

Adaptation to climate change: the role of ecosystem services.
International Workshop, CATIE, Turrialba, Costa Rica. November 3-5, 2008

Ecosystem services and adaptation to climate change

Bruno Locatelli, CIRAD-CIFOR
Markku Kanninen, CIFOR

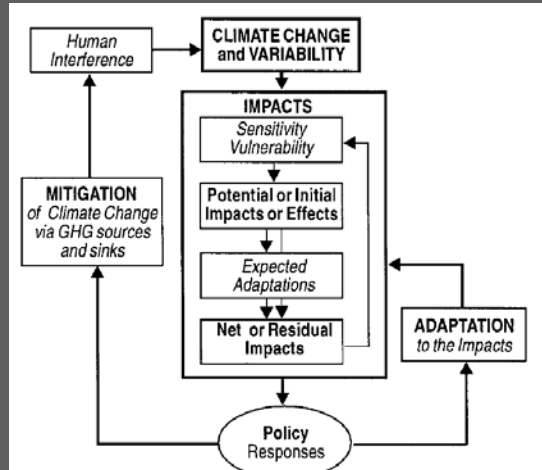


The Center for International Forestry Research

- 6 research domains
 - D1: Climate Change Mitigation
 - Leader: Daniel Murdiyarso
 - D2: Climate Change Adaptation
 - Leader: Bruno Locatelli
 - D3: Smallholder & Community Forestry
 - Leader: Bruce Campbell
 - D4: Conservation & Development
 - Leader: Terry Sunderland
 - D5: Trade & Investment
 - Leaders: Laura German & Chris Barr
 - D6: Production Forests
 - Leader: Robert Nasi
- Adaptation for forests
 - Forests for adaptation

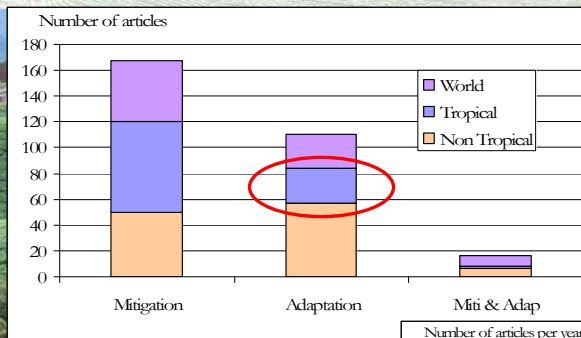


Adaptation



Smit et al., 1999

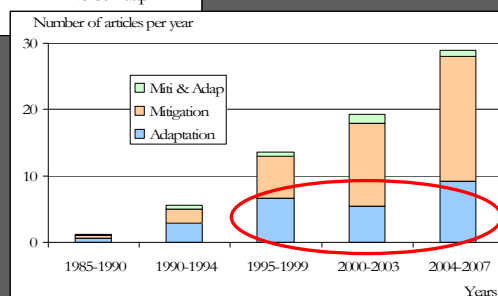
Forests and adaptation in the literature



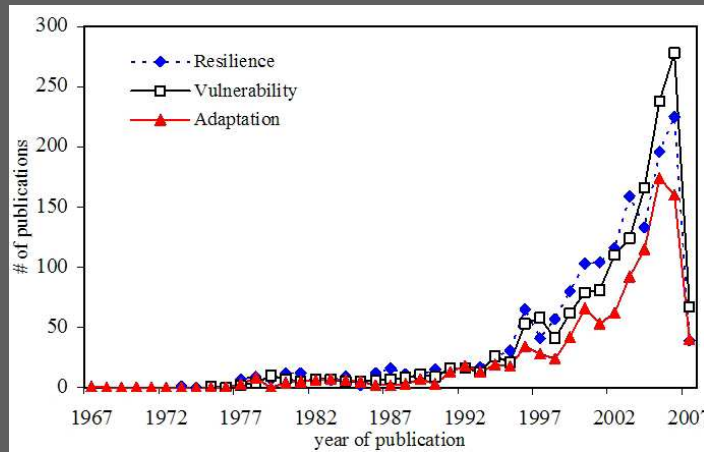
Forest and climate change
4 journals

- Global Environmental Change
- Climatic Change
- Climate Policy
- Mitigation and Adaptation Strategies for Climate Change

