



**ENVIRONMENTAL SERVICES AND THE PRECAUTIONARY PRINCIPLE:
Using Scenarios to Reconcile Conservation & Livelihood Objectives in Upper Catchments**

*“Financing Forest Conservation: Payments for Environmental Services in the Tropics,”
Yale School of Forestry, March 2nd-3rd, 2007*

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I. INTRODUCTION

Environmental Governance in ECA

- **History, E. Africa:** Customary → Colonial → Post-colonial
 - **Rebellion against colonial regulations** following independence
 - **Post-colonial era regulation has created tensions**
(*conservation vs. livelihood; rural vs. urban ES values*)
- **Poor enforcement** (friends, relatives enforcing one another)
- **Consequence:** break-down in environmental governance and policy enforcement

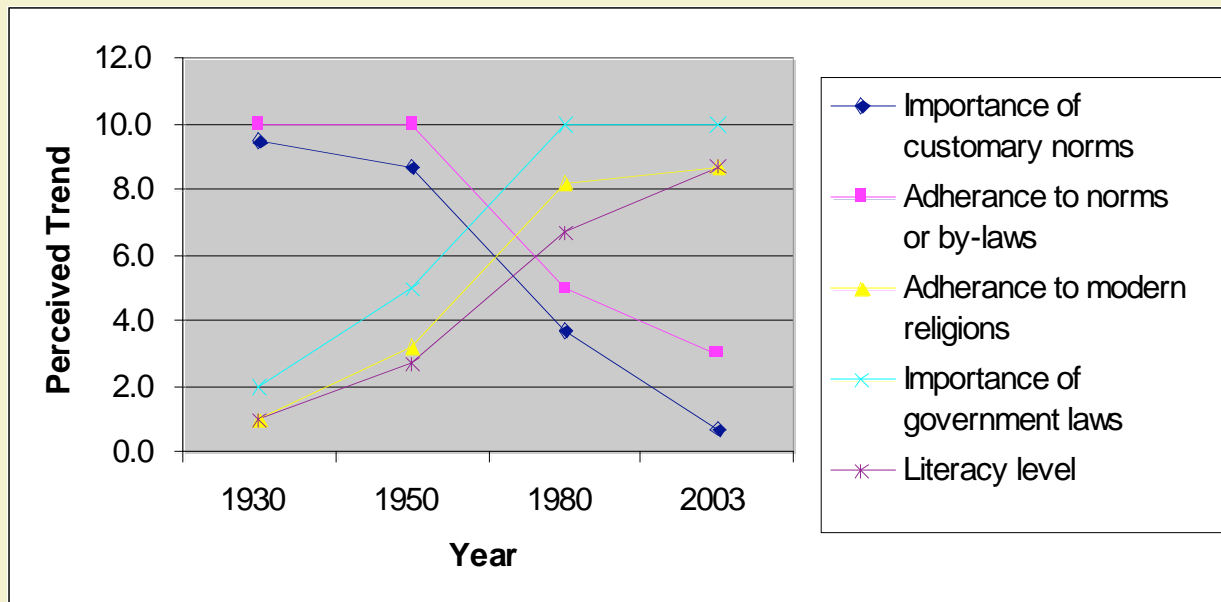


Figure 1. Perceived Trends in Natural Resource Governance, Lushoto (TZ)

