Alberta Government

Southern Region Modelling Initiatives

Regional Science and Planning
Environmental Modelling Team

Southern Region

Drivers of Model development in the Southern Region

- Population Growth
- Water Scarcity
- Large water consumers

- Need for safe, secure water supply

Southern Region Modelling Team

Primarily Water Modelling

- Allocation
- Quality

Support to

- Approvals
- WMO
- Planning
- Apportionment negotiations

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Development Plans

Supporting

- SSRB (South Saskatchewan River Basin) Plan
  - Approved water management plan
  - Basin closure to new applications (except Red Deer basin)
  - Updating of WRMM to support implementation

- SSRP (South Saskatchewan Regional Plan)
  - Land use framework planning
  - Building capacity for Water Quality and Land Use modelling

WRMM

Water Resources Management Model

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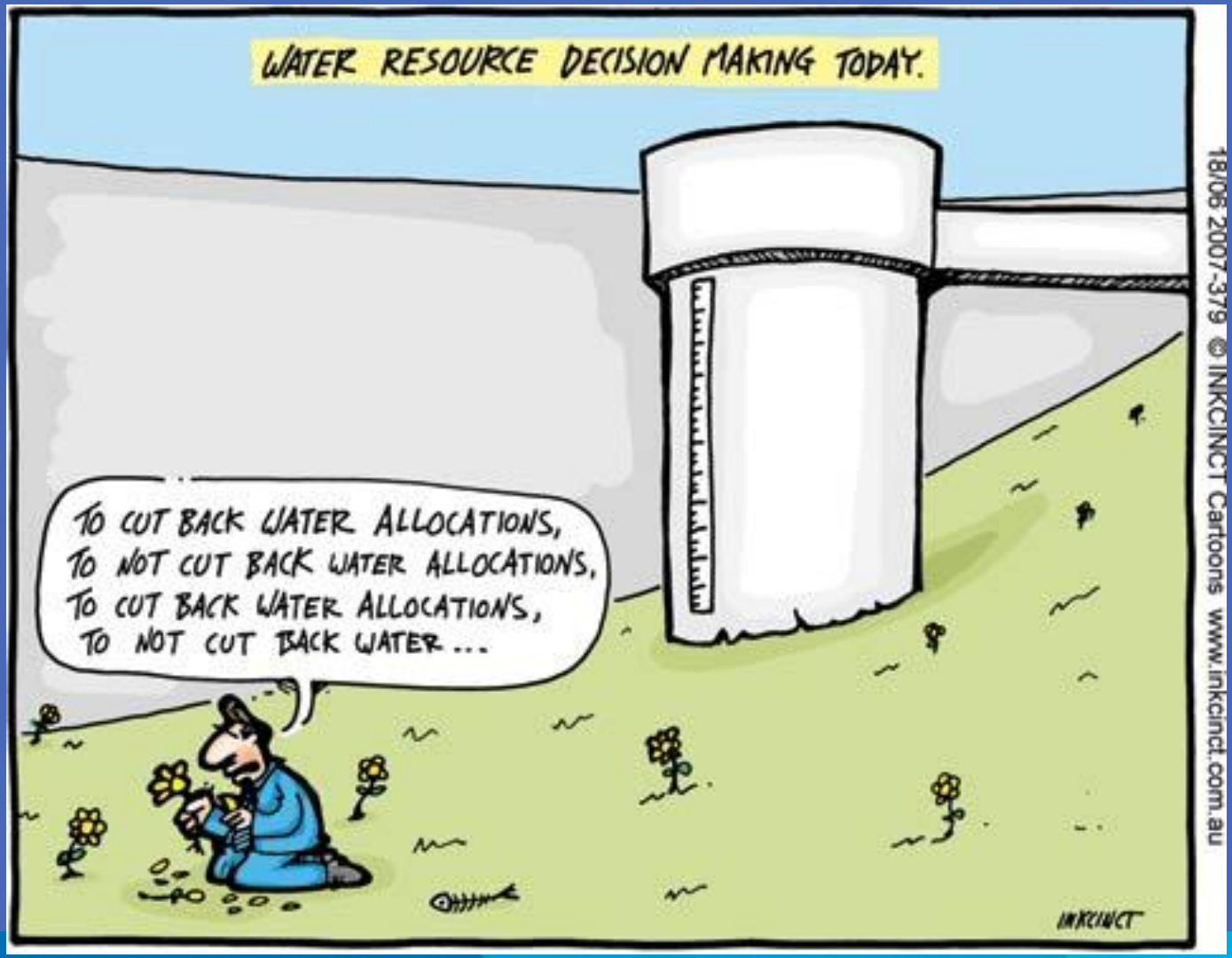
The Water Allocation Problem



