GENERIC MODELING FRAMEWORK FOR INTEGRATED WATER RESOURCES MANAGEMENT

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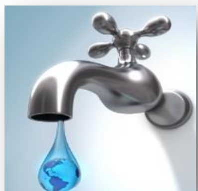
0 | Presentation Outline

1 | Global Change

Challenges of humanity: **Water** | Food | Energy




<u>Integrated Water Resources Management</u> | Global Water Partnership

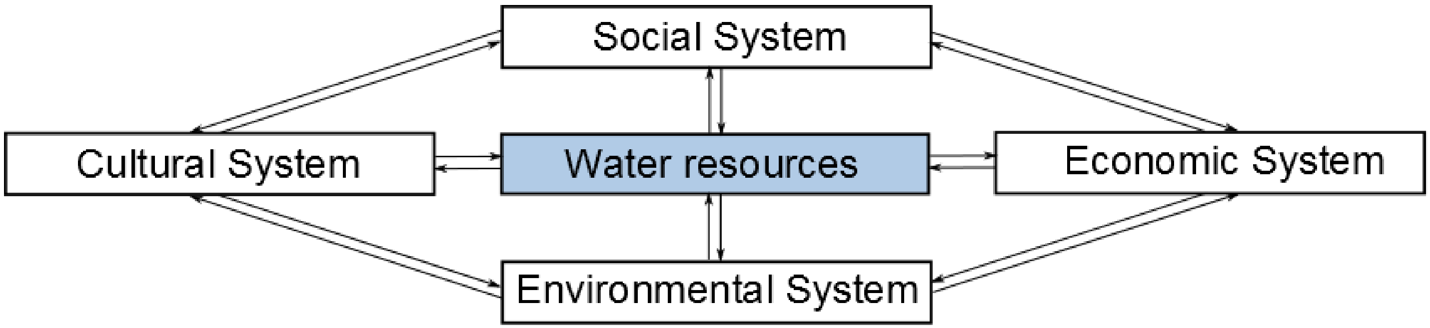
"Process that promotes the **coordinated** development and management of water, land and its related resources, in order to maximize the resultant **economic** and **social welfare** in an equitable manner without compromising the **sustainability** of vital **ecosystem**."

2 | Comlexity of IWRM and Guiding Principles

IWRM GUIDING PRINCIPLES | Simonovic, 2009

- Systems view
- Integration
- Partnership
- Participation
- Uncertainty
- Adaptation
- Science

3| Methodology Requirements



Objectives of Generic Modeling Framework:

Objective 1| Address the **guiding principles**

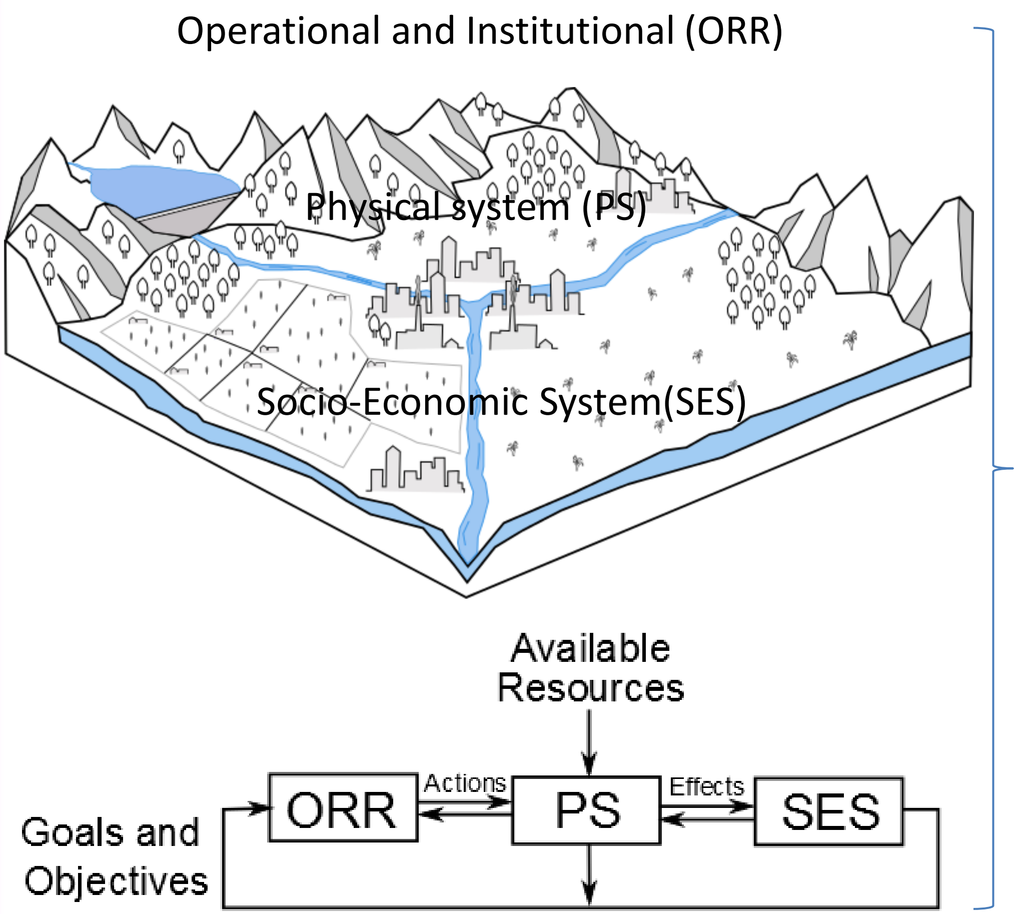
Objective 2| Address the complexity of system **structure** and **relations** between components

