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Water–Energy–Food (WEF) Nexus Tool 2.0

Guiding Integrative Resource Planning and Decision Making

(B.T. Daher & R.H. Mohtar, 2015)

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Gap?

Decision makers do not have access to comprehensive tools that:

1. Are inclusive and multi-scale

2. Define and quantify interconnectivity between water, energy, and food

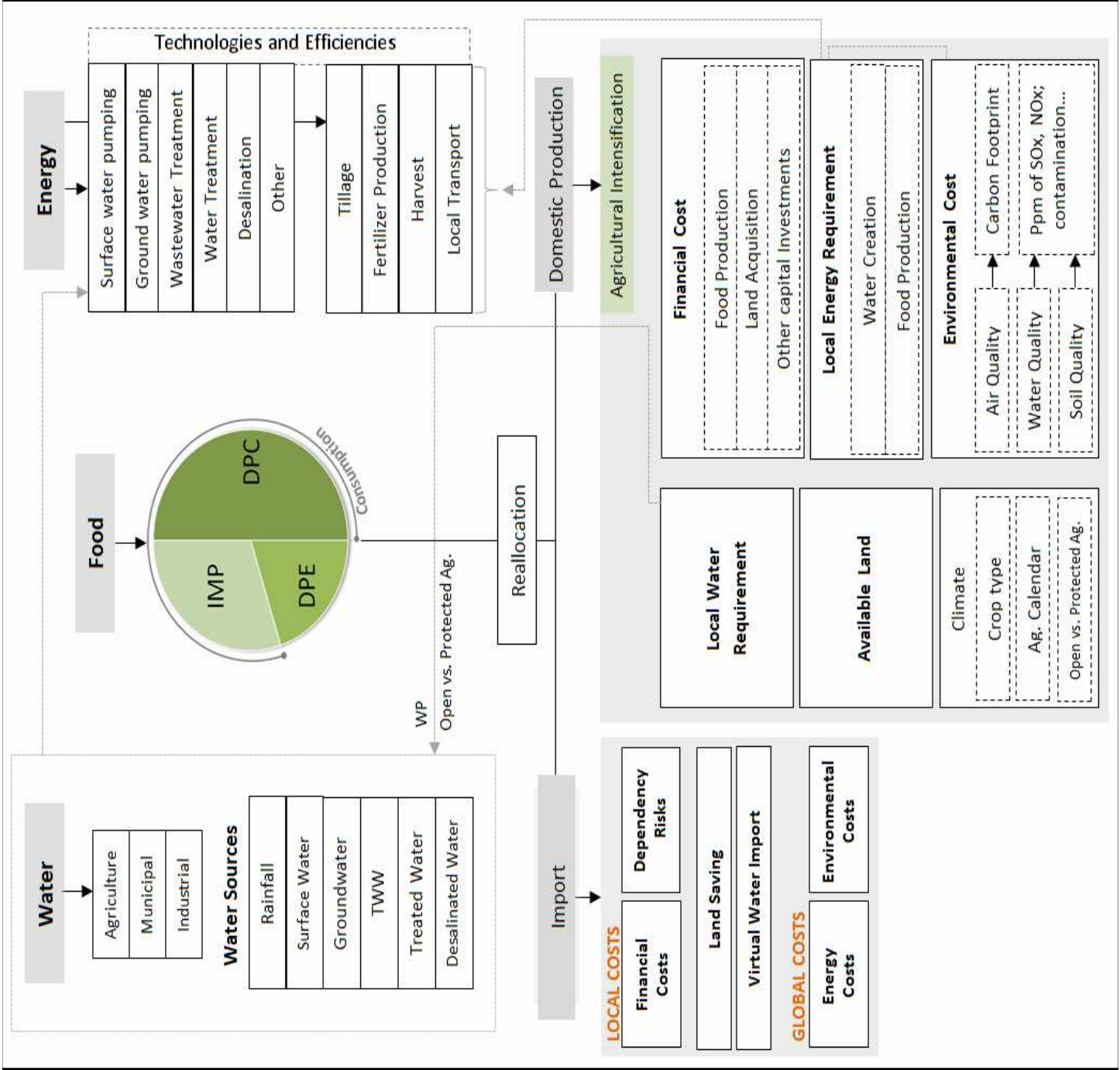
3. Support development of an **integrative strategy for holistic management** and planning for the future of these resources

