



Adaptation of forest ecosystems and the forest sector to climate change

**Workshop in Islamabad, Pakistan
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Carmenza Robledo and Jürgen Blaser

INTERCOOPERATION

inter
cooperation



Hilfe2

Diese Folie enthält zwei Mastergruppen (Master und Titelmaster), welche den Corporate-Design-konformen Auftritt definieren. Der jetzt zugewiesene Empa-Master 1 sieht für die Titelfolie das Empa-Logo vor. Den weiteren Folien ist kein Logo zugewiesen. Für längere Vorträge mit Zwischentiteln empfehlen wir, den Folien mit Zwischentiteln den Empa-Master 2 (mit Logo unten rechts) zuzuweisen. Dazu öffnen Sie via Ansicht > Aufgabenbereich > Foliendesign-Entwurfsvorlage rechts die Masterauswahl. Nun markieren Sie im linken Ansichtsfenster die Folien, denen Empa-Master 2 zugewiesen werden soll (mindestens zwei, ansonsten für den ganzen Satz Empa-Master 1 verwendet wird). Weitere Hilfe erhalten Sie bei Monika Ernst, 4995 (Empa, Dübendorf)

M. Ernst, 2/4/2005

Forest in a land-use continuum

500 million people directly depend on forest resources for their livelihoods

50 million people (in particular indigenous communities) live within forested areas



1,800 m people (1,300 in the tropics) make part of their subsistence out of forests and trees

Forest can sequester C from the atmosphere helping to mitigate climate change

Forest plays an important role in reducing vulnerability of livelihoods

Up to 20% of the GHG come from deforestation and forest-degradation in tropics/subtropics

Forests (biomass and soil) stock between 430-540 Pg of carbon. Maintaining these reservoirs is key

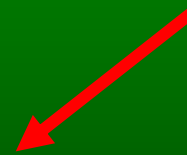
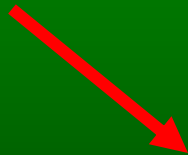
Adaptation as a cross-cutting issue: Linking sectors and livelihoods

Livelihoods

- Where are the major risks?
- Which are the potential benefits?
- How is the verall vulnerability?
- Local Indicators

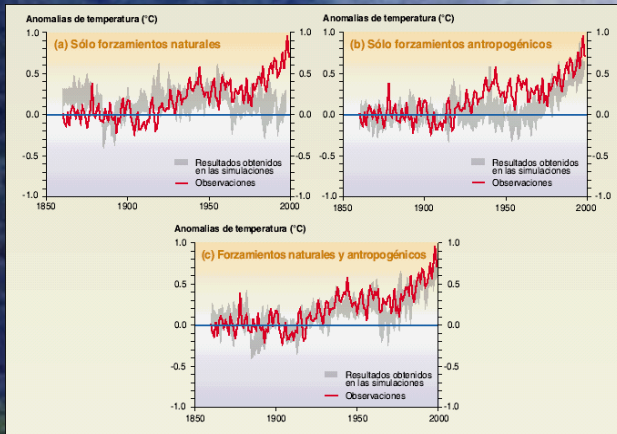
Sectoral policies

- Technology development and transfer
- Infrastructure
- Investments within the sector
- Market development



Forest dependent livelihoods

A framework for today's discussion



**What is needed to link science, international policy-making
and the livelihood level?
(realities, knowledge and coping strategies of rural people)**

Why should the (sustainable) livelihood approach be used?

- Helps to assess vulnerabilities and strengths of ecosystems and social systems
- Because the livelihood approach is integrative:
 - it allows to highlight cross-sectoral linkages
 - enhance capacity to cope with overall climate-related shocks
 - Useful to realize the interrelations between hard-won lessons from many disciplines (e.g., sustainable livelihoods, disaster mitigation, natural resource management, climate research)
- Allows to increase the overall adaptation capacity to to climate change

The SLA allows to understand adaptation to climate change in the development continuum