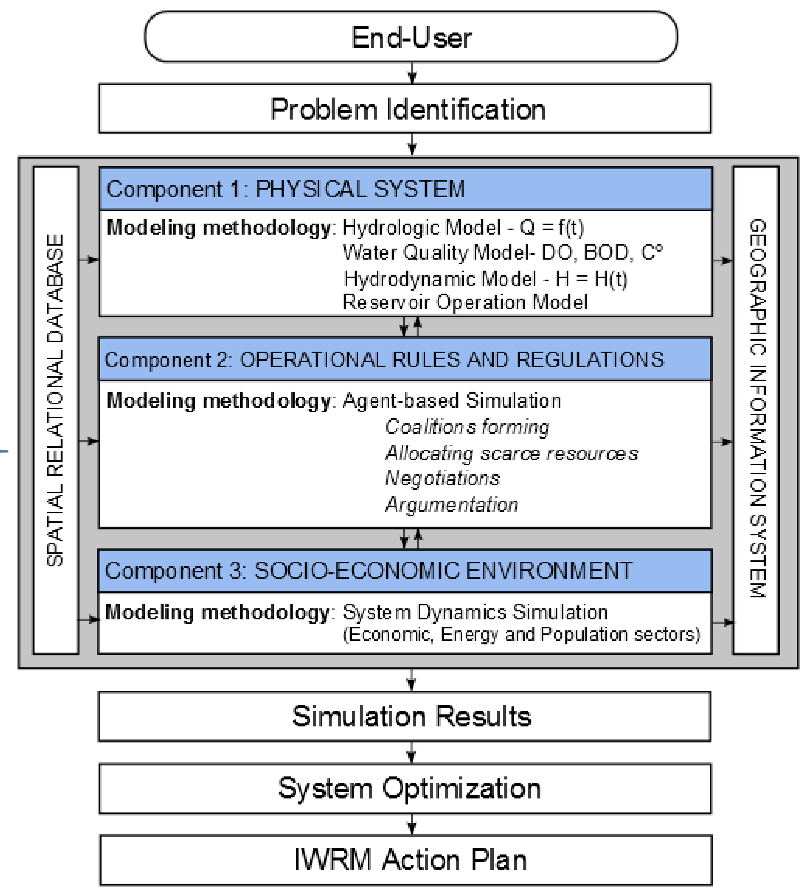
Objective 3| Address the system behavior in **space** and **time**

Specific IWRM Goals of Modeling Framework:

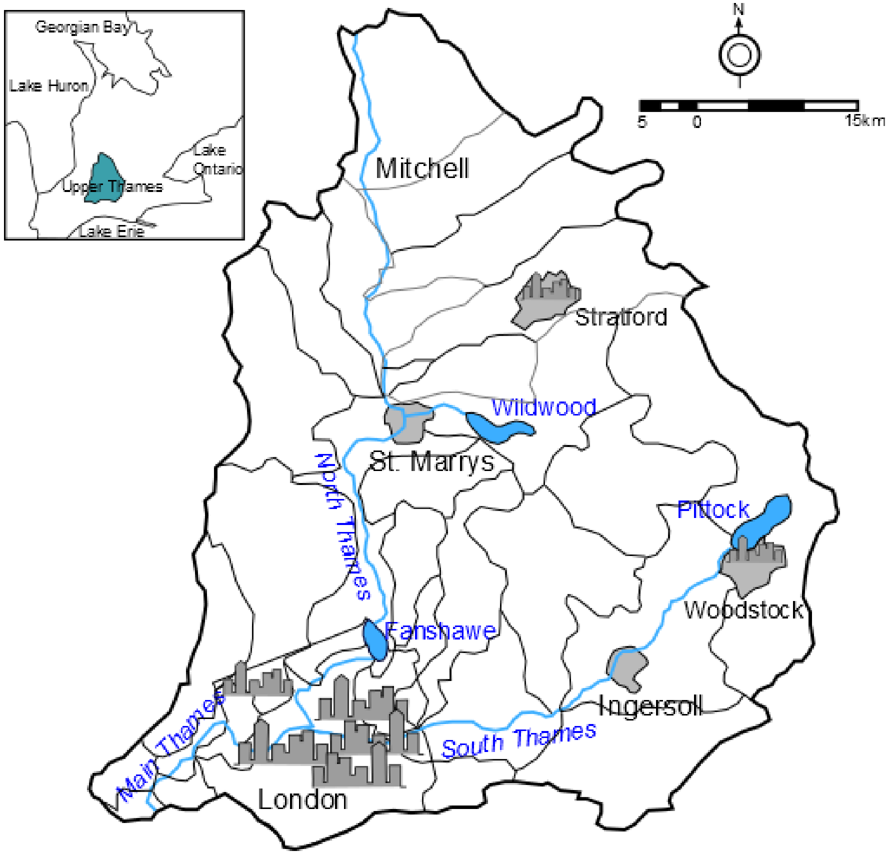
Water allocation | Water Quality Management | Ecosystem protection | etc.

4| Generic System Architecture





5| Case Study: The Upper Thames River Basin

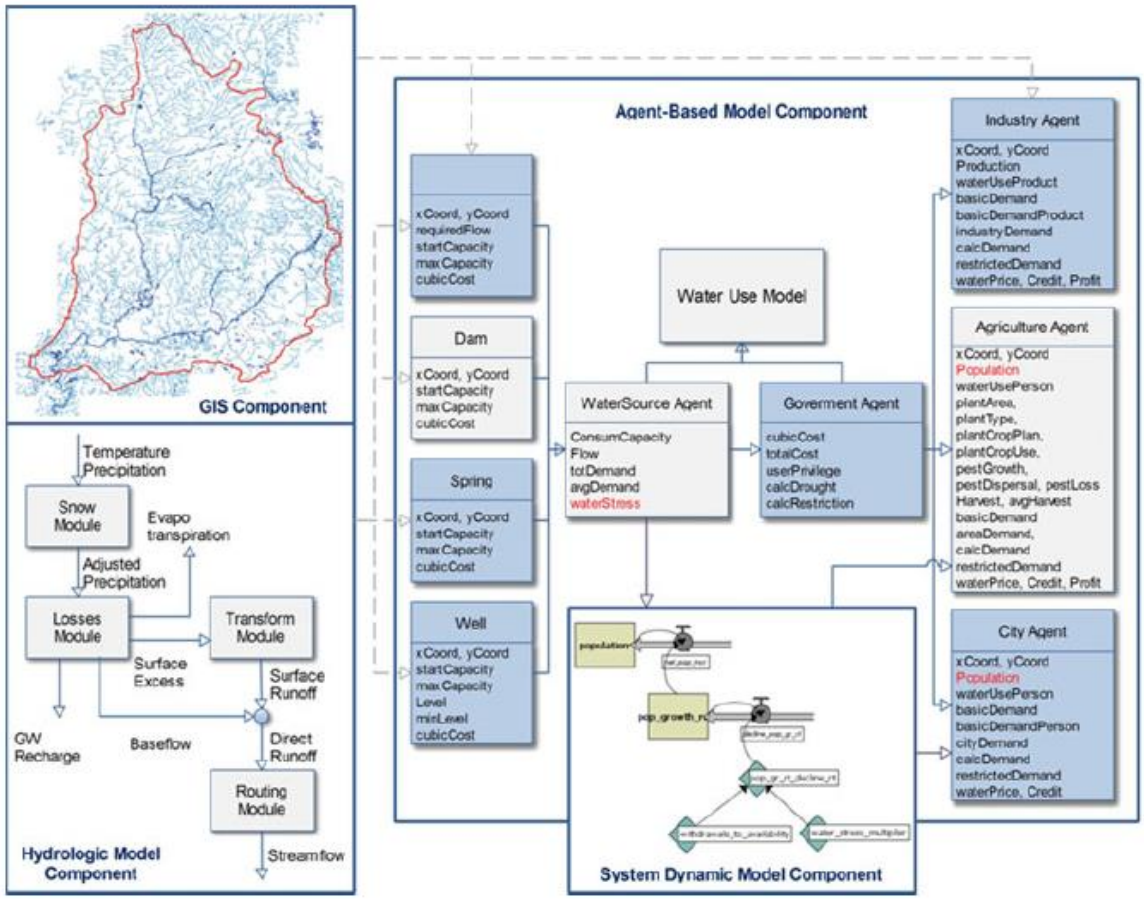


Upper Thames River Basin, SW Ontario, Canada

Important River Basin Properties	
Average precipitation	1000 mm/year
Average annual discharge	39.5 m^3/s
Land use	78% Agriculture 9% Urban 12% Forest
Population	485.000

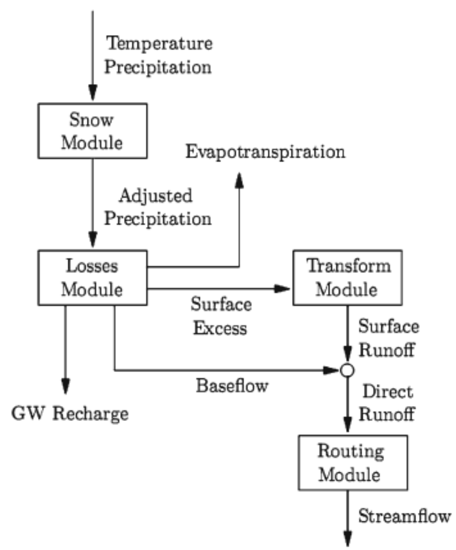
Data Source | Upper Thames River Conservation Authority