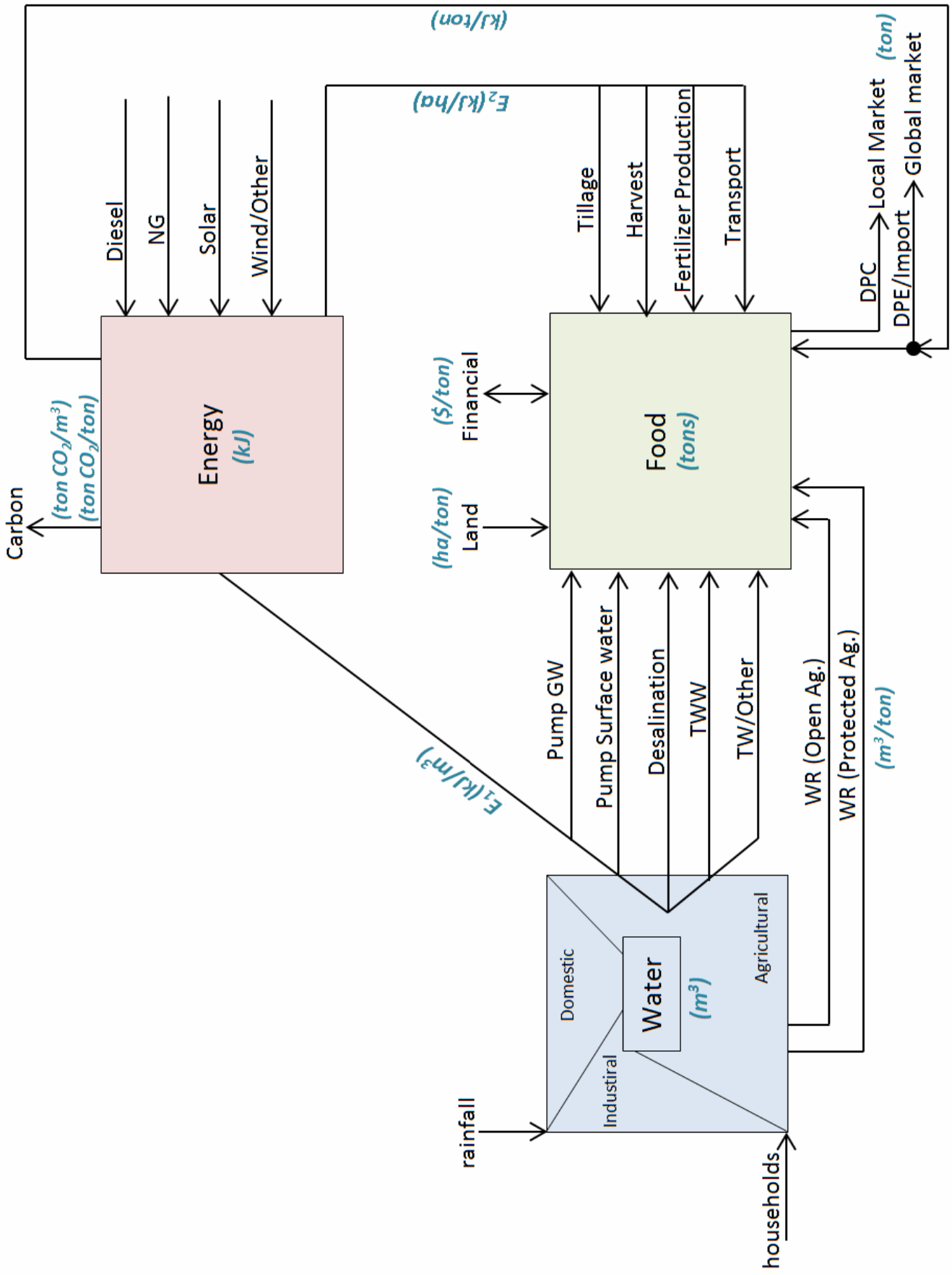




Objectives

- **Present** a **scenario-based framework** that offers an **explicit quantification** of the existent **interlinkages** between water, energy, and food systems.
- **Present** and **evaluate** assessment tool corresponding to developed framework.
- **Demonstrate the tool's utility** in supporting decision making in **food security** case study in **Qatar**.





