ASSESSMENT OF IMPACTS OF CLIMATE CHANGE ON WATER ALLOCATION IN CAU RIVER BASIN-VIETNAM

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2. Study site
3. Objectives and method

Background

A 2007 assessment of the World Bank (wps4136) listed Vietnam as one of the five worst affected countries by climate change.

1. National target program to response to climate change (2,Dec,2008)

2. Climate change, sea level rise scenarios for Vietnam (2009,2012)

Action plan to respond to climate change in provinces

Study site

Cau river basin

- Important economic zone of Northern Part of Vietnam
- Population: 3,509,940
- Total area: **6,030** km^2
- The main river length: **288.5**km
- Annual rainfall: 1500-2000mm, 75-80% in rainy season (V-IX)

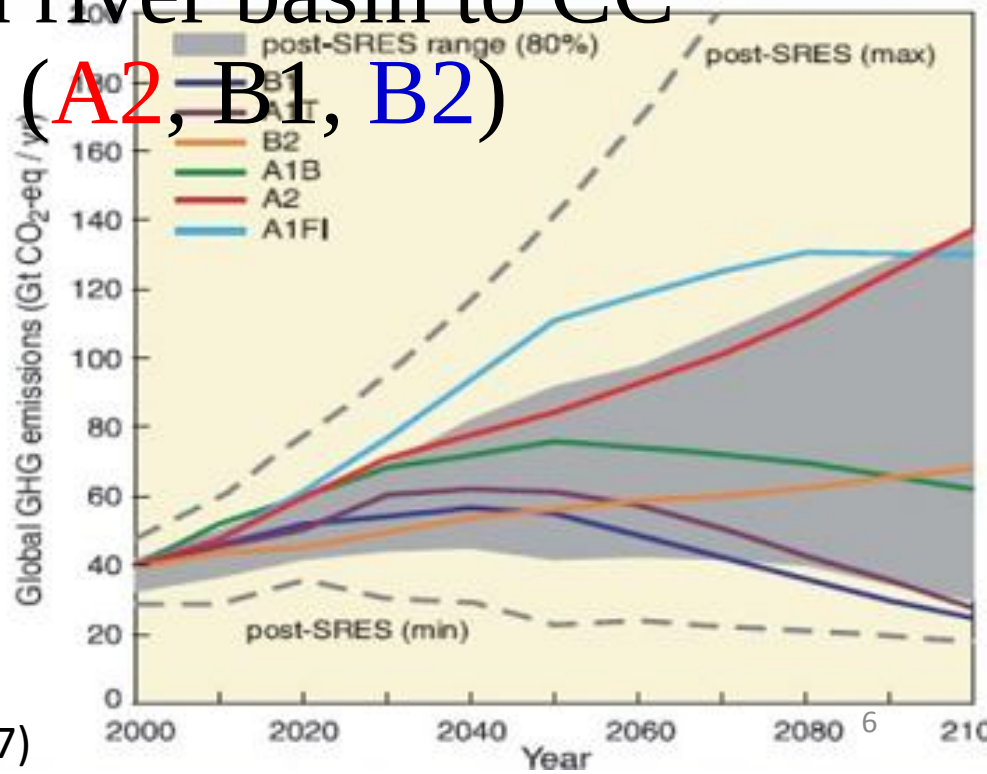
Study site

Cau river basin

Source: HMEC (2009)

