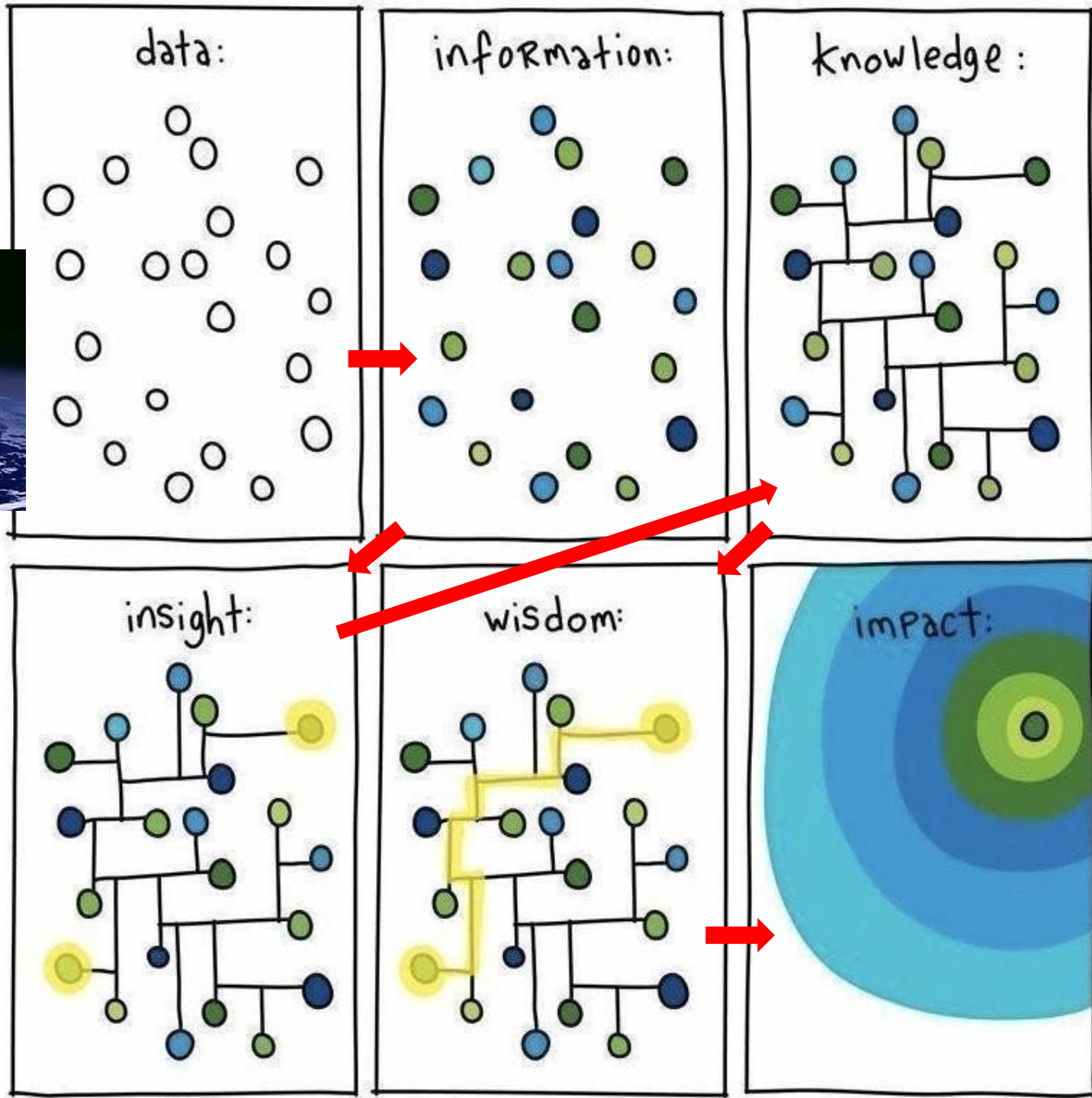


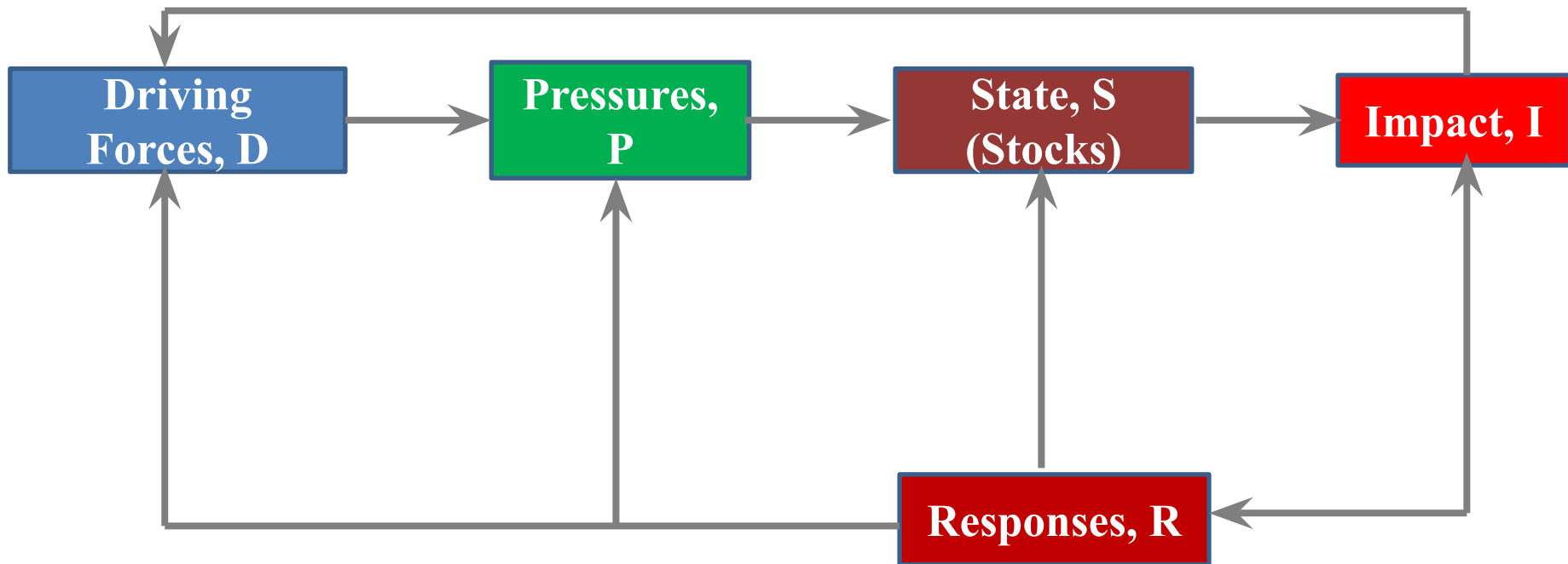


Artist's impression of a major asteroid impact. An asteroid with an impact strength of a billion atomic bombs may have caused the extinction of the dinosaurs.

