How will human activities interact with future global change to affect the sustainability of natural ecosystems and human societies?

Objectives from ARCSS Science Plan

- Assess impacts of global change on natural ecosystems and human societies
- Assess the responses and adaptations of those systems to change.
- Develop models to project pathways of change for particular applications in collaboration with affected communities

What are key uncertainties?

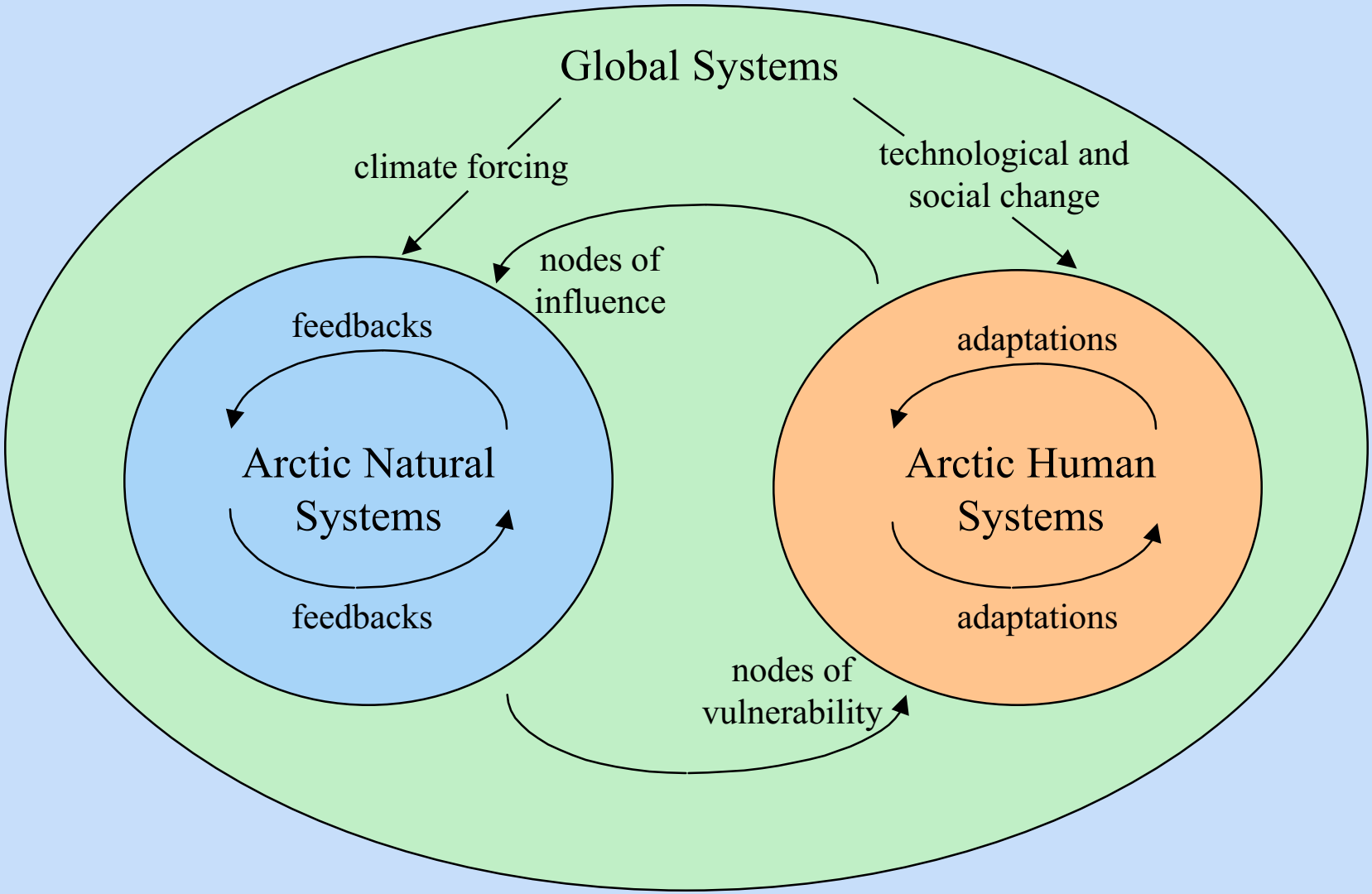
Guidance from Science Plan:

Since most of the arctic region's people live on the coast **[or along major rivers]**, land-shelf-ocean interactions are critical to this theme, sea level, erosion, and transport of constituents, including contaminants.