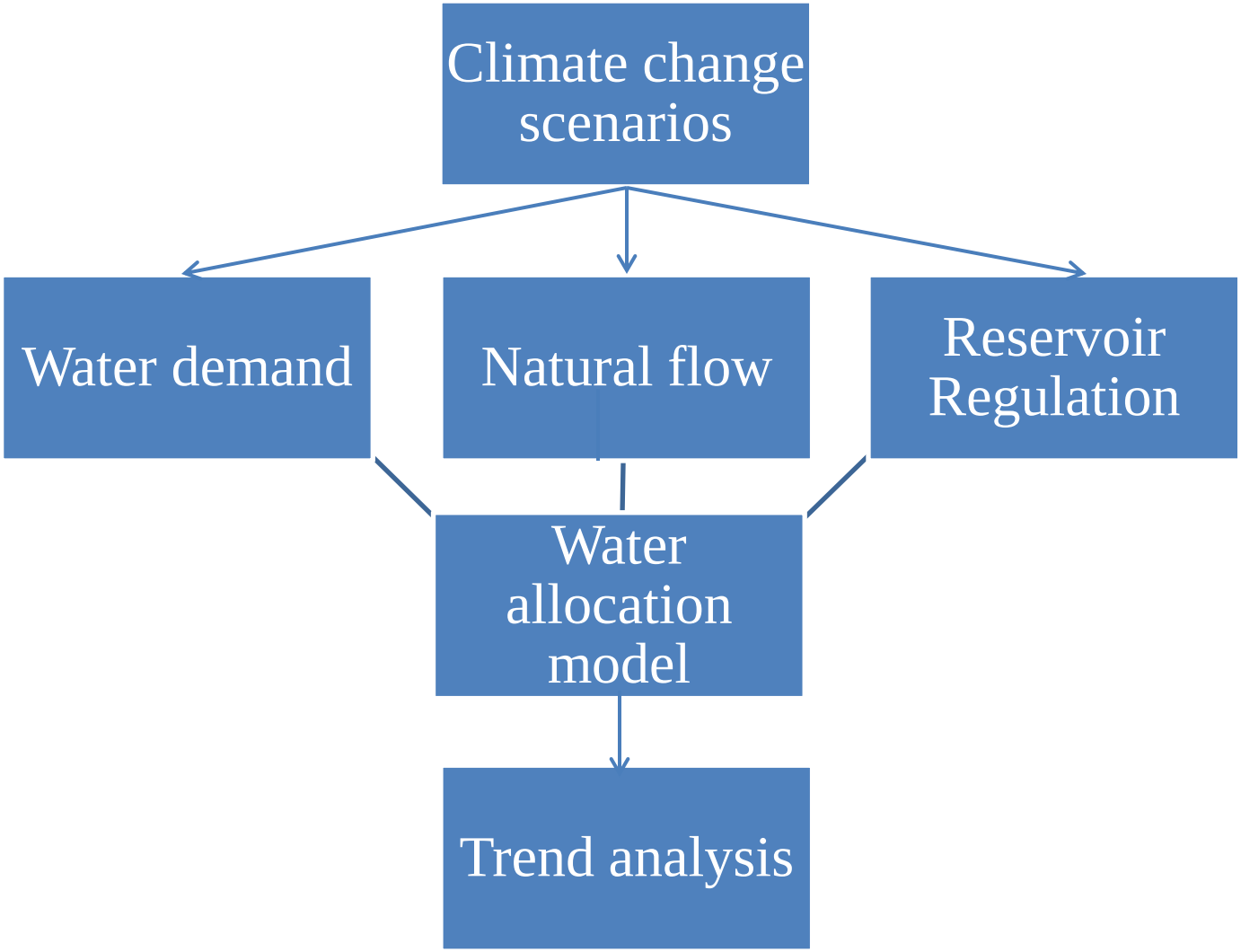
Objective of Thesis

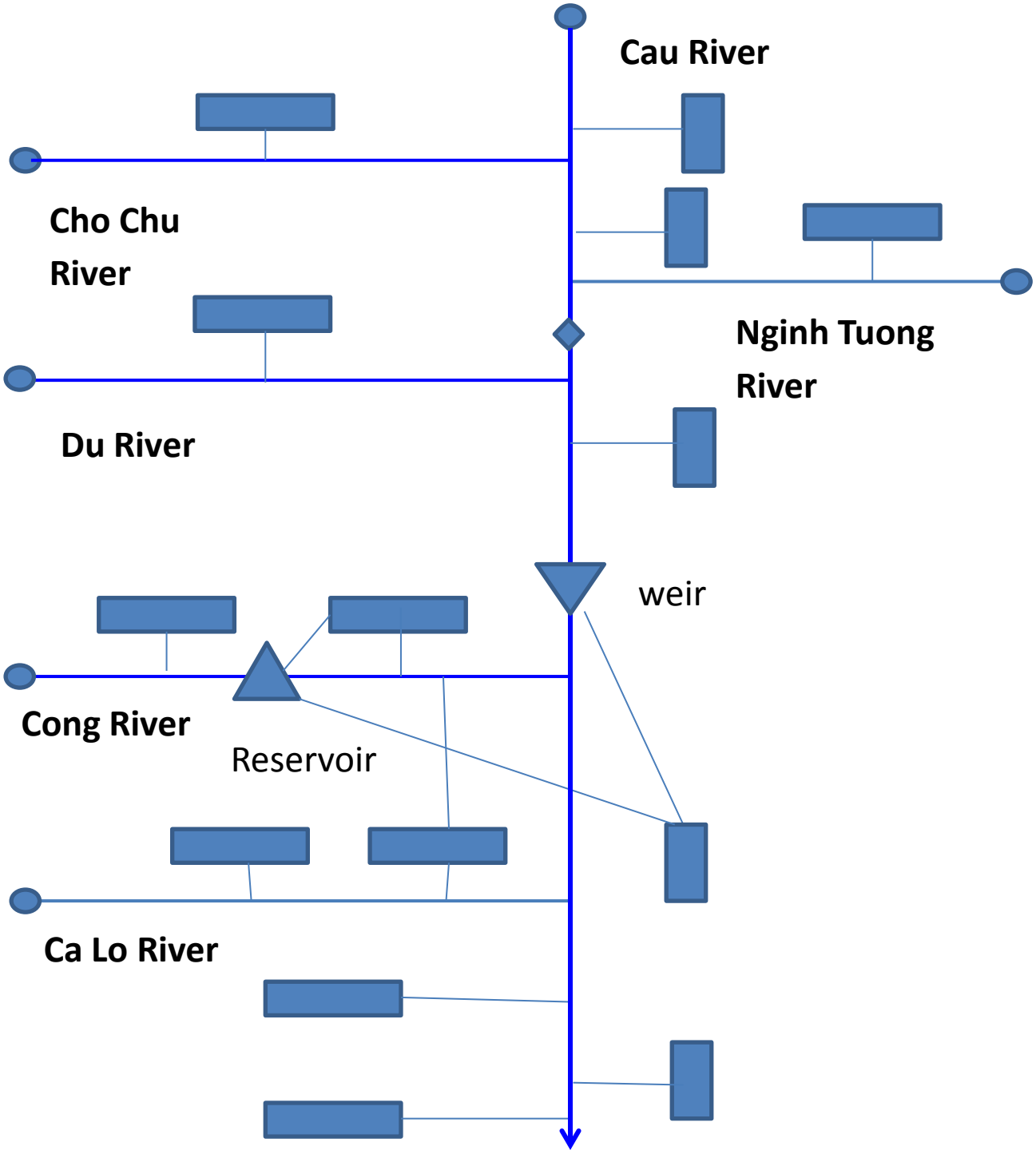
- To assess impacts of climate change (CC) on river flows in Cau river basin to CC scenarios for Vietnam (A2, B1, B2)