6| First Level of Integration

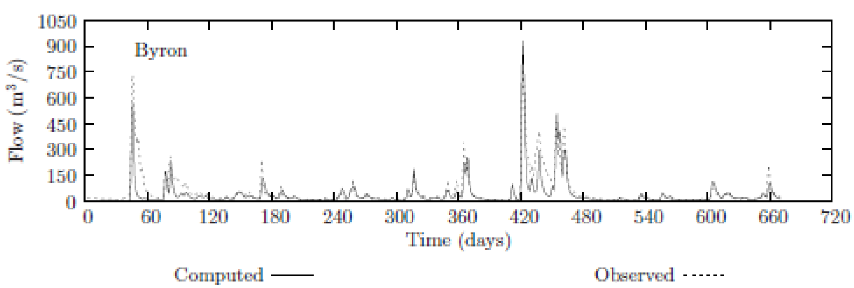


System Structure

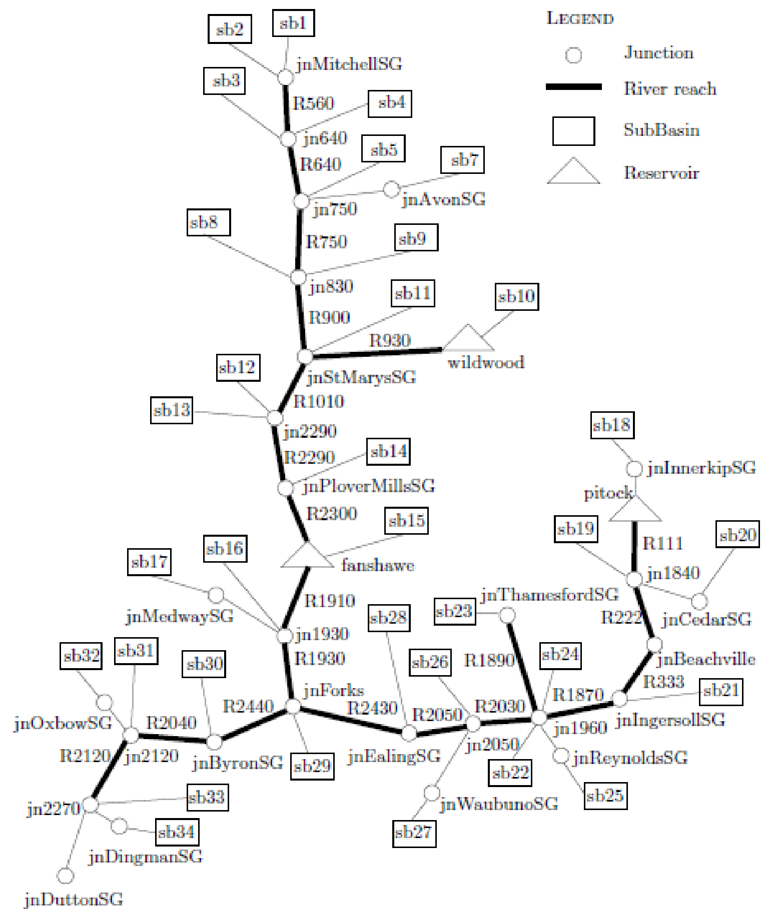
7| Physical System: Hydrologic Model



Modules of Hydrologic Model

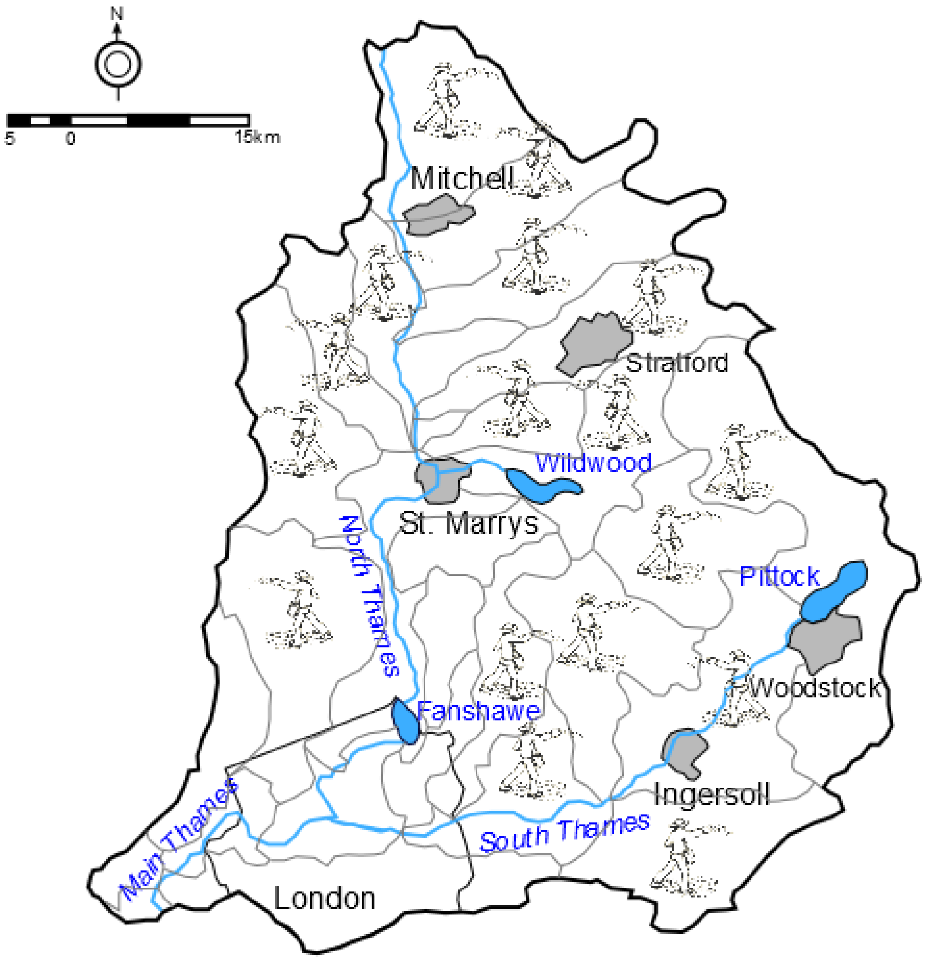