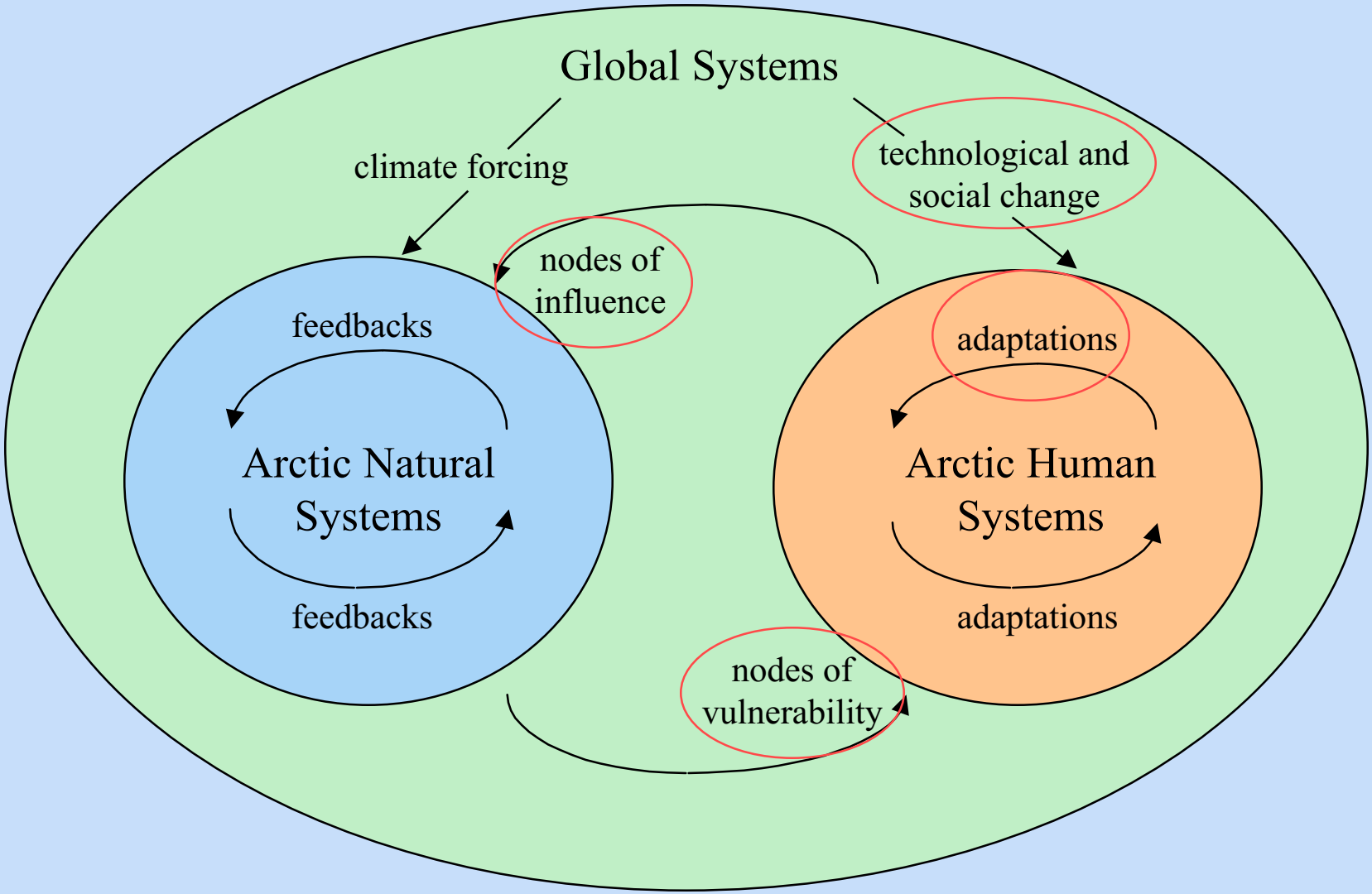
Arctic residents and visitors interact with the natural environment in linked human-natural systems.