<https://www.linkedin.com/feed/update/urn:li:activity:6551127044619591681/>



# The basic DPSIR framework



Aral Sea as an example



**VUCA factors:**

**V: Volatility or Variability**

**U: Uncertainty**

**C: Complexity**

**A: Ambiguity**

# RETURN FROM SHORT- AND LONG-TERM ACTIONS OVER TIME

**VUCA factors:**

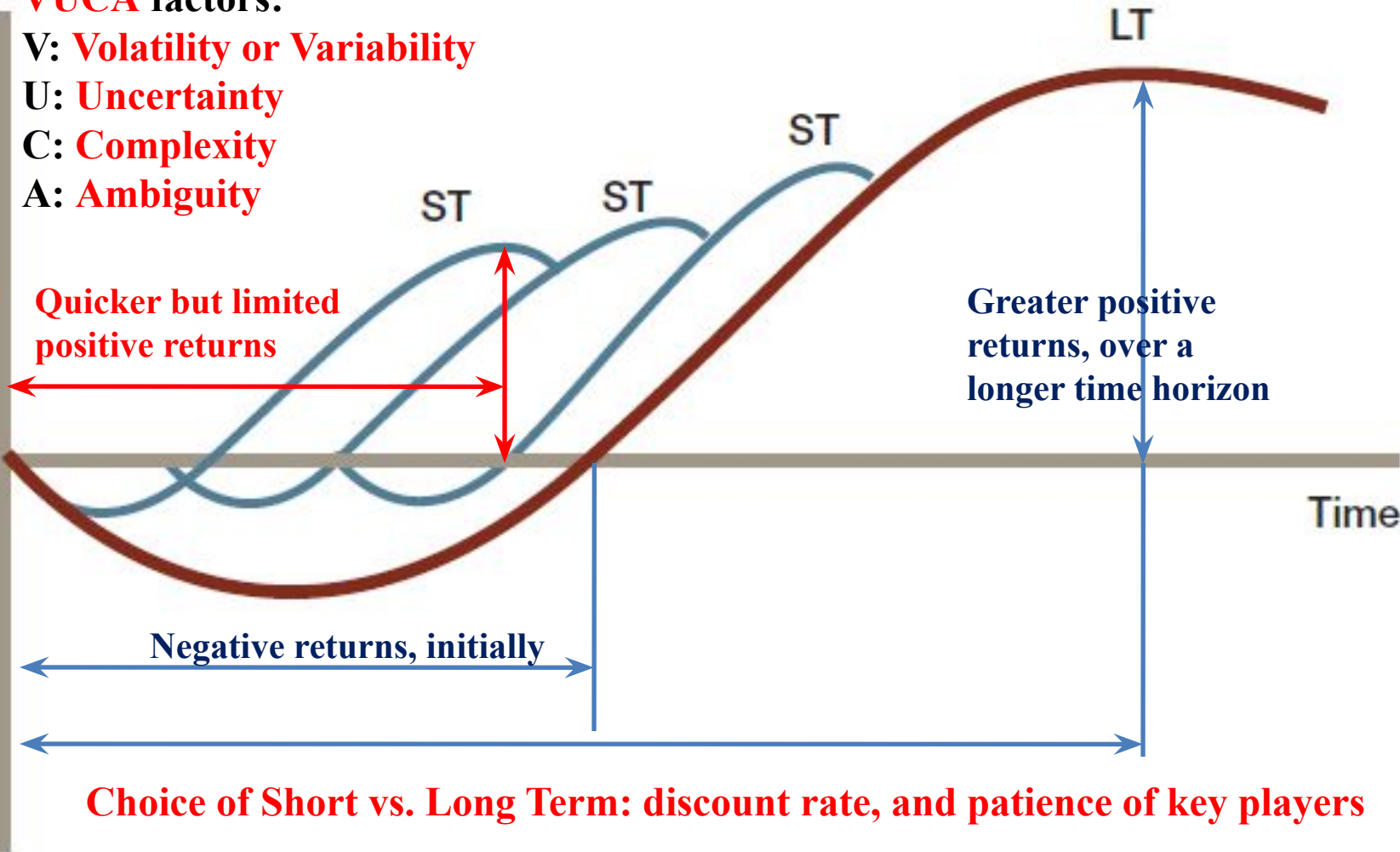
**V: Volatility or Variability**

**U: Uncertainty**

**C: Complexity**

**A: Ambiguity**

Net Return



Adapted from Laverty, K. J. 1996. Economic “short-termism”: The debate, the unresolved issues, and the implications for management practice and research. *Academy of Management Review*, 21(3): 825–860.

[https://api.van2.auro.io:8080/v1/AUTH\\_6bda5a38d0d7490e81ba33fbb4be21dd/sophia/blox/assets/data/000/000/271/original/NBS-Long-Term-Thinking-ER.pdf?1495743490](https://api.van2.auro.io:8080/v1/AUTH_6bda5a38d0d7490e81ba33fbb4be21dd/sophia/blox/assets/data/000/000/271/original/NBS-Long-Term-Thinking-ER.pdf?1495743490)