Computed and Observed Hydrographs at Byron GS

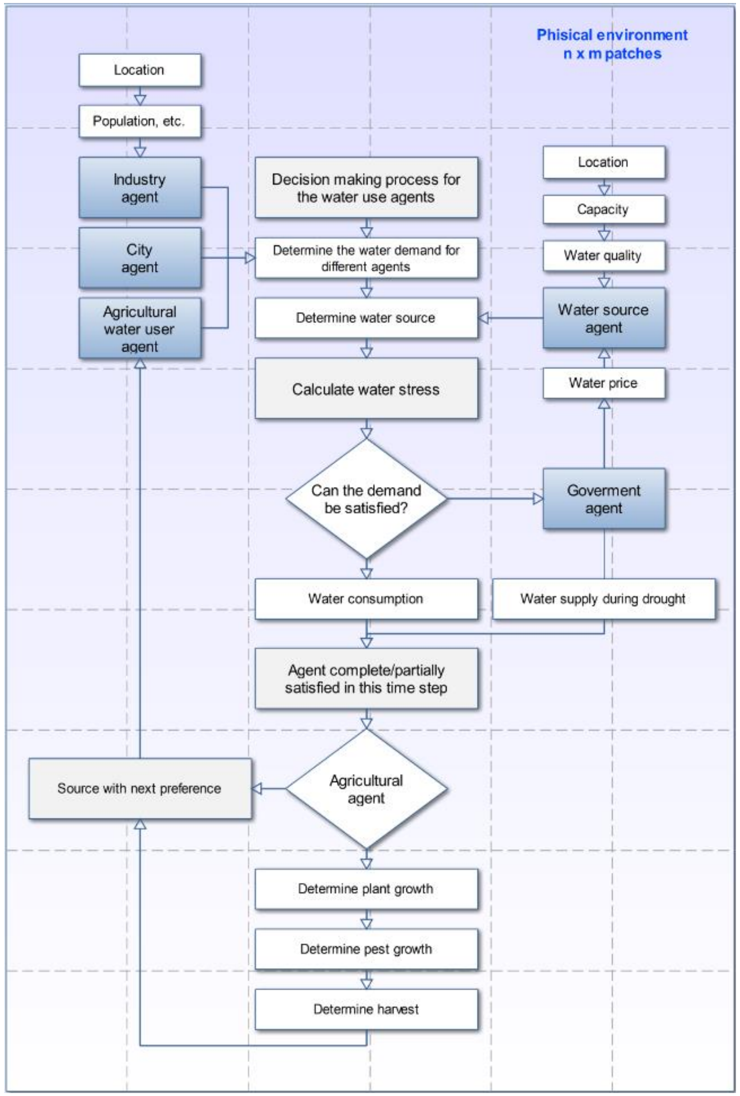


Schematic of Upper Thames Basin Hydrologic Model

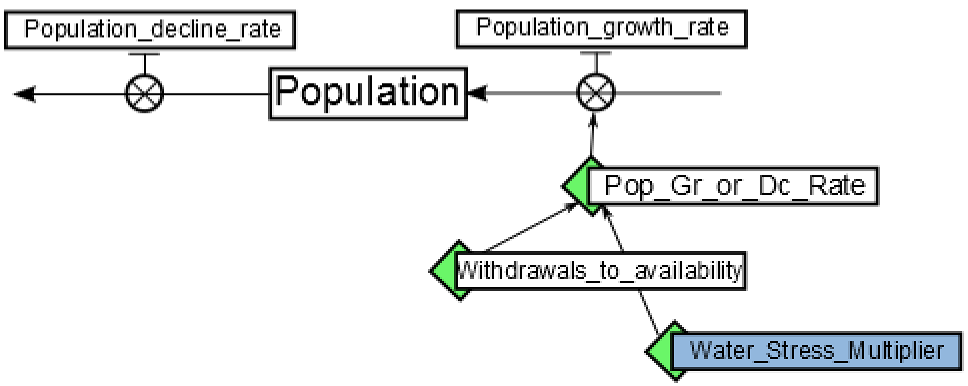
8 | Operational and Institutional: Agent-based Model