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The Water Allocation Problem (in words)

How do you allocate a scarce resource (water) among competing demands in the most efficient way?

More than simple accounting

Constraints add complexity:

- Priorities.
- Instream objectives.
- Sharing agreements.
- Storage
- Variable flow from week to week , month to month, year to year

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Origin of WRMM

Water scarcity in southern Alberta led to SSRB planning program

- WRMM was built for Alberta Environment.

To meet our ongoing needs

- WRMM models have grown in number and complexity over time.

Uses of WRMM

Major projects and studies

- SSRB planning program (1980's, 2000's)
- Meridian Dam analysis
- Highwood / Little Bow diversion plan
- Special Areas Water Supply Study
- Acadia Irrigation Proposal
- Negotiations with Siksika on Bassano dam claim
- Expansion of the Carseland Headworks
- Alberta/Montana sharing of flow in the St. Mary and Milk

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Model Versions

WRMM (the original)

- Owned by Alberta ESRD
- Designed specifically for Alberta
  - Water Act
  - Instream objectives
  - Reservoir operating policy
- Runs quickly
- Proven itself in Southern Region Projects and GOA Studies
  - 30+ years history

Model Versions

Wrm-Dss (Wrmm version 2)

- New method of formulating solution
  - More optimal solution than WRMM
- No limitation on size of schematic
  - Commercial solver replaces built-in OKA solver
- No longer needs text files (uses databases)
  - Backwards compatible with existing model documents (can still use text files)

Model Versions

Wrm-Dss (cont'd)

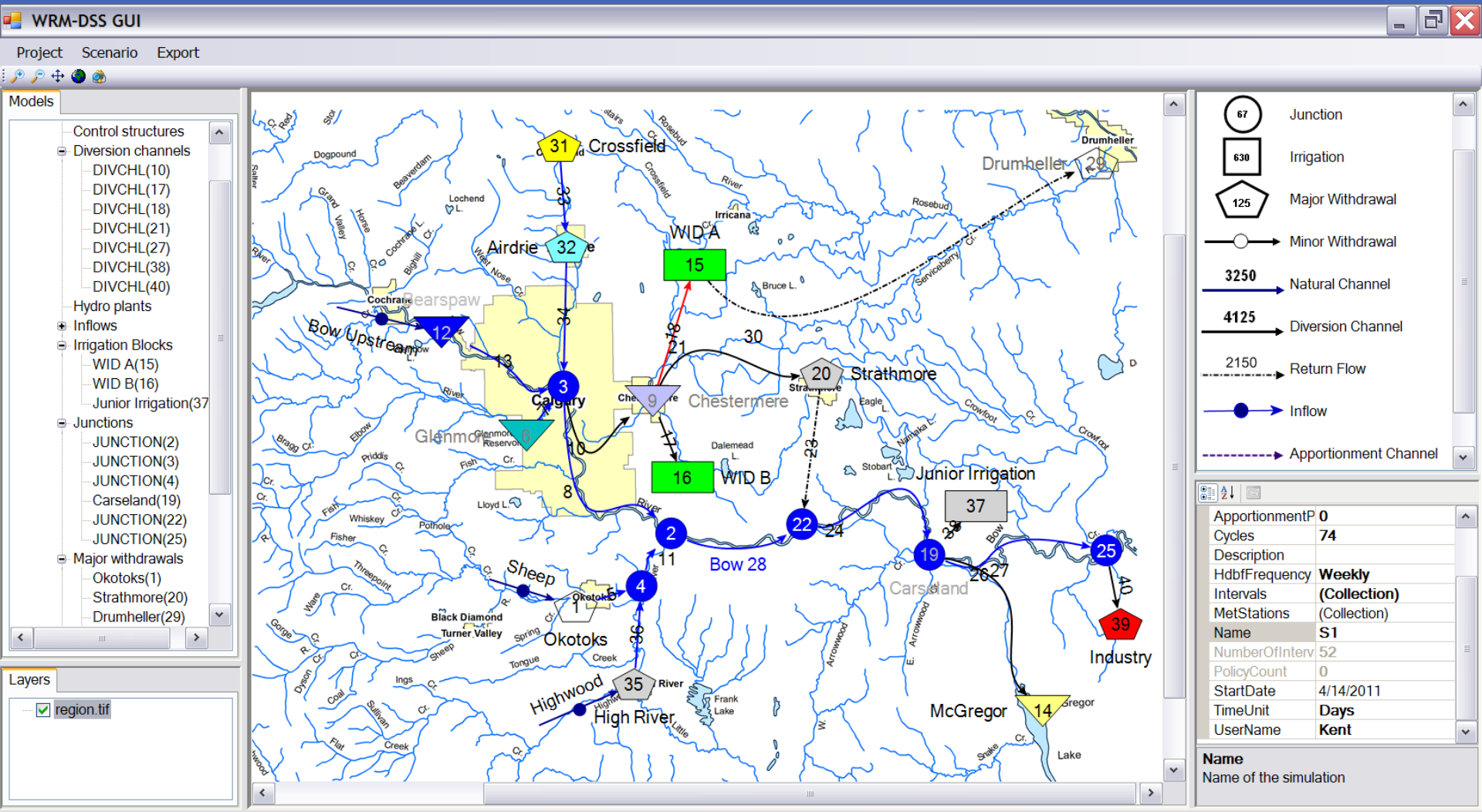
- Includes Channel Routing features
  - For daily operational decision support

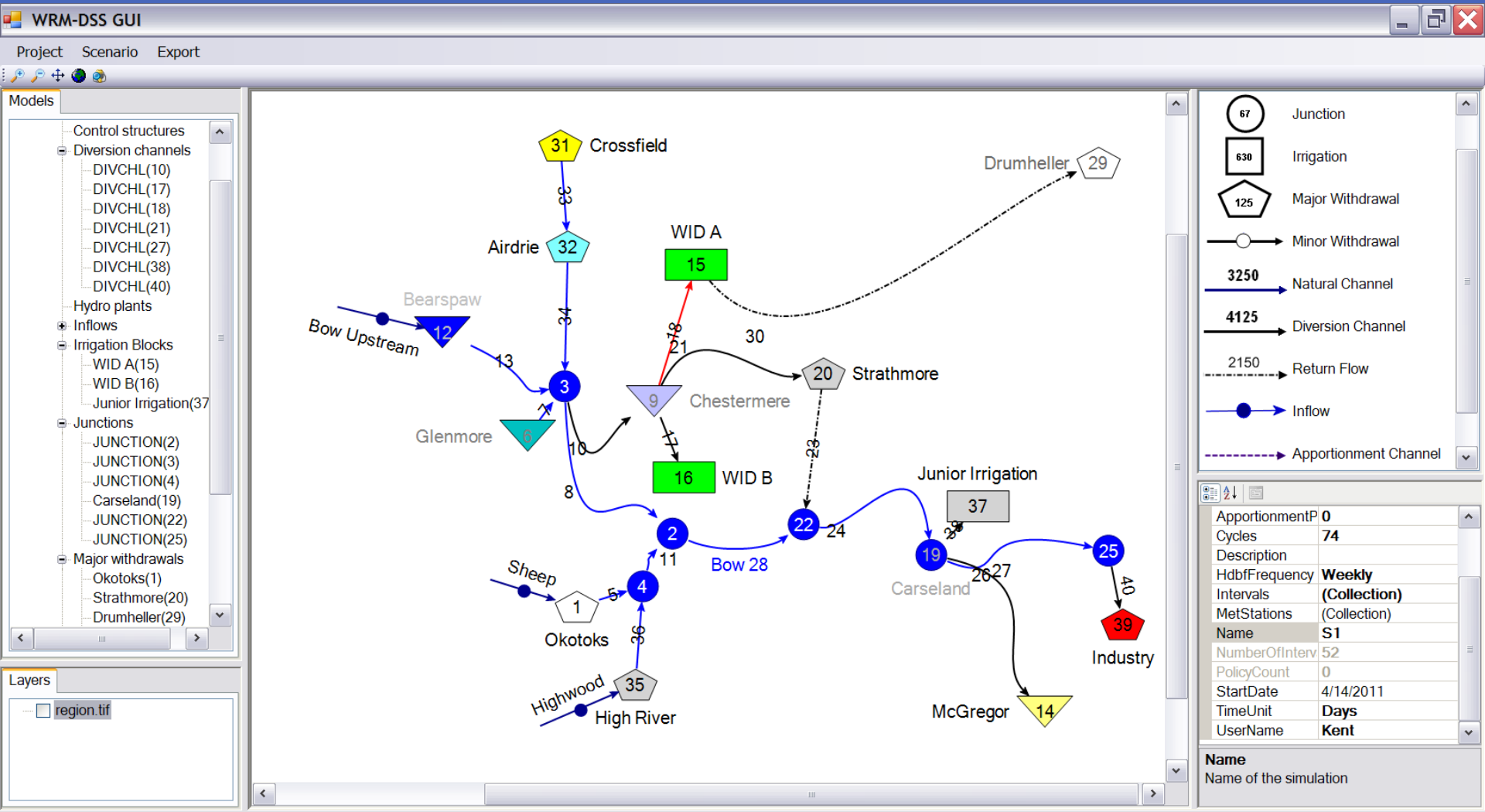
- State of the art programming for adaptation to other computing platforms