296 articles

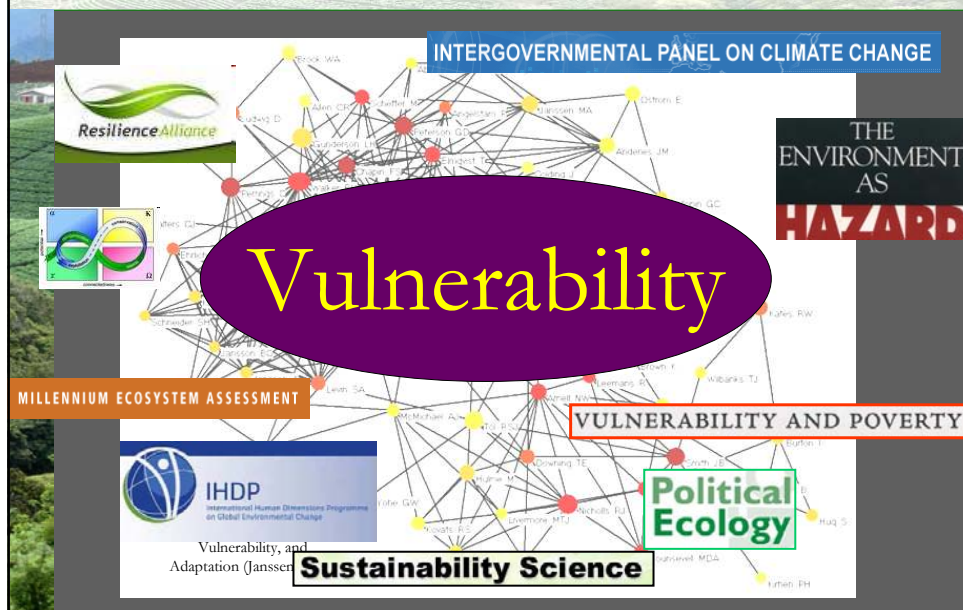


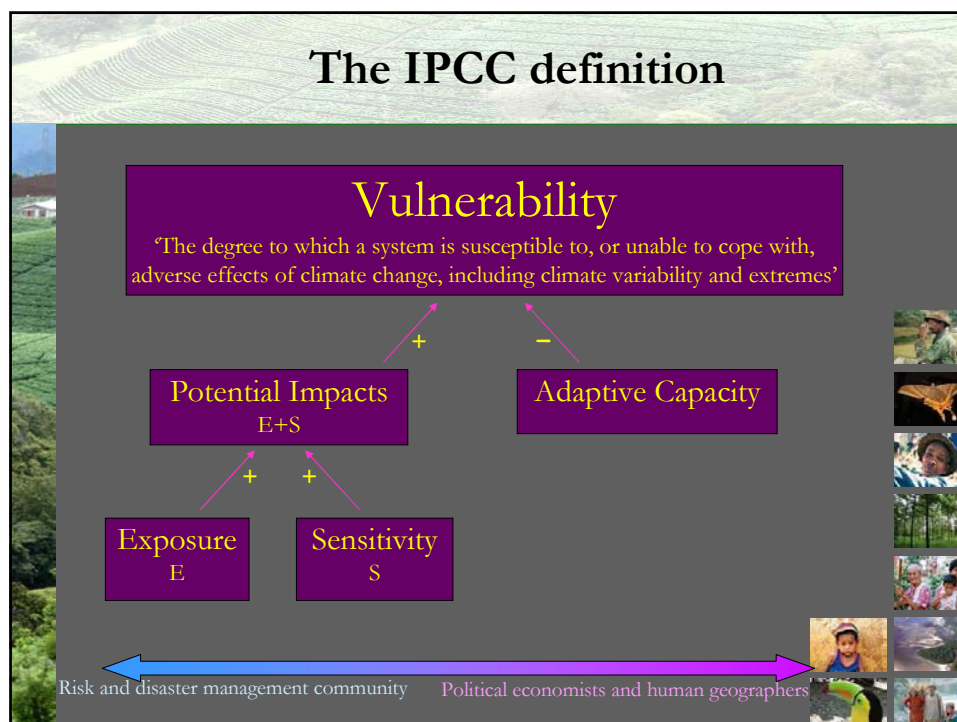
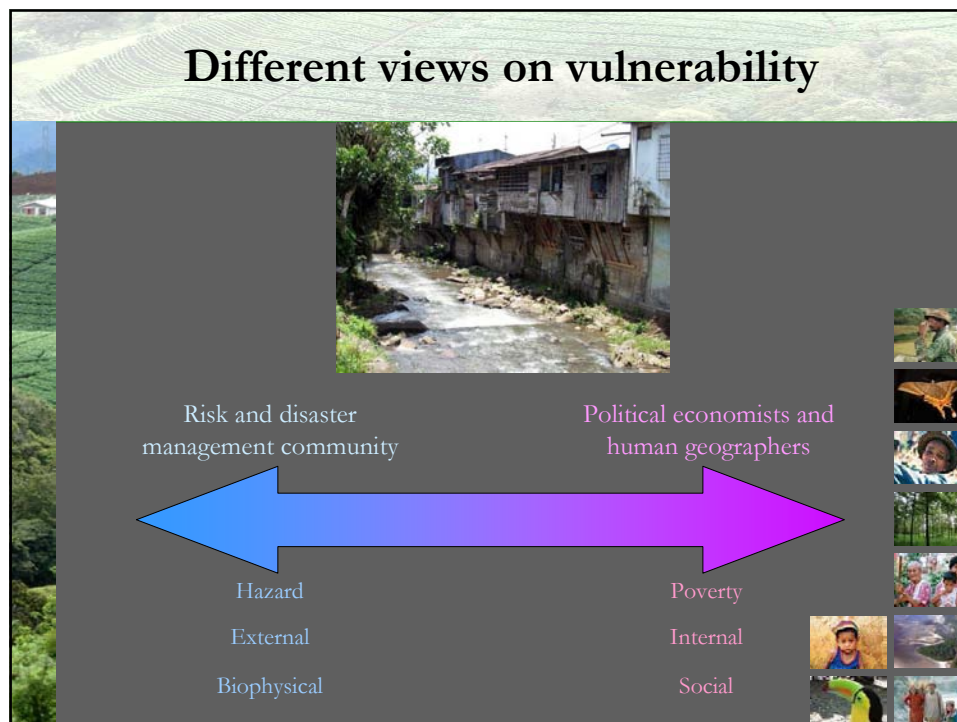
Is adaptation a growing scientific issue?