WEF NEXUS TOOL 2.0

wefnexustool.org



The Resource Management Strategy Guiding Tool

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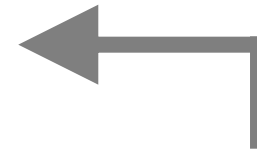
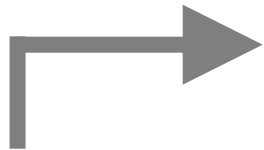
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The Resource Management Strategy Guiding Tool



ADMIN interface

Local Characteristic Data

- Local Yields
- Water Requirements
- Energy Requirements
- Land Availability
- Import Data
- Other

Science

USER interface

Scenario Components

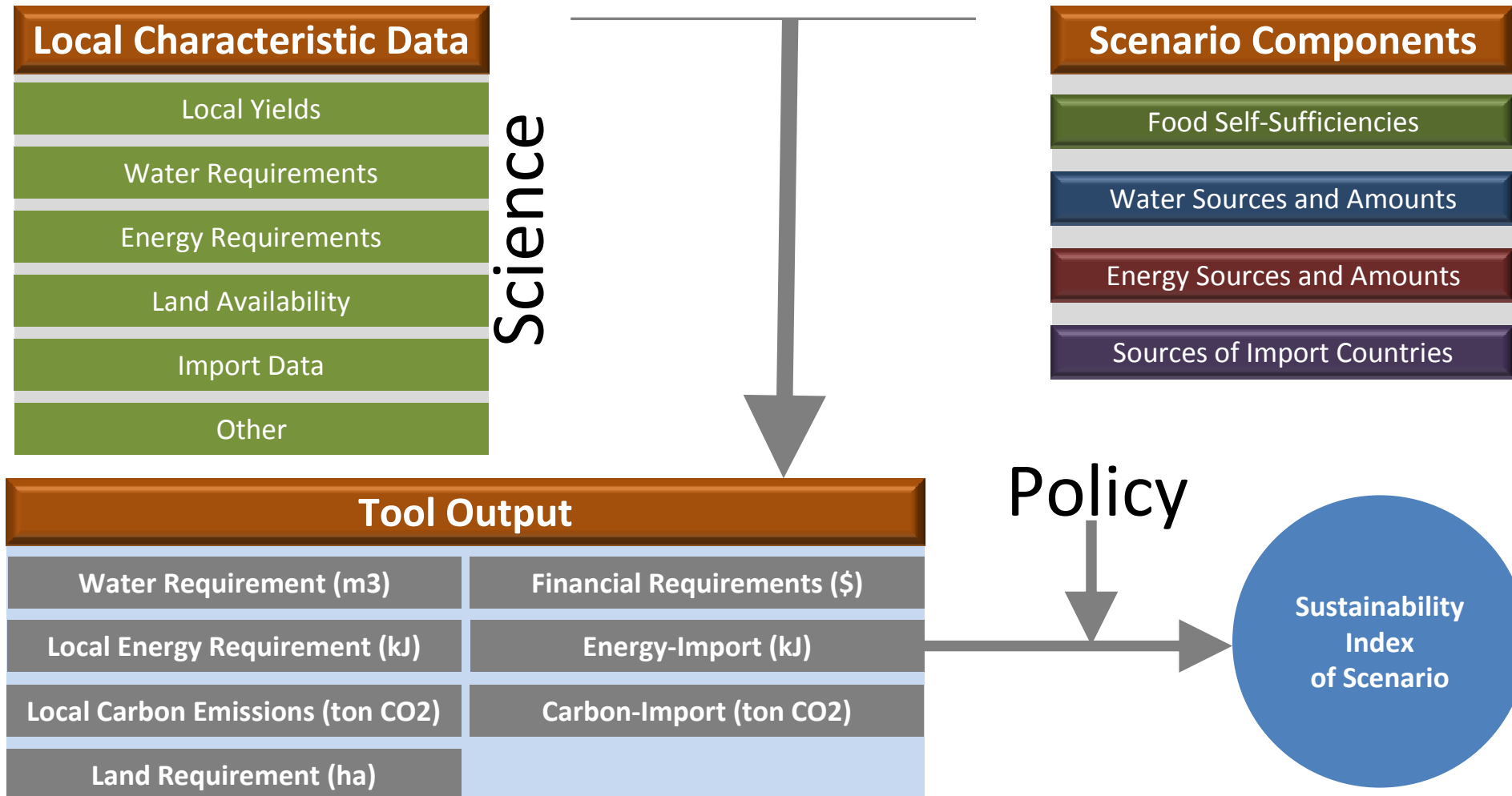
- Food Self-Sufficiencies
- Water Sources and Amounts
- Energy Sources and Amounts
- Sources of Import Countries

