

Conceptual Earth Ecosystem Model

A product of the Northern Gulf Institute



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Earth Ecosystems

Earth System Models are a class of models that integrate components and processes beyond the physical, dynamical systems present in climate models, with the intention of accurately representing the complex human, natural, chemical, and physical interactions that contribute and respond to climate.

(NSF, <http://www.nsf.gov/geo/sees/easm/>)

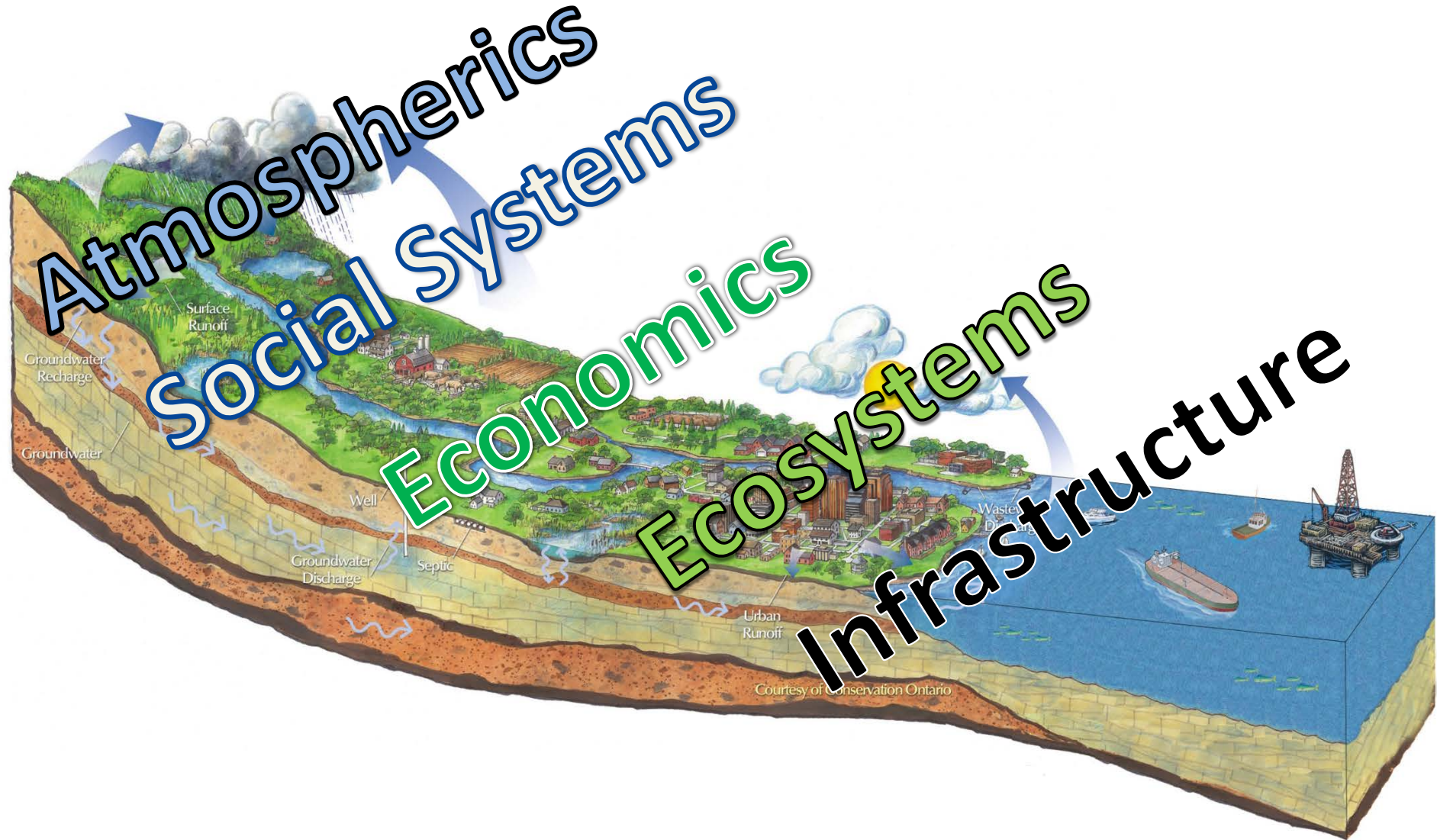
Earth Ecosystem Models are a class of models that integrate and quantify the complex human, natural, chemical, and physical interactions of ecosystems as they respond to human and natural perturbations.

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Aquascapes = Watershed + Waterspread