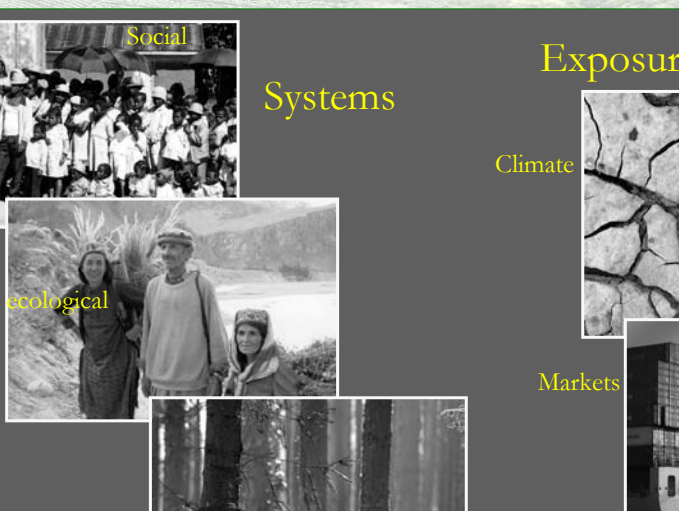
(Janssen, 2007)

The adaptation landscape





Applicability of the concept of vulnerability



Social

Systems

Exposure

Climate

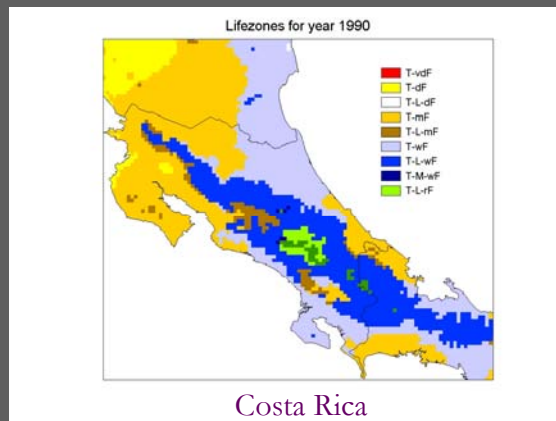
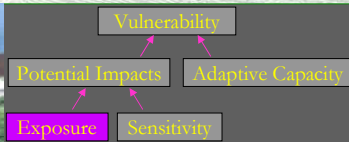
Markets

Socio ecological

Ecological

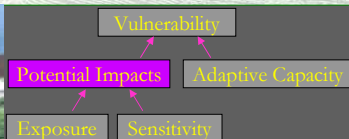
[illegible]