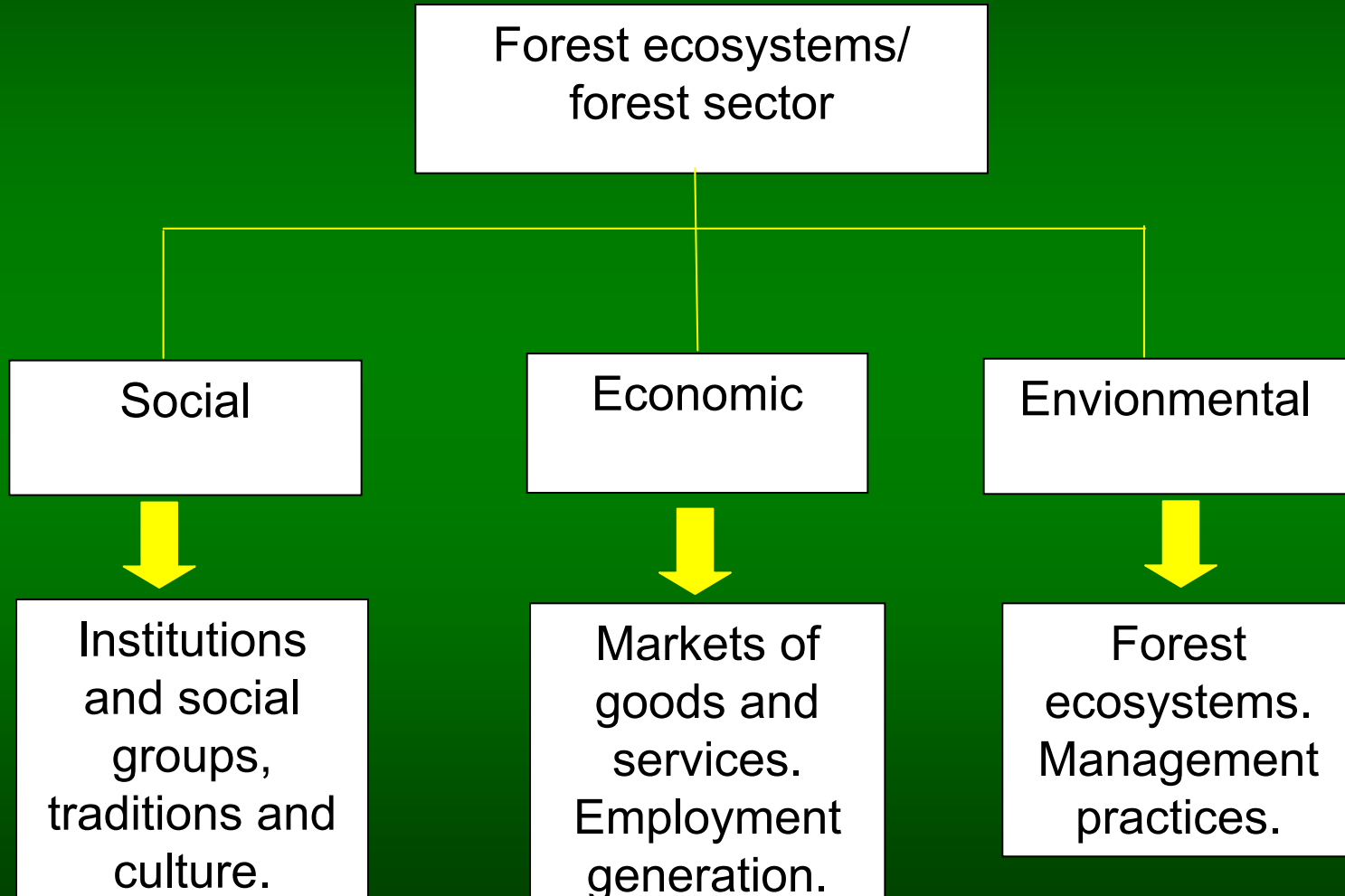
1. Impacts on forest and livelihoods

Different types of impacts

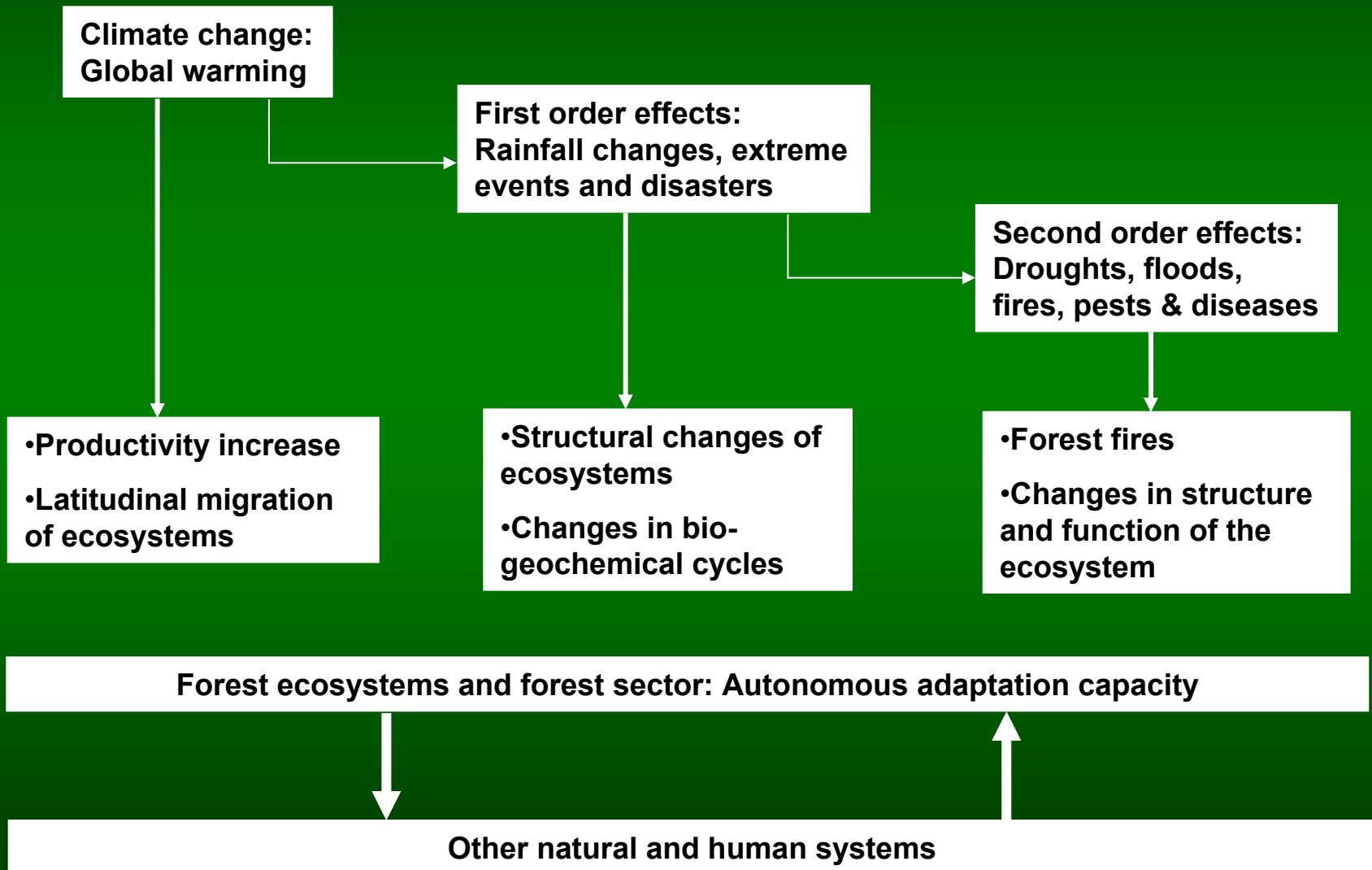
- **Direct impact**
 - On the ecosystem
 - On social groups
- **Indirect impact**
 - Linked with the forest sector development
- **Incremental impact**
 - Depending on the management practices