- Understanding the whole system important for predicting impacts
- Major uncertainties in links among system components

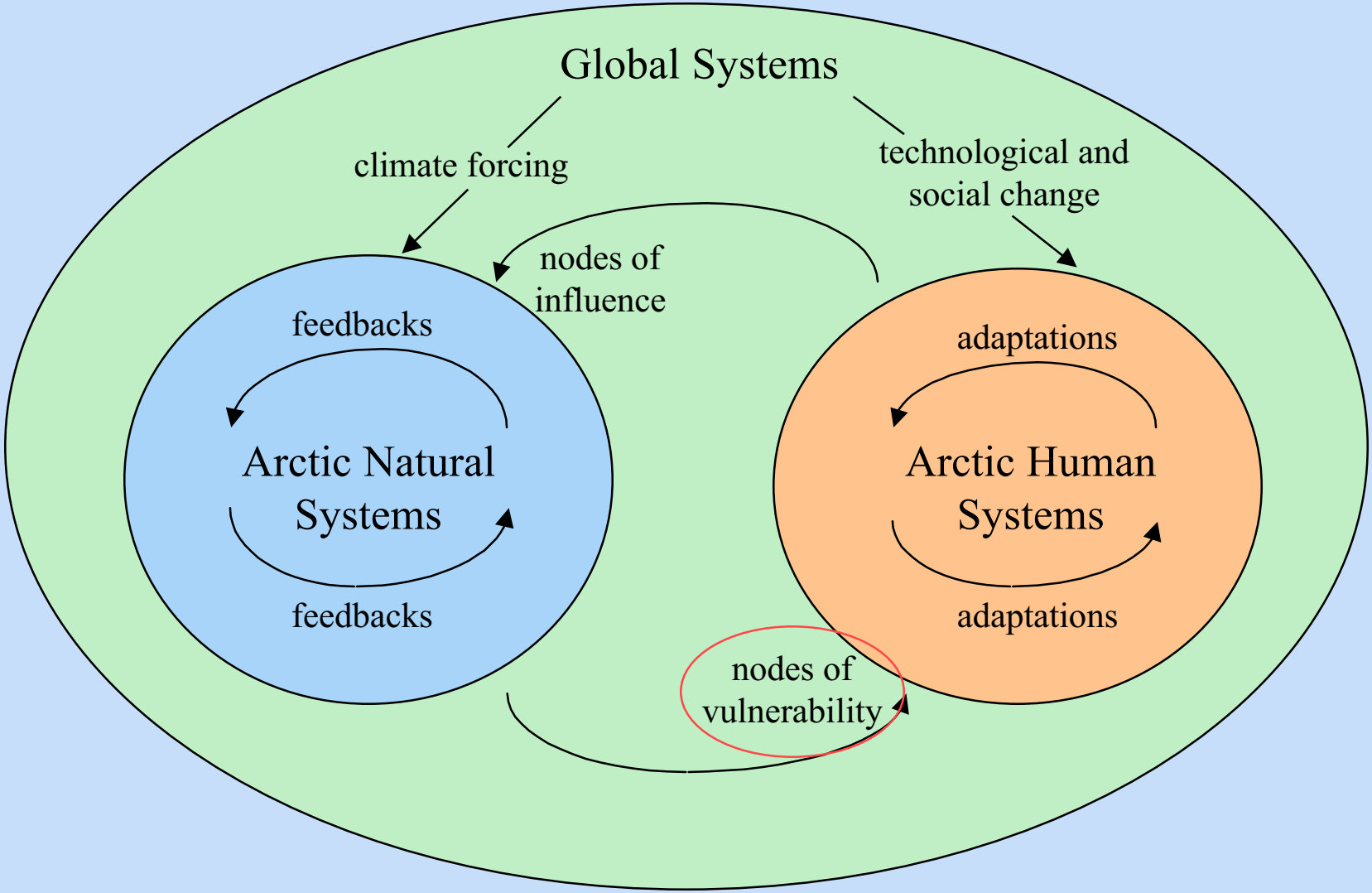
Linked Human-Natural Arctic Systems



Uncertainties lie along links of Human-Natural Arctic Systems



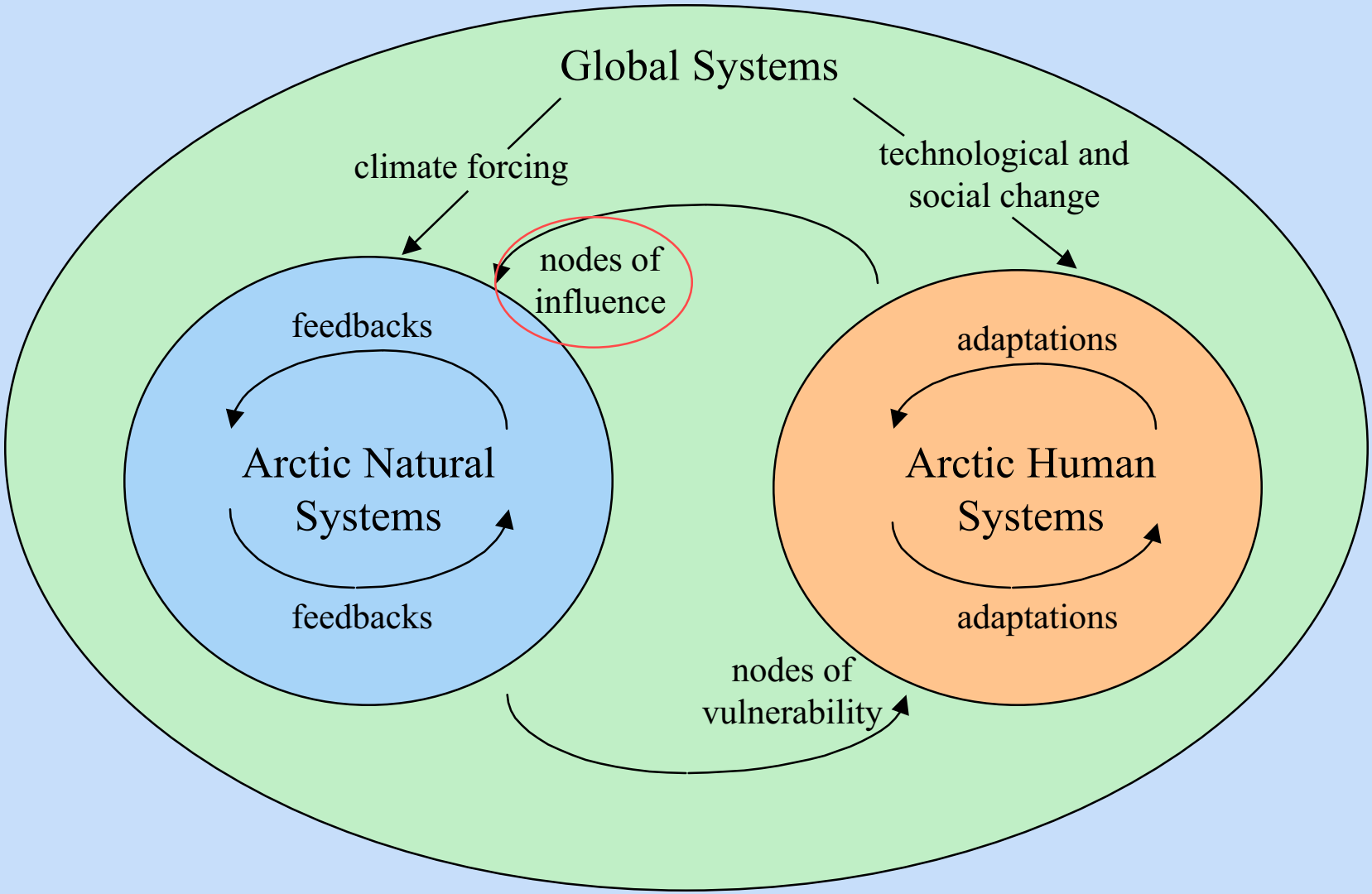
Nodes of vulnerability-- environmental hazards for communities



Key uncertainties: nodes of vulnerability

- Ice and access: sea ice, ice roads, ice bridges
- Fish and wildlife abundance and distribution
- Storm events, flooding, coastal erosion
- Fire in the boreal forest
- Contaminants