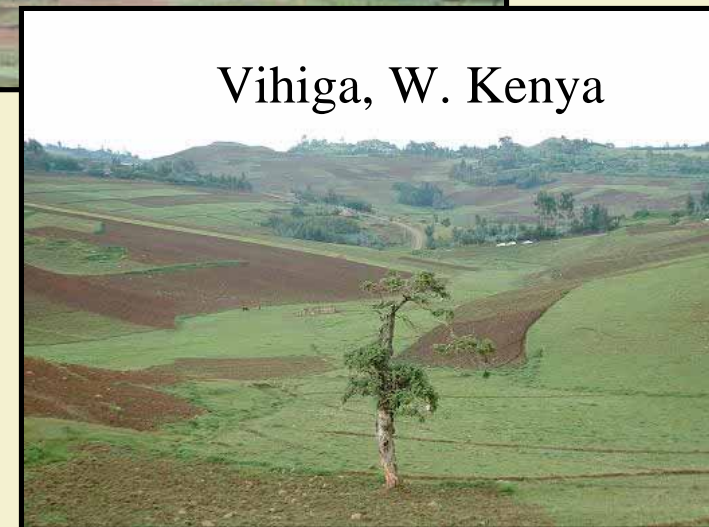
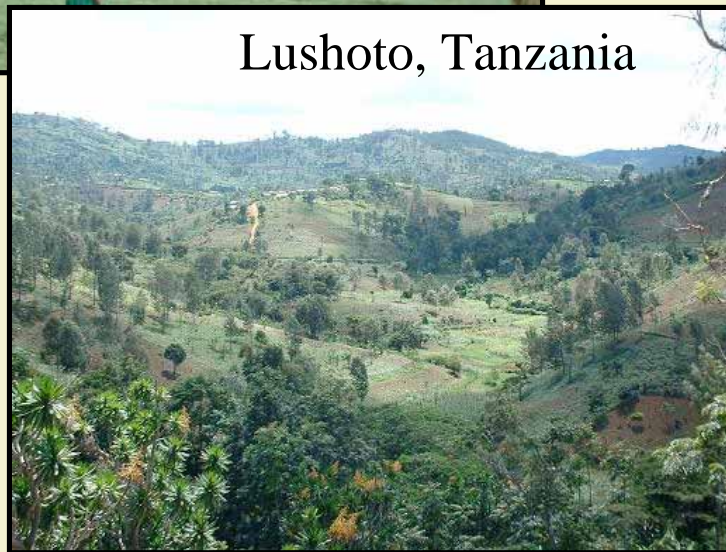
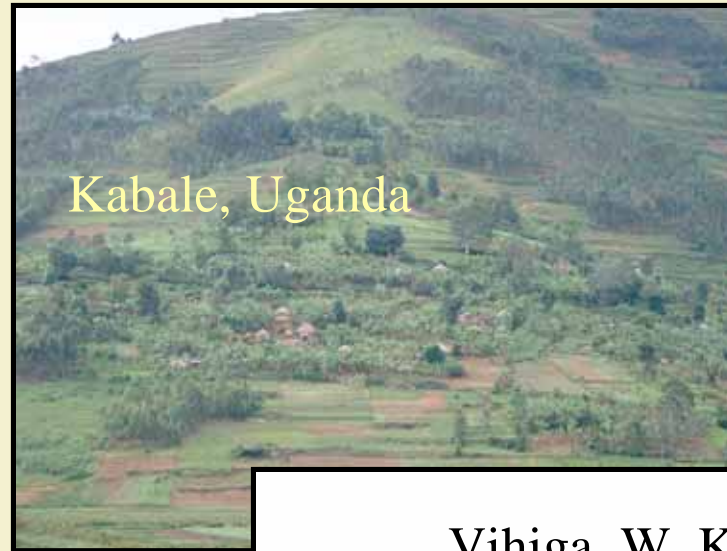
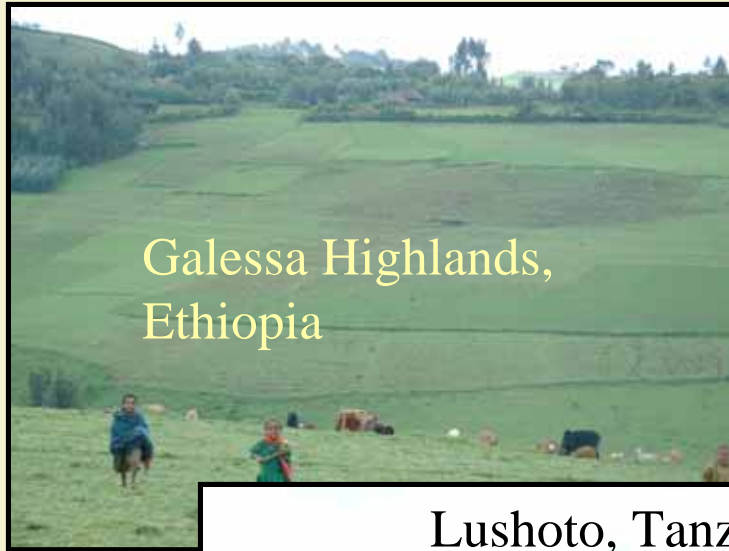
I. INTRODUCTION