Trans-Aquascape Considerations

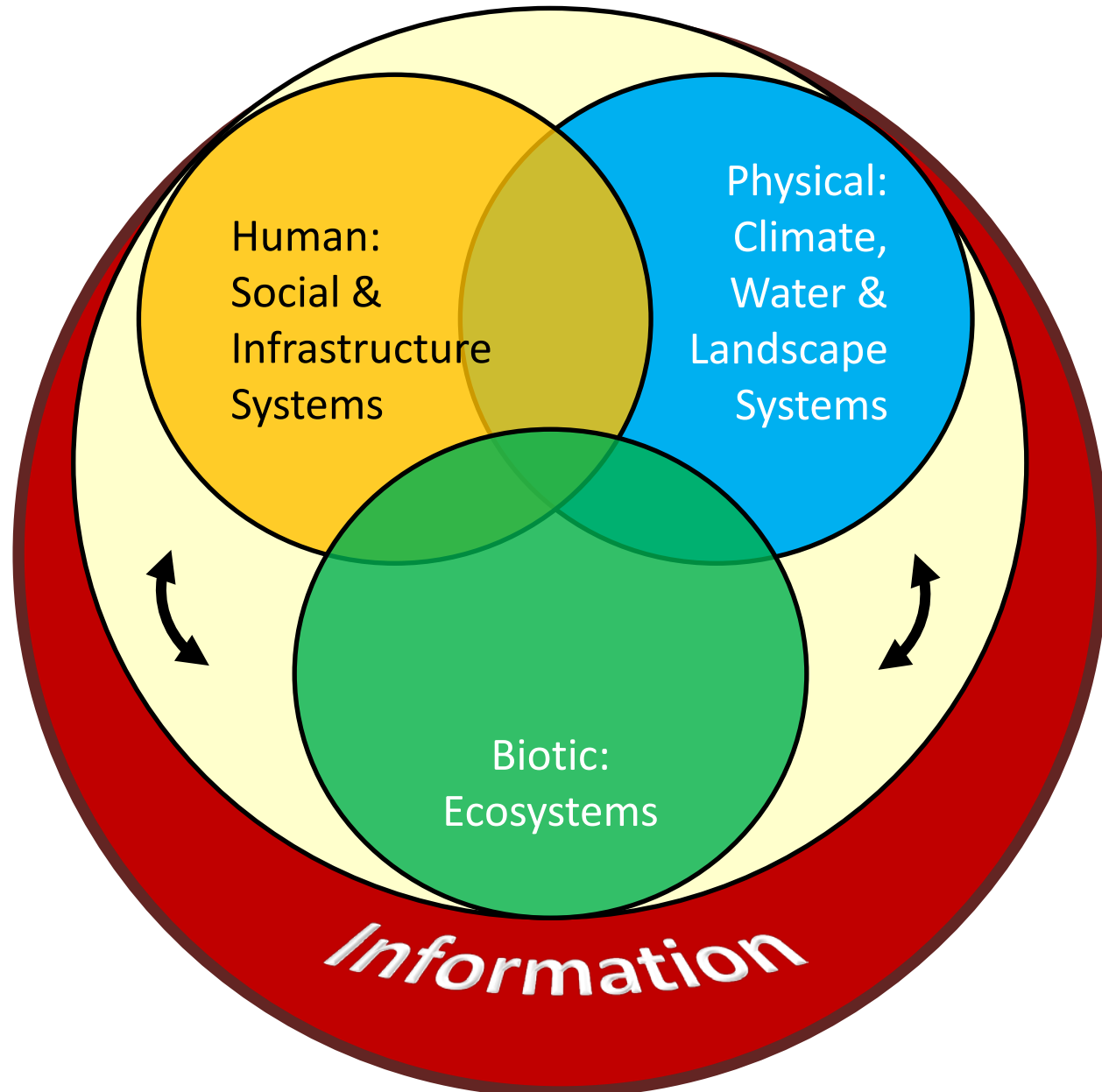




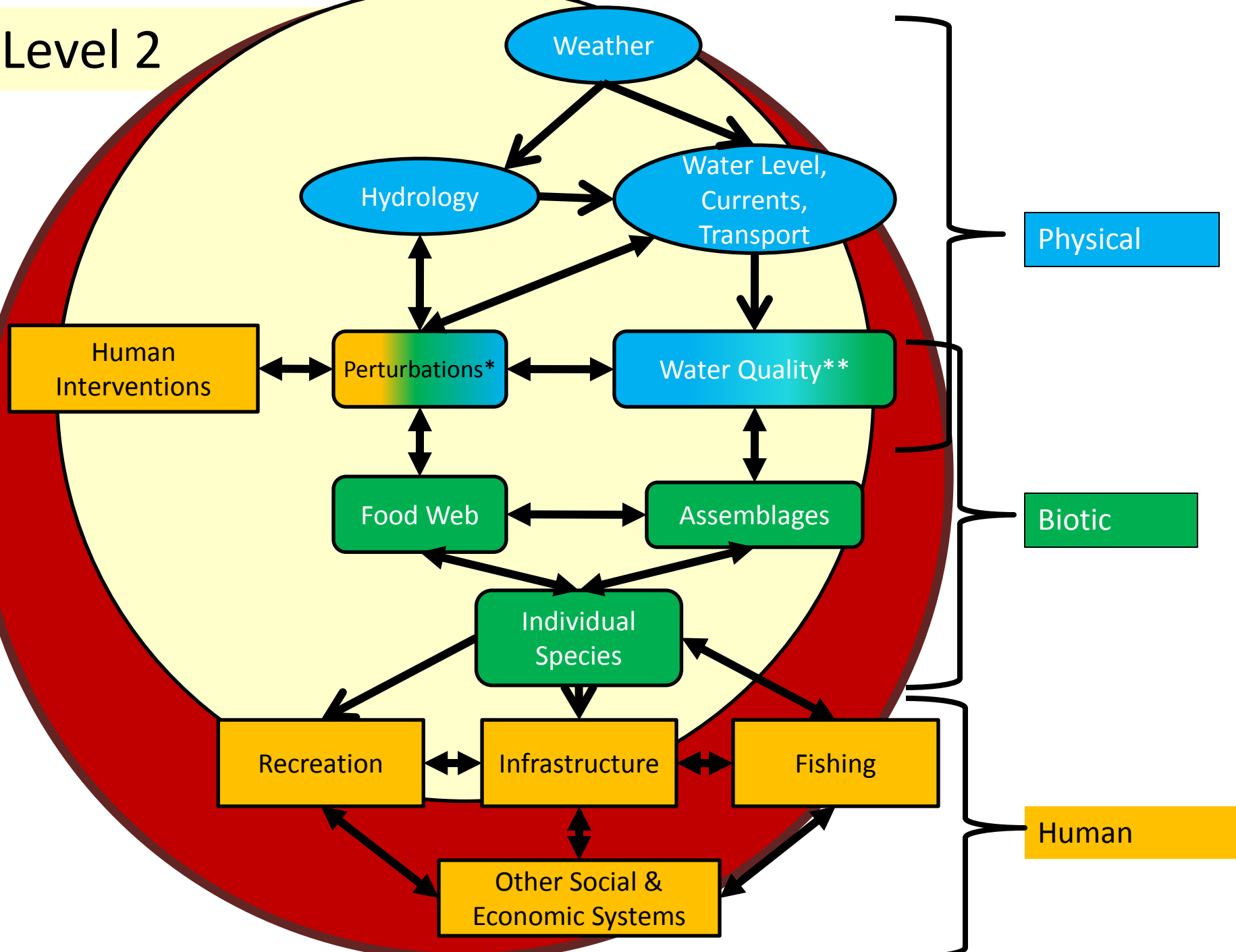
“Aquascape”

- A complete hydrologic footprint, including:
 - Watershed – an area of the earth’s surface from which water flows downhill to a single outflow point.
 - Water-spread – the coastal and ocean area over which the watershed’s flow spreads and ocean forcings affect coastal and upstream waters.
- Expansive view required by the holistic nature of water resources and the systems which depend on water -- ecosystems, economic communities, social systems and their infrastructure.

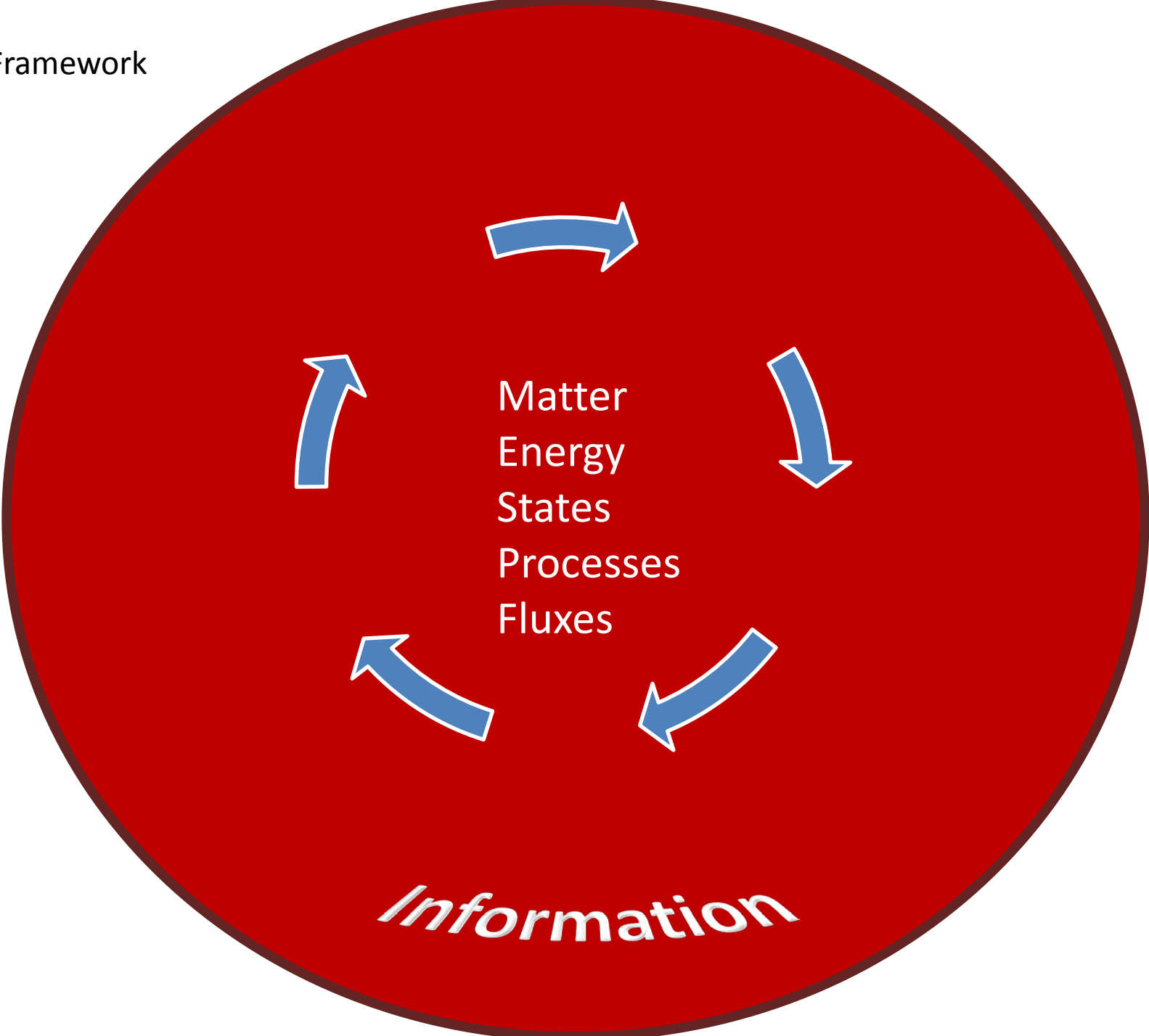
The Earth System Perspective: Level 1

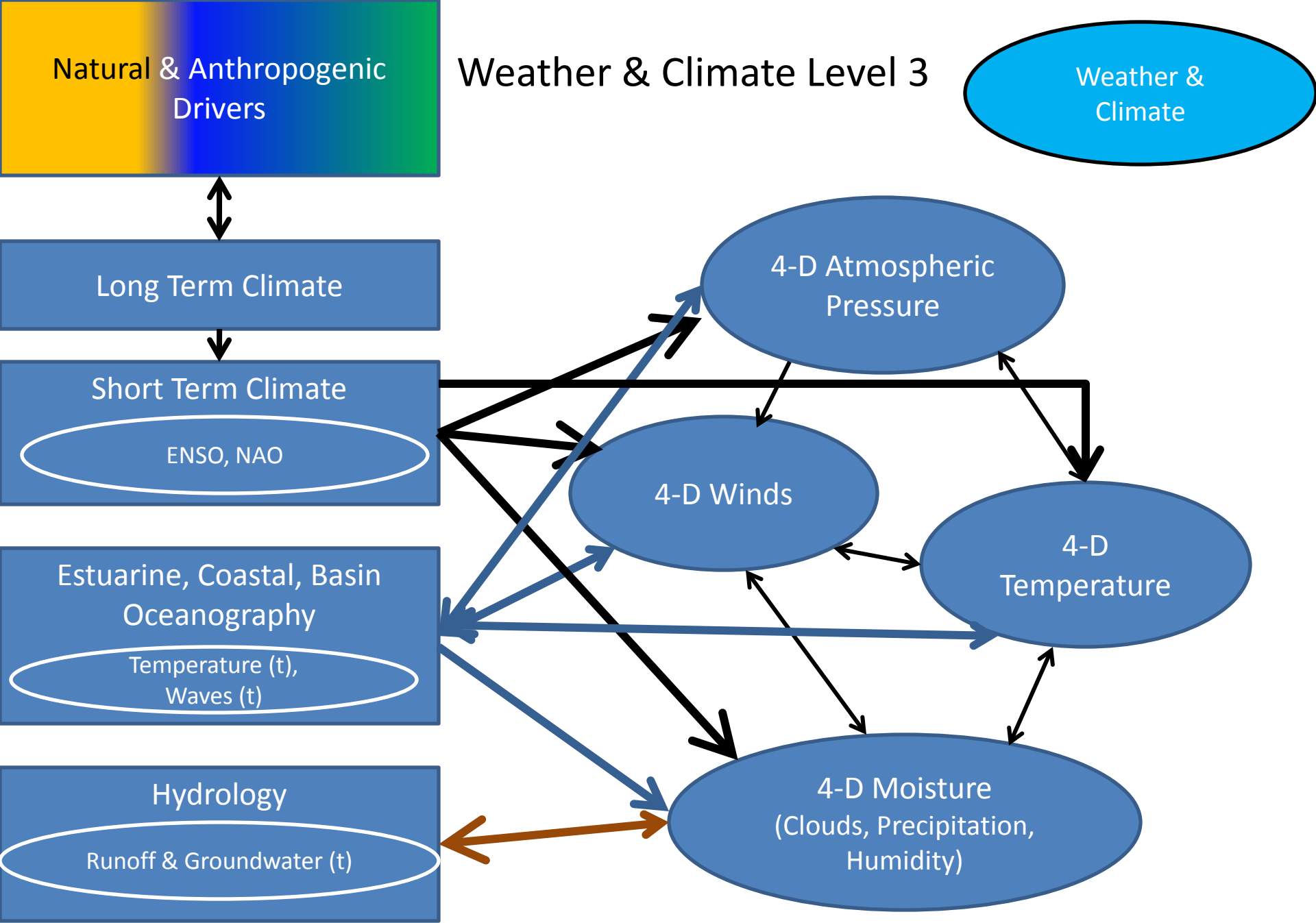


Level 2

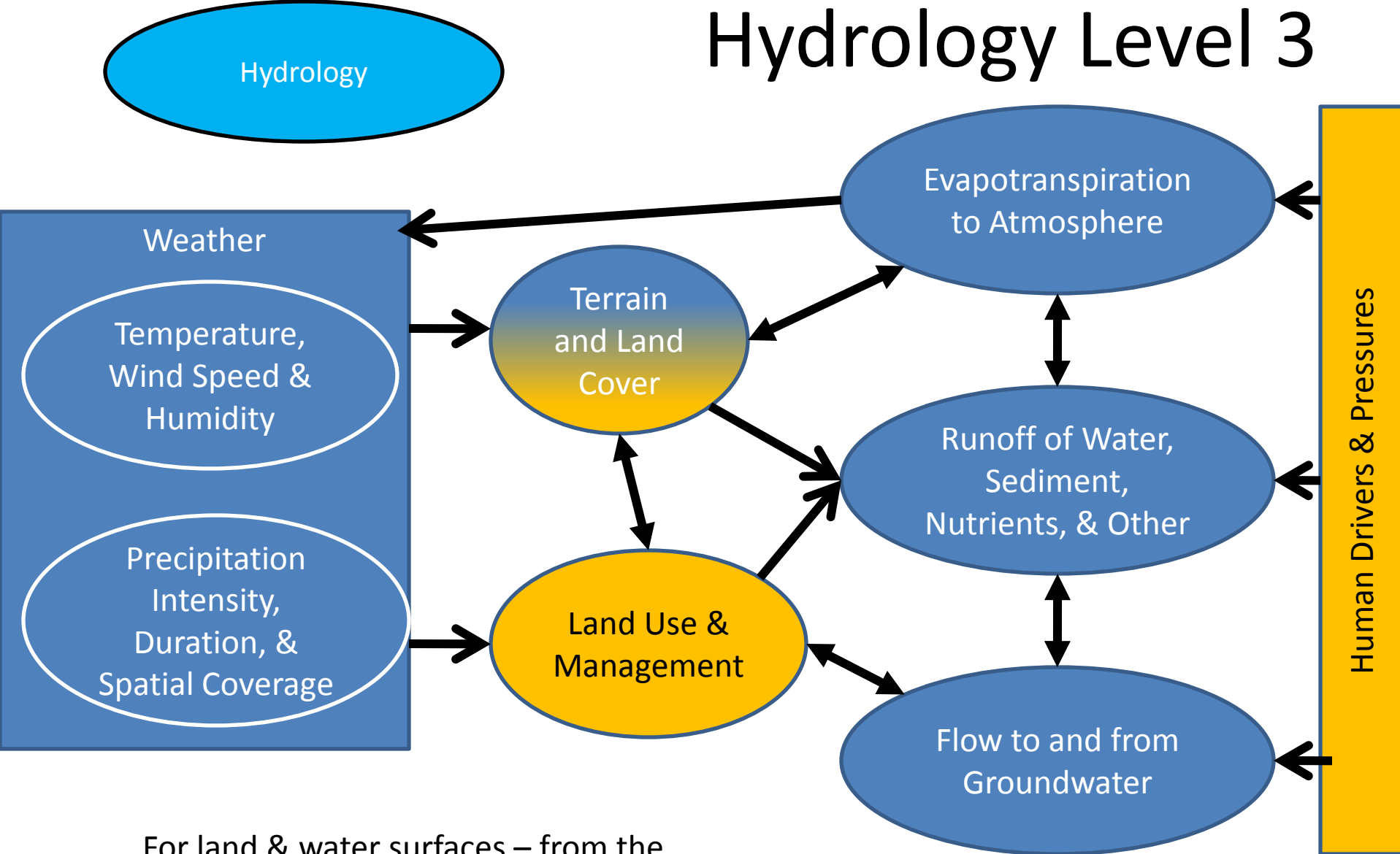


Level 2 Framework





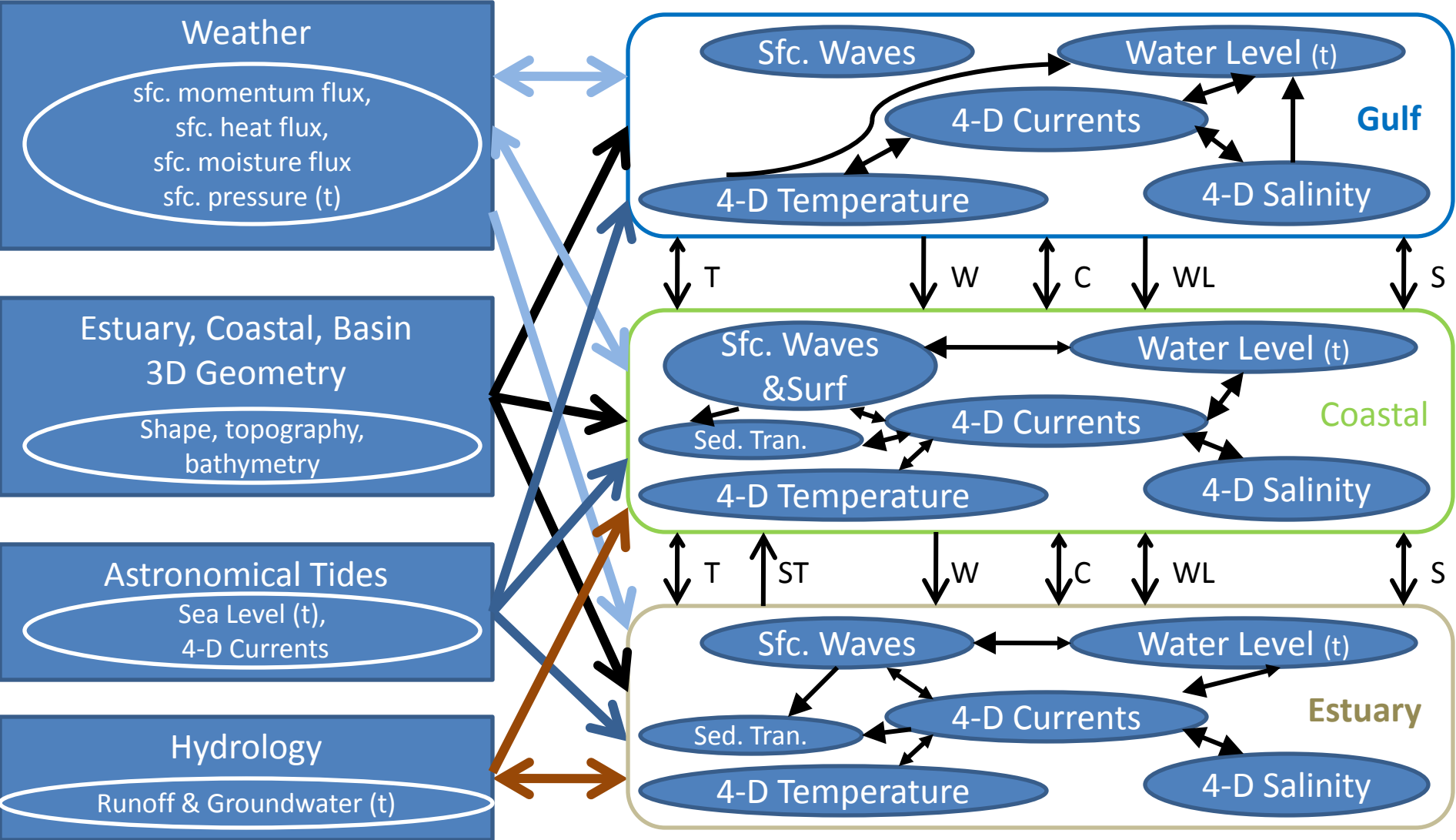
