DECISION SUPPORT FOR INTEGRATED WATER RESOURCES MANAGEMENT

SPATIAL AND TEMPORAL VARIABILITY

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2 | Pete

- Mentor
- Friend
- Invisible guide
- Pete I am honored and humbled
- Many interactions
  - Formation of my professional views
  - Help for staying on the right path
  - …
  - Indirect impact on my promotion
  - Test of my ‘intelligence’ or luck of it
  - Recognition in accepting to write the forward for my book

Pete I am honored and humbled!

3 | IWRM support
Summary

- IWRM
  - Water – food – energy nexus
  - Systems approach
  - Variability in time and space
- Modelling framework
  - Physical models
  - Agent – based model
  - System dynamics simulation model
- Work in progress
  - Domain-specific models
  - Dynamic data exchange
  - Definition of agents (rules and chracteristics)

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Outline

- Challenges
- Systems approach
  - Complexity
  - Integration
- Modelling framework
- An illustrative example
- Summary

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Challenges

- Water-Energy-Food common concerns
  - Access to services
  - Environmental impacts
  - Price volatility
- Growing population
  - Poverty
  - Health
- Climate change
  - Mitigation – energy
  - Adaptation – land and water
- Management
  - Enormous opportunities for higher efficiency
  - Study of the whole complex system
  - Understanding interactions – it is all about feedbacks
- Scale
  - 1.4 billion people without access to electricity
  - 3 billion with out access to modern fuels or technologies for cooking and heating
  - 900 million people without access to safe drinking water
  - 2.6 billion do not have sanitation
  - 900 million people are chronically hungry
  - 2 billion people lack food security

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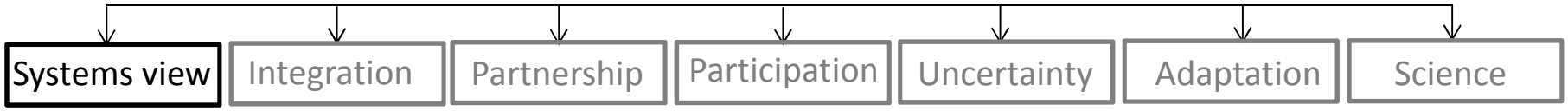
Challenges

- IWRM
  - "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."

Global Water Partnership

GUIDING PRINCIPLES



- Systems view
  - Complexity
  - Whole system approach
  - Difficult to translate into government policy making processes
- System structure
- Feedbacks
- System behavior

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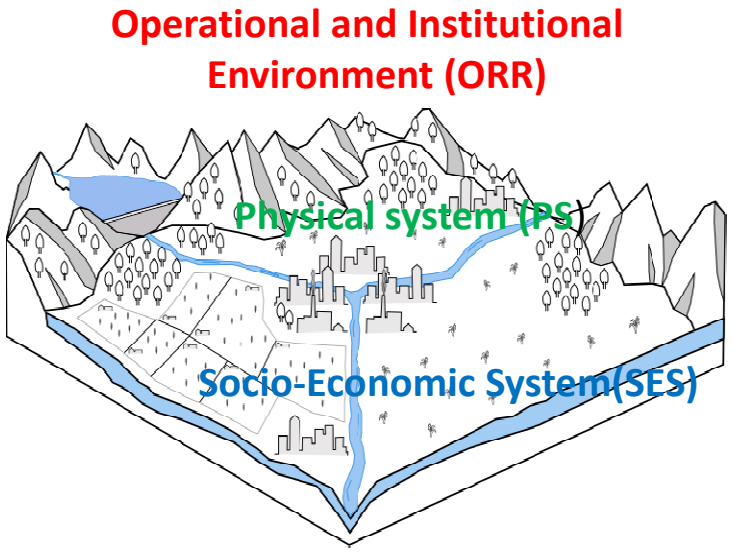
Modelling framework

- Requirements
  - Ability to address complexity
  - Structure – interconnections - feedbacks
  - Variability in time and space