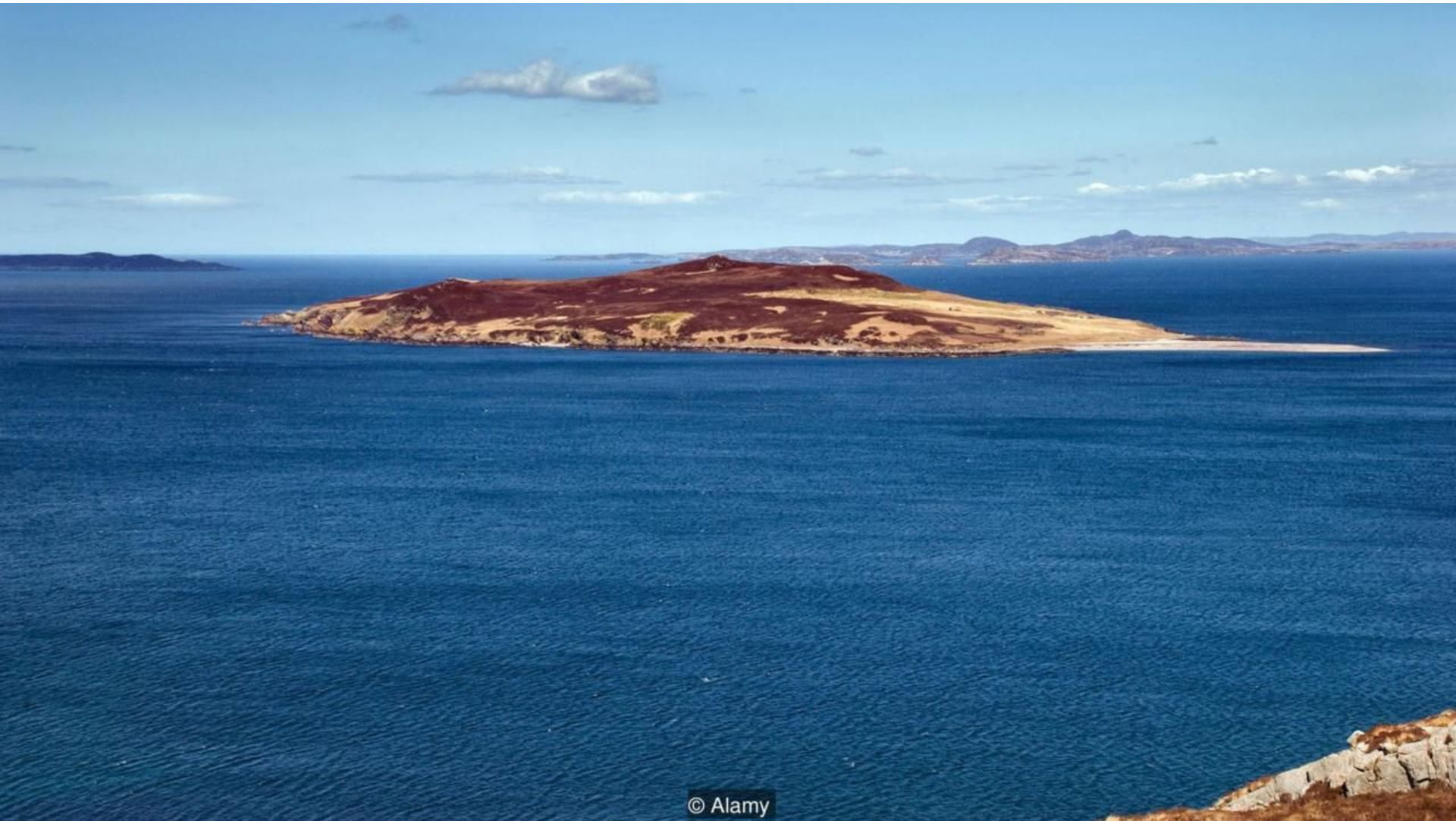








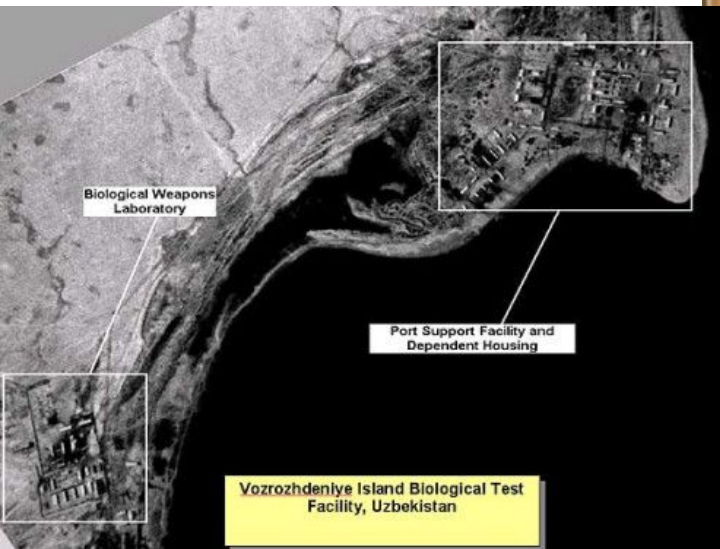
# Vozrozhdeniya Island



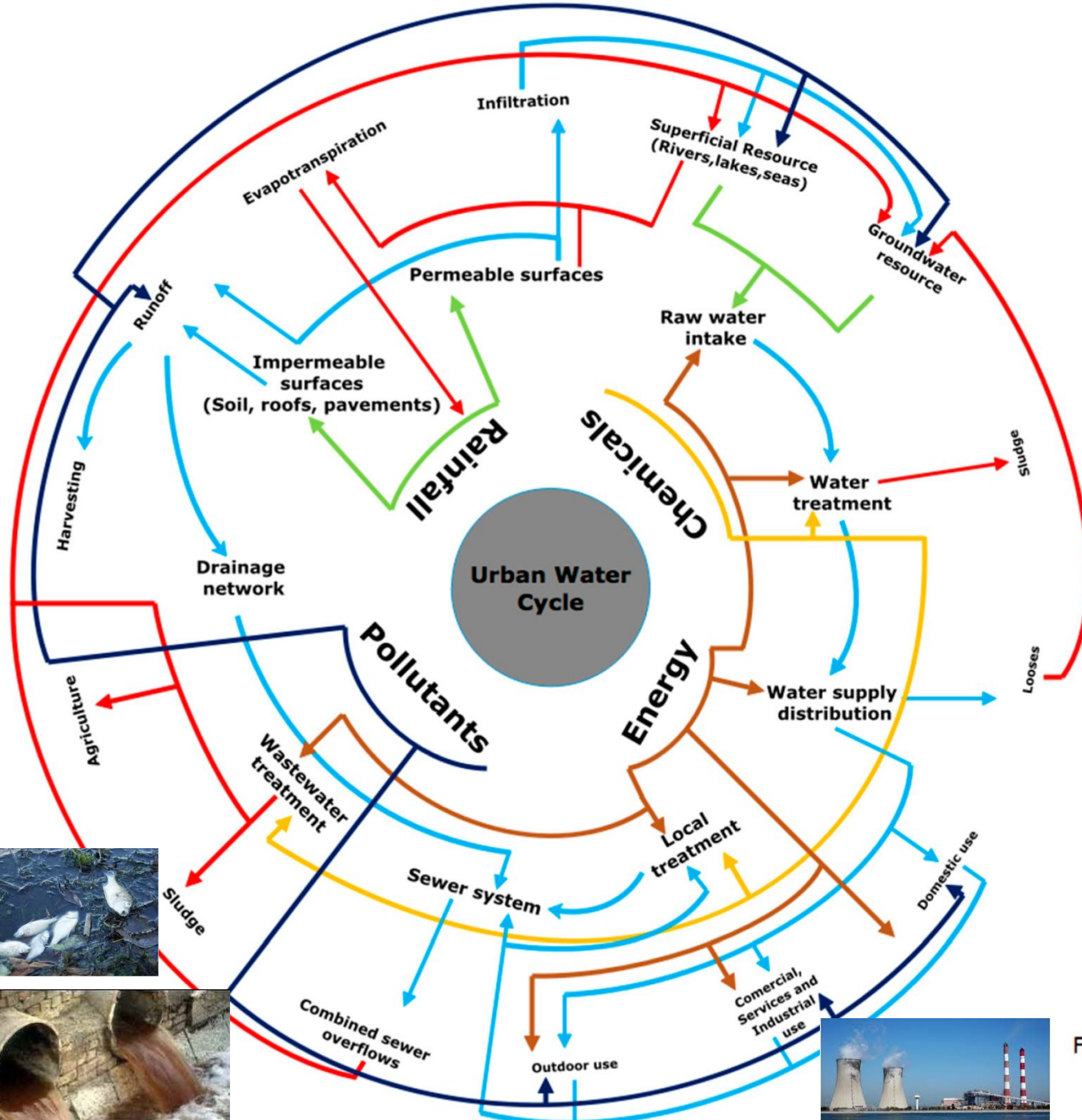
© Alamy

# Vozrozhdeniya Island

In the 1990s, word of the island's danger was spread by Soviet defectors, including Ken Alibek, the former head of the Soviet Union's bioweapons program. It was here, according to recently released documents, that anthrax spores and bubonic plague bacilli were made into weapons and stored. The main town on the island was Kantubek, which lies in ruins today, but once had approximately 1,500 inhabitants.