Tool Output

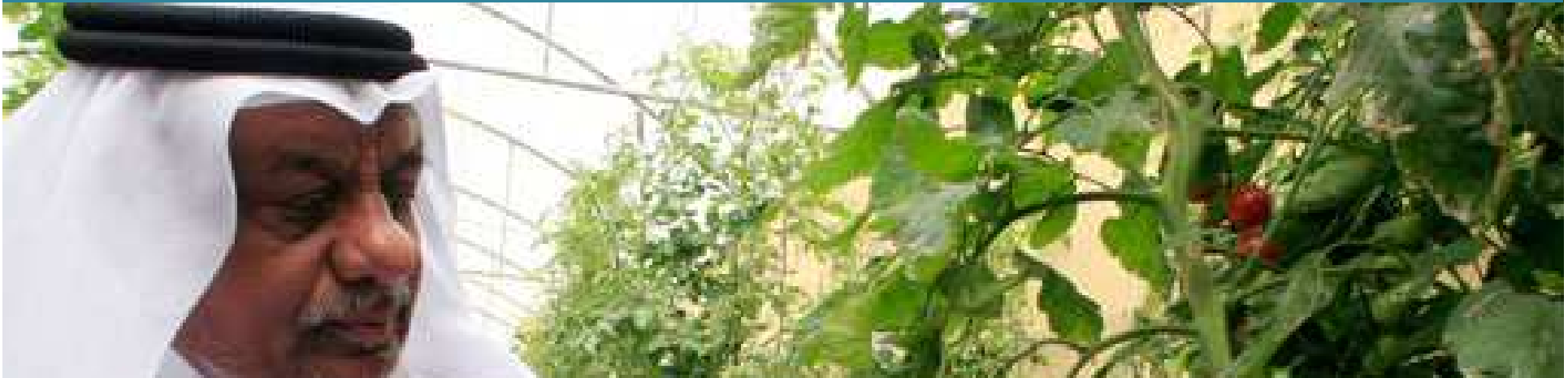
Water Requirement (m3)	Financial Requirements (\$)
Local Energy Requirement (kJ)	Energy-Import (kJ)
Local Carbon Emissions (ton CO2)	Carbon-Import (ton CO2)
Land Requirement (ha)	

Policy

Sustainability Index of Scenario



Case Study: Qatar Food Security



- Ranks 3rd in NG reserves; Ranks 12th in Oil reserves
- Arid Climate
- **Water:** 99% Desalination
- **Agriculture:** limited by low water quantity and quality, unsuitable soil, climatic conditions → low crop yields
- Food imports exceed **90%**
- Qatar National Vision 2030
- Qatar National Food Security Program (QNFSP)