- Our focus

$$S = f(t, s)$$



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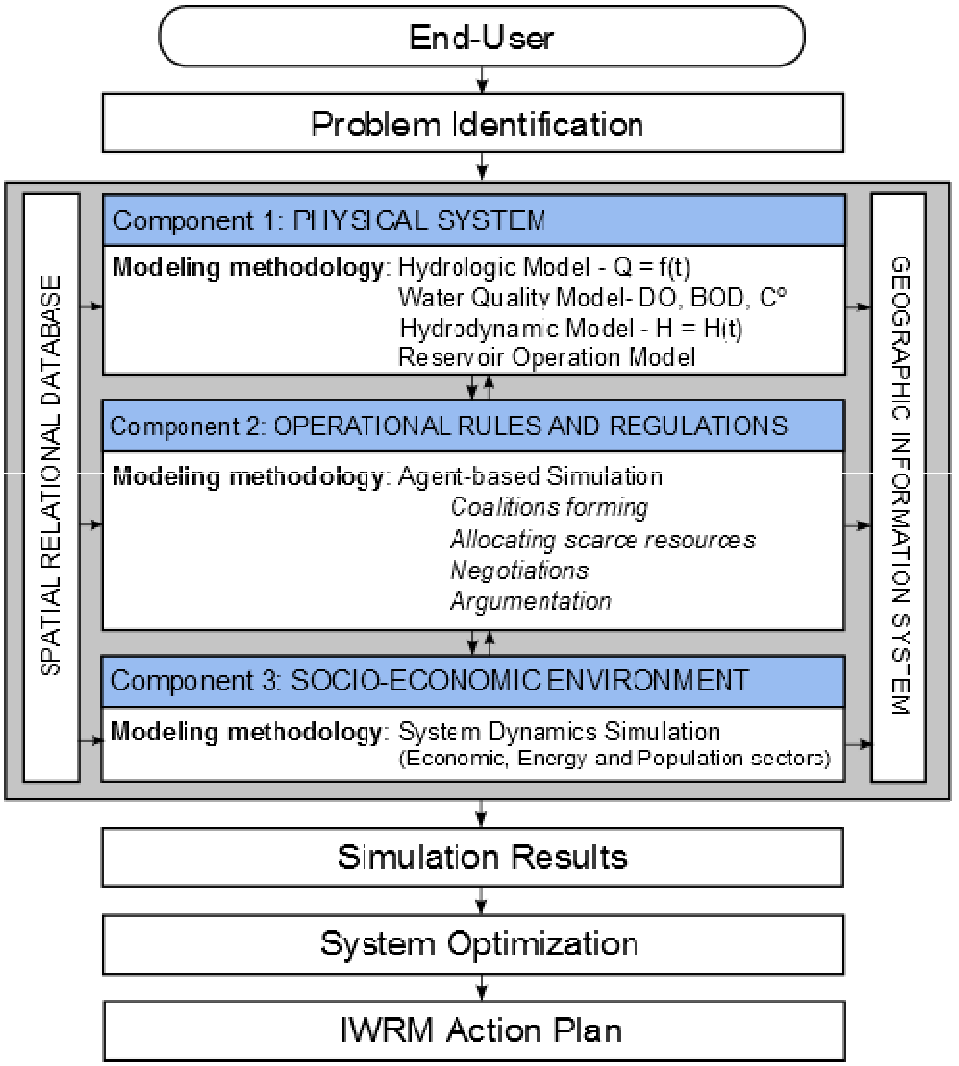
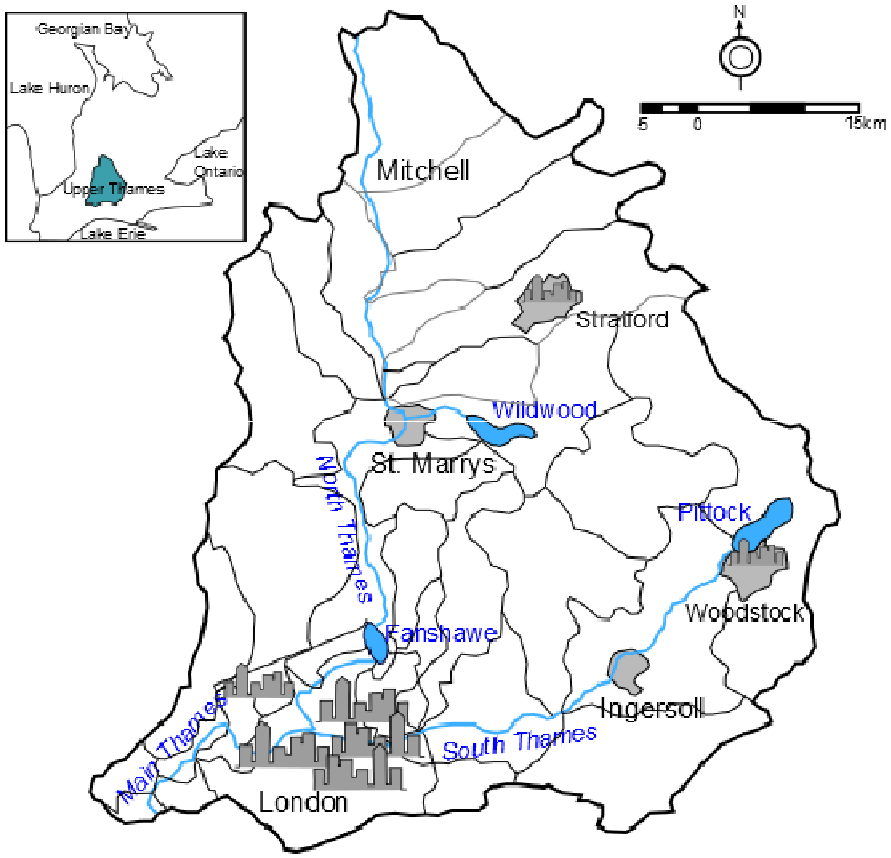
Modelling framework