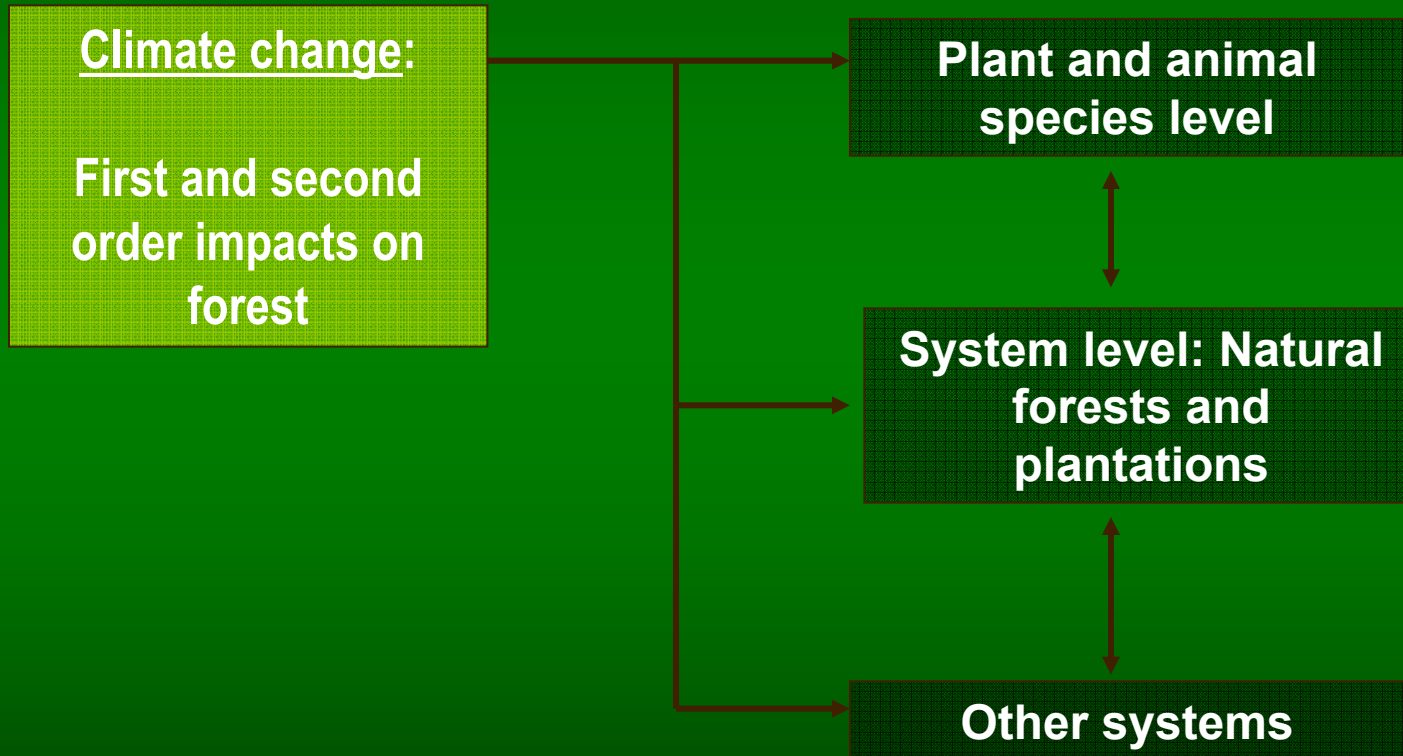
Analysis of indirect and incremental impacts



Direct impacts on the ecosystems and the forest sector (1)



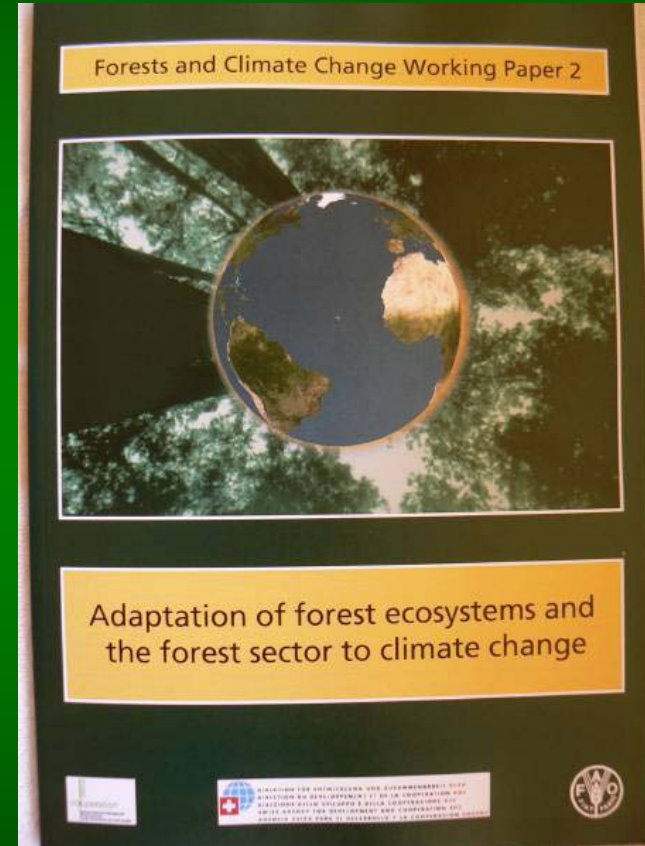
Direct impacts (2)



