (RSS) • University of Jordan • Jordan Environment Society (JES) • Royal Society for the Conservation of Nature (RSCN) • Badia Research and Developmental Center (BDRC)

Sustainable Development (including SDGs Greenhouse Gas Mitigation and Adaptation to Climate Change)	• Establishing the Post-2015 Development Agenda: Sustainable Development Goals (SDG) towards Water Security • Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication (UNEP), 2011 • The Jordanian Perspective (MWI, 2014) • National Resilience Plan 2014-2016 (MOPIC), 2014 • Integrated Investment Framework for Sustainable Land Management in Jordan • Integrated Investment Framework for Sustainable Land Management, (Government of Jordan), 2015 • The Executive Development Plan: 2011 – 2013 (Government of Jordan), 2011 • Second Millennium Development Goals Report in Jordan (MOPIC), 2010 • Jordan's Executive Development Program 2011-2013 (MOPIC), 2010 • Enabling the Rural Poor to Overcome Poverty in Jordan (IFAD), 2007 • Jordan Poverty Update. DOS. (2009). • Poverty Status in Jordan. DOS. (2010).	• Ministry of Environment (MOENV) • The Ministry of Agriculture (MOA) • Ministry of Health (MOH) • Ministry of Planning (MOPIC) • Department of Statistics • Ministry of Energy and Mineral Resources • Ministry of Municipal Affairs • National Information Technology Center (NITC) • The Higher Council for Science and Technology (HCST) • Water and Environment Research & Study Center, University of Jordan • Natural Resource Authority	• **Jordan Environment Society (JES)** • **Royal Society for the Conservation of Nature (RSCN)** • **Badia Research and Developmental Center (BDRC)** • **Royal Scientific Society (RSS)**

Policy/plan	Lead institution
The National Water Strategy 2016-2025 and the related Water Sector Policies	Ministry of Water and Irrigation
The National Energy Strategy 2007-2020	Ministry of Energy and Natural resources
The National Strategy for Agricultural Development 2016-2025	Ministry of Agriculture
Pathways towards a Green Economy (2011) and the National Framework for Green Economy (in final stage of endorsement)	Ministry of Environment
Sustainable Consumption and Production Action Plan in the agricultural sector and food production (2016)	Ministry of Environment
Intended Nationally Determined Contribution (INDC) of Jordan in 2016	Ministry of Environment

Interlinkages	Related institutions

Water and energy demands for meeting the Plan Maroc Vert	• Ministry of Agriculture, Rural development fishing, water and forests
	  ○ L'ADA, ORMVA, Rural Development, etc..
	• Secretariat of State in charge of water: responsible for water resources and sector (under Ministry of Equipment logistics and Water)
	  ○ ABH
	• ONEE, National Office of Electricity (Power generation/transport)

Water demand for renewables	• Ministry of Energy, Mining, and Sustainable Development • MASEN • Secretariat of State in charge of water: responsible for water resources and sector (under Ministry of Equipment logistics and Water) ○ ABH • ONEE (Water)
Energy recovery from wastewater	• Secretariat of State in charge of water • ONEE DGCL: DEA & DRSC (Ministry of Interior) : National Sanitation Plan • Secretariat of State in charge of Sustainable development (under Ministry of Energy, Mining, and Sustainable Development) • Ministry Of agriculture

What is climate proofing?

“The incorporation of climate change issues into planning procedures at national, sectoral, and project level in order to increase resilience to climate change impacts.”

→ allows measures to be analysed with regard to the current and future challenges and opportunities presented by climate change

→ applied in the planning phase or during revision of plans

→ proper implementation makes a given plan or investment more “climate-proof ”

- Approach of climate proofing of investments has rapidly gained momentum over the past 10 years

- Countries and regions around the world have begun creating guidelines for including climate change into investment decisions

- Some countries are beginning to make climate proofing mandatory, i.e. through existing regulatory frameworks such as SEA and EIA or stand-alone climate checks

Impacts of climate change on investments

- **Some climate change impacts on various dimensions of a project** (operational, financial, environmental and social performance, market conditions):
  - Deteriorating assets and reduced design life, risk of damage
  - Increasing operational costs and need for additional capital investment
  - Loss of income
  - Reputation damage at several levels
  - Changing market demand for goods and services
  - Increasing insurance costs or lack of insurance availability

Manual

CLIMATE PROOFING TOOL

July 2010

gtz Climate Protection Programme

On behalf of
Federal Ministry
for Economic Cooperation
and Development

Concluding remarks (1)

- At regional level, LAS plays a key role in advocating WEF nexus to the LAS member countries.

- Given the scepticism of many individuals and institutions about the need for a nexus approach, the way forward is to start from those national and regional institutions which are interested and are willing to change their practices accordingly. These “champions” can lead the way and take the process forward.

- Political will, political commitment and good governance, as well as closure of the huge implementation gap from which the region currently suffers, are necessary prerequisites for successful implementation of a nexus approach.

Concluding remarks (2)

- At the national level, there is a need to follow up with individual, institutional and systemic capacity development, in order to enable a nexus approach.

- Unless the nexus approach is integrated in the planning and implementation of new projects, including megaprojects, these may not appropriately address the enormous challenges of the region and may in fact obstruct the required sustainability transition.

- Water and water institutions provide a useful entry point for nexus mainstreaming in the MENA region, given the pressing scarcity and its essential role in providing food and generating energy. However it turned out to be counter-productive to make the water ministries exclusively responsible for the process, as this diminished the motivation of other sectors to engage in the dialogue.

Concluding remarks (3)

- Data availability, complementarity and consistency across the different sectors is a critical issue for nexus planning and implementation. There are significant gaps either because data has not been collected or because collected data has not been released.

- Within the scope of this study it was not possible to address the economic and financial costs and benefits of nexus vs. sectoral approaches. It will be critically important to generate such additional information for bringing critical partners for nexus mainstreaming on board.