<http://www.mdpi.com/2073-4441/9/4/285>

Urban Water Cycle (UWC). Adapted from [Wagner, I.; Breil, P. The role of ecohydrology in creating more resilient cities. *Ecohydrol. Hydrobiol.* 2013, 13, 113–134.]

Input energy ———

Input chemicals ———

Input hydrological water ———

Input pollutants ———

Flow through from the system ———

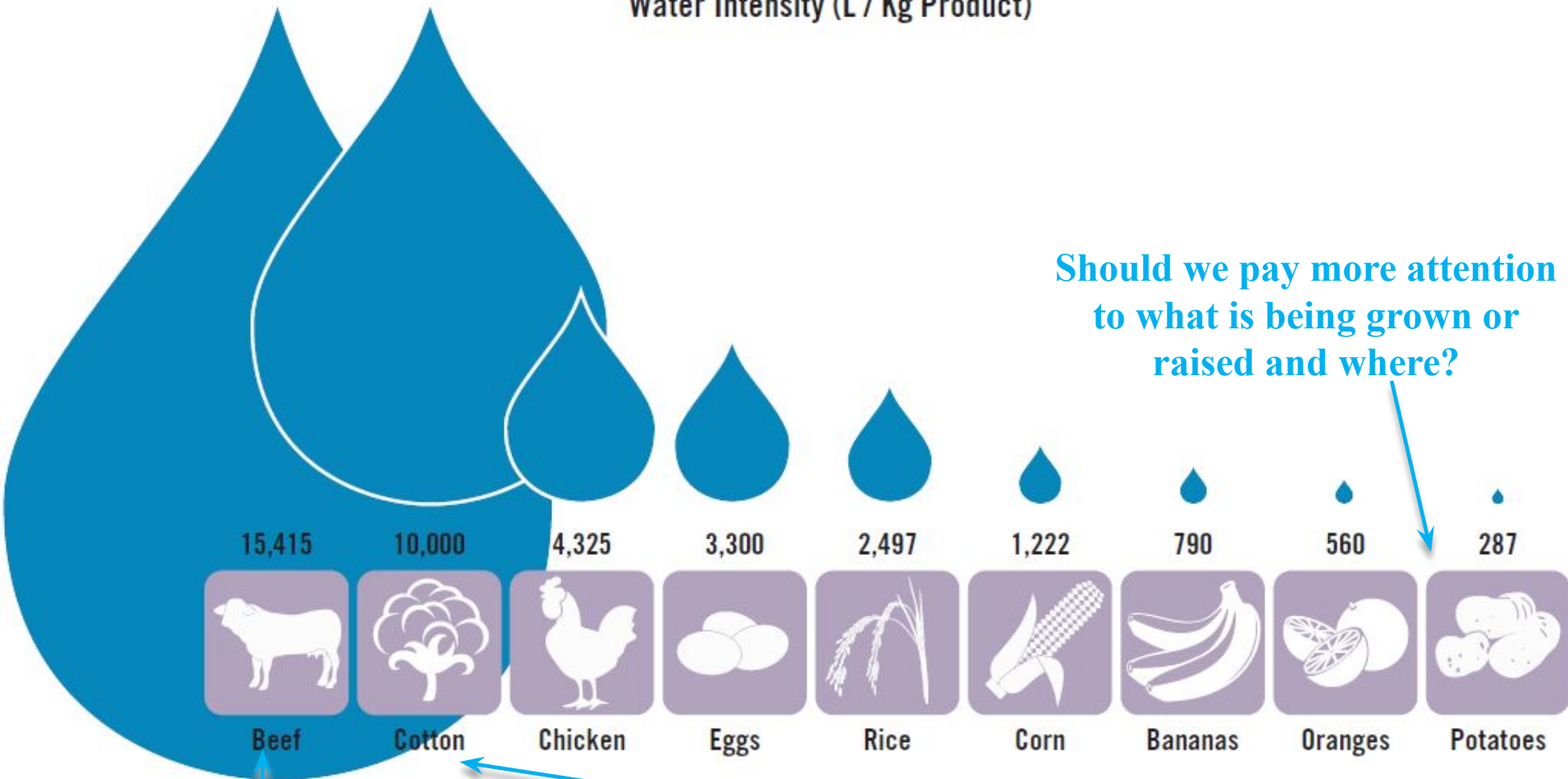
Output ———





# Water Footprint of Major Commodities

Water Intensity (L / Kg Product)