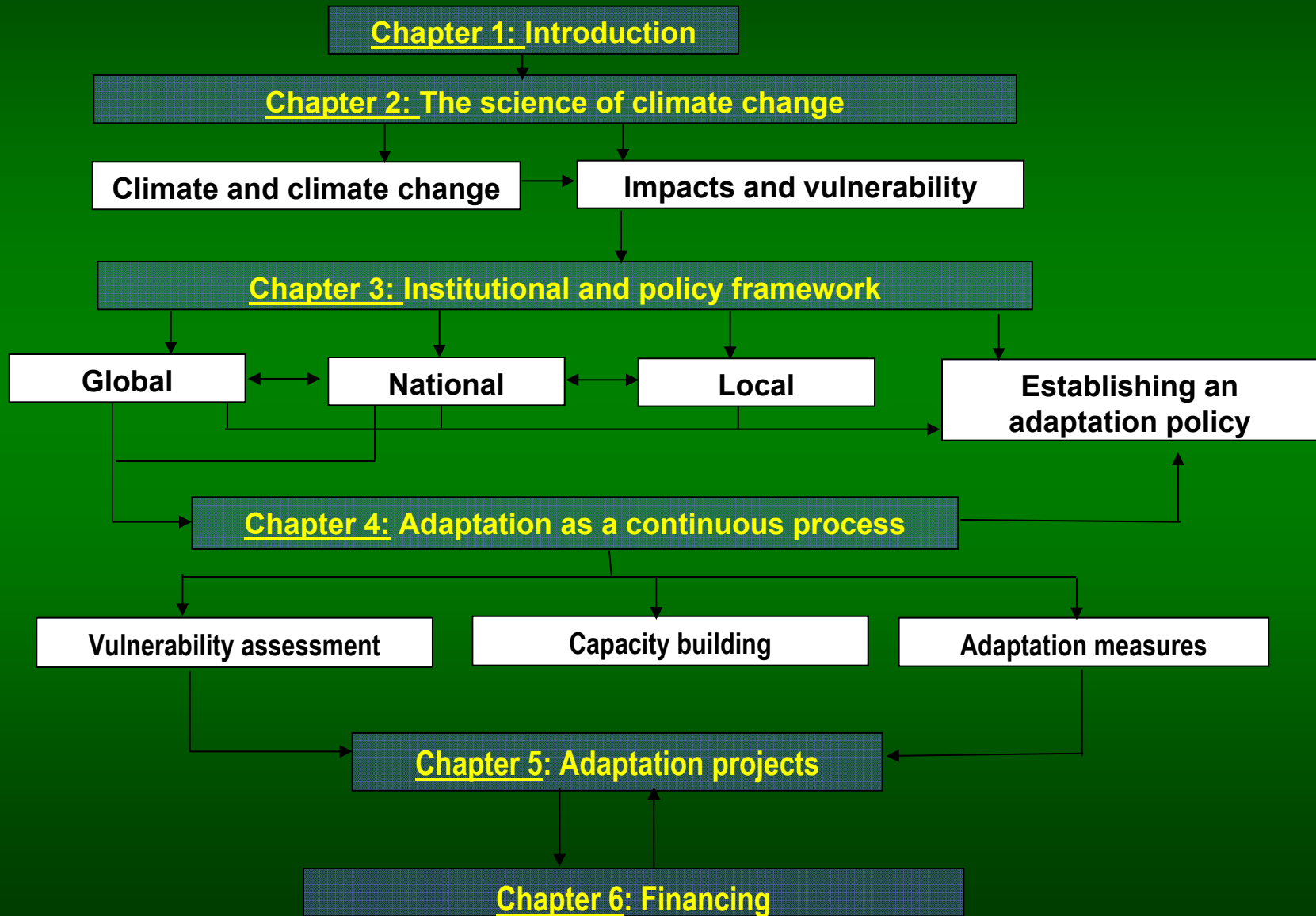
Factor	Cell level	Organism level	Species level	Ecosystem level
CO ₂ increase	Photosynthetic rate increase	Growth rate increase	Decreased seed mortality	Biomass production increase
	Stomatal conductance reduction	Water use efficiency increase	Increased recruitment	Alterations in species competitiveness
		Seed production increase	Period for individuals to reach maturity	Changes in species composition
			Changes in density	
Temp. increase	Photosynthesis increase or decrease	Primary production positive or negative changes	Regeneration rate changes	Alterations in species competitiveness
	Photosynthetic period can increase	Seed production changes	Possible increase in tree mortality	Species' composition changes
	Transpiration increase		Negative consequences for species sensitive to temperature changes	Soil mineralization increase
Rainfall regime change	Growth rate decrease	Seed mortality rate increase		Alterations in species competitiveness
			Increase of mature individuals' mortality rate	Species composition changes

Addressed to whom?

- Persons in charge with the *formulation and execution of NRM policy* at national, sub-national and local level.
- Professionals and technicians linked with regional entities, planning units of ministries, local administrations and other persons linked with organizations interested in the *formulation and execution of adaptation projects*.

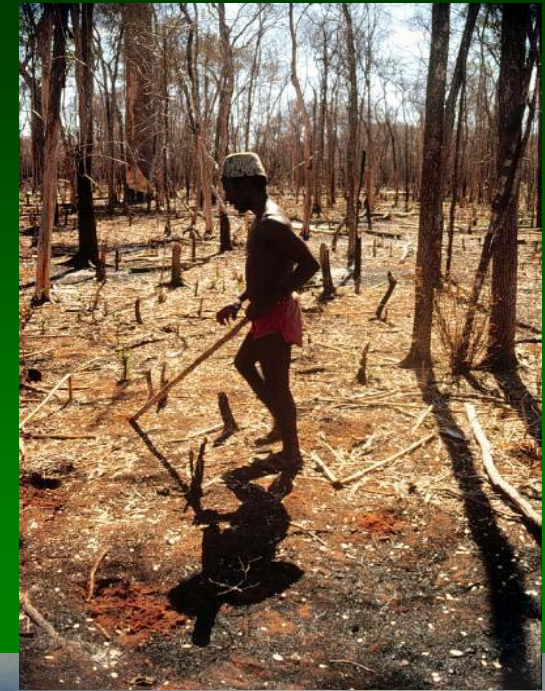


Document structure



However,...

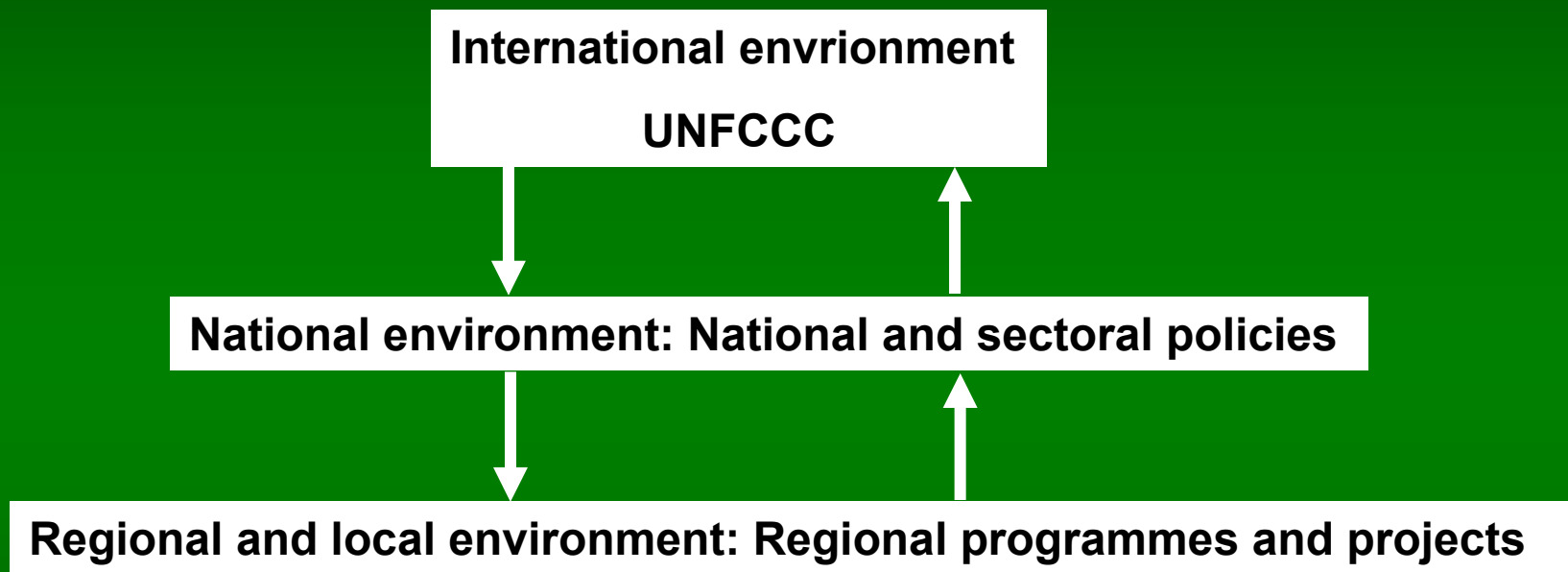
Even though climate change is likely to occur, the magnitude (and frequency) of such impacts on the forest ecosystems may not be as great as other processes such as indiscriminate deforestation, progressive expansion of agriculture or contamination.



The policies and actions related to adaptation and vulnerability must therefore take these other processes of equal or even bigger importance into account.