9 | IWRM support
Illustrative example



Upper Thames River Basin

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

Upper Thames River Conservation Authority

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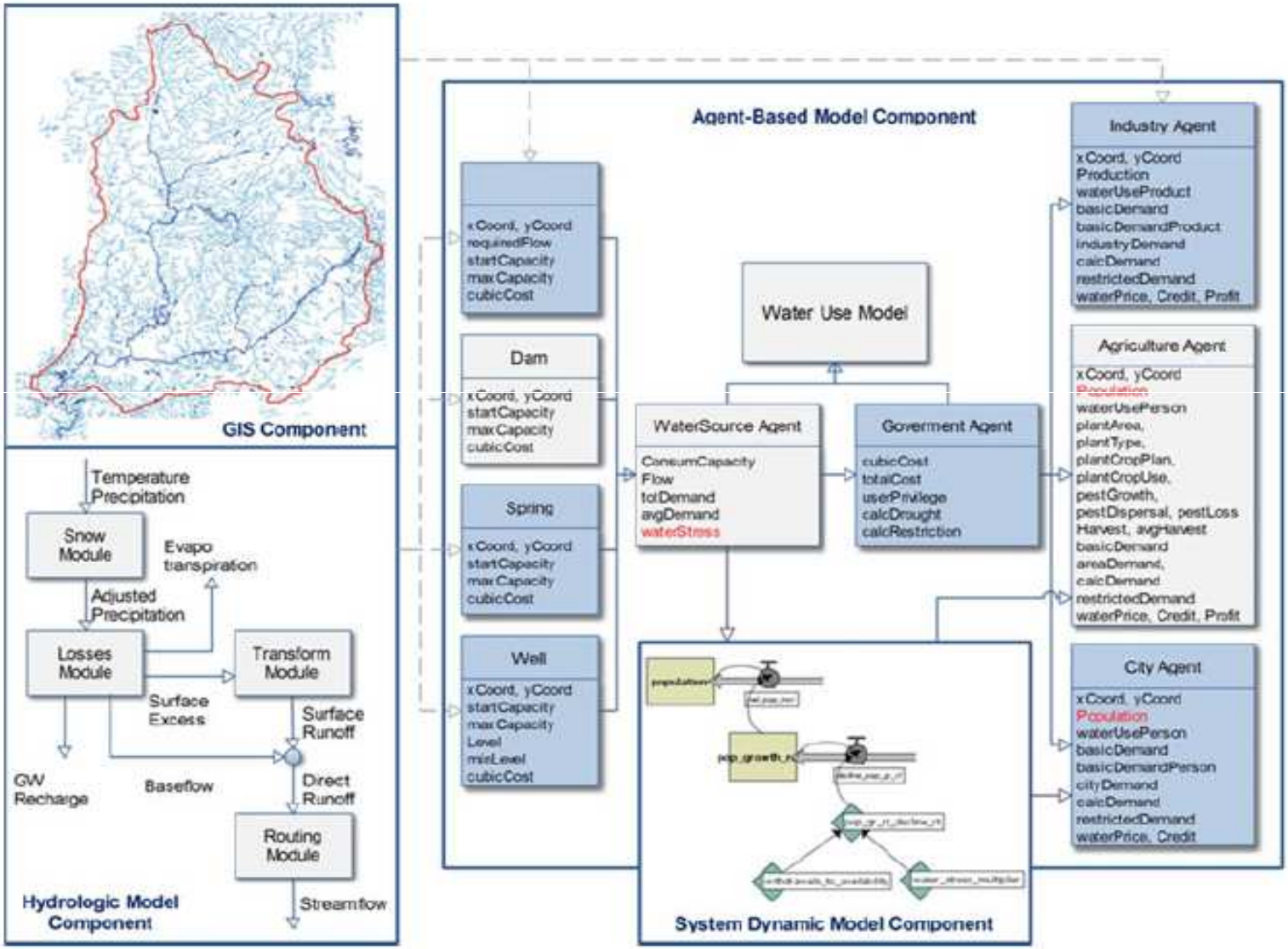
Illustrative example