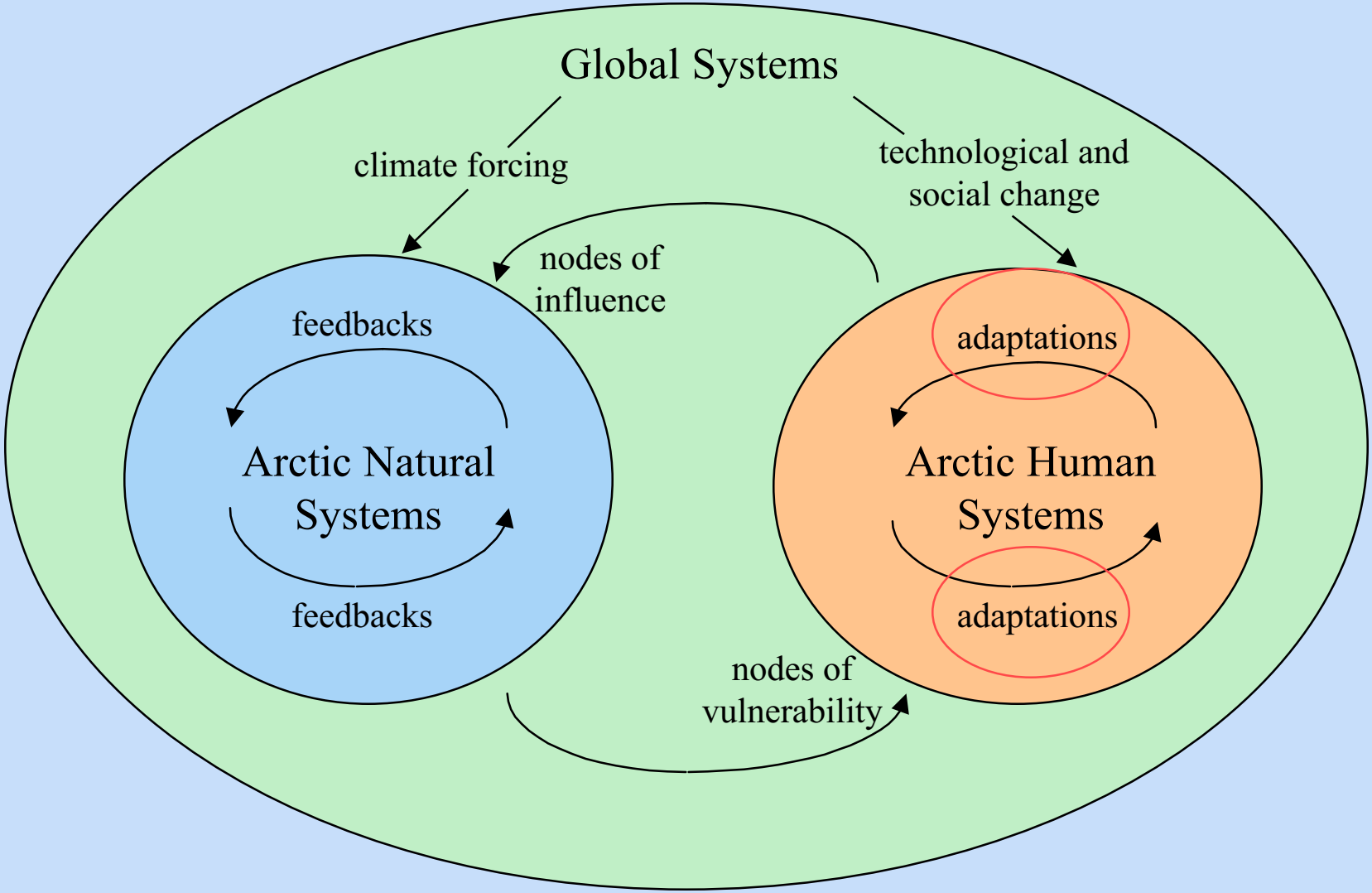
Nodes of influence -- human activities affecting ecosystems



Key uncertainties: nodes of influence

- Subarctic fisheries management
- Land use and resource development
  - Expansion of agriculture and forestry
  - Expansion of settlement
- Water use -- dams, diversions
- Pollution