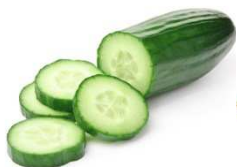
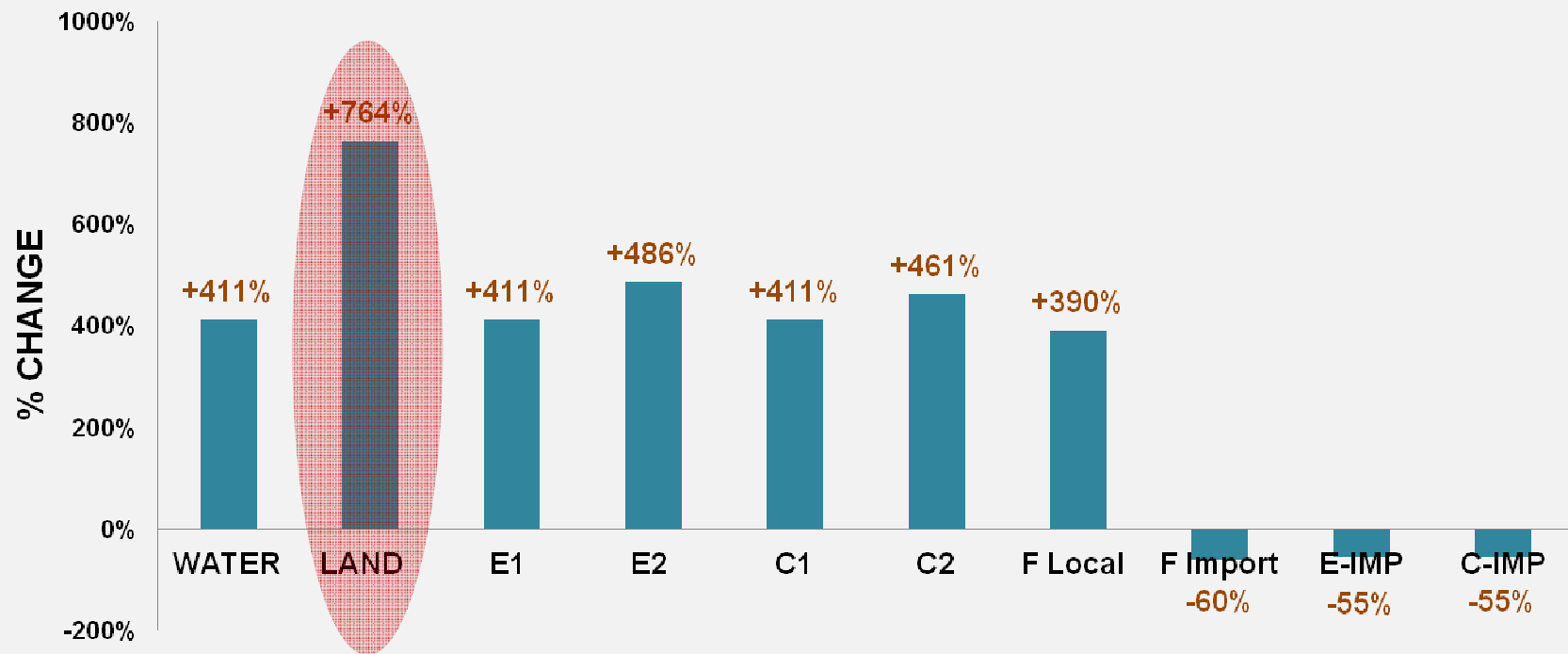


(Source: Athaia, 2011)

Discussions

Hypothetical Scenario

Percentage change for resources as a result of 50% increase in self-sufficiency per product





