Pedometrics, Relational Science & Integral Science – Pedometrics, Landscape Analysis & GIS Laboratory

Lab Director: Sabine Grunwald, Professor and Research Team
Soil and Water Sciences Department, University of Florida. Email: sabgru@ufl.edu

Pedometrics, Digital Soil Mapping and Landscape Analysis

<table>
<thead>
<tr>
<th>Integral Ecologies</th>
<th>Pedometrics, Digital Soil Mapping and Landscape Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threats to soil, water, food, and human security and health entail global climate change, land use change, population growth, rapid development of new technologies, economic and social uncertainties. It is not sufficient anymore to use disciplinary (e.g., soil science, hydrology) or multi-disciplinary (e.g., biogeochemistry) approaches to address complex interacting ecologies. Integral Ecology (developed by Esbjörn-Hargens and Zimmerman, 2009) based on Integral Theory (by Ken Wilber, 2000) were developed out of the realization that environmental/ecological issues are not only scientific issues but are also human/social/cultural issues that need to be viewed from multiple perspectives to provide adequate solutions. The Integral Model integrates objective, quantitative (“It/Its”), subjective/individual (“I”), and intersubjective, community (“We”) perspectives. Our research team has adopted Integral Theory and Integral Ecology as conceptual frameworks to integrate multiple perspectives to address wicked human-environmental problems of our time. An Integral Soil Security Model was presented by Grunwald et al. (2017) based on the integral Meta Soil Model (Grunwald, 2014).</td>
<td></td>
</tr>
</tbody>
</table>

Integral Theory – Integral Ecology

**Individual**
- Self awareness
- Sensations
- Perception
- Interceptions
- Thoughts and experiences
- Interpersonal and social interactions
- Cultural values
- Relationships
- Communication

**Collective**
- Ecosystems
- Earth system
- Biogeochemical cycles
- Social and economic systems
- Education
- Technologies
- Policies and laws

**“I”**
- Ego transcendence

**“It”**
- Subjective/individual

**“We”**
- All life on Earth

**“Its”**
- Global economies

- The four quadrants are tetra-arising and interact with each other
- Synthesis and integral research focused on only one (or two) quadrants
- The integral approach acknowledges different perspectives (lenses of “I”, “We”, and “Its” and methods (data collection and multiple ways of knowing)
- Relational science: Harmonization of scientific FACTS (data, measurements) + beliefs, interpretations, valuations, and expectation of individuals, researchers, larger communities, and people in general
- Development levels:
  - “I” quadrant: Ego transcendence “the world is bigger than Me” → selflessness → service for larger communities/humanity/life
  - “We” quadrant: Health, wealth, happiness, well-being and fulfillment for family/friends → local community → nation body → globe: human-centered view → all life on Earth → the whole cosmos
  - “It/Its” quadrant: Interdisciplinary → Transdisciplinary → Postdisciplinary

**STEP-AWBH data**
- Environmental spatio-temporal datasets representing STEP-AWBH factors: S: Soil; T: Topography; E: Ecology; P: Parent material; A: Atmosphere/climate; W: Water; B: Biota/organisms; and H: Human

**References:**
- Knox et al., 2015. Geoderma
- Various methods and models: Machine learning, data mining, statistical, geostatistical, Bayesian, econometrics, pedometrics, mixed-methods, belief networks, mechanistic and simulation models, factor analysis, structural equation modeling

**Synthesis of data and models to assess and understand:** Impact of global climate change; soil change, soil and terrestrial carbon dynamics, land use change, ecosystem services, soil properties and health, landscape evolution, ...