ES Rewards/Payments: An Alternative to Regulation

- ES Rewards/Payments – dual goals of poverty alleviation and environment conservation
- Carbon Sequestration & the Kyoto Protocol
 - Existing LULUCF guidelines cause some concerns:
 - minimum eligible farm size would favor large-scale plantation over mixed systems
 - invasive alien species and genetically modified trees are treated according to the rules of the host country [not always sufficient]
 - species choice: fast-growing species yielding carbon quickly
- ES & likely downsides: social and environmental tradeoffs

II. METHODOLOGY

Research Sites



II. METHODOLOGY

Participatory Diagnosis of Landscape-Level NRM Problems

- ✓ Focus Group Discussions (by gender, wealth, age, landscape position)
- ✓ Participatory Mapping
- ✓ Historical Trends Analysis (elders)



Trends mapping,
Ginchi BMS

II. METHODOLOGY

Niche Compatibility Study: *Local Knowledge on 'Harmful' Trees*

1. Focus Group Discussions to identify:

- Landscape niches where trees are or could be grown
- Tree species that are: a) culturally-important, b) harmful, and c) compatible / incompatible with each identified niche
- The properties that make trees important, harmful, niche compatible or incompatible (tree features)

II. METHODOLOGY

Niche Compatibility Study: *Local Knowledge on 'Harmful' Trees*

1. Focus Group Discussions

2. Compile Item-by-Feature Matrix → *Rank Species According to Features*

Sample Item-by-Feature Matrix

| Code | Tree Characteristics (Features) | S1 | S2 | S3 | S5 | S6 |
|------|---|---|---|---|---|--|
| | Scientific Genus: Scientific Species: Amharic: Oromifaa: | <i>Hagenia abyssinica</i> Kosso | <i>Dombeya torrida</i> Welkafa Danisa | <i>Buddleja polystachya</i> Anfar Anfari, Adado | <i>Eucalyptus globulus</i> Bargamo Baharzaf | <i>Vernonia auriculifera</i> Ch'och'inga |
| F1 | Adversely affects adjacent crops | 0 | 0 | 0 | 2 | 0 |
| F2 | Good source of fuel wood | 2 | 2 | 2 | 2 | 2 |
| F3 | Is a good source of income | 2 | 2 | 1 | 2 | 0 |
| F4 | Causes drying of springs | 0 | 0 | 0 | 2 | 0 |
| F5 | It is fast growing | 2 | 2 | 2 | 2 | 2 |
| F6 | Helps control soil erosion | 2 | 2 | 2 | 2 | 2 |
| F7 | Is good for shade | 2 | 1 | 1 | 1 | 0 |
| F8 | Leaves decompose easily | 2 | 2 | 2 | 0 | 2 |
| F9 | Changes taste of water | 0 | 0 | 0 | 2 | 2 |

II. METHODOLOGY

Niche Compatibility Study: *Local Knowledge on 'Harmful' Trees*

1. Focus Group Discussions
2. Compile Item-by-Feature Matrix → *Rank Species According to Features*
3. Descriptive Statistics; Multi-dimensional Scaling

II. METHODOLOGY

Participatory By-Law Reforms to Address Negative Effects of 'Harmful' Trees

1. **Graphical representations** of landscapes with and without rules governing NRM;
2. **Feed back watershed problems** identified by local residents;
3. **Introduce meeting objectives** (solutions to watershed problems) **and identified policy shortcomings** (enforcement, gaps, design);
4. **Analysis of existing policies:** identification, degree of enforcement (or enforceability), effectiveness in addressing problems;
5. **Open-ended negotiations & action planning by issue** to address identified watershed problems (new content, process).

III. FINDINGS

I. Participatory Diagnosis of Landscape-Level NRM Problems

Table 1. Landscape NRM Problems Related to Trees

| Identified NRM Problems | Galessa, ET | Lushoto, TZ |
|---|------------------|-------------|
| <i>Problems Directly Related to Agroforestry:</i> | | |
| Negative impact of <i>boundary trees</i> on (neighbouring) crops and soil, reducing available cropland and yields | √ | √ |
| <i>Deforestation</i> and loss of indigenous tree species | √ | √ |
| <i>Theft</i> of crops, trees | √ | √ |
| <i>Shortage of fuel wood