- To assess impacts of CC on water allocation (surface water) in Cau river basin to CC scenarios for Vietnam (A2, B1, B2)



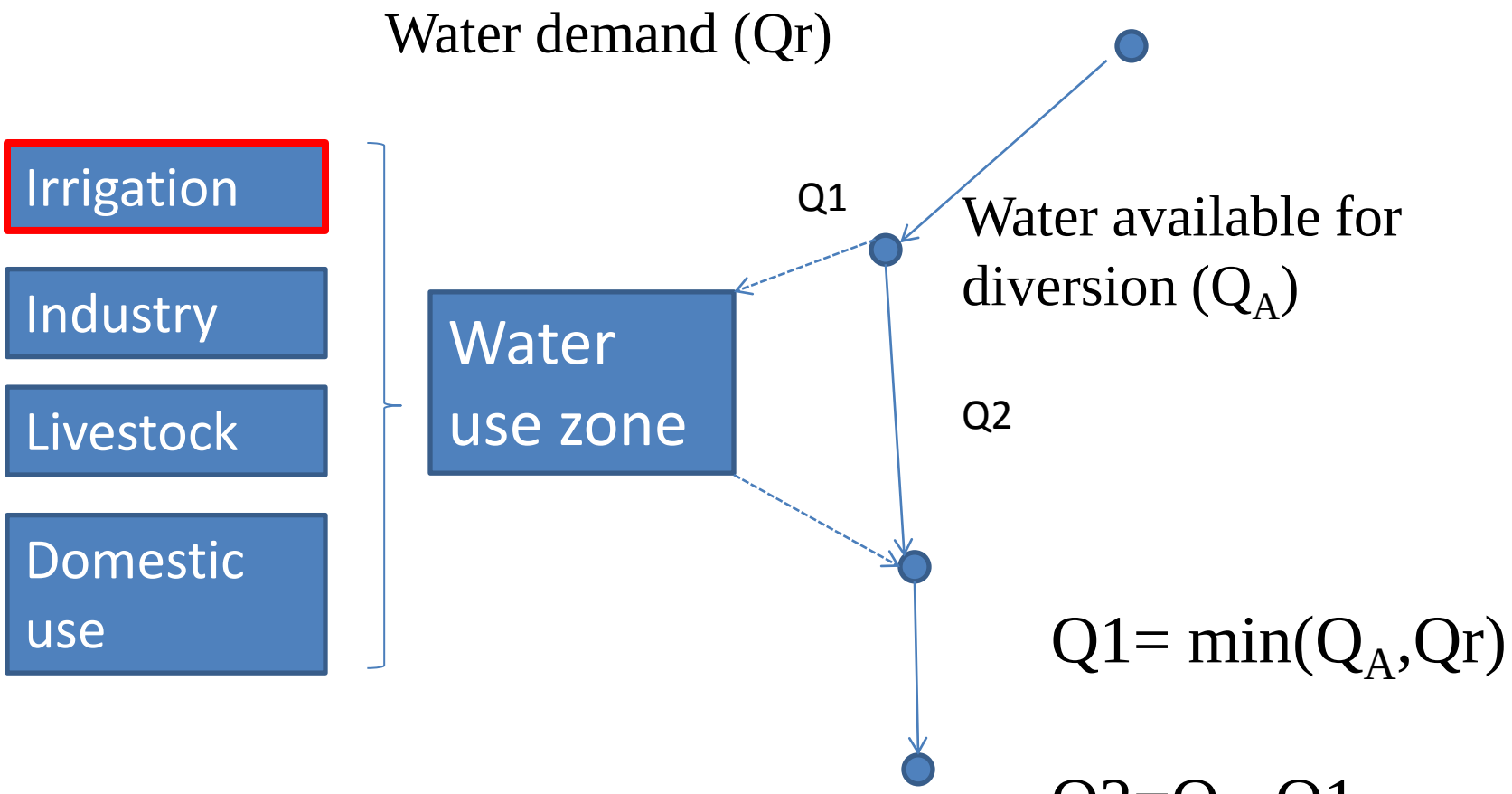
Source: IPCC (2007)

