# INTRODUCTION TO SYSTEMS ANALYSIS

**Judith Blaauw[1] and Alyssa Offutt[2]**

[1]Deltares and [2]IHE Delft Institute for Water Education

**Excerpts from slides prepared for Water, Peace and Security tailor-made capacity development activities in Iraq. Please attribute authors when using materials.**

# The importance of understanding a system

A system is a set of components working together as part of an interconnected mechanism or network. https://www.youtube.com/watch?v=17BP9n6g1F0

There are all kinds of systems:

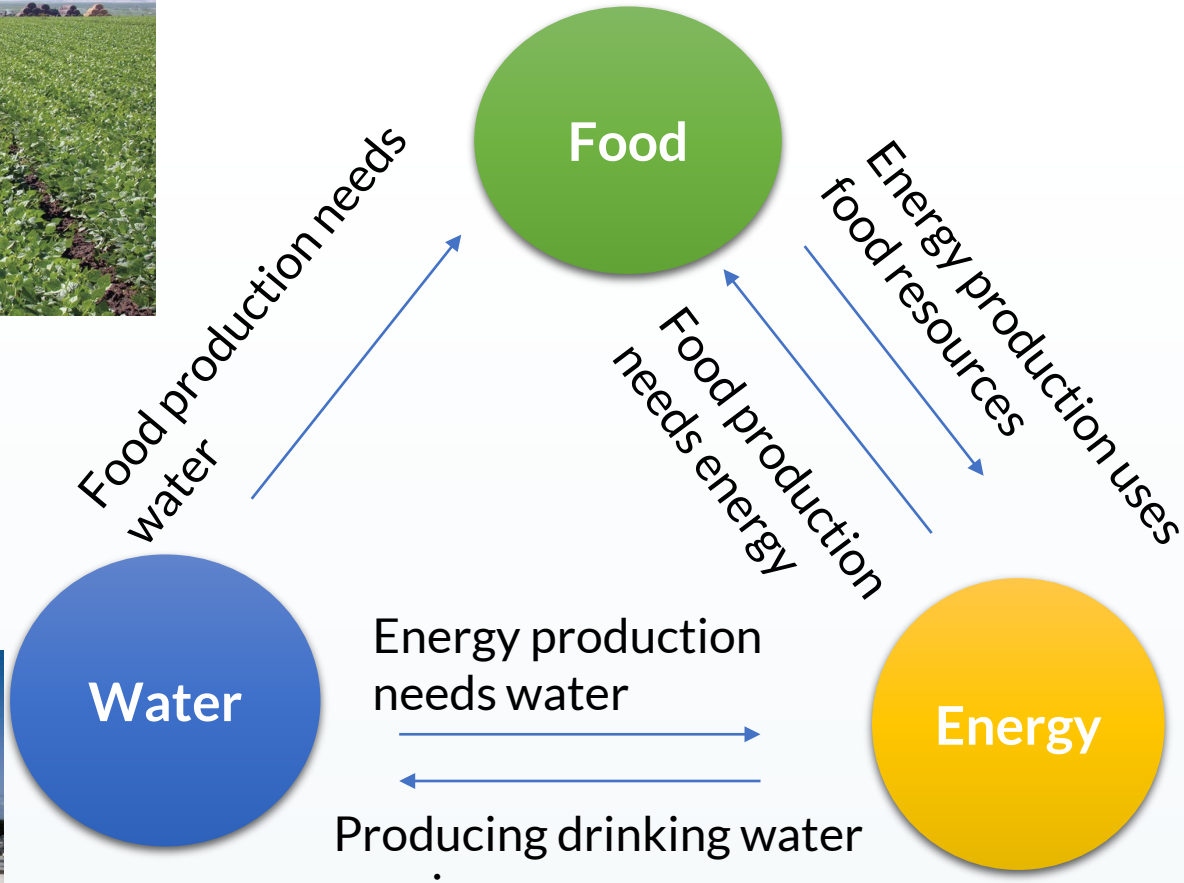
- The human body
- The ecosystem of the Marches
- The system of the Tigris-Euphrates river basin

# The importance of understanding a system

- When the interdependence of the elements of a system is not understood, the solutions are likely to create even more problems.

- Even simple questions sometimes require complex thinking to find effective solutions.