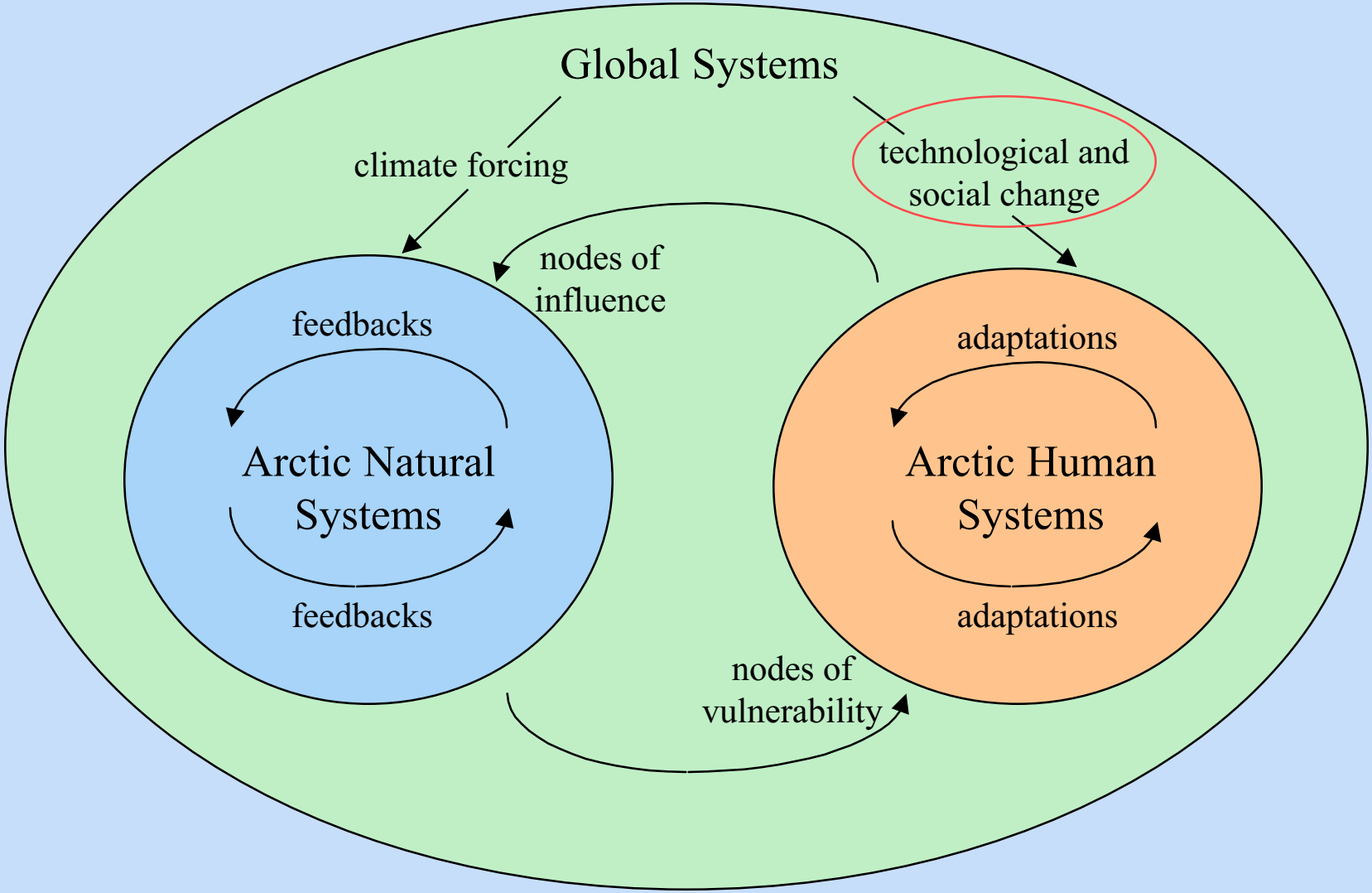
Modes of adaptation -- feedbacks of change within Arctic human systems



Key uncertainties: modes of adaptation

- Mobility -- within and among regions
- Strength of local institutions of self-governance
- Transfer of traditional knowledge and practices across generations
- Participation in cash economy

Within-system effects are confounded by external “forcing”



Climate-related impacts on people must be viewed in context of pressures from external forces for change

- New technologies
- Changes in world markets for Arctic products
- Changes in national policies toward the Arctic
- Global social change

Key uncertainties: external forces

- Longevity of senior senator for Alaska
- U.S. participation in international climate protocol

Key uncertainties: external forces (cont.)

- National government policies toward Arctic
- Arctic as a destination -- patterns of tourism and settlement
- Globalization, technology, markets, etc.

Highest priority for Arctic systems human dimensions research:

Interaction of external forces with local adaptations to natural system variation and change

– These interactions create new vulnerabilities and biophysical interventions in the Arctic

Geography matters

- Nodes of vulnerability are place-specific
- Nodes of influence are ecosystem-specific
- National policies speed or hinder adaptations

Comparative studies across places and ecosystems provide insight

- Reindeer herding adaptations in Eurasia vs. caribou hunting in North America
- Marine mammal hunting along Arctic coast
- Subsistence and commercial fisheries: Bering vs. Barents-Norwegian Seas
- River basin studies -- Land use, vegetation change, hydrology, human role

Importance of seeing the complete system