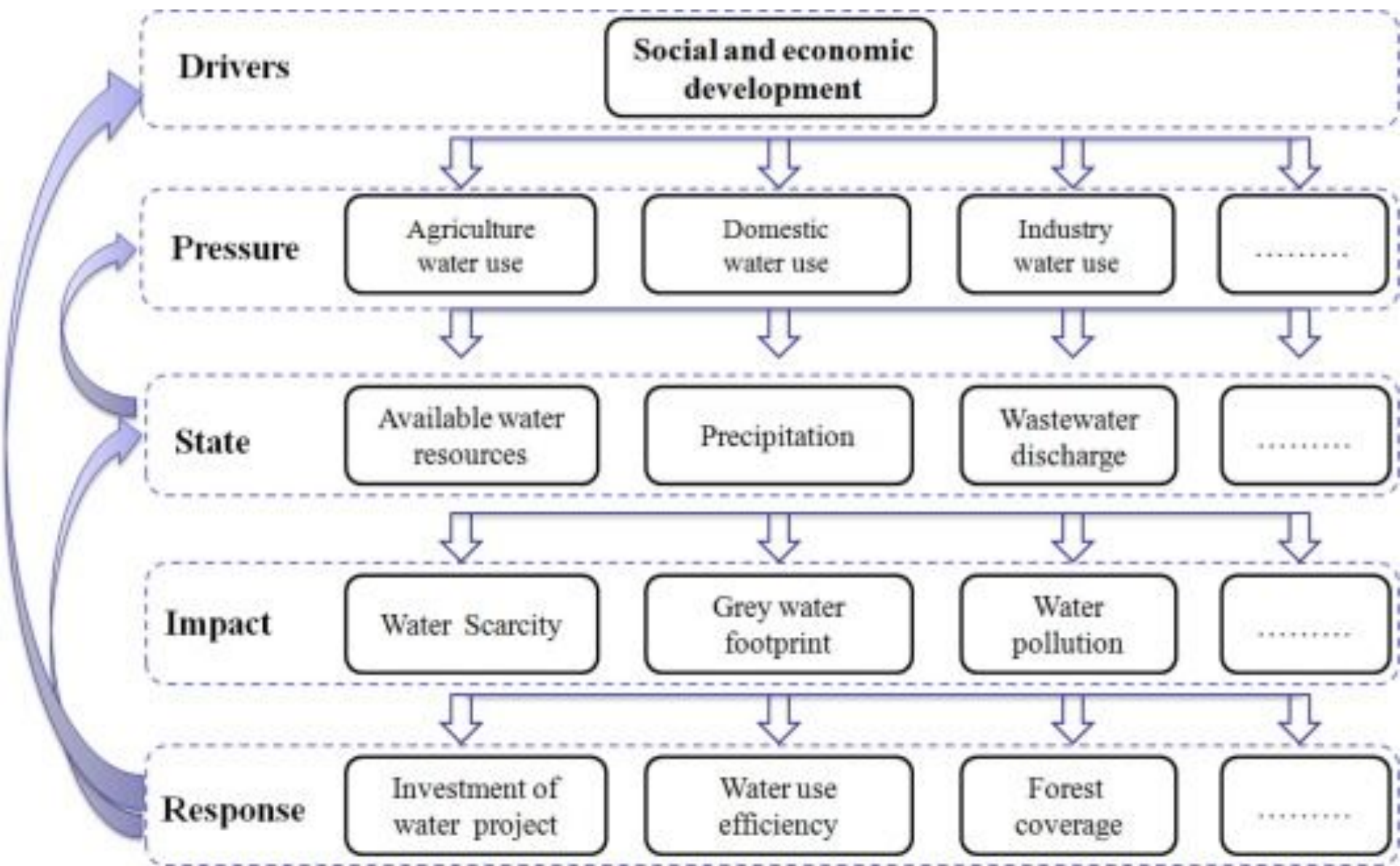
Should we pay more attention to what is being grown or raised and where?

If beef is so water-intensive, should we become more vegetarian?