Exposure

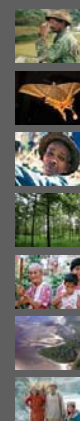
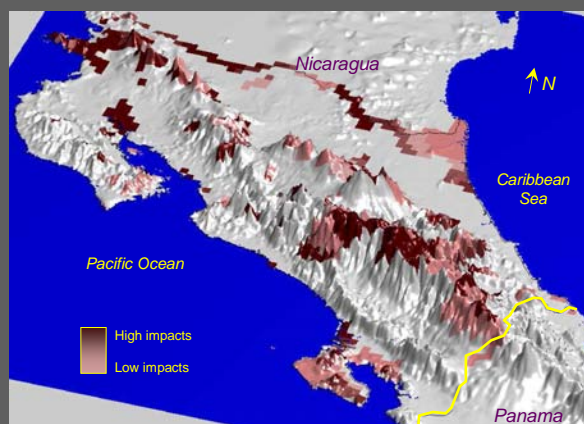


Potential impacts on ecosystems

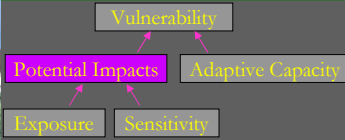
Changes in species distribution



Impacts of CC on protected areas in Costa Rica

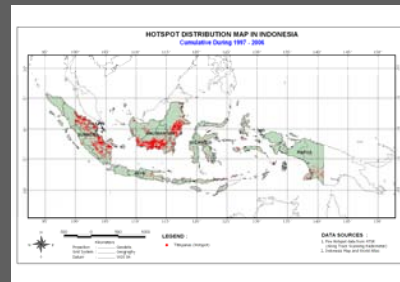
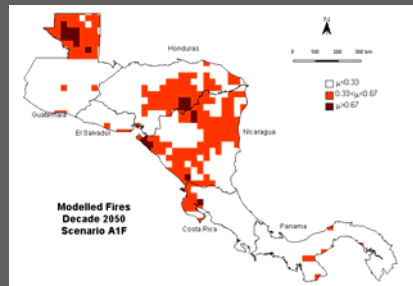


Potential impacts on ecosystems

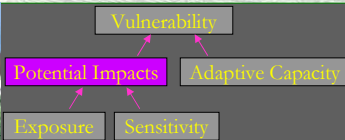


Changes in disturbance regimes

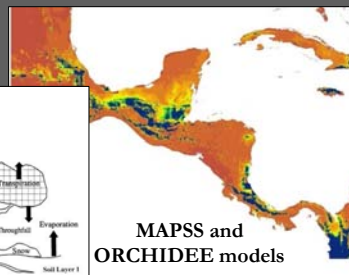
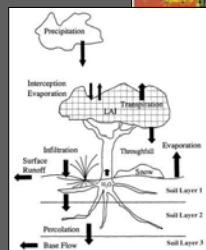
Impacts of CC on forest fires in Central America and Indonesia



Potential impacts on ecosystem services



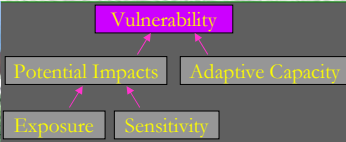
- Changes in hydrological services in Central America (Pablo Imbach)



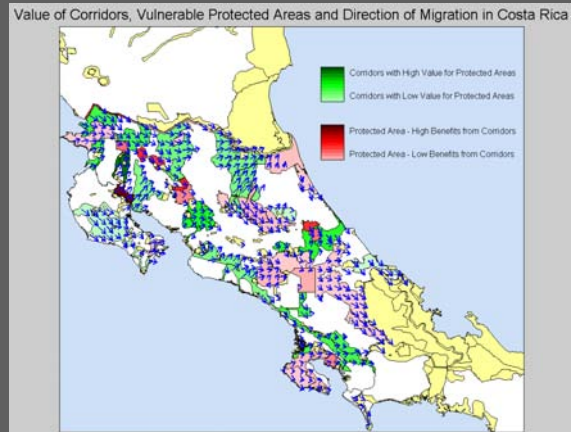
MAPSS and ORCHIDEE models



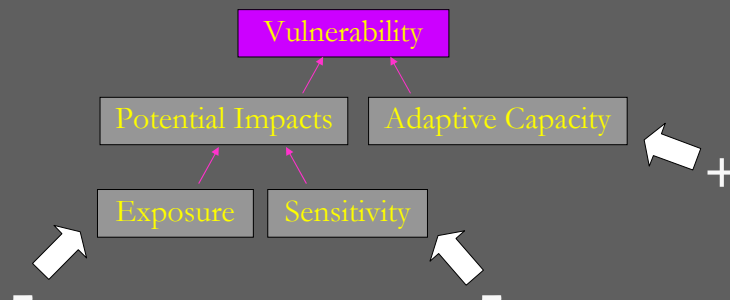
Adaptive capacity and vulnerability of ecosystems



Migration as an adaptive capacity



Adaptation



Adaptation for forests (1/2)

- Buffering perturbations
 - Increasing resilience and resistance



- Fire suppression
- Active management of invasive species, insects and diseases
- Post-disturbance management
- ...



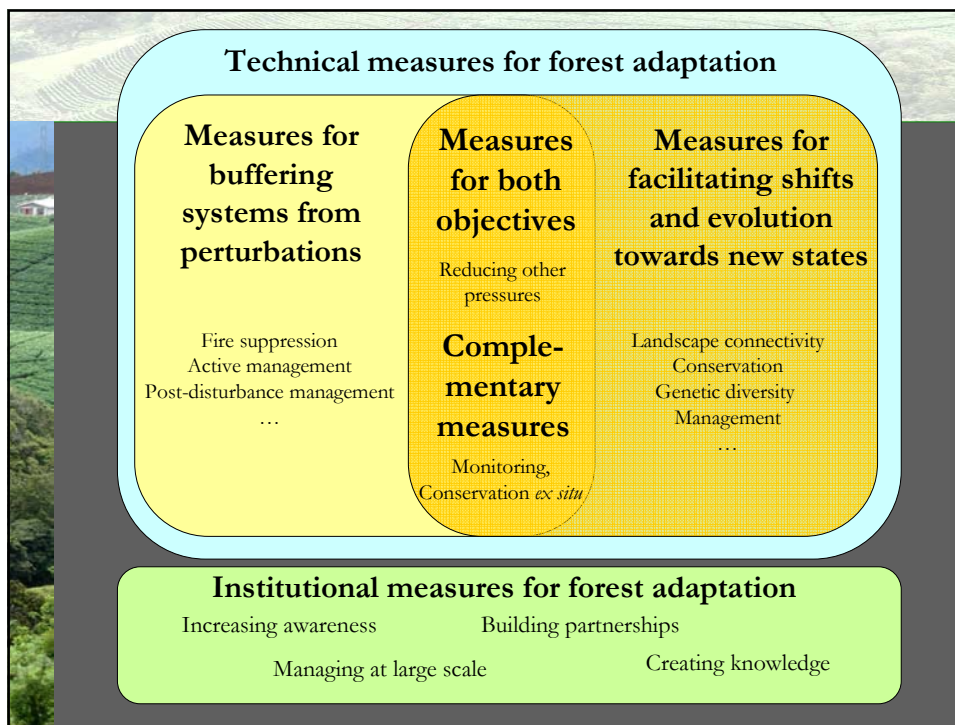
Adaptation for forests (2/2)

- Facilitating shift or evolution
 - Easing natural adaptation processes



- Landscape connectivity
- Conservation
- Genetic diversity
- Management
- ...

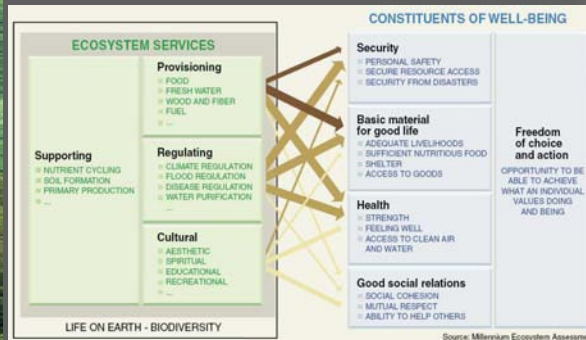




The slide has a background image of a forest landscape. On the right side, there is a close-up photograph of a pine cone on a branch. The text on the left is as follows:

- Adaptation for forests
- Forests for adaptation

Vulnerability of forest = Vulnerability of society



Provisioning services

- Wide array of goods for local or regional people, national and international companies
 - Wood
 - Fuelwood
 - More than 90% of energy demand in 13 countries (Shvidenko et al., 2005)
 - Non wood products
 - Livelihoods of 250 M to 1 B people
 - Food, Traditional medicines, Fodder for animals
 - Biochemicals, Genetic Resources, Cosmetics



Regulating services

- Regulation of global climate through carbon sequestration
- Purification of water
- Mitigation of floods and drought
- Detoxification and decomposition of wastes
- Pollination of crops and natural vegetation
- Control of agricultural pests
- Dispersal of seeds
- Moderation of temperature extremes
- Moderation of the force of winds and waves

(Daily, 1997)



Cultural services

- Spiritual and religious value
- Aesthetic, recreation or heritage
- For local people, visitors, citizens...



Scales

- Global scale (carbon, genetic resources...)
- Watersheds (hydrological services...)
- Local (pollination, non marketed NTFPs...)
- From local to global (marketed NTFPs...)

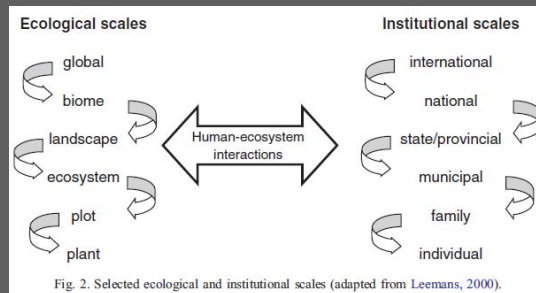
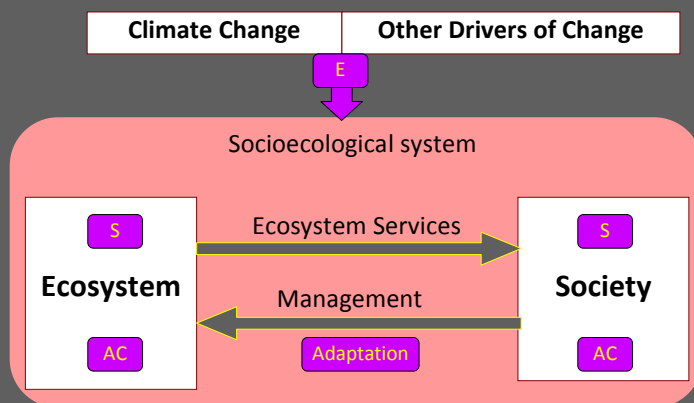
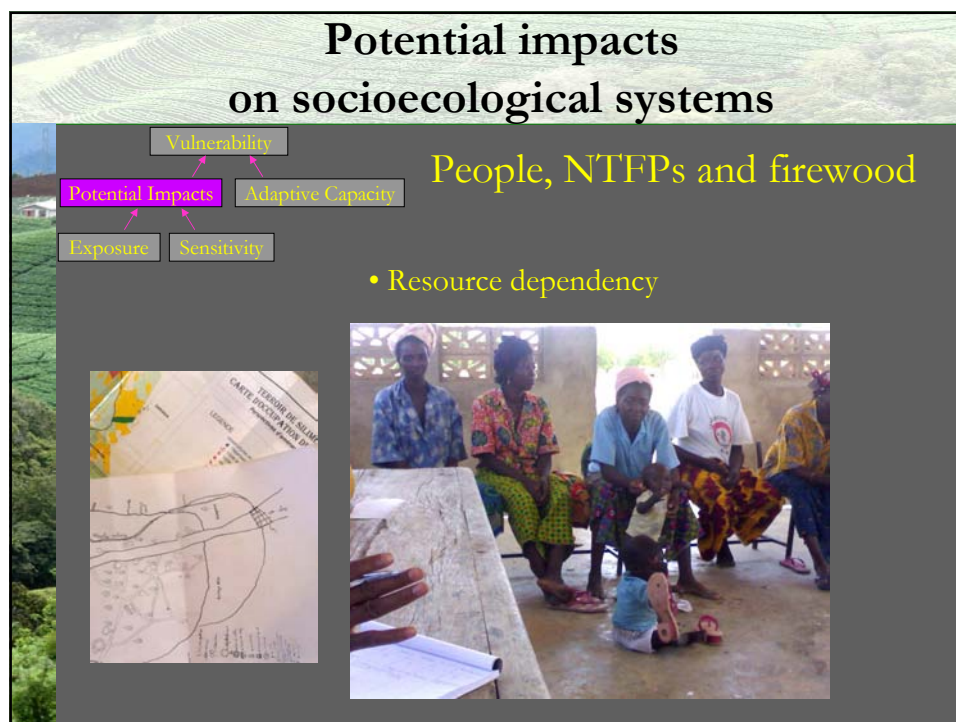
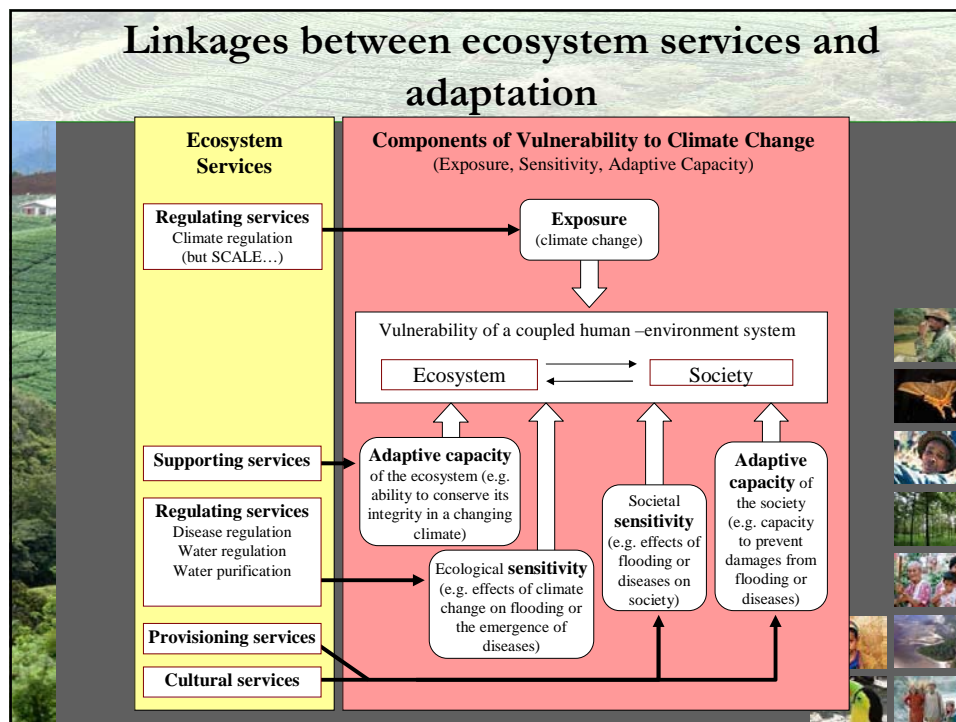


Fig. 2. Selected ecological and institutional scales (adapted from Leemans, 2000).

Vulnerability of socioecological systems






Adaptive capacity of socioecological systems

Adaptive capacity of communities across scales

- Learning & knowledge: individual understandings
- Governance: institutional flexibility



-

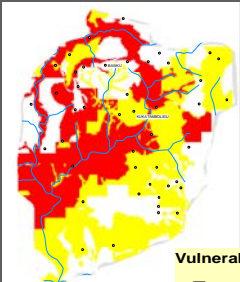
Vulnerability of socioecological systems

Vulnerability

Potential Impacts Adaptive Capacity

Exposure Sensitivity

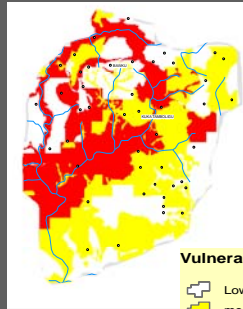
Vulnerability to the loss of ecosystem goods in SW Ghana



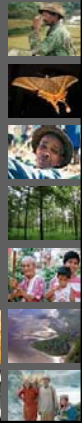
Vulnerability

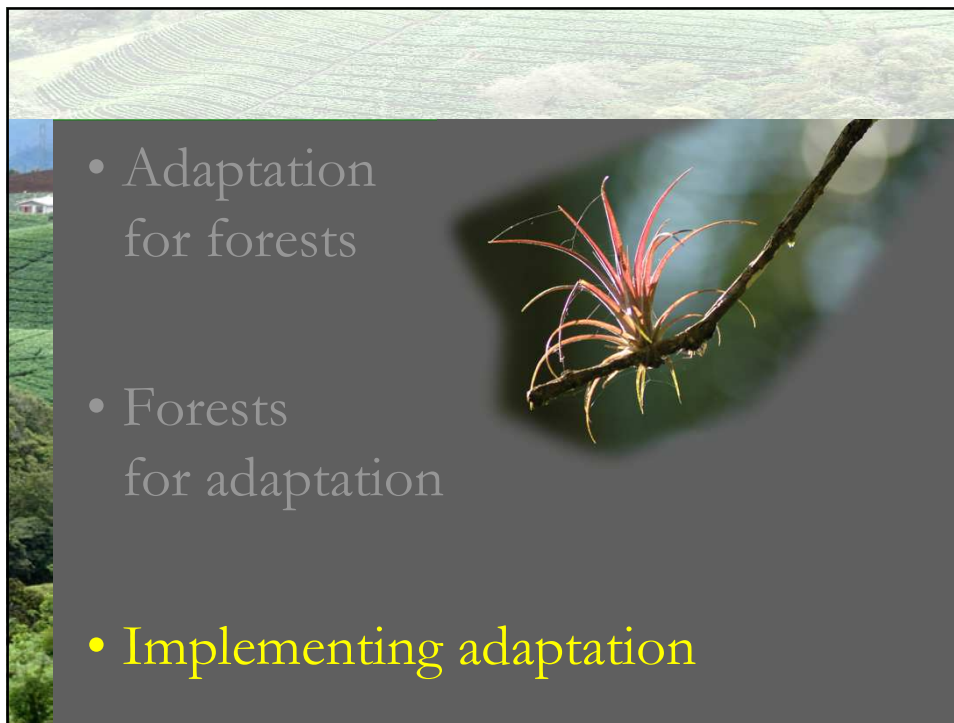
- Low Vulnerability
- medium Vulnerability
- High Vulnerability