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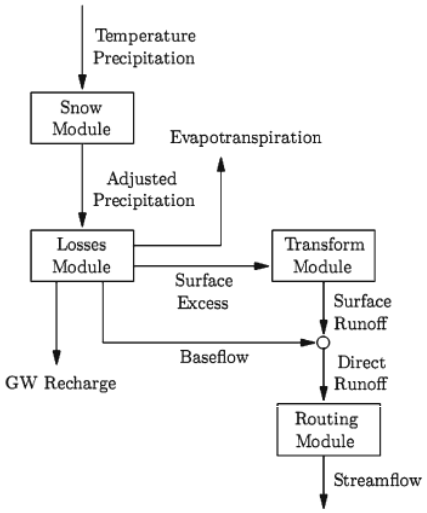
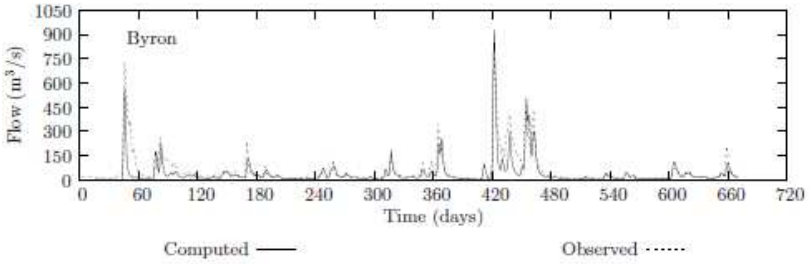
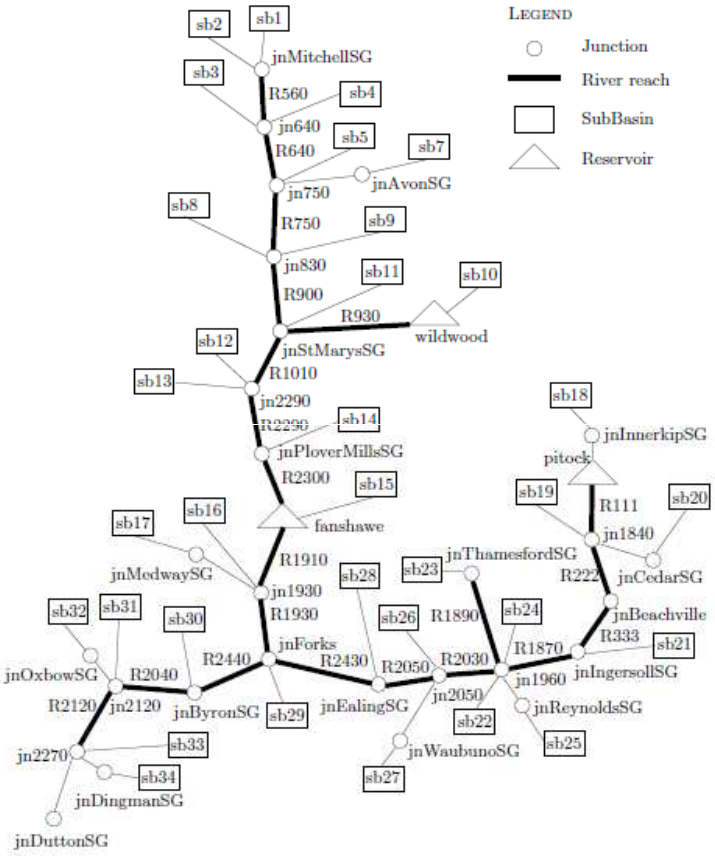
Illustrative example



Modules of Hydrologic Model



Computed and Observed Hydrographs at Byron GS



Schematic of Upper Thames Basin Hydrologic Model

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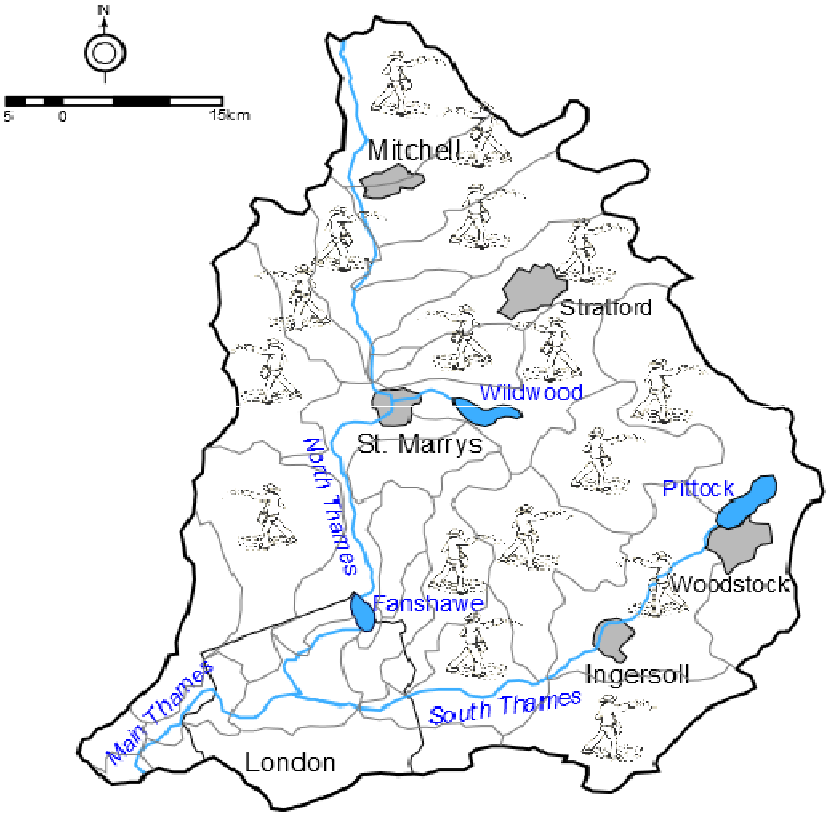
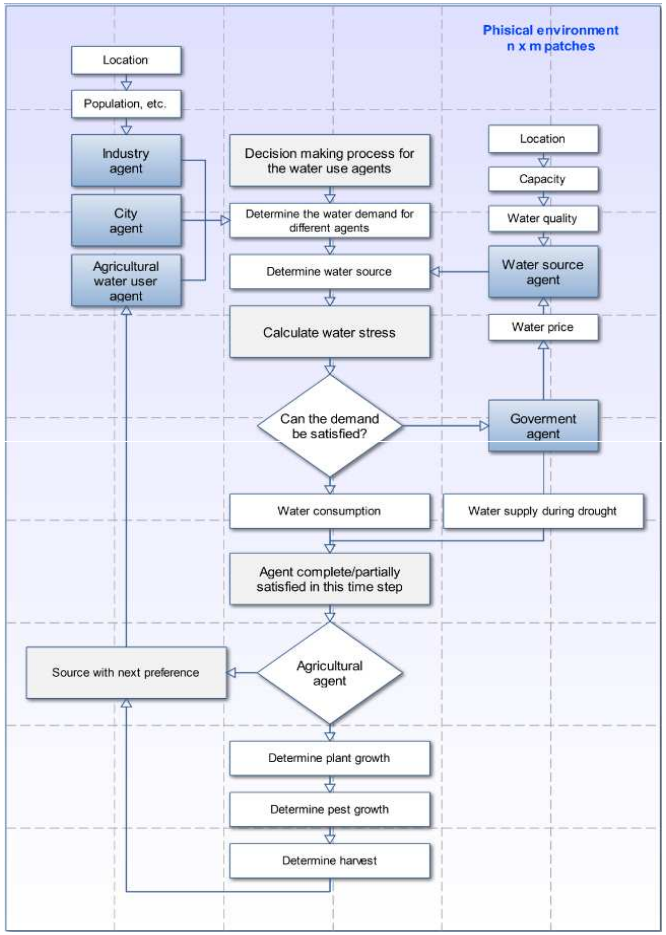
Illustrative example