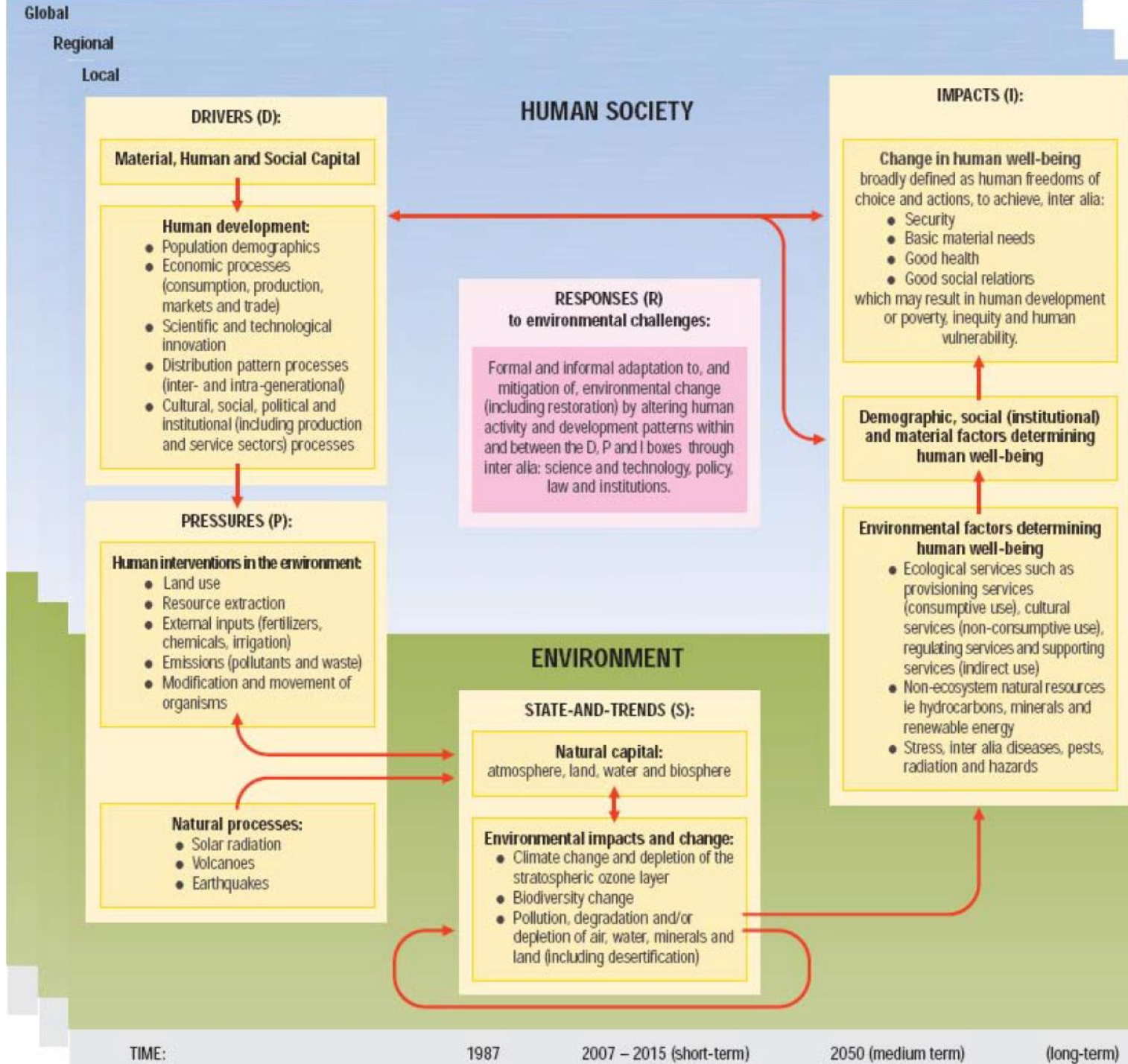
What is cotton doing to Central Asia?

Source: Water Footprint Product Gallery, Water footprint Network, <http://www.waterfootprint.org/?page=files/productgallery>

From Feeding Ourselves Thirsty: How the Food Sector is Managing Global Water Risks, A Ceres Report, May 2015

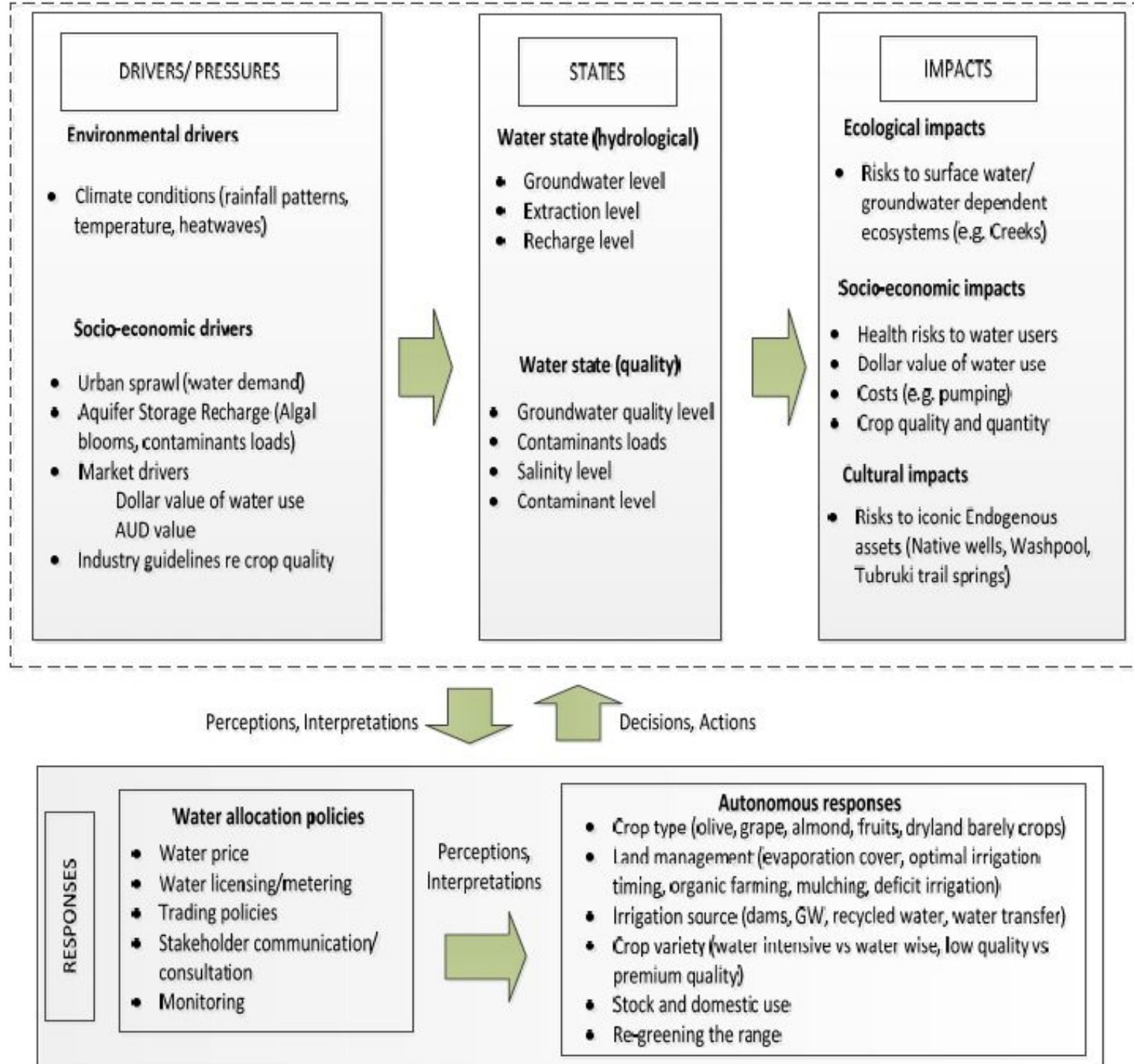




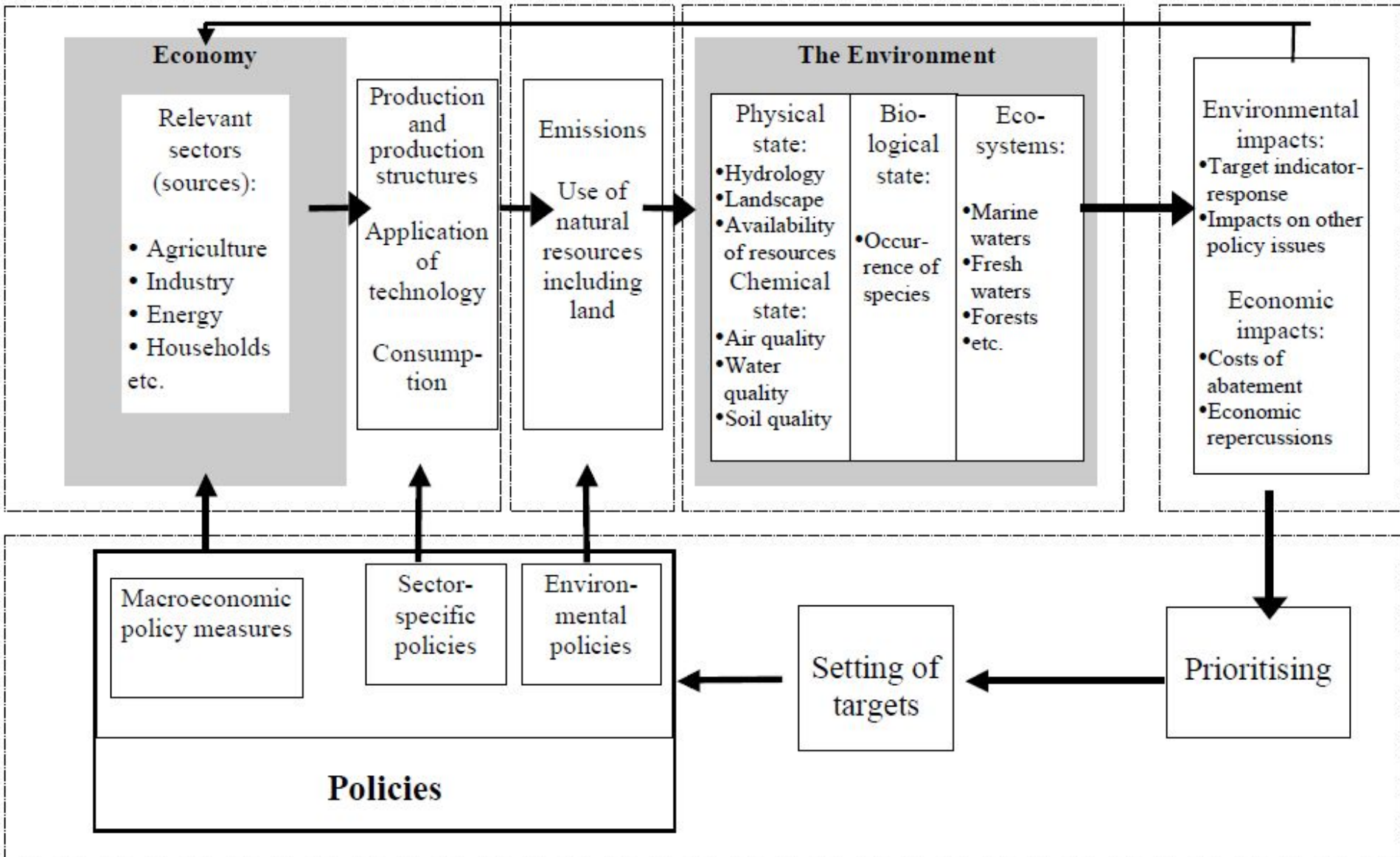


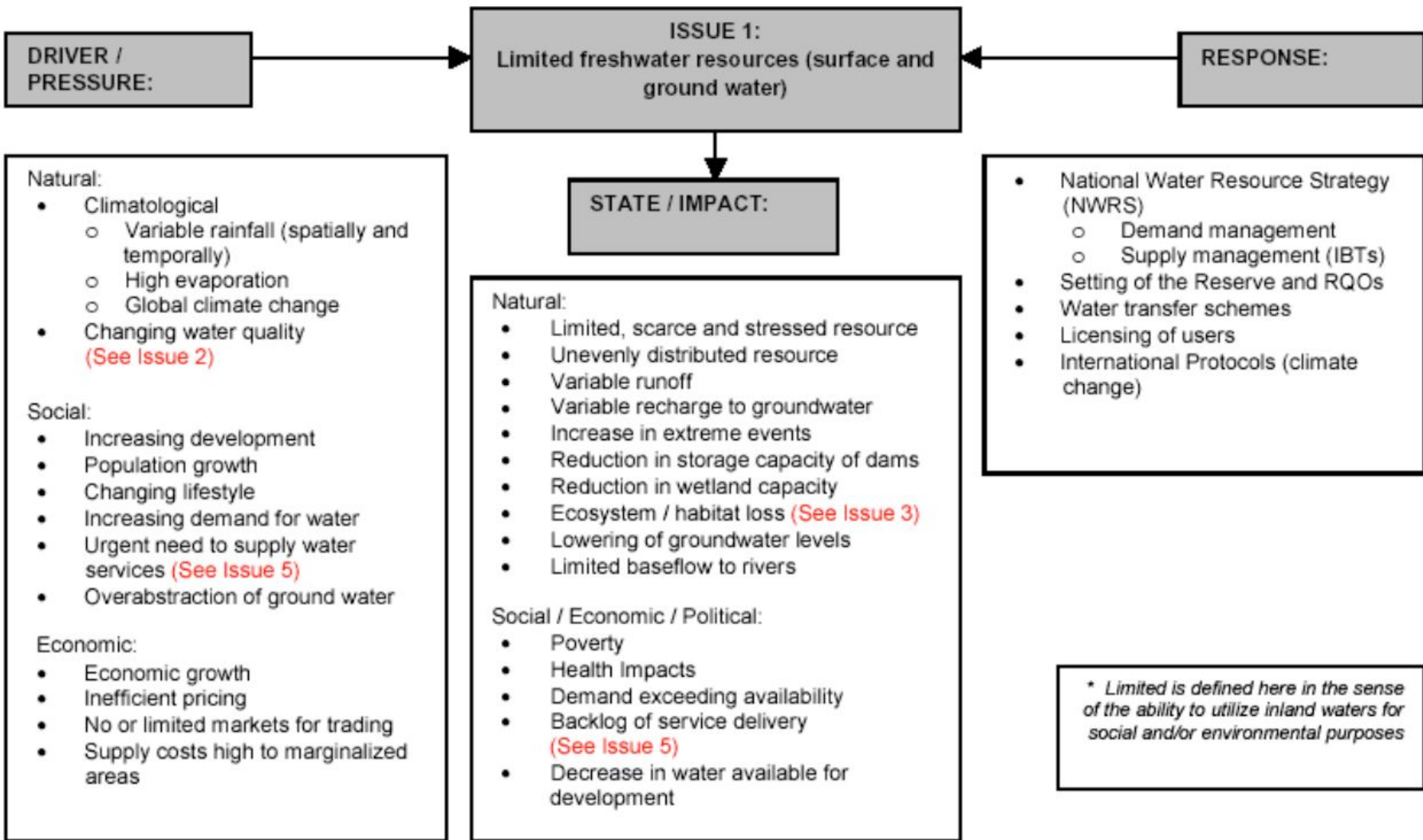
Source: Training Manual on Integrated Environmental Assessment and Reporting in Africa