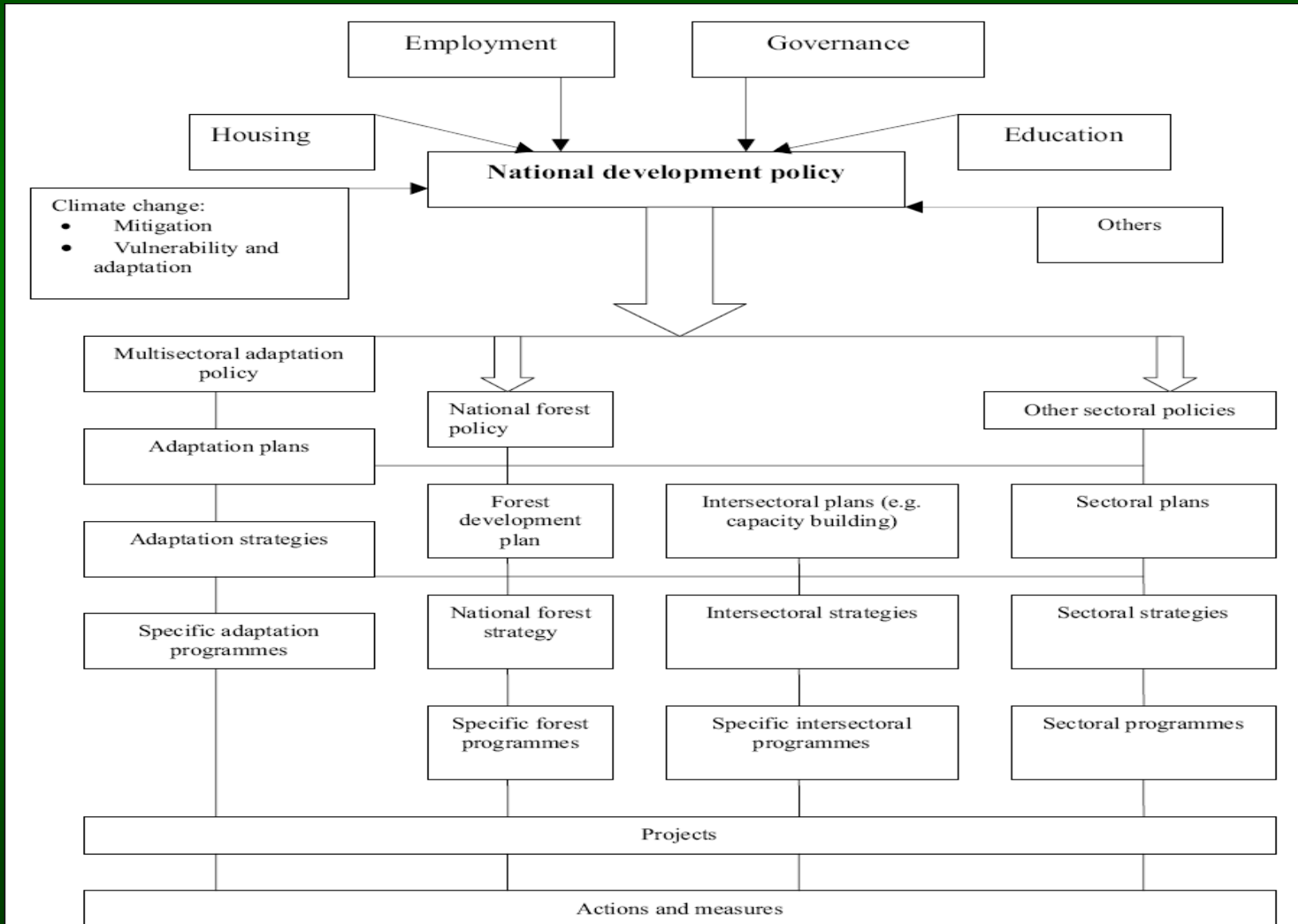


Institutional and policy framework



→ The challenge is to articulate the possibilities and restrictions at international level with the national priorities as well as the local needs and the local potential

Schematic proposal for the design of adaptation policies



Components of adaptation projects

- **Institutional:**
 - policies,
 - plans and programs,
 - legal framework,
 - structure and operation modalities of government entities, and the mechanisms of participation among government and non-government entities
- **Economic and financial:**
 - costs
 - implications on overall economics of implementing adaptation measures
 - financial sources
- **Forest management:**
 - Silvicultural aspects
 - Forestry aspects , technical considerations and management practices
- **Social:**
 - Identification of involved or affected social groups,
 - Meet the requirements and establish mechanisms that promote the participation of such groups at different stages of the project
- **Research:**
 - Scientific evidence

Classification of adaptation projects in the forest sector

According to stage of adaptation	Vulnerability assessment of ecosystems and the forest sector
	Improvement of capacity in the forest sector
	Measures for improving the adaptive capacity of ecosystems and the forest sector
According to scale	Regional
	National
	Local
According to forest management	Conservation
	Rehabilitation and restoration
	Plantations
Mixed projects	Combine one or more of the previous classifications
	Intersectoral projects

Projects according to adaptation stages

Adaptation process	Examples of projects in the forest sector
<i>Vulnerability assessment</i>	<p>Assessment and valuation of:</p> <ul style="list-style-type: none"> - Loss or potential appearance of species - Decreased/increased timber production - Impacts on micro and macro watersheds, soil conservation, desertification - Indirect effects (e.g. on employment, water)
<i>Improvement in capacity and design of measures</i>	<ul style="list-style-type: none"> - Intersectoral forest resource planning - Capacity building - Integration of vulnerable social groups - Improvement of governance in the forest sector - Strengthening of forest management plans with adaptation components
<i>Implementation of adaptation measures</i>	<p>According to the impact</p> <ul style="list-style-type: none"> - Watershed management - Plantations for soil conservation - Agroforestry to improve food security - Selection felling and/or reduced-impact logging - Mixed projects - Mangrove management for flood control

Projects according to their scale

	Regional	National	Local	
According to ecosystems	Vulnerability assessment in the Amazon	Impact study of climate change on the forest sector in Guatemala	Vulnerability assessment of a micro watershed	Vulnerability assessment
According to political-administrative divisions	Assessment of vulnerability to climate change in the European Union	Vulnerability assessment of the forest sector in Malaysia	Study of the impact of climate change on the marketing of agricultural products in 2 departments	
According to ecosystems	Design of an adaptation policy for the Congo basin	Design of a strategy for an adaptation policy for the Galapagos archipelago	Forest management plan for a micro watershed	Capacity improvement measures
According to political-administrative divisions	UNDP-GEF project for the improvement of training on adaptation (Central America, Mexico and Cuba)*	National training plan on adaptation for the forest sector	Territorial ordering plan for the Rio Nare slopes in Colombia	
According to ecosystems	Afforestation to reduce the risk of desertification in the Sahel region	Restoration of a watershed at the national level (e.g. watershed management of the Magdalena river in Colombia)	Pilot project to pay for soil conservation in a micro watershed	Implementation of adaptation
According to political-administrative divisions	Establishment of regional biological corridors	Establishment of an Environmental Services Act to promote adaptation	Municipal regulation of payment for environmental services related to adaptation	