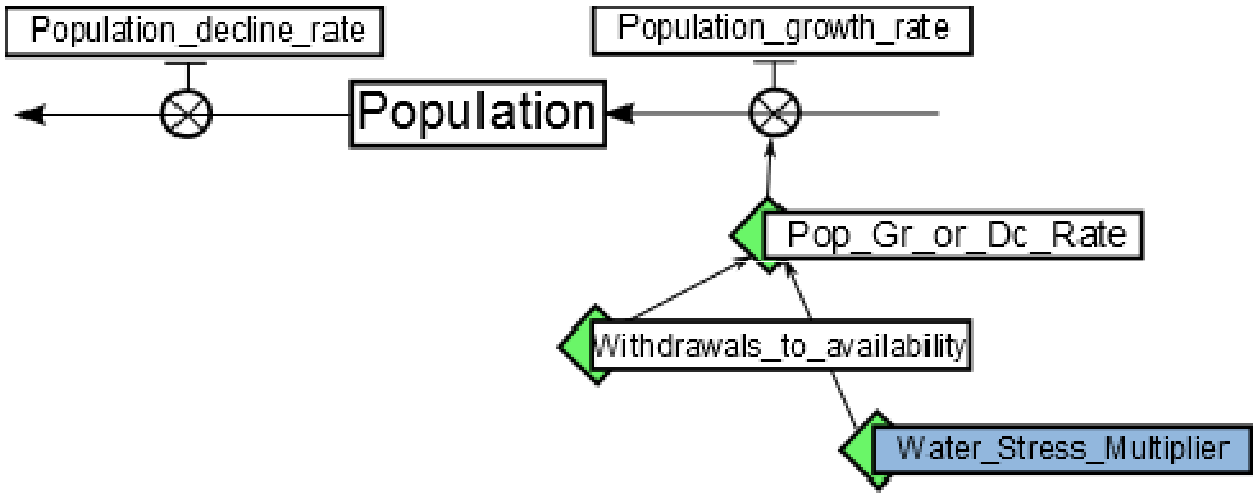


28 Sub-basins = Actors



EWRI 2013
Slobodan P. Simonović

IWRM support
Illustrative example