Source: Using Participatory Rapid Appraisal and DPSIR approaches for participatory modelling: A case study for groundwater management in South Australia  
 El Sawah, S., H. A. Guillaume, M. Mitchell  
 19th International Congress on Modelling and Simulation, Perth, Australia, 12–16 December 2011





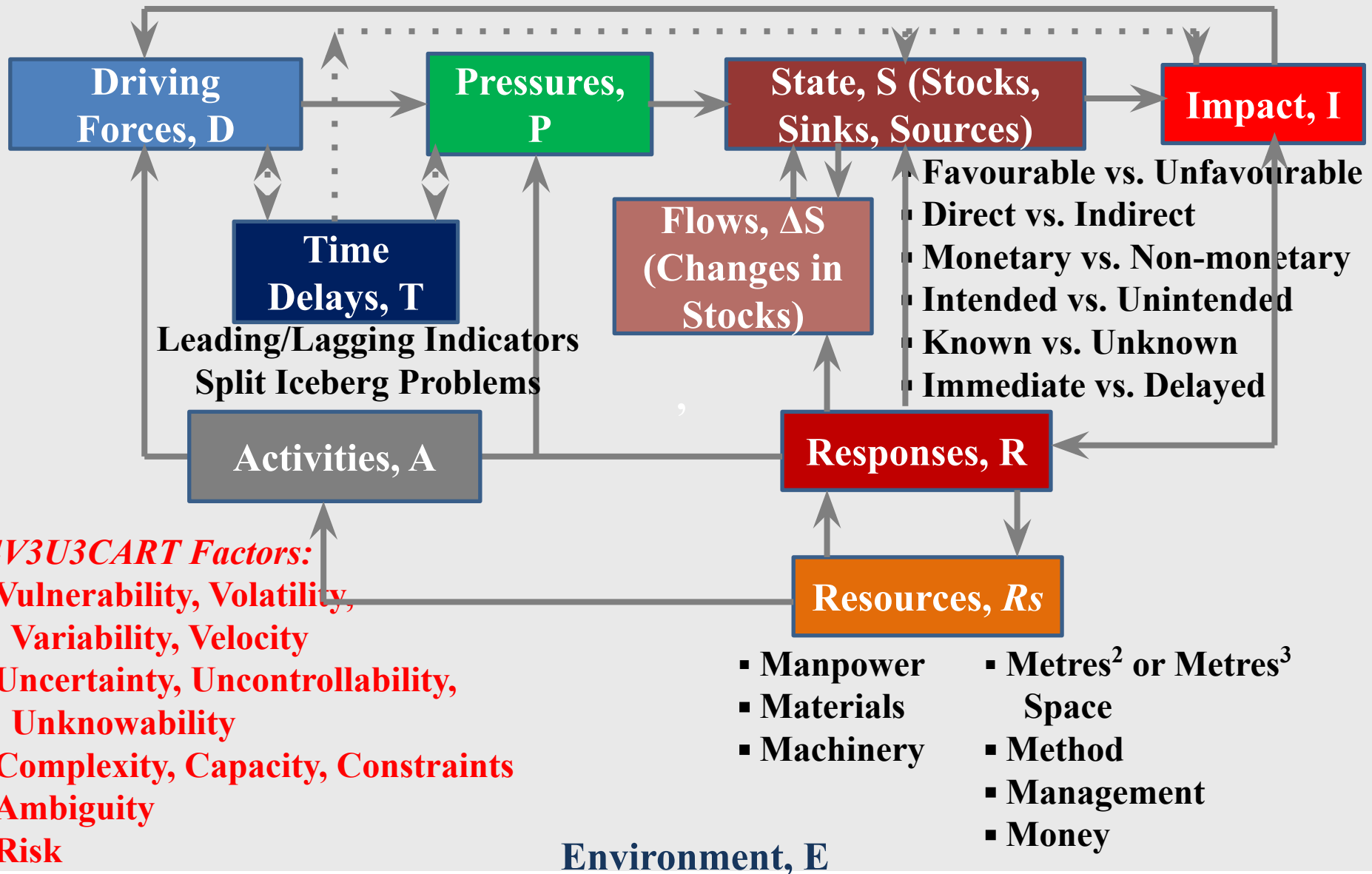
**D****P****S****I****R**





# The DPSIR framework with Modifications and Conceptual Relationships

Connections: Cause Effect Relationships, Correlations, Precursor Conditions, Trigger Events



- 4V3U3CART Factors:**
- **Vulnerability, Volatility, Variability, Velocity**
  - **Uncertainty, Uncontrollability, Unknowability**
  - **Complexity, Capacity, Constraints**
  - **Ambiguity**
  - **Risk**
  - **Term: Short vs. Long Term**

- **Manpower**
- **Materials**
- **Machinery**
- **Metres<sup>2</sup> or Metres<sup>3</sup> Space**
- **Method**
- **Management**
- **Money**