The map shows a coastal region with a network of roads and rivers. The vulnerability is color-coded: yellow for low, orange for medium, and red for high. High vulnerability areas are concentrated along the coast and in some inland patches. A legend at the bottom right of the map area defines the color coding.

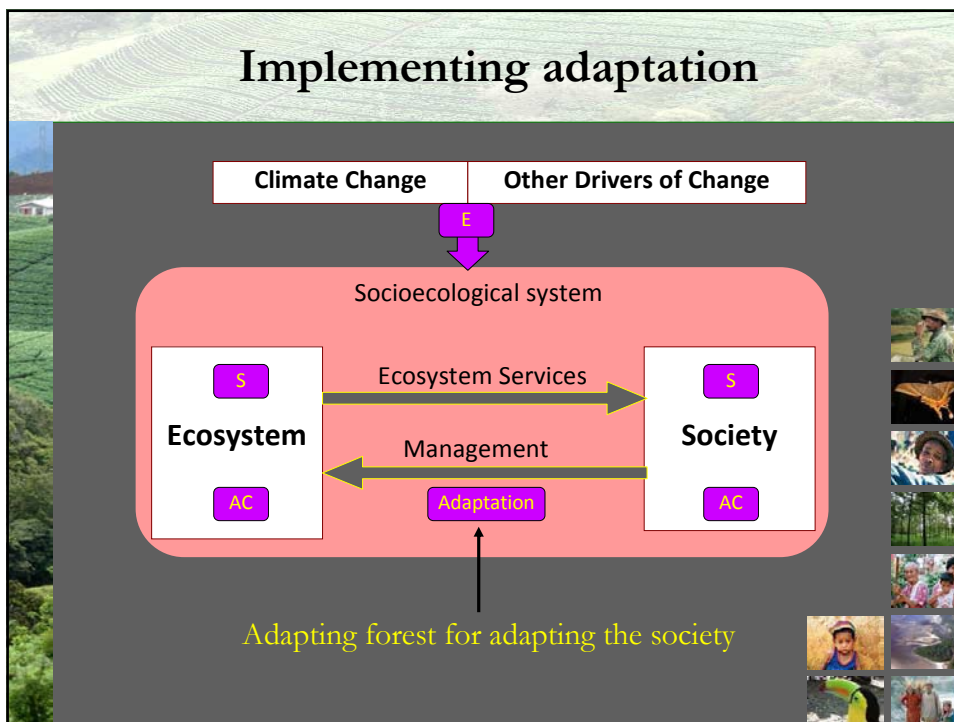


A man in a red cap and dark clothing is leading a brown donkey through a muddy river. The donkey is carrying a large, heavy load of firewood on a yellow cart. The background shows a dry, hilly landscape under a clear sky.





- Adaptation for forests
- Forests for adaptation
- Implementing adaptation



Local adaptation

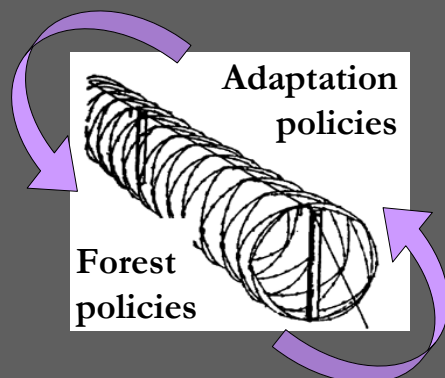
- Building on the local
- Institutional changes needed
- Learning from previous experiences



Stratégie	Bénéfices	Coût	Conflits	Précisibilité	Durabilité
De défrichage	5	4	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5
de défrichage	5	5	1	3	5

National policies

Mainstreaming adaptation into forest policies



Mainstreaming forest into adaptation policies



International policies

- Local or national vulnerability assessment and adaptation implementation can provide relevant inputs for:
 - International negotiations
 - Financial mechanisms
 - Nairobi work programme



Thank you!