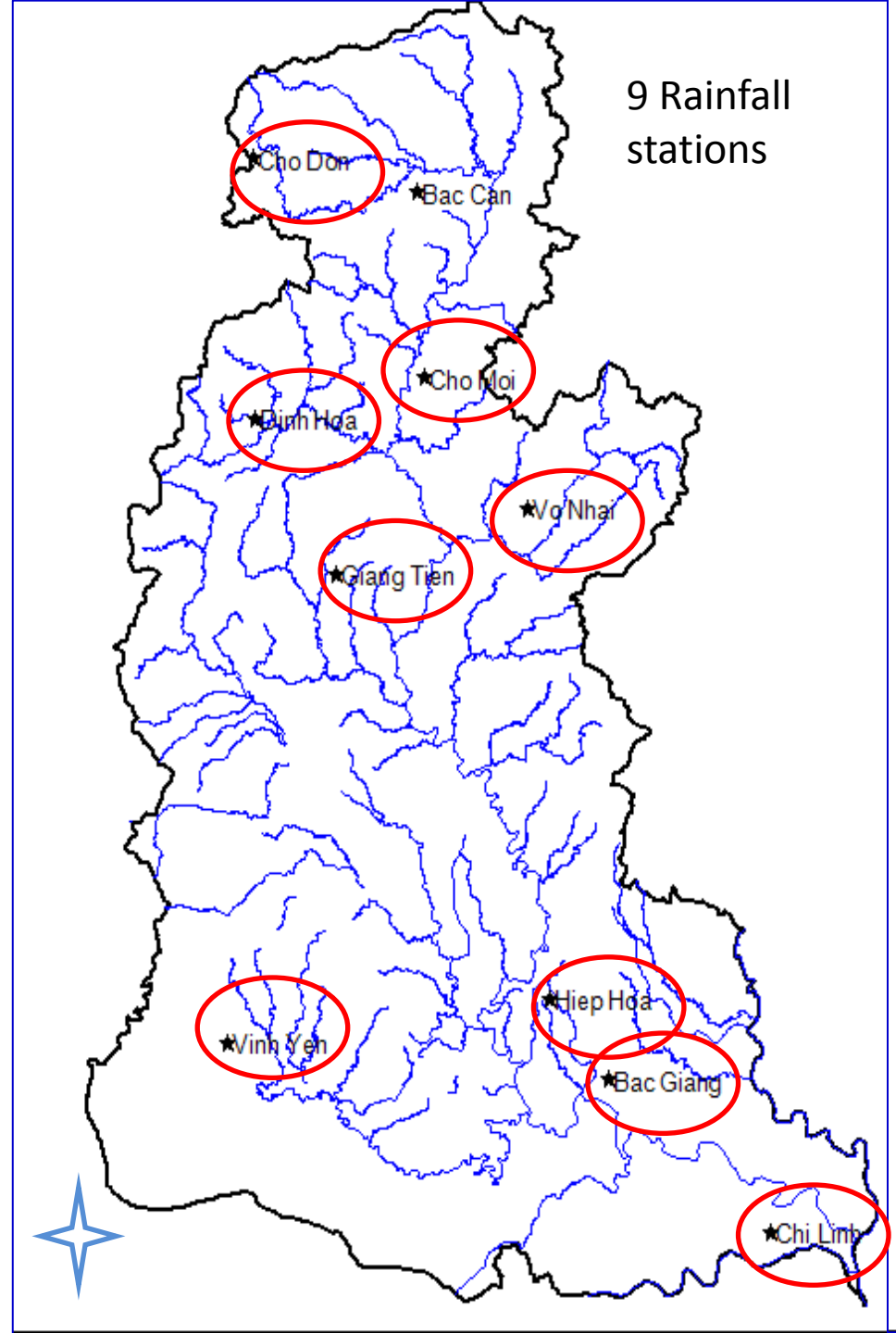
RESEARCH METHOD

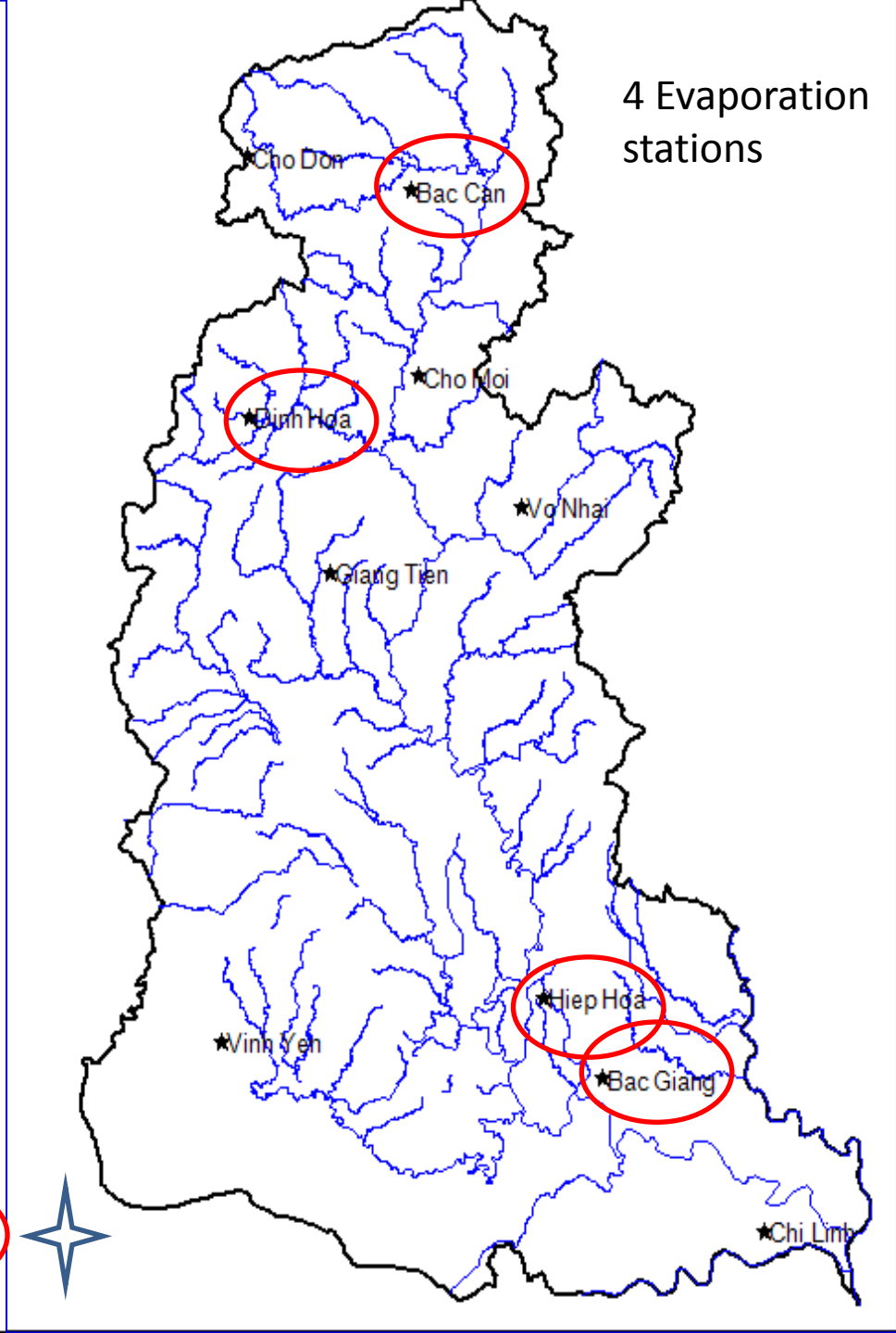


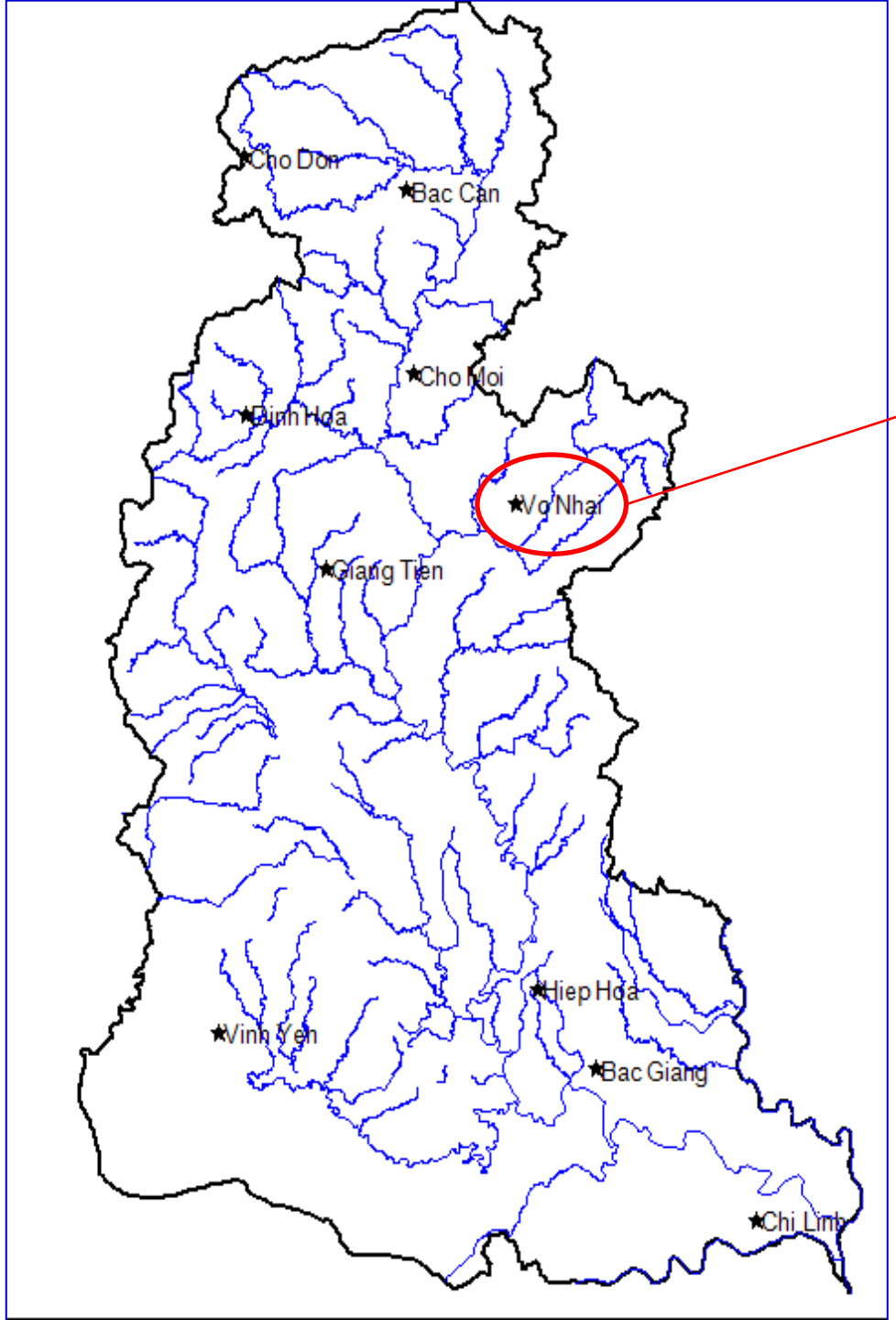

Cau River
Cho Chu River
Nginh Tuong River
Du River
weir
Cong River
Reservoir
Ca Lo River