Hydrology Level 3



For land & water surfaces – from the watershed to the sea

Estuarine,
Coastal & Gulf
Oceanography

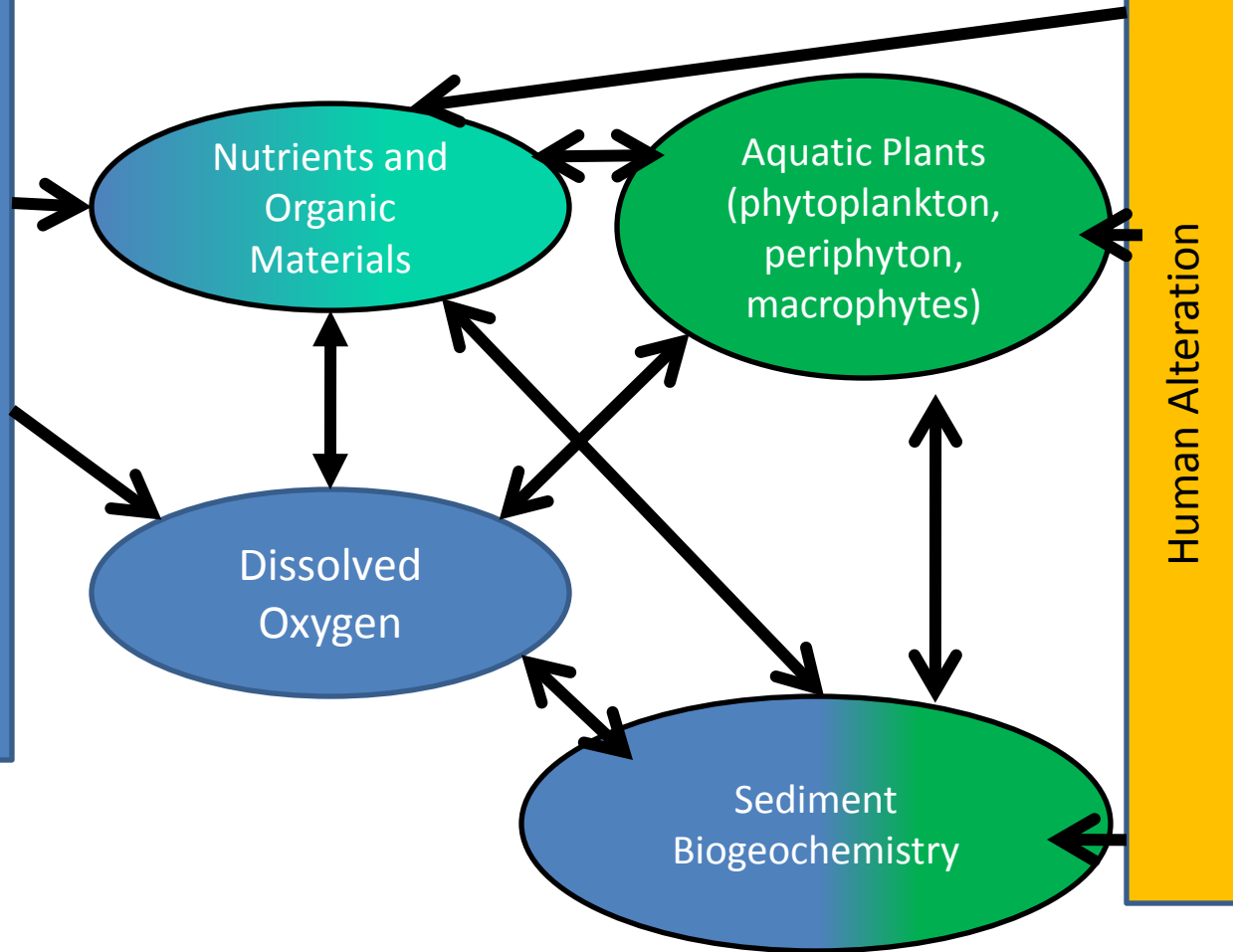
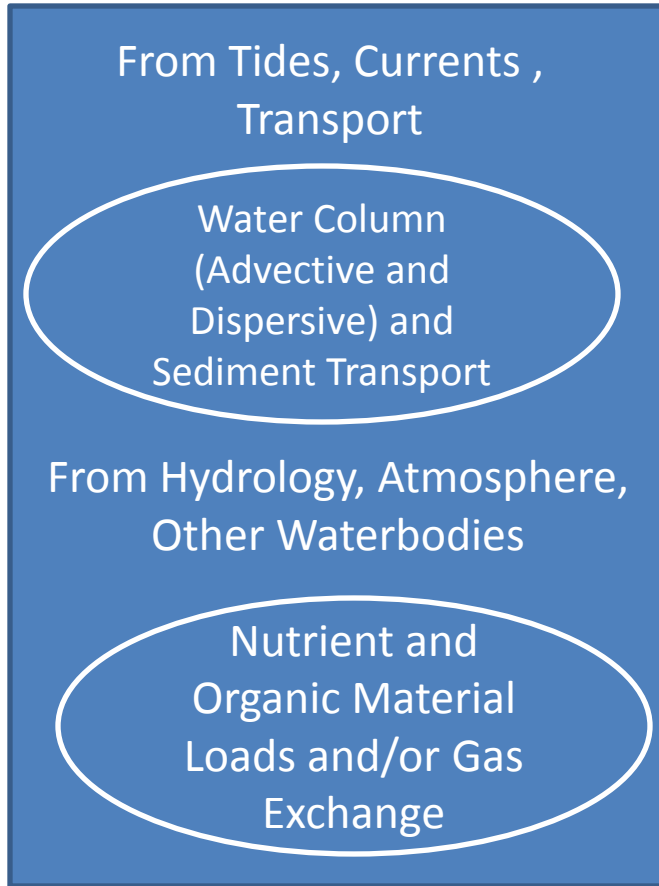
Estuarine, Coastal, & Gulf Oceanography Level 3