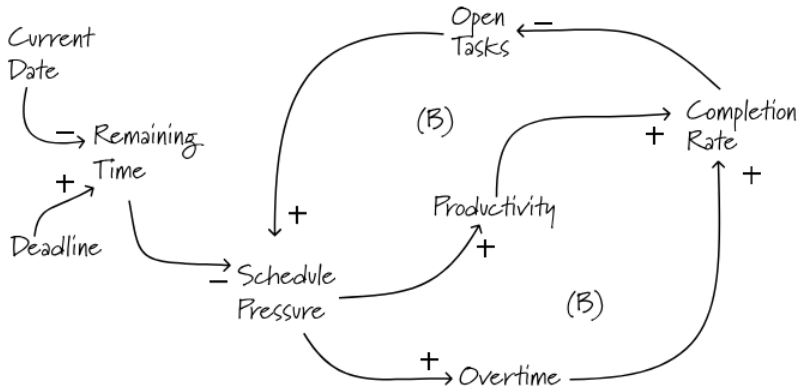
# The water, energy, food nexus



# The water, energy, food nexus

- A change in the system (e.g. in a catchment area) can lead to another change (e.g. in water distribution).
- This often means that there are 'winning' stakeholders and 'losing' stakeholders.
- The system must therefore be balanced, and actions must be geared towards balancing the system. A distribution perceived as unfair could aggravate social tensions.
- Systems analysis can therefore help to understand the system in order to balance the interests of the various stakeholders and select the most effective actions.

# System analysis




System analysis suggests

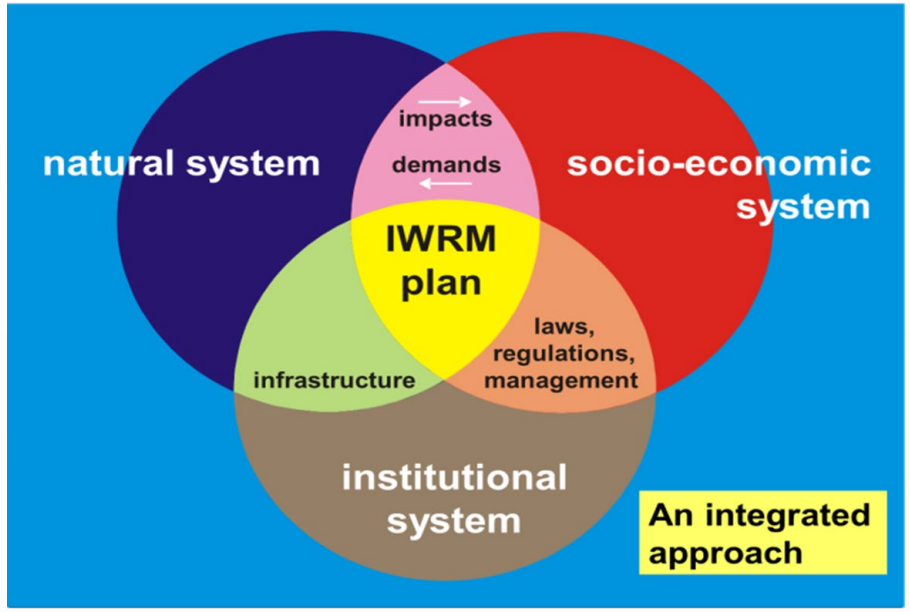
- taking a global view of the system on which we wish to intervene
- as well as taking into account the interdependence of the system's components (=the different species, flora, fauna, inhabitants, etc.) rather than simply addressing one component of the system.

Systems analysis provides an analysis of how changes in one factor in a system propagate through the system and produce results for society.

It enables complexity to be mastered without oversimplifying reality.

It enables the development of models that provide a communicable representation of complexity.