RESEARCH METHOD




9 Rainfall stations
Cho Don
Bac Can
Cho Moi
Dinh Hoa
Vo Nhai
Giang Tien
Vinh Yen
Hiep Hoa
Bac Giang
Chi Linh


4 Evaporation stations
Cho Don
Bac Can
Cho Moi
Dinh Hoa
Vo Nhai
Giang Tien
Hiep Hoa
Vinh Yen
Bac Giang
Chi Linh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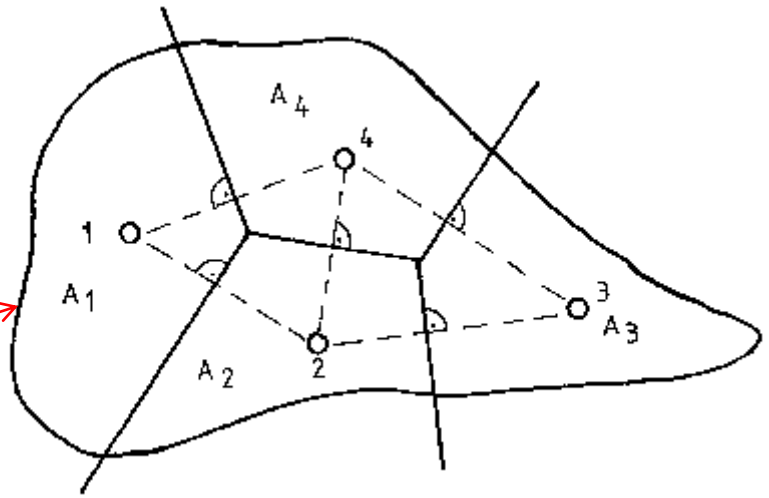
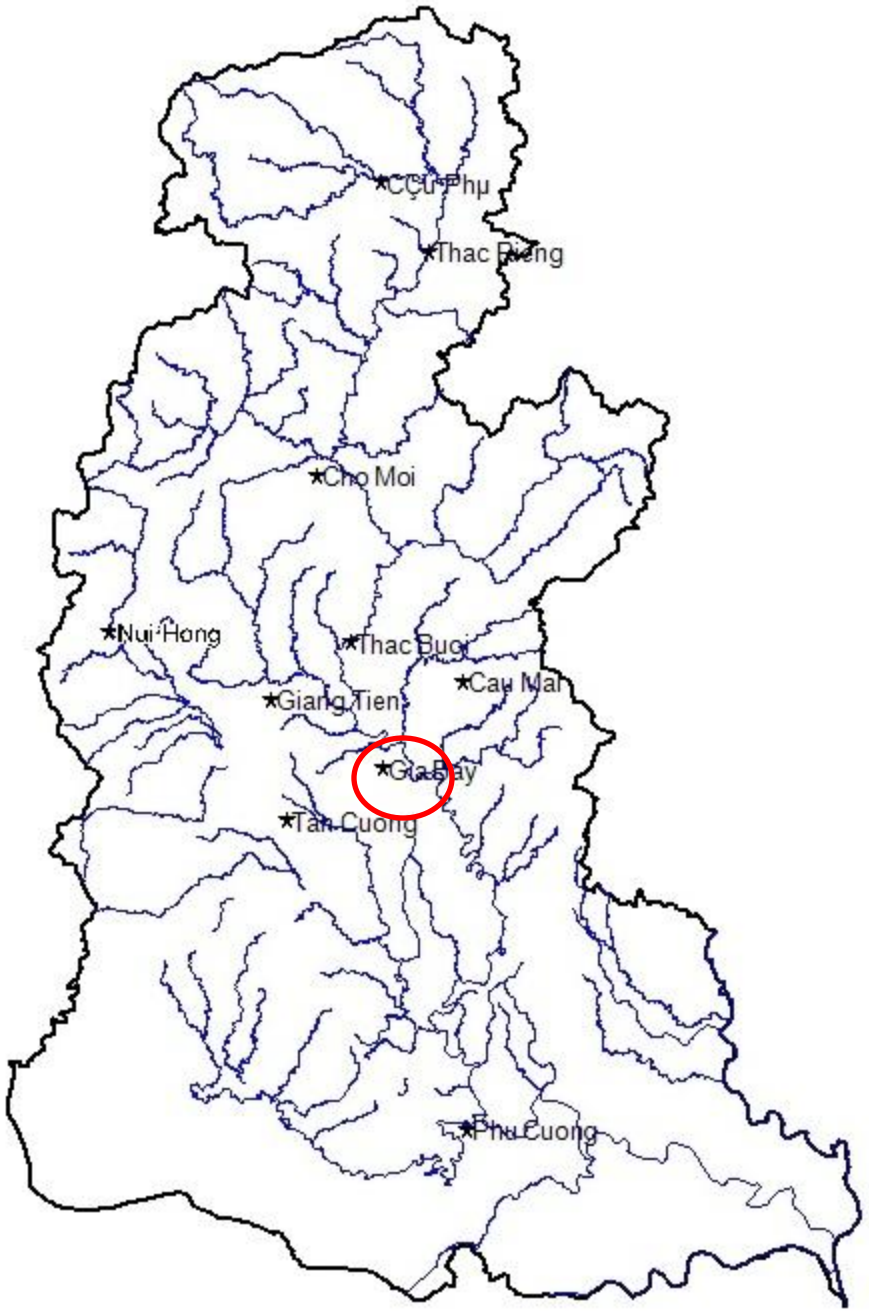

A 4
4
1
A 1
3
A 3
A 2
2

No	Station	River	Observation period
1	Thác Riềng	Cầu	60-81
2	Thác Bưởi	Cầu	60-96
3	Gia Bảy	Cầu	96-present
4	Giang Tiên	Đu	62-71
5	Cầu Mai	Cầu Mai	70-85
6	Núi Hồng	Công	62-68
7	Tân Cương	Công	61-76
8	Phú Cường	Cà Lồ	65-75
9	Ngọc Thanh	Thanh Lộc	67-81



CROPWAT

CROPWAT 8.0 for Windows is a computer program for the calculation of crop water requirements and irrigation requirements based on soil, climate and crop data (FAO)

For irrigation requirements:

- Climate data:
  - Temperature
  - Humidity
  - Sunshine
  - Wind speed
  - Rainfall
- Crop data:
  - First and last planting date
  - First and last harvesting date
  - Crop and crop variety

Irrigation requirements calculation based on water balance formula:

$$IRR = (ET_c + P_{rep}) - P_{eff} \quad \text{(mm/day)}$$

Where:

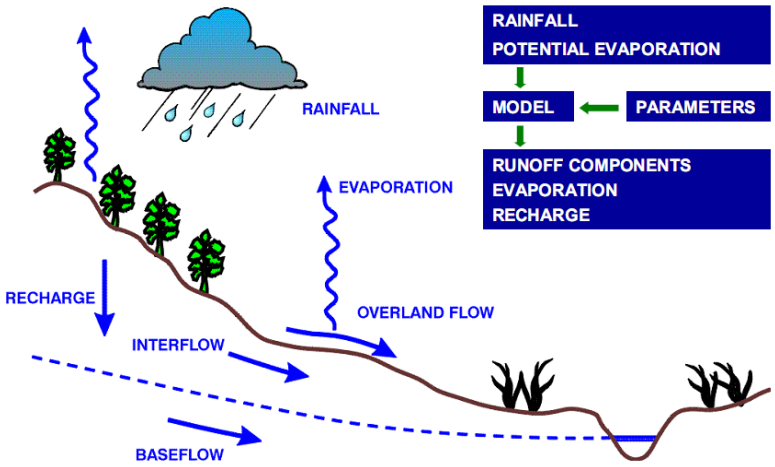
IRR: irrigation requirements (mm/day)

ETc: crop evapotranspiration (mm/day)

P_{rep}: infiltration (mm/day)

P_{eff}: effective rainfall (mm)