Wrm-Dss Utility

Graphical User Interface

- Makes model design visual
- Can use maps or images created in GIS applications as backgrounds
- State of the art industry standard programming
  - Potential to migrate to the Web
- Can be developed independently and in parallel to Wrm-Dss application
- No licencing / maintenance fees for dep't


WRM-DSS GUI
Project
Scenario
Export
Models
Control structures
Diversion channels
DIVCHL(10)
DIVCHL(17)
DIVCHL(18)
DIVCHL(21)
DIVCHL(27)
DIVCHL(38)
DIVCHL(40)
Hydro plants
Inflows
Irrigation Blocks
WID A(15)
WID B(16)
Junior Irrigation(37
Junctions
JUNCTION(2)
JUNCTION(3)
JUNCTION(4)
Carseland(19)
JUNCTION(22)
JUNCTION(25)
Major withdrawals
Okotoks(1)
Strathmore(20)
Drumheller(29)
Layers
region.tif
Crossfield
Airdrie
WID A
Drumheller
Cochrane
Bow Upstream
Calgary
Chestermere
Strathmore
Glenmore
WID B
Junior Irrigation
Bow 28
Carseland
Sheep
Okotoks
Highwood
High River
McGregor
Industry
Junction
Irrigation
Major Withdrawal
Minor Withdrawal
Natural Channel
Diversion Channel
Return Flow
Inflow
Apportionment Channel
ApportionmentP 0
Cycles 74
Description
HdbfFrequency Weekly
Intervals (Collection)
MetStations (Collection)
Name S1
NumberOfInterv 52
PolicyCount 0
StartDate 4/14/2011
TimeUnit Days
UserName Kent
Name
Name of the simulation
Ready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Drumheller(29)
Layers
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31 Crossfield
Drumheller 29
Airdrie 32
WID A
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Bearspaw
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Glenmore
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High River
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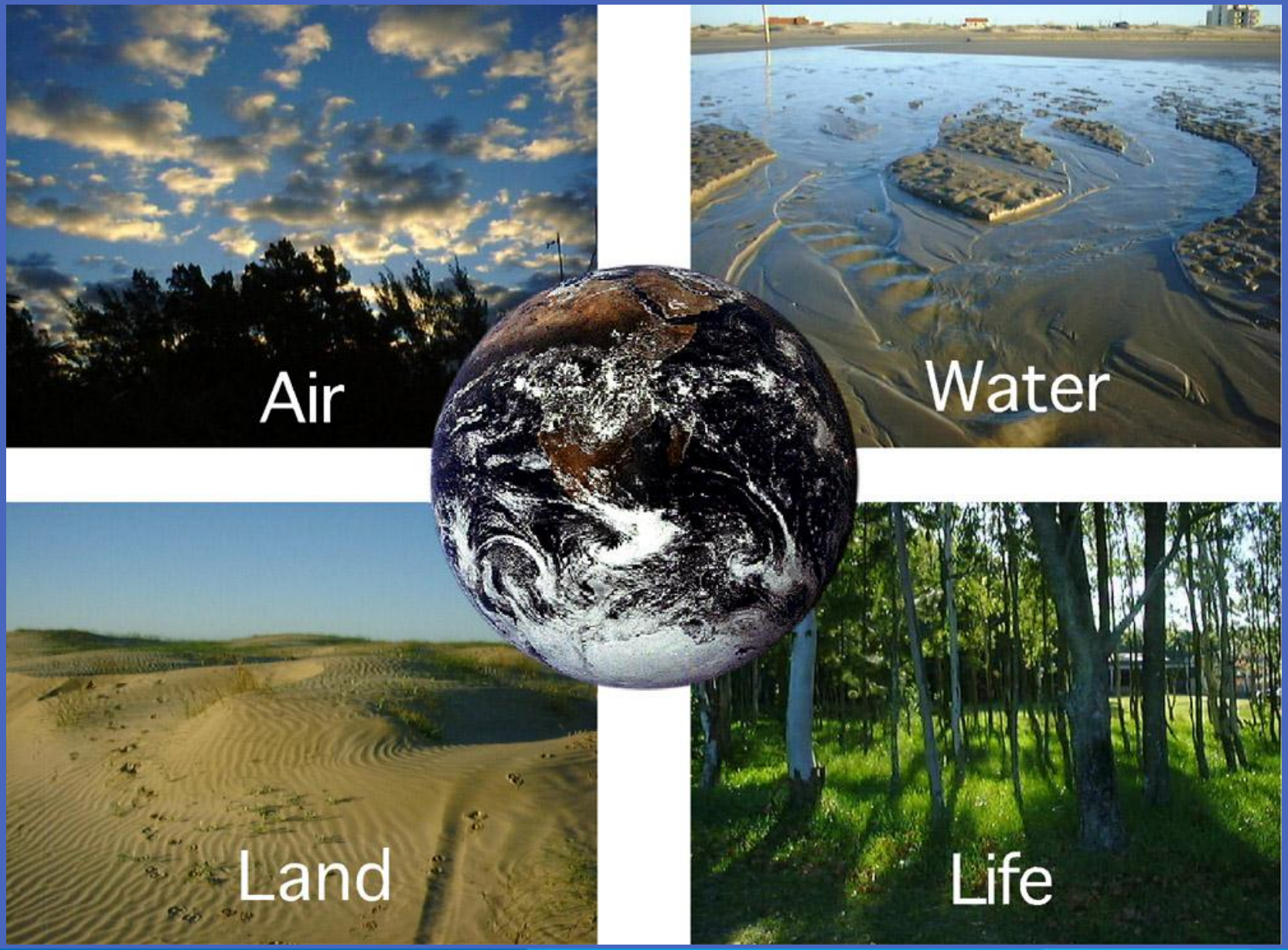