Examples of forest management strategies as adaptation measures

Forest management strategy	Potential impact of climate change	Adaptation measure
Conservation	Desertification increase	Watershed conservation
	Change in structure and morphology of forest ecosystems	Protection of seed sources
	Increase in fire events	Creation of fire barriers, collection and use of biomass
Rehabilitation	Greater exposure to torrential rains Reduced food security	Rehabilitation by agroforestry
	Change in structure and morphology of forest ecosystems	Selection of adequate species
Plantations	Landslide risk	Plantations with fast-growing species and protection
	Exacerbation of impacts on ecosystems owing to increased fuelwood demand	Establishment of fuelwood orchards

Relationship between adaptation and environmental and social services

Changes in climate system



Impacts and vulnerability



Adaptation alternative



Components of a proposal

Changes in temperature and rainfall regimes



Increase in frequency and intensity of extreme events



On the ecosystem:

- Change in ecosystem structure
- Habitat loss for some species
- Loss of species
- Genetic pool loss
- Epidemics

On the social system:

- Reduction of food availability and of ecosystem products and services
- Reduction of farmland
- Increment illnesses as a consequence of low quality of drinking-water
- Housing loss
- Damage to infrastructure



Promotion of environmental services:

- Water cycle regulation
- Micro-climate regulation
- Carbon fixation and storage
- Soil protection
- Biodiversity conservation

Promotion of social services:

- Cultural habitat conservation
- Scenic beauty conservation



Institutional:

Legal framework and improvement in governance

Financial:

Payment instruments for social and environmental services

Technical:

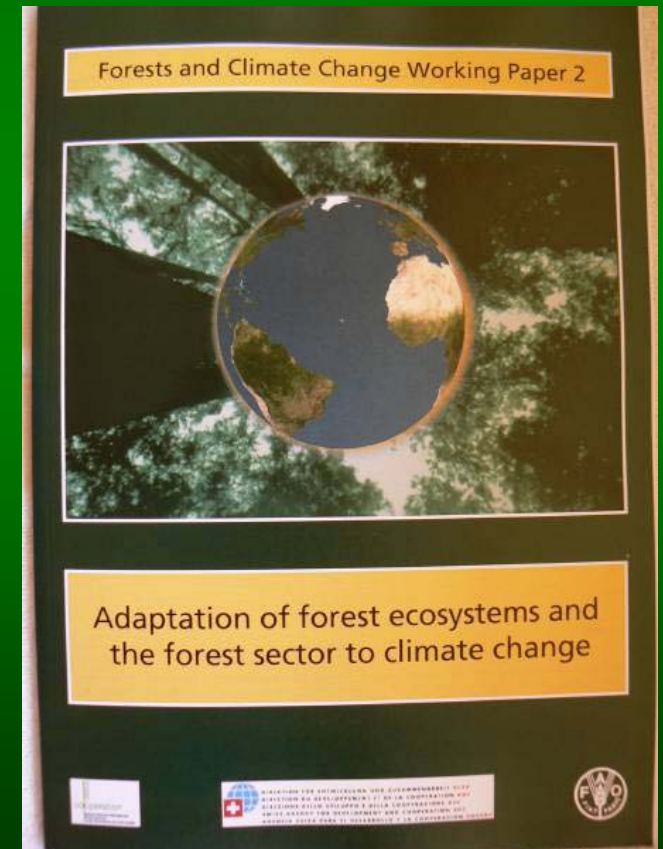
Sustainable management of natural resources

Social:

Participation, training and improvement in governance

Methodology for formulating projects

1. Identifying the problem
2. Defining and characterizing the system
3. Evaluating the options
4. Establishing strategic alliances
5. Formulation the project
6. Assuring the financing



Problem identification – national level –

CONSEQUENCES

Impossibility of using the benefits and reducing the risks of climate change



PROBLEM

Ignorance about the possible impacts on the countries of region F



CAUSES

Climate change, especially an increase in the frequency and intensity of extreme events

Problem identification - local level -

CONSEQUENCES

Soil loss and landslides
Loss of crops, infrastructure and lives



PROBLEM

Erosion increase
High landslide risk in municipalities a, b and c



CAUSES

Changes in rainfall patterns in a degraded ecosystem

System definition

	Forest ecosystem	Social system	
		Institutions	Social groups
Example 1	Natural forest with high biological diversity	<ul style="list-style-type: none"> - Regional and national plans and programmes - Governmental entities (regional and national) - Legal framework (regional and national) - Forest development plans - Other institutional entities 	<ul style="list-style-type: none"> - Indigenous groups - Settlers - Concession holders - NGOs - Primary and secondary timber processors
Example 2	Highly degraded hillside ecosystem, grassland	<ul style="list-style-type: none"> - Territorial ordering plan - Municipal legal framework - Government entities - Other insititutional entities 	<ul style="list-style-type: none"> - Peasants - Intermediaries fo rpurchase of agricultural products