NAM MODEL

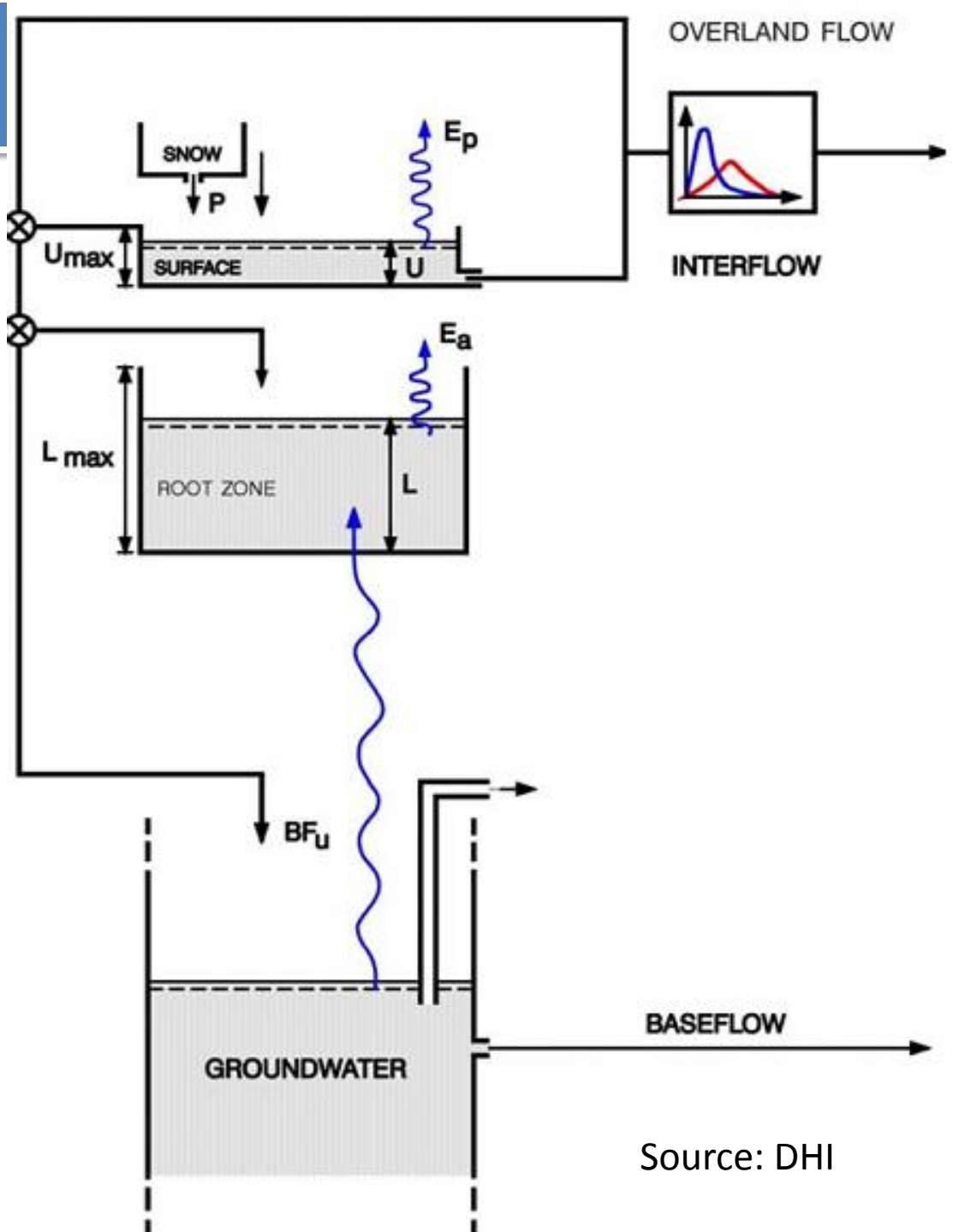


RAINFALL
POTENTIAL EVAPORATION

MODEL ← PARAMETERS

RUNOFF COMPONENTS
EVAPORATION
RECHARGE

Developed by DHI (1973)



Source: DHI

Surface flow

Surface flow:

$$QOF = \begin{cases} CQOF \dfrac{L/L_{max} - TOF}{1 - TOF} P_N & for\ L/L_{max} > TOF \\ 0 & for\ L/L_{max} \le TOF \end{cases}$$

Where:

CQOF: Overland flow runoff coefficient

TOF: Root zone threshold value for overland flow

P_N = U-Umax

Interflow :

$$QIF = \begin{cases} (CKIF)^{-1} \dfrac{L/L_{max} - TIF}{1 - TIF} U & for\ L/L_{max} > TIF \\ 0 & for\ L/L_{max} \le TIF \end{cases}$$

Where:

CKIF: Time constant for interflow

TIF: Root zone threshold value for inter flow

Baseflow

Base-flow :

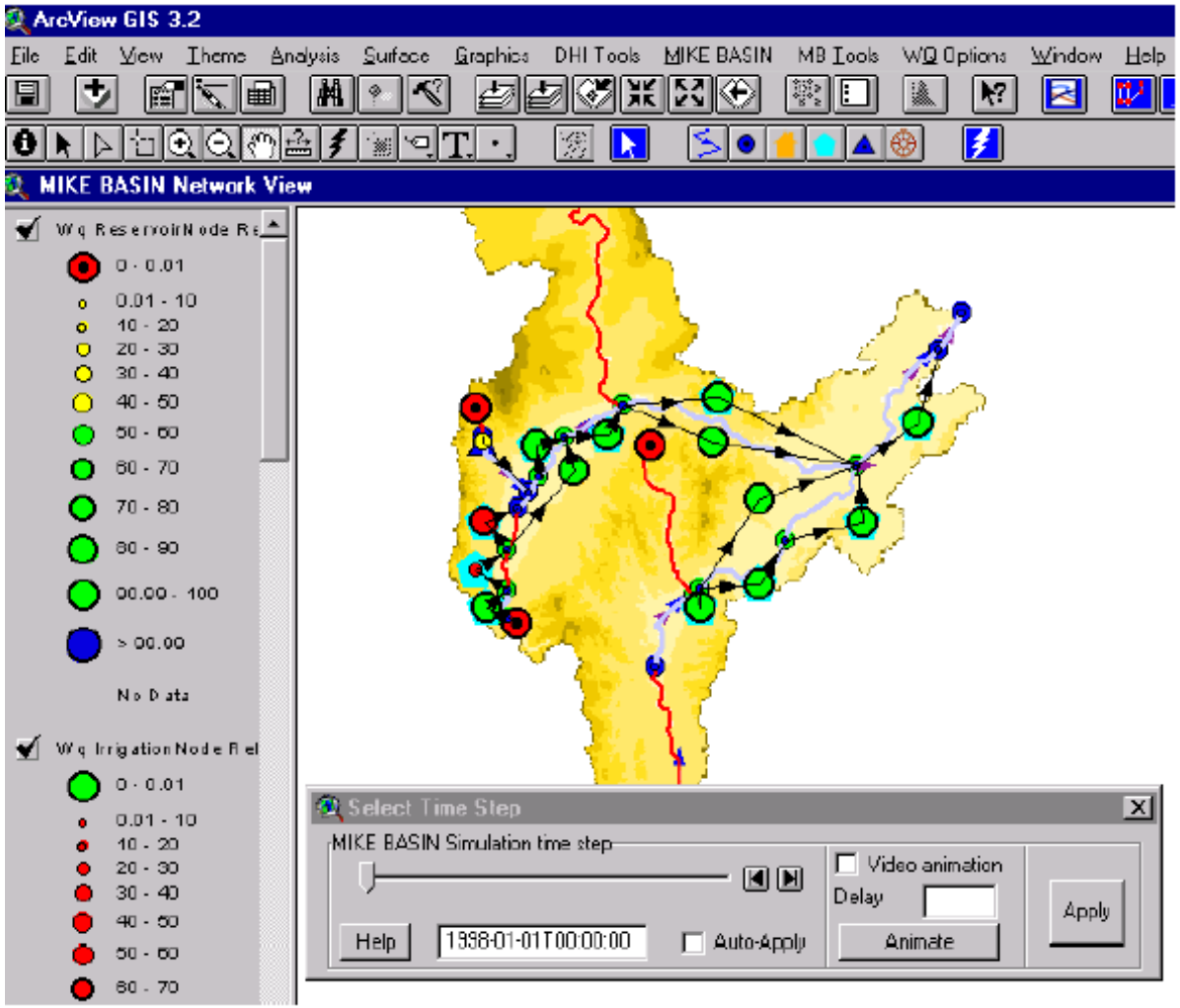
$$G = \begin{cases} (P_N - QOF)\dfrac{L/L_{max} - TG}{1 - TG} & for\ L/L_{max} > TG \\ 0 & for\ L/L_{max} \le TG \end{cases}$$