Water Quality**

Water Quality Level 3

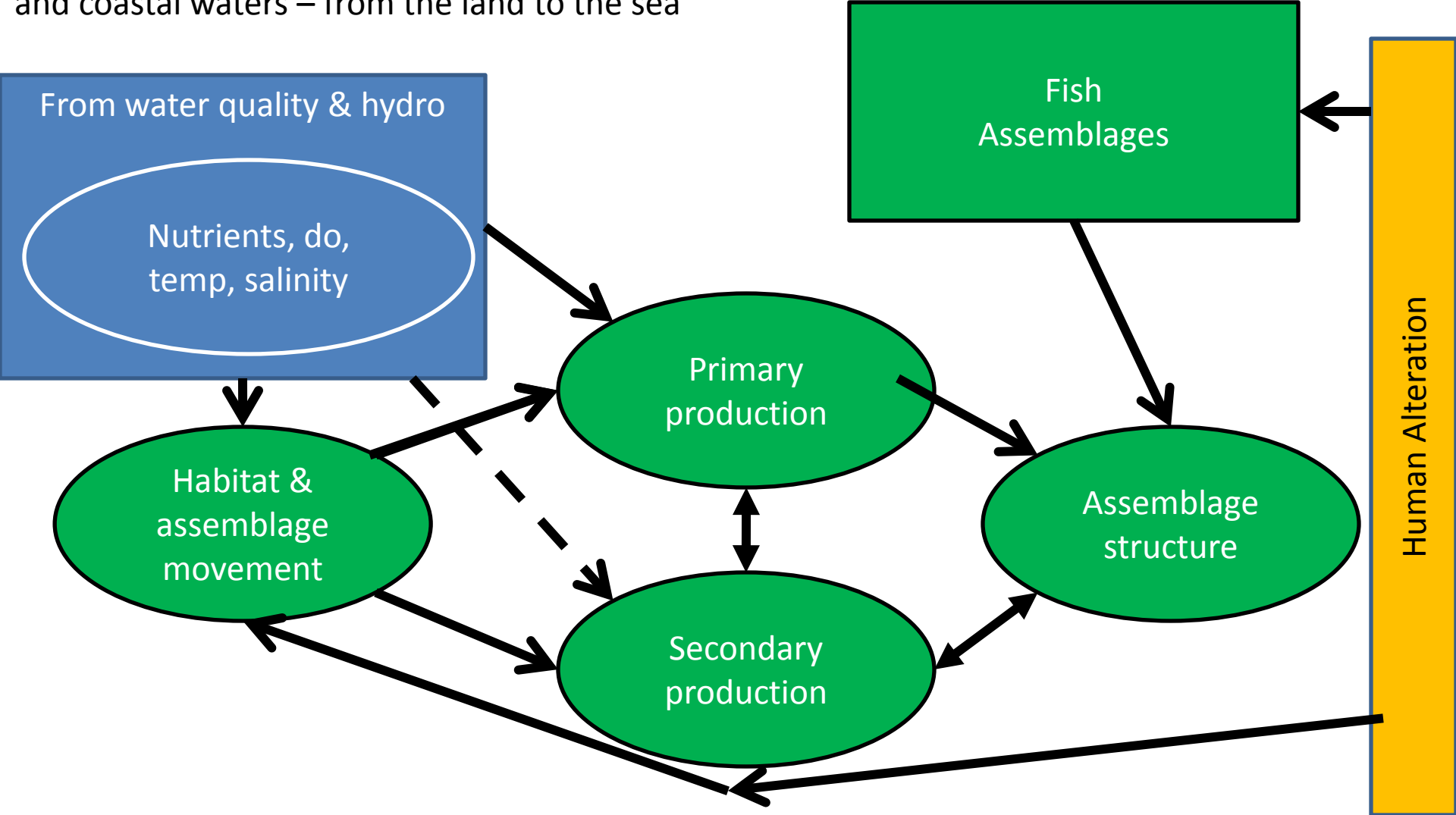
For waterbodies – streams, rivers, lakes, reservoirs, estuaries and coastal waters – from the land to the sea

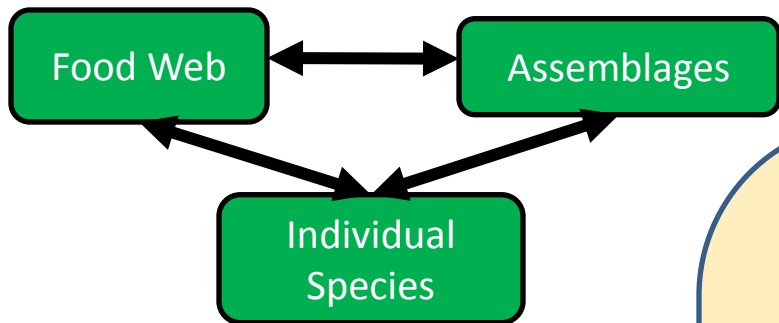


Food Web

Foodweb – Level 3

For waterbodies – streams, rivers, lakes, reservoirs, estuaries and coastal waters – from the land to the sea