Evaluating the options

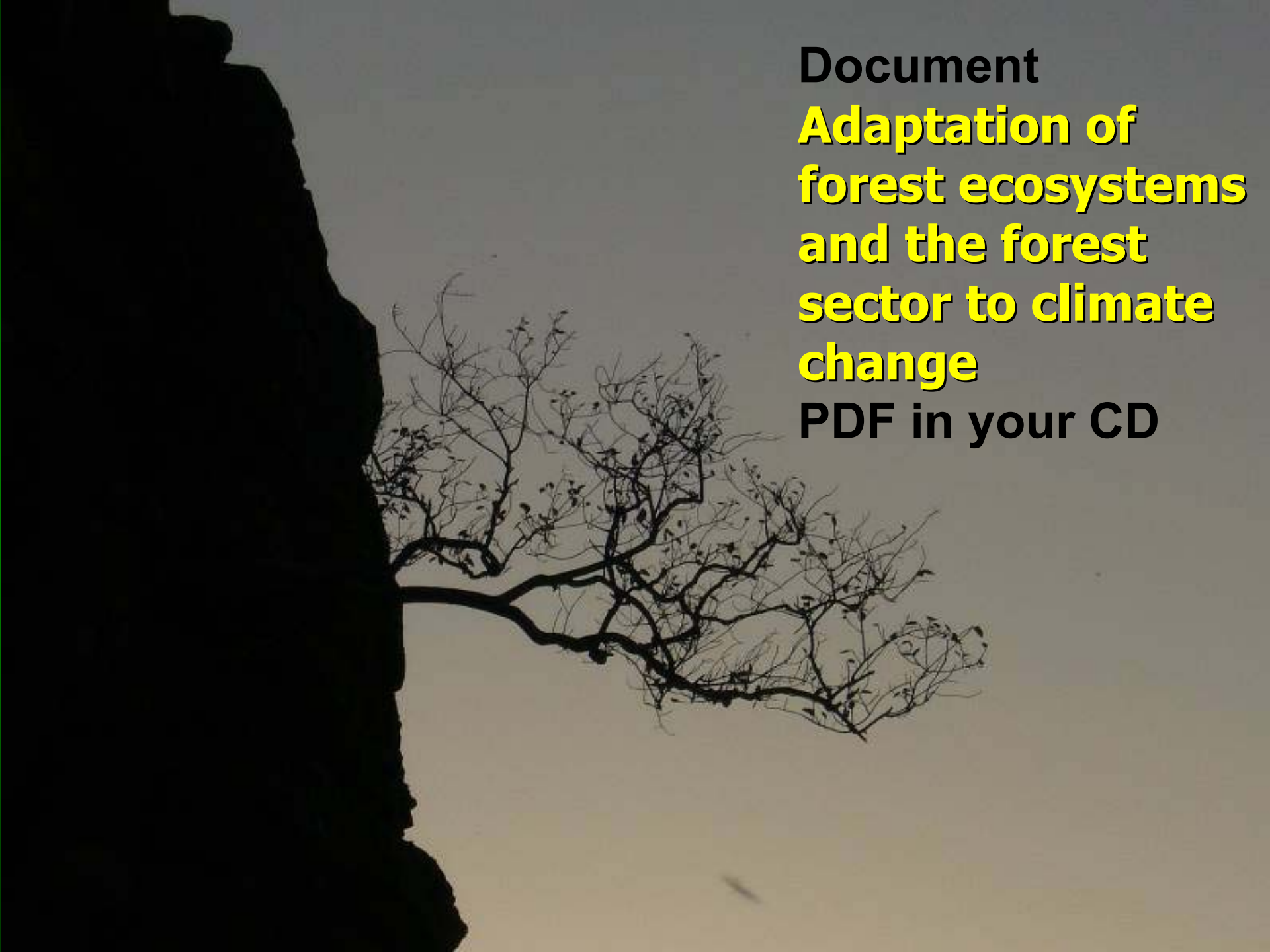
	Local scale	Forest management
Compensation	<ul style="list-style-type: none"> - Create a compensation fund - Define criteria and regulations for compensation 	
Impact prevention / modification of circumstances	<ul style="list-style-type: none"> - Improve and coordinate the institutional framework 	<ul style="list-style-type: none"> - Rehabilitate ecosystems with native species - Plantations
Search of alternatives	<ul style="list-style-type: none"> - Training in new productive activities - Credit for new productive activities 	<ul style="list-style-type: none"> - Production innovation - Silviculture - Silvopastoral systems
Location change	<ul style="list-style-type: none"> - Encourage expropriation and migration 	<ul style="list-style-type: none"> - Promote natural revegetation
Research	<ul style="list-style-type: none"> - Calculate social cost - Compare institutional frameworks at the local level 	<ul style="list-style-type: none"> - Silviculture of forests - Quantify and evaluate forest services
Education and awareness creation	<ul style="list-style-type: none"> - Disseminate information on vulnerability - Create awareness about the role of environmental services 	

And then...

- **Establishing strategic partners**
- **Formulation the project**
 - **Design a logical framework: objectives, results, activities and indicators**
 - **Establish participation mechanisms**
 - **Define the organizational structure of the project**
 - **Define the timetable**
 - **Establish the budget**
 - **Propose a monitoring plan**

Financing

- **Self-financing**
 - Equity (including taxes and transfers)
 - Credits (national or international, public or private)
- **Donations and aid**
 - Bilateral cooperation
 - UNFCCC Funds (implemented by GEF)
 - Adaptation Fund
 - Least Developed Countries Funds
 - Convention Fund
- **Co-financing**
 - Multilateral entities

A silhouette of a tree trunk and its branches against a light, hazy sky. The tree is on the left side of the frame, with its trunk extending vertically and its branches spreading out to the right. The sky is a uniform light color, possibly a pale yellow or grey, suggesting a clear or slightly overcast day.

Document
**Adaptation of
forest ecosystems
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