AsiaFlux: Flux Monitoring in Search for Sustainable Systems

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“Il faut cultiver son jardin?”
(One must cultivate one’s own garden – the only way to survive in a world full of difficulty and tragedy is to focus on your own little garden and ignore everything else around you?)
AsiaFlux

Our mission is to bring Asia’s key ecosystems under observation to ensure quality & sustainability of life on earth
Ecosystem

A unit comprising communities of organisms and their physical and chemical environment, at any scale desirably specified, in which there are continuous fluxes of matter and energy (and information) in an interactive open systems

- Willis (1997) -
Observation

the action or process of observing (notice, perceive & register as being significant: ob- 'toward' + servare 'attend to, look at') something carefully in order to gain information

bring under observation: being closely and constantly watched and monitored
Monitoring

✓ **Synthesizing** the observations into a **narrative** (i.e. 'telling a story or scenario') and

✓ Providing **feedback** to the system, which **serves** as the source of **learning** required for

✓ Successful **adaptation** for resilient ecological-societal systems
We’re the watchman!

Watch: keep under careful, protective observation; look out, be on the alert for (i.e. remaining awake)
Our Mission is

To closely and constantly keep Asia’s key ecosystems under careful, protective observation, thereby gaining information that can be synthesized into narrative(s) which will provide feedback for system/community to learn how to adapt successfully toward sustainability.
Key Questions

- How can “ecosystem science” contribute to the “sustainable management” of Ecological-Societal Systems that underpin human well-being?
- How can science provide service to cultivate stewardship*?

* steward (manager) + - ship (character, skill)
AsiaFlux Vision

A ‘community’ where science & technology work more directly for sustainable ecological-societal systems particularly in Asia
To accomplish our Vision

(1) Develop forward-looking collaborative research and data sets on carbon, water and energy cycles; (2) Provide workshops and training on current and future challenges posed by global change; and (3) Cultivate the next generation of scientists with skills and perspectives so that they are prepared to engage in regional sustainability challenges in Asia as an informed stewards and leaders based on systems thinking & visioneering.
Training / Linking Networks

Activation of national/regional networks is important.

AsiaFlux short training seminar on measurement, data analysis for the eddy covariance method


Seoul, Korea 19-20 Aug. 2013 (49 trainees from 13 countries)
- 92 sites @ 2013
- Recently sites in Tropics are increasing

<table>
<thead>
<tr>
<th>Year</th>
<th>Registered sites</th>
</tr>
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<tbody>
<tr>
<td>2007</td>
<td>39</td>
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<tr>
<td>2008</td>
<td>4</td>
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</tr>
<tr>
<td>2011</td>
<td>10</td>
</tr>
<tr>
<td>2012</td>
<td>3</td>
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92 sites in AsiaFlux (June 2013)
Number of people download data from April 2012-July 2013
We encourage site PIs to submit site information first, and next the dataset. Please also consider datasets in recent years are requested.
Key Questions

- How can “ecosystem science” contribute to the “sustainable management” of Ecological-Societal Systems that underpin human well-being?
- How can science provide service to cultivate stewardship* toward sustainability?

* steward (manager) + - ship (character, skill)
Although the perspectives of the world’s people vary in space and time, every human concern falls somewhere on this graph. The majority of the world’s people are concerned with matters that affect only family or friends over a short time period. Others look farther ahead or over a larger area (a city or a nation). Only a very few people have a global perspective that extends far into the future.
“Then the Lord God took the man and put him into the garden of Eden to **work** it and **take care of** it”

- Genesis 2:15 -

**work** (ועָד): cultivate; serve; plow; cause to worship

**take care of** (שָמַר): keep within bounds; watch as a watchman; guard as a prophet

“My privilege and responsibility is to recognize the pre-existing boundaries of the garden (i.e., *family, neighbor, school, company, nation, earth, universe* ...).

As God’s **steward**, I need to **stand, guard and protect** my garden in the same way a shepherd or a **watchman** watches over his sheep in a **proactive and prophetic manner**.”
Vision starts with Concerns

a clear mental picture of what "could be", inspired by the passion that it "should be"
"When we study the History of Science, we discover, two mutual contrary phenomena: either behind an apparent complexity a simplicity is hidden or, on the contrary, an evident simplicity conceals an extraordinary complexity within itself."  

- H. Poincaré
Need Paradigm Shift

ENVISIONING AND IMPLEMENTING SUSTAINABLE SOLUTIONS TO PROBLEMS IN SOCIAL-ECOLOGICAL SYSTEMS
Epistemological Rethink needed

- Epistemology (Greek ἐπιστήμη, meaning "knowledge, understanding", and λόγος, logos, meaning "study of")
  - The branch of philosophy concerned with the nature and scope of knowledge (i.e., theory of knowledge)
- Ontology questions “what is reality?” whereas Epistemology questions “how to perceive reality?”
- An epistemological rethink is needed to instigate paradigm shift from the Newtonian perspective to an appraisal of complexity that includes both reductionism and holism together
Systems Thinking

an interconnected set of elements that is coherently organized in a way that achieves something

Complex Systems
Disturbances
Extremes
Resilience
Telos  Evolution
Self-organization
Security
Sustainability
Thermodynamics

Technology
Information Theory
Pursuit of Truth

• The ultimate aim of scientific research is to understand nature (now complex human-nature systems)

• “Truth is ever to be found in the simplicity, not in the multiplicity and confusion of things.” - Isaac Newton

• In 17C, René Descartes first introduced ‘reductionism’ – the world can be regarded as a clockwork mechanism; to understand it, one need only investigate the parts and reassemble each component to recreate the whole

• In 1687, Newton published the ‘Principia Mathematica’; advancing the idea of a ‘clockwork universe’
Ah... since the time of Newton...

- Classical mechanics has been regarded as the foundation of scientific research.
- Scientists have adopted the Newtonian approach both at the ‘ontological’ and ‘epistemological’ levels.
- Newtonian epistemology: The world’s apparent complexity can be resolved by analysis and reducing phenomena to their simplest components!
But in early 20th century...

- Physicists began to explore especially the atomic and subatomic realms. Their new discoveries required a ‘paradigm shift’ and a new intellectual framework to understand events at the subatomic level, which resulted in ‘quantum physics’ & ‘molecular biology’
- Reductionistic view adopted to explain biological systems according to the physical and chemical properties of their individual components (in terms of physics & chemistry)
- But can no longer cope with both the enormous amount of information and the astonishing complexity they reveal.
We’re preoccupied with “what is - that which exists”
Need to account for “what is missing” - a key to sustainability lies with information concerning ‘absence’
Information theory (IT) – a means for apprehending and quantifying ‘what is missing’
IT tells us that a system’s capacity to undergo change (C) has two components so that:  \( C = A + R \)
  (1) Order, A (mutual constraint → Efficiency)
  (2) Absence of Order, R (uncommitted potential → Resilience)
Yin (陰) - Yang (陽): complementary forces interacting to form a dynamic system (in which whole > sum of parts)
Nature does not select for max efficiency

(Ulanowics et al., 2009)

• But for a balance between the two opposing poles of efficiency and resilience - both indispensable for long-term sustainability and health

Diversity & Interconnectedness
Sustainability

Optimal Balance
Greater Efficiency
Greater Resilience
Talk about Future ~
REVENONS À NOS MOUTONS ~
“History will be kind to me for I intend to write it.”

- Sir Winston Churchill