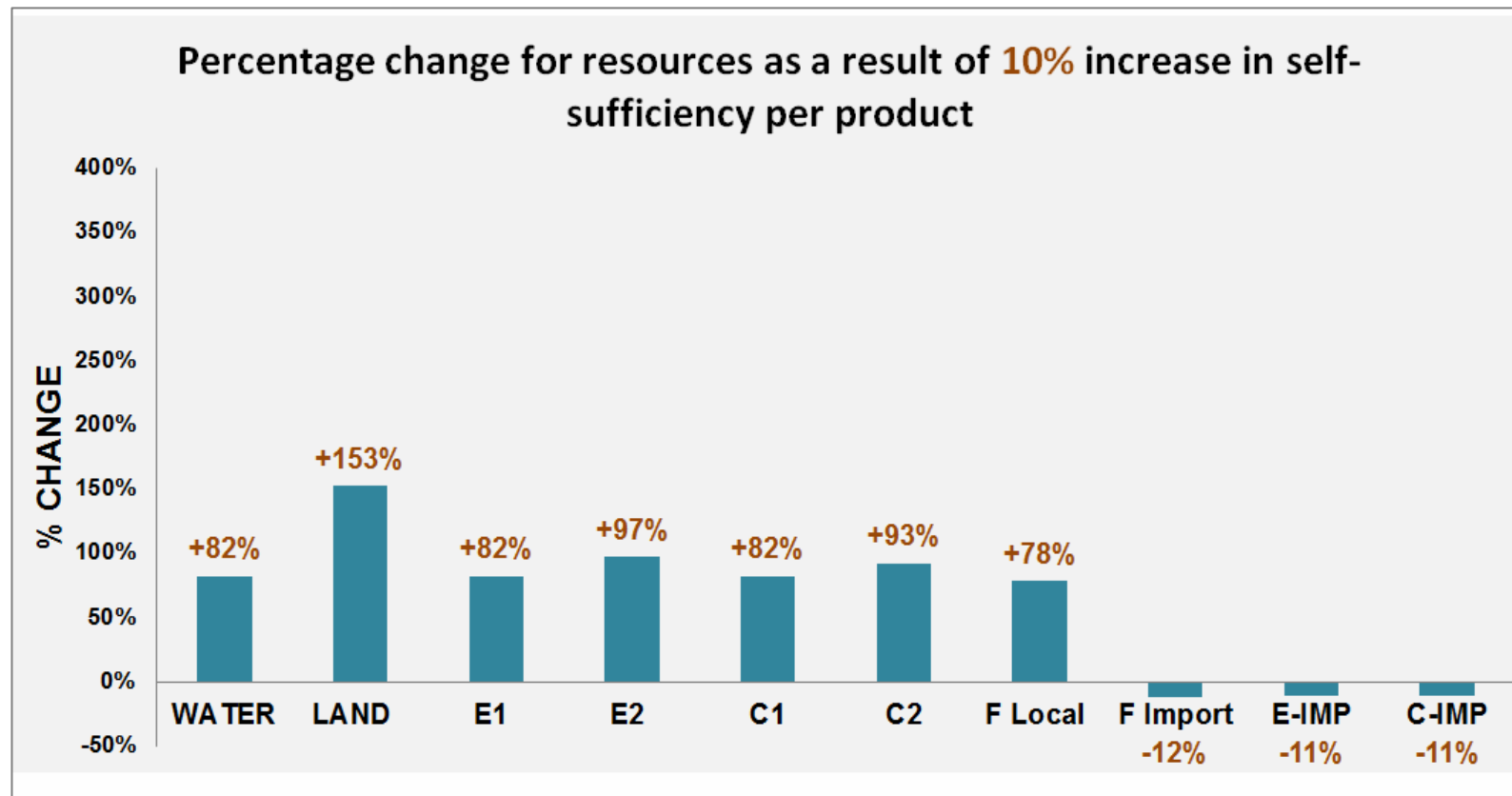
Discussions

Based on preliminary projections of the study sample in Qatar:

- **Land** is the most sensitive resource requirement
 - invest in research and consolidate efforts towards improving local yields
 - detailed soil suitability mapping for potential food products
 - investigate different food growing technologies
- **Food production energy and carbon footprint (E_2 , C_2)**
 - invest in less carbon emitting machinery
 - control over energy consumption during the food growing phases
- **Water, Energy for water, and respective carbon footprint (W , E_1 , C_1)**
 - Relying on groundwater for irrigation is catastrophic/use other sources
 - less water demanding technologies/ new irrigation techniques
 - invest in less energy demanding technologies
 - explore potential of renewables to fuel these water sufficing technologies

Discussions

- Most **sensitive** does not mean most **critical**!





Remarks

- **Research Limitations:**

- data unavailability
- absence of locally measured data
- confidentiality of present data

- **Potential improvements** to tool:

- water quality & water degradation
- soil quality & soil degradation
- improve financial assessment
- quantify risk for scenarios
- projection models



Conclusions

- **NO** one-size-fits-all tool
- **Need to identify the critical question** and prescribe proper tool
- Different tools answer **different questions** at **different scales**, requiring **different data resolution**, involving **different stakeholders**
- Choice of tool will depends on the **output** needed and **resources** and **time** available



Thank You