Where:

TG: Root zone threshold value for ground water recharge

$$0 \le TG \le 1$$

MIKE BASIN

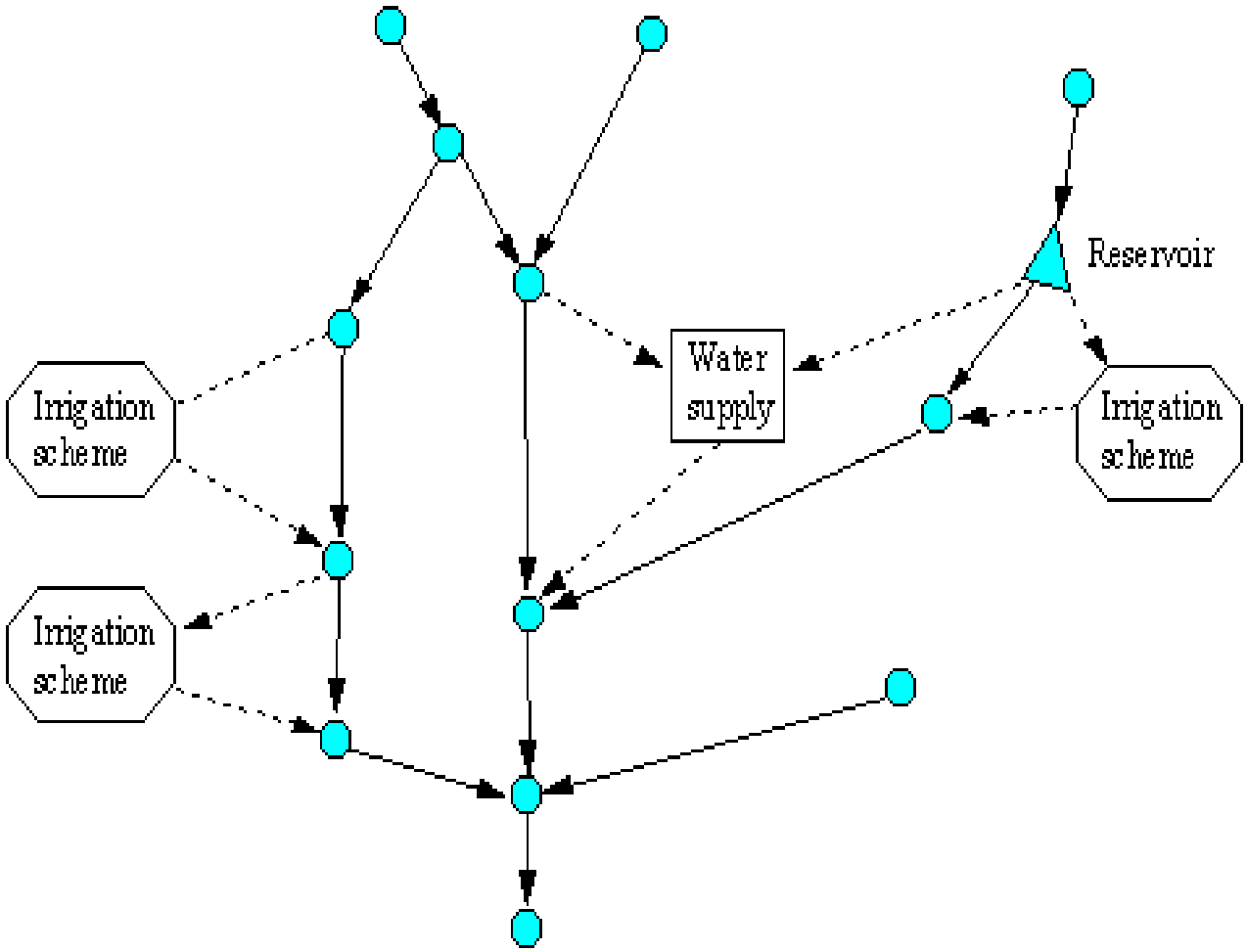


MIKE BASIN is a mathematical representation of the river basin, including the configuration of the main rivers and their tributaries, the hydrology of the basin in space and time, and existing as well as potential major water use schemes and their various demands for water.

http://mikebydhi.com/

MIKE BASIN

- MIKE BASIN is structured as a network model in which the rivers and their main tributaries are represented by a network consisting of branches and nodes.
- The branches represent individual stream sections
- The nodes represent confluence, locations where certain water activities may occur or important locations where model results are required.