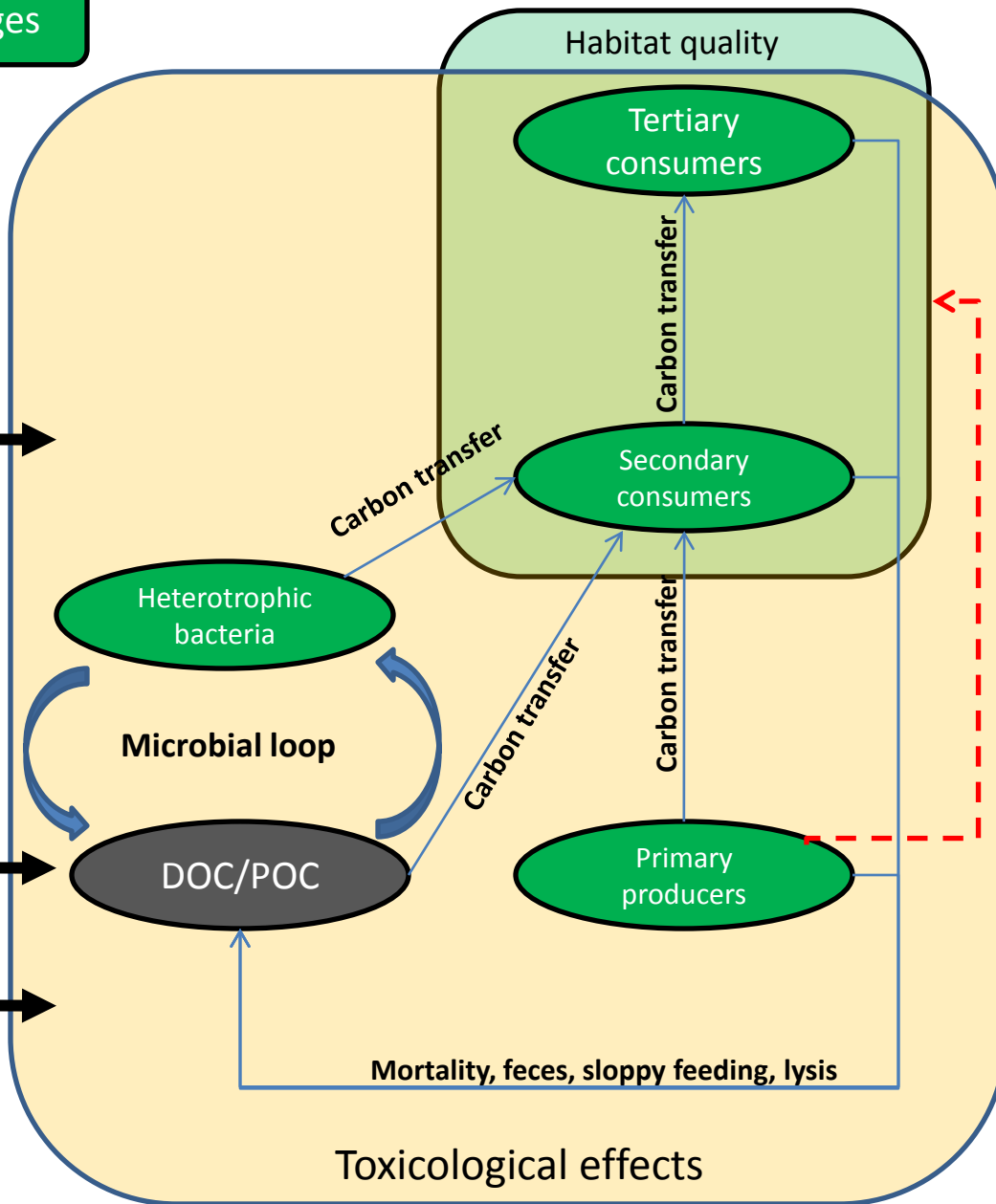


Ecosystem Level 3

From Hydrology/ECGO/Weather
transport vectors, light penetration, temperature, salinity, total suspended solids

From Water Quality
Nutrient and organic material load, dissolved oxygen level, biogeochemical interchange

From Human activities
Fishing pressure, habitat degradation (?)



Structural benefit of plants - - - - ->

Ecosystem Services

For a Habitat or Species

Bio-physical
Functioning

Ecological
Functioning

Ecosystem
Services
Generated
from
Ecological
Functioning

Constituents of Well-Being

Security

- Personal Safety
- Resource Access
- Secure from Disasters

Material

- Livelihoods
- Food
- Shelter

Health

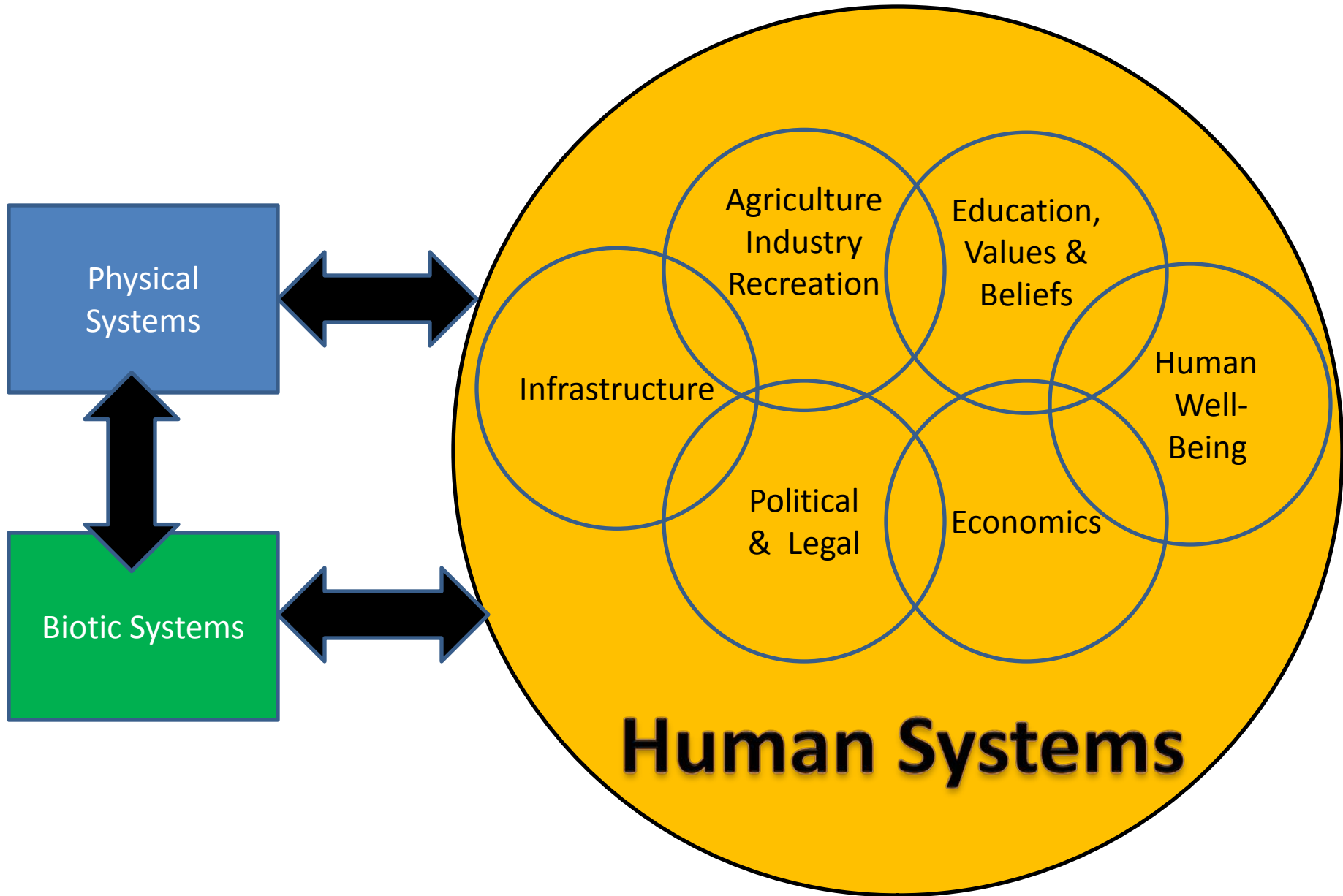
- Strength
- Feeling Well
- Clean air & Water

Social Relations

- Social cohesion
- Mutual respect
- Ability to help others

Freedom of Choice and Action

Opportunity to achieve what an individual values doing and being



Physical
Systems

Biotic Systems

Infrastructure

Agriculture
Industry
Recreation

Education,
Values &
Beliefs

Human
Well-
Being

Political
& Legal

Economics

Human Systems

Processes and Models