28 Sub-basins = Actors

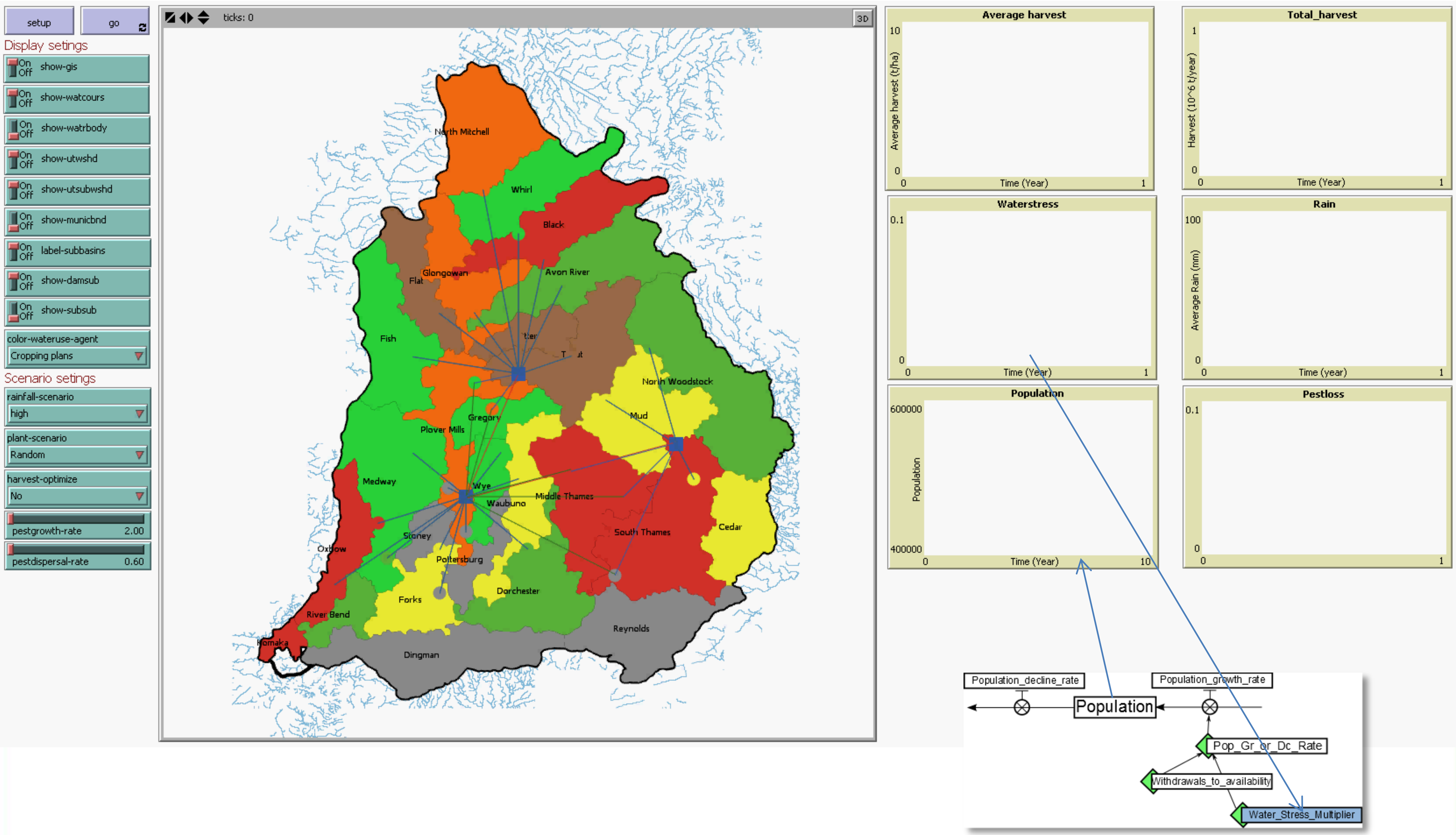


Socio-Economic System: System Dynamics Simulation