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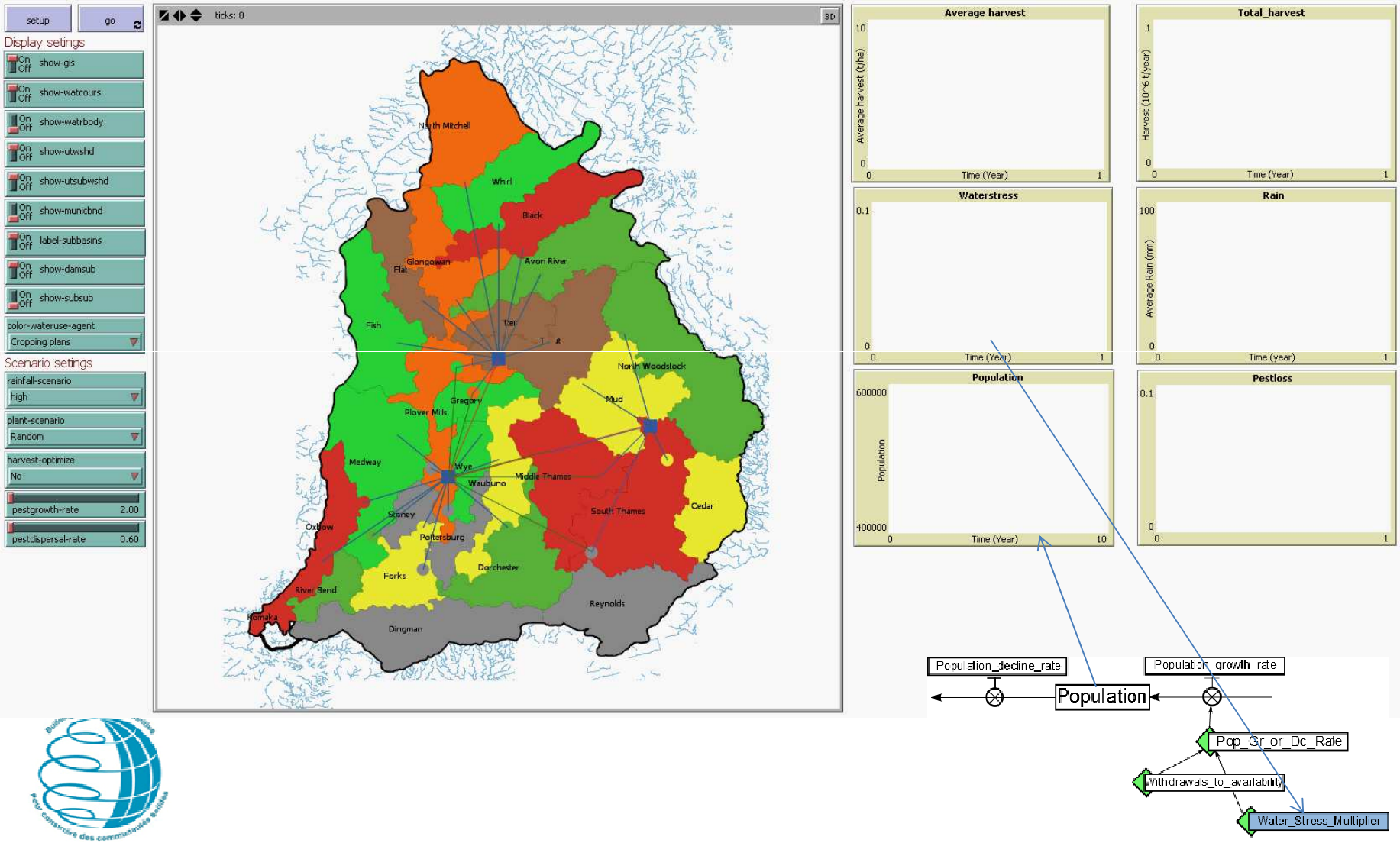

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Resources

www.slobodansimonovic.com