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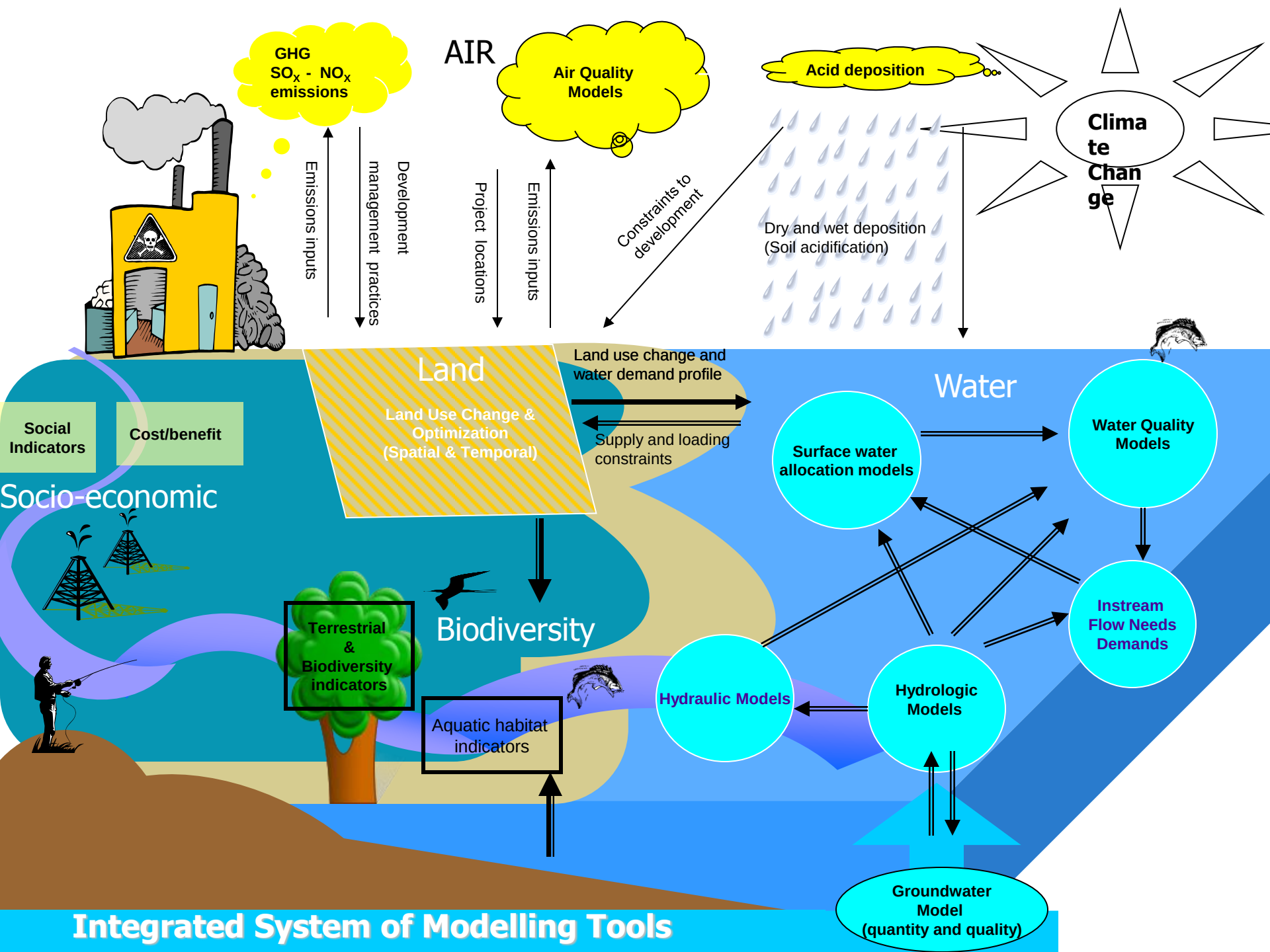
Cumulative Effects Management