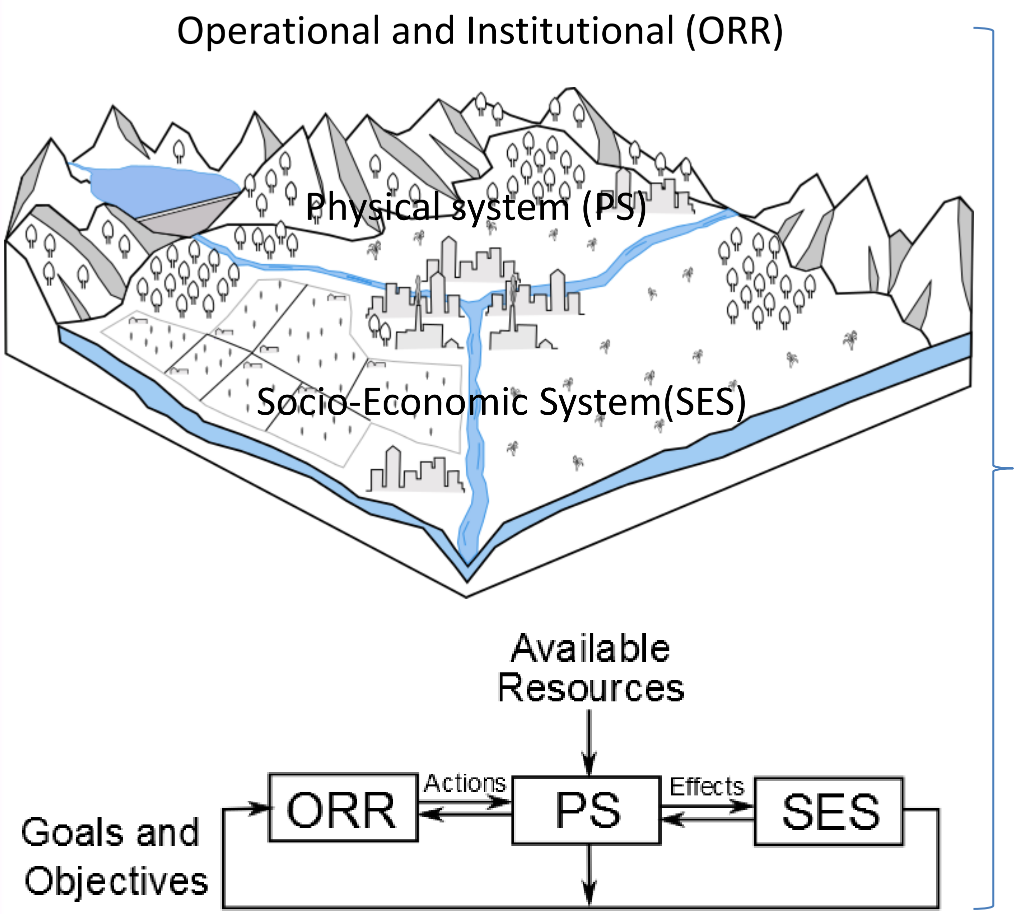


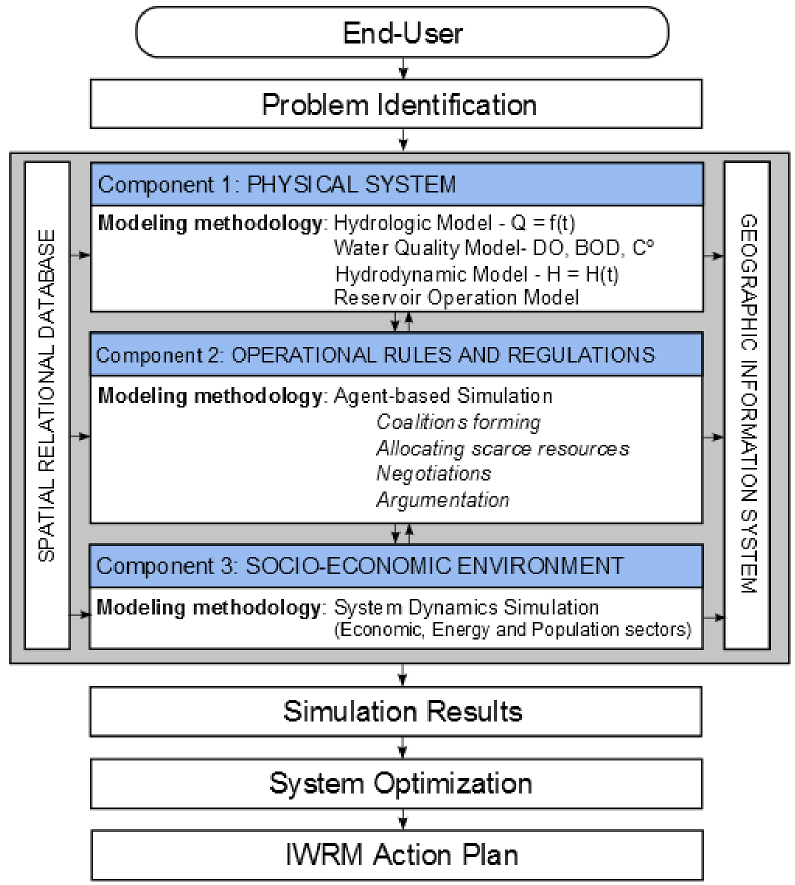
Population on the Watershed Level| Stock and Flow Diagram