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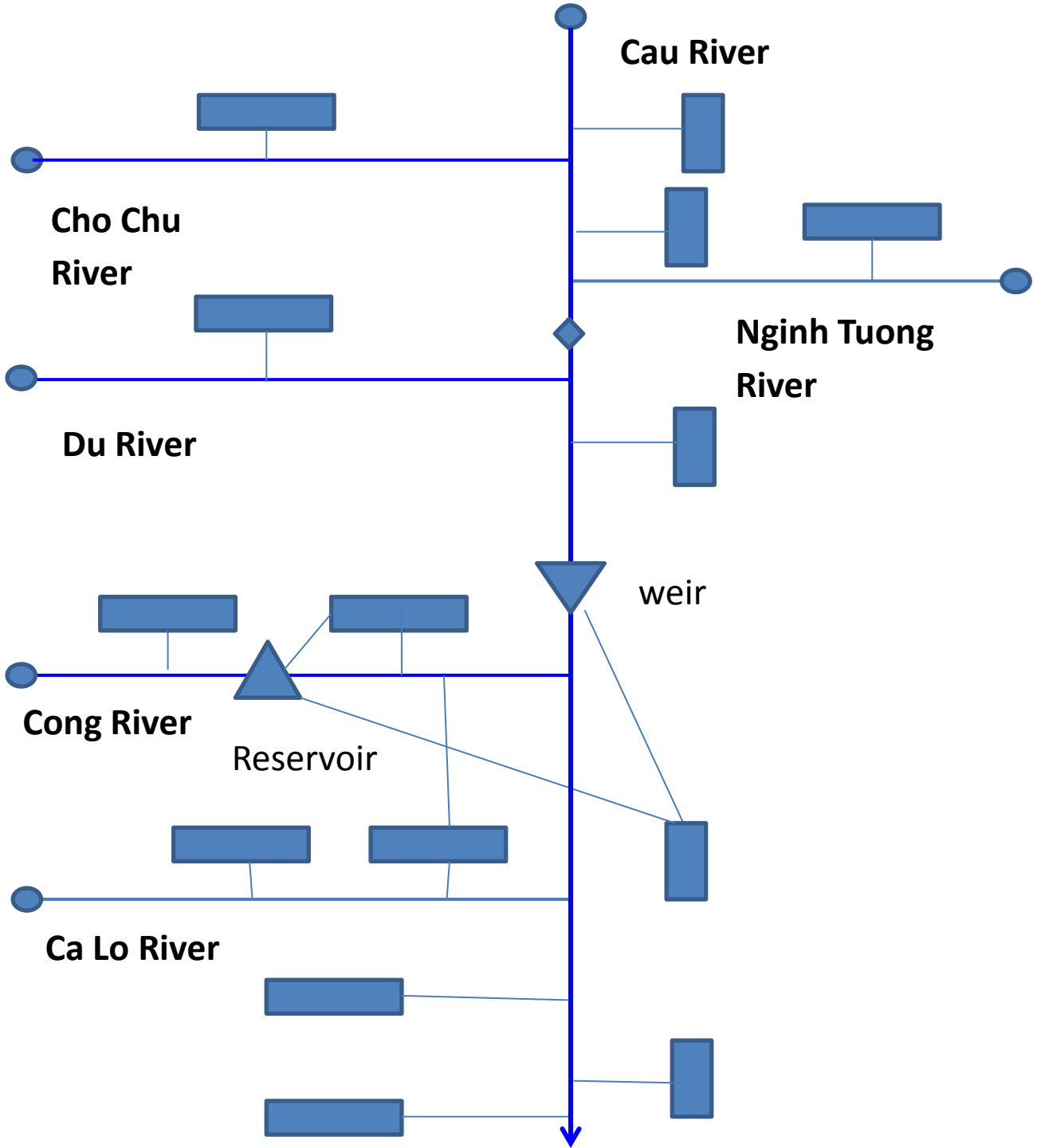
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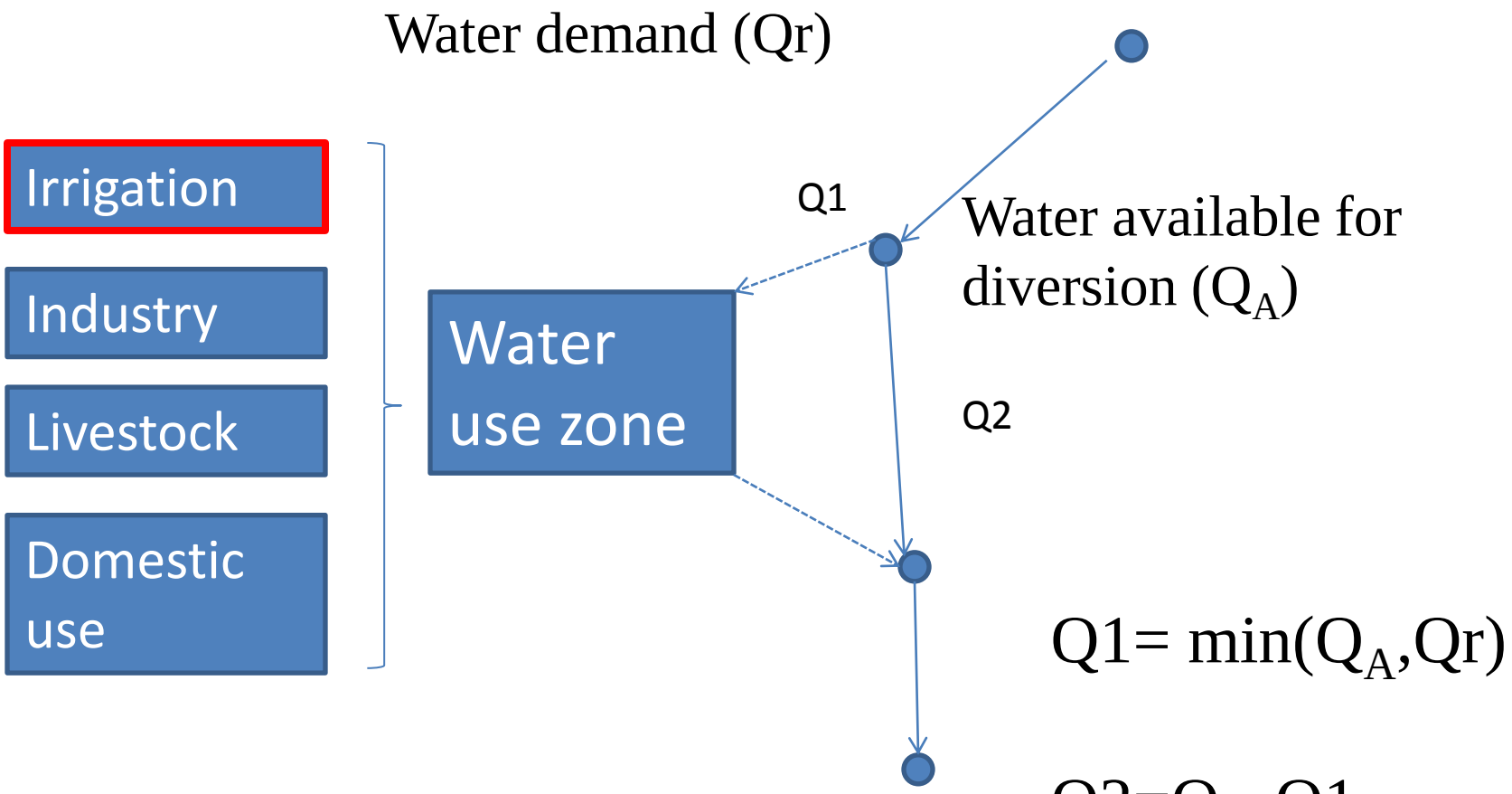

Thank you for your attention!