GHG
SO_X - NO_X
emissions
AIR
Air Quality
Models
Acid deposition
Clima
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Chan
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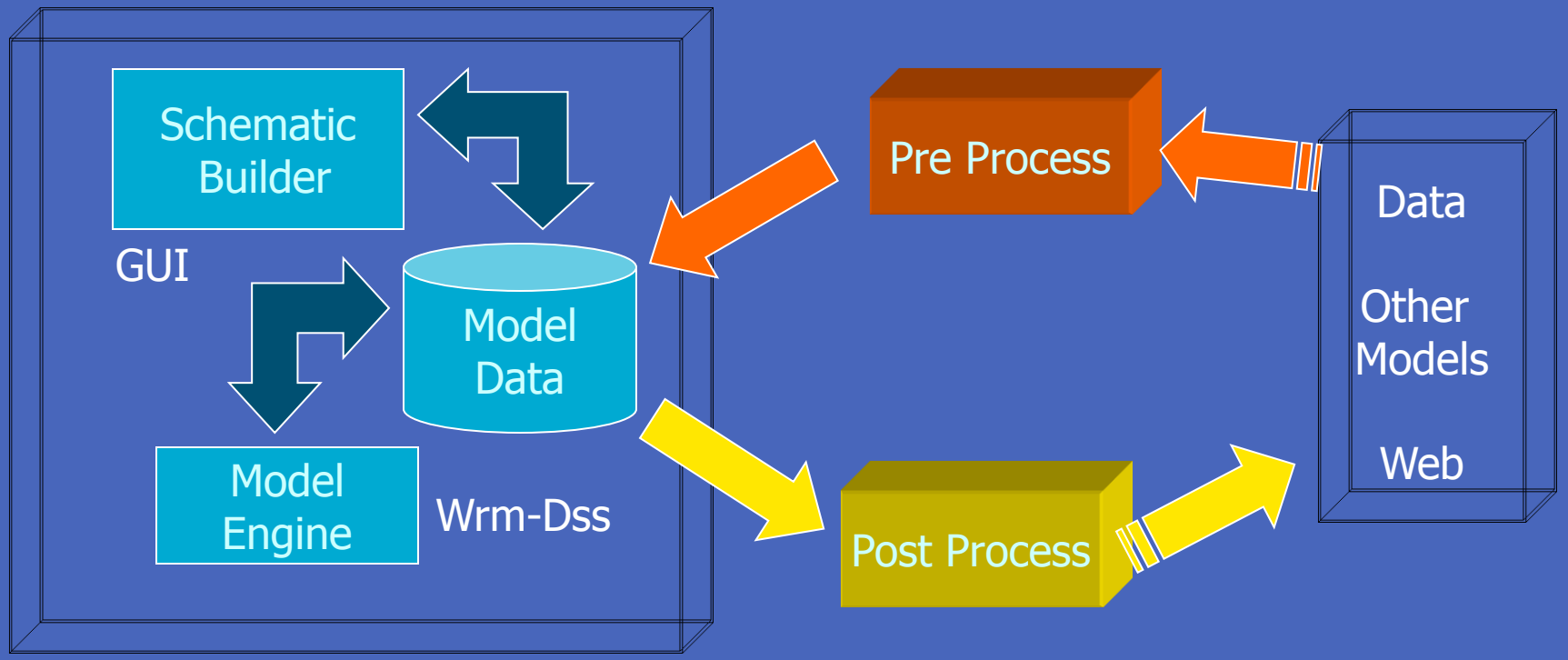
Emissions inputs
Development
management practices
Project locations
Emissions inputs
Constraints to
development
Dry and wet deposition
(Soil acidification)
Land
Land Use Change &
Optimization
(Spatial & Temporal)
Land use change and
water demand profile
Supply and loading
constraints
Water
Social
Indicators
Cost/benefit
Socio-economic
Surface water
allocation models
Water Quality
Models
Terrestrial
&
Biodiversity
indicators
Biodiversity
Instream
Flow Needs
Demands
Aquatic habitat
indicators
Hydraulic Models
Hydrologic
Models
Groundwater
Model
(quantity and quality)
Integrated System of Modelling Tools

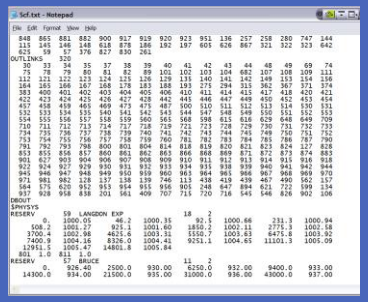
WRMM Linkages



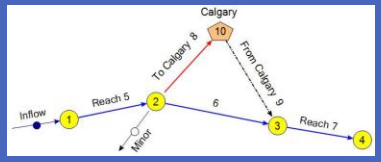
WRMM
Evolving with technology

1970's to 90's

1990's to 2010



Current to Future



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