# The water system



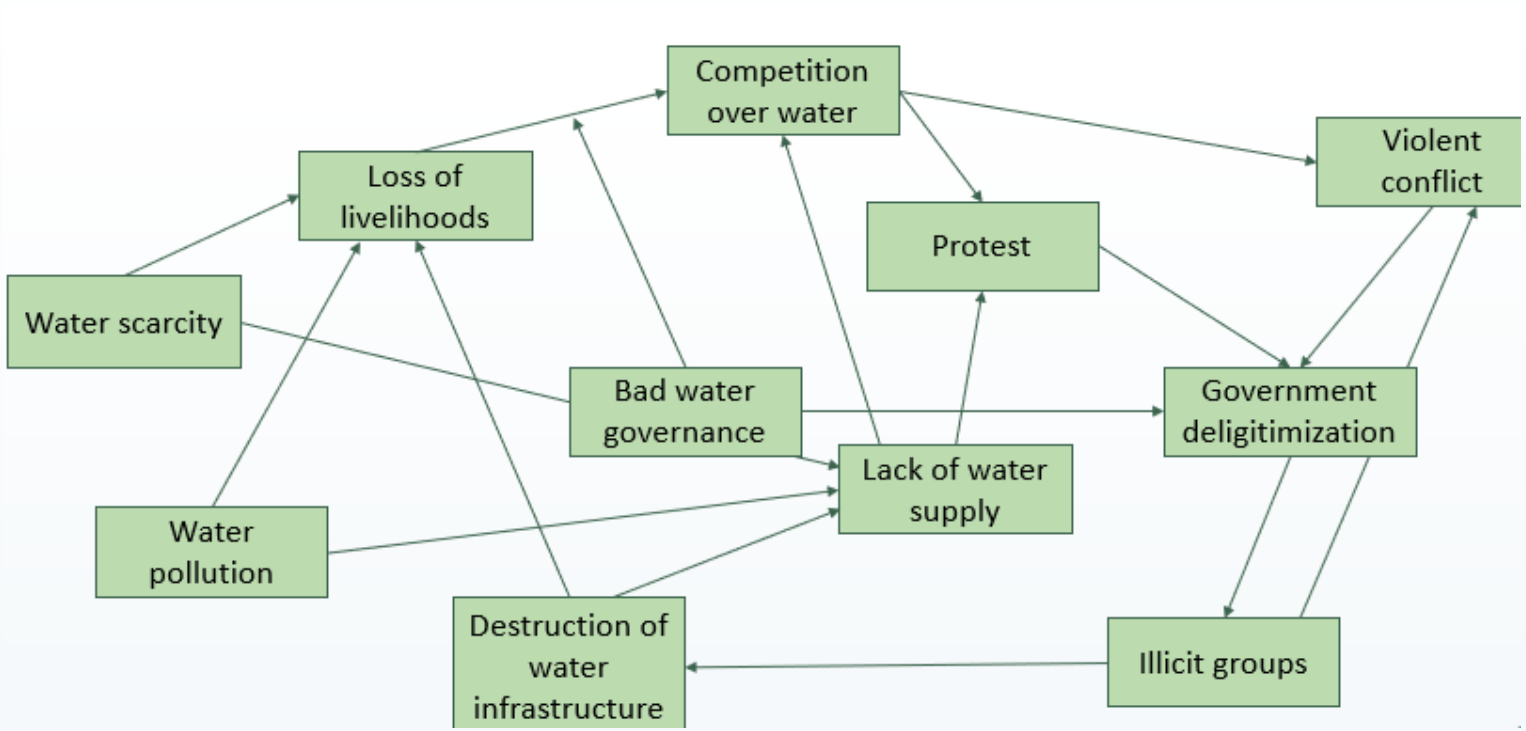

The Water system can be divided into three subsystems

- The natural system – mostly defined by hydrological boundaries
- The socioeconomic system – economic and social activities in a river basin
- The institutional system – administrative and institutional settings (organization government, laws)

They are all interlinked which underlines the importance of an integrated apporach in IWRM taking these links into account

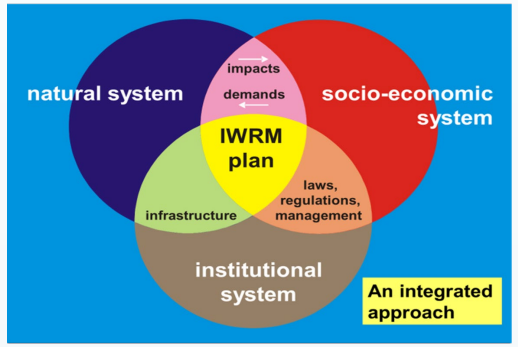
# The broader system of the water-conflict relationship

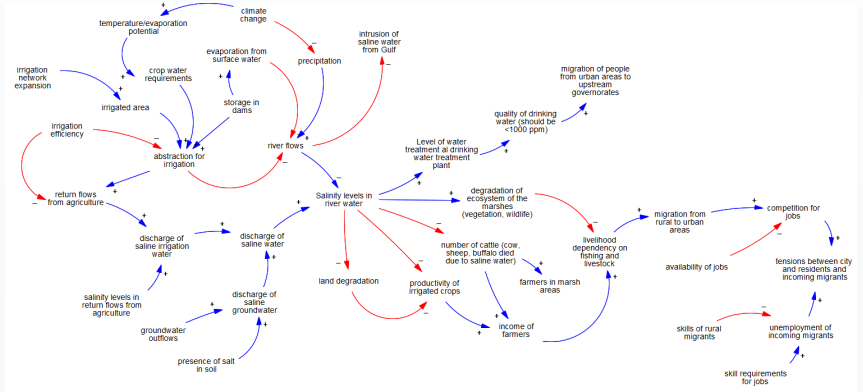
- Given the complex relationships between water and conflict, systems analysis can further expand IWRM analyses to understand the many factors that shape water insecurity, conflict, and cooperation



# The role of models in system analysis

- A model is a representation of reality that enables the functioning of a system to be analysed and discussed.
- Models can provide insight into how the different components of the system are interconnected.
- In addition, quantitative models provide insight into the scale of problems and the effectiveness of actions.
- In this training, we're going to take a look at the qualitative model.



# System analysis based planning

This process can also support planning because:

- Understanding the relevant linkages in the water-security system provides insight in elements/variables that can support change
- Stakeholders can identify elements that are potentially more accessible to influence through interventions (quick wins)
- Stakeholders can identify what may be needed to influence other variables and bring that into a planning proces
- Consideration of different future scenarios can help to identify how urgent different interventions are