10 | Level 1: The Integrated Model

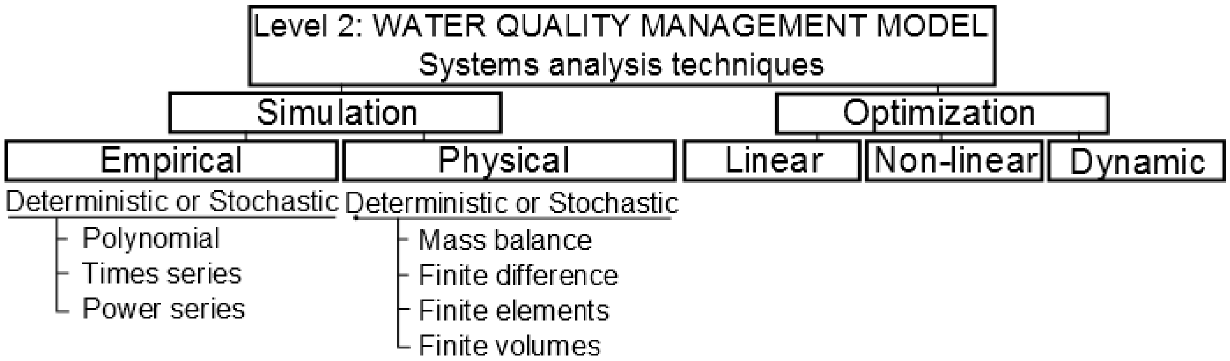


11| Generic System Architecture

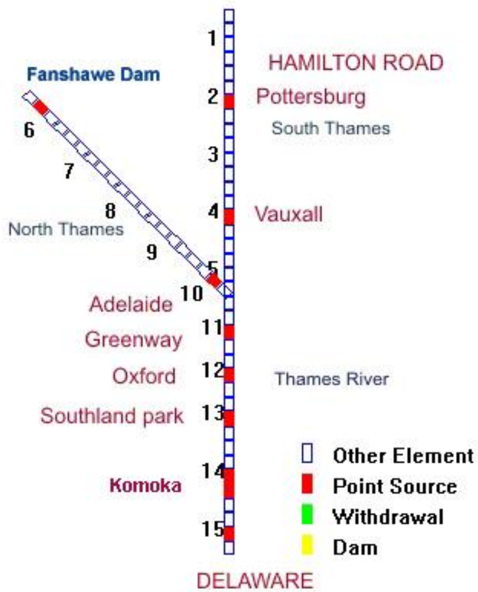


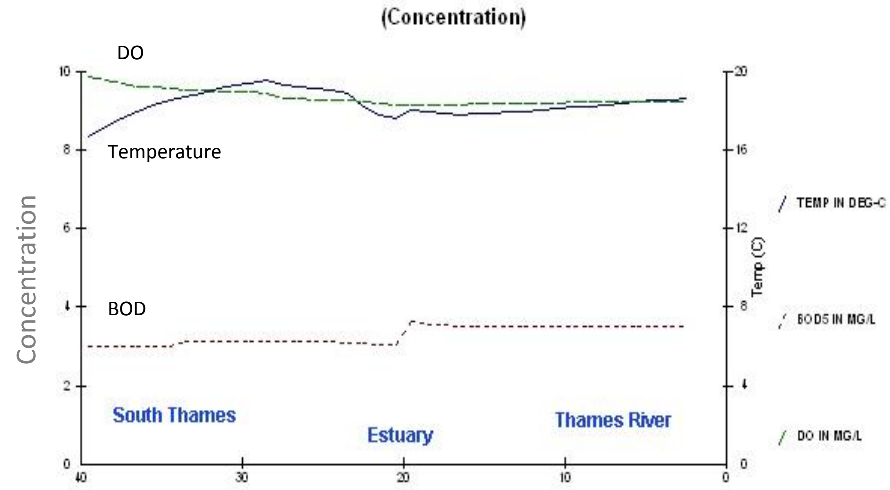


12 | Second Level of Integration

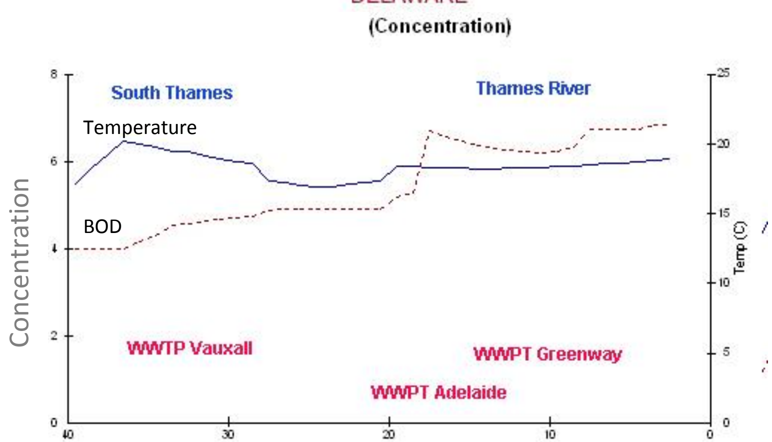


13 | Upper Thames River Water Quality Model





River Kilometer, Reaches 1 – 15



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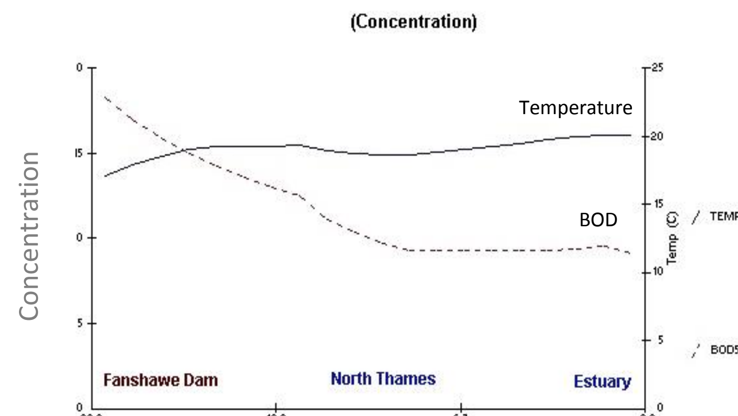

River Kilometer, Reaches 6 – 10

14 | Conclusions and Future Work

i. Systems View as a guiding principle in IWRM

ii. Modeling framework to describe system behavior in space and time

iii. Interaction between system elements and actors

iv. Dynamic data exchange between system components and detailed representation of all system actors |water sources, users, polluters, etc.|

Thank you for your attention…