

Crosscutting Issues and Integration: Complex Interactions

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“Complex Interactions” Can Include a Host of Important Issues for Integrated Assessment, e.g.:

- **Complex interactions between climate change and other driving forces for change in urban areas**
- **Complex interactions between sustainable development paths and climate change responses**
- **Complex interactions between climate change adaptation and climate change mitigation**
- **Complex interactions between what is happening in a particular urban area and what is happening elsewhere**
- **Complex interactions between impacts and actions in different sectors**
- **Complex linkages of first-order effects and actions with second, third, and *n*th order effects**

Complex Interactions Between Climate Change and Other Driving Forces for Change:

- **Climate change is only one of many driving forces for change in urban areas: demographic change, economic restructuring and globalization, technological change, institutional change....**
- **Its implications are wrapped up in interactions with these other driving forces**
- **Consider, for example:**
 - **Population displaced from vulnerable coastal areas by climate change in 2080**
 - **Effects of climate change on Northern India in 2100**

Complex Interactions Between Sustainable Development Paths and Climate Change Responses:

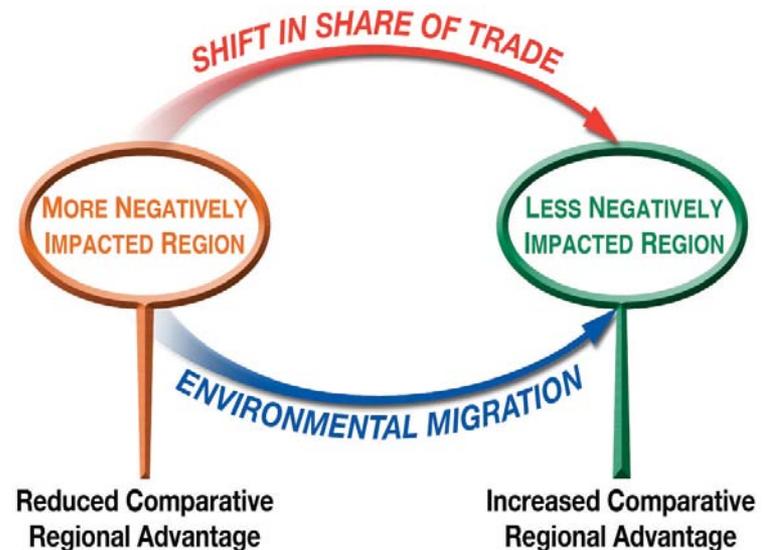
- **A focus on “co-benefits:” actions good for both climate change risk management and also reducing other development stress points**
- **An emergent property of every US urban climate change and adaptation planning effort to date, whether intended or not – from New York City to Keene, NH**
- **Attention to climate change impacts and challenges, in fact, can be a catalyst for more comprehensive analyses of development goals and challenges at regional and local scales**

Complex Interactions Between Climate Change Adaptation and Mitigation:

- **Distinguishing between complementary and contradictory actions, e.g.:**
 - **Complementary: improvements in the efficiency of space cooling technologies**
 - **Contradictory: coastal development vs. coastal vulnerability reduction**
- **A search for synergies: e.g., adaptation actions that reduce net GHG emissions**
- **Attention to cross-cutting urban development issues, e.g.: urban form as it relates (a) to GHG emissions from transportation and buildings and (b) to needs for water and energy supplies and also to vulnerabilities to impacts of severe weather events**

Complex Interactions with What Is Happening Elsewhere:

- **Urban areas depend on other areas for supplies of food, materials, water, and other inputs and as destinations for products, services, and wastes**
 - **How are those other areas affected by climate change?**
 - **How are movement infrastructures affected by climate change?**
- **The economic base of an urban area depends on regional comparative advantage**
 - **How are competitors and markets affected by climate change?**
 - **How are trade flows affected by climate change?**



Complex Interactions between Impacts and Actions in Different Sectors:

	Effects of Sectoral Impacts on Energy	Effects of Energy Impacts on Sector
Water	Energy for water pumping	Competition for water in water-scarce regions
Ecosystems	Effects on bioenergy production	Changes in regional air pollutant emissions
Agriculture	Effects on energy requirements for cultivation, storage, and transportation	Competition for water in water-scarce regions; possible changes in conditions for energy crop production, energy costs
Forestry	Effects on energy requirements for harvesting and transportation	Possible changes in conditions for energy crop production
Coastal Areas	Effects on energy facilities in vulnerable coastal areas	Risk management leading to relocation of energy facilities
Settlements	Increased demands for space cooling; energy requirements for infrastructure changes, such as water supply	Effects on reliability and costs of energy supplies; short-term power outages from heat waves and storms
Health	Increased demand for space cooling and refrigeration	Effects on reliability and costs of energy supplies; short-term power outages from heat waves and storms
Transportation	Effects on fuel requirements	Effects on biofuel production

Complex Linkages of First-order Effects with Second, Third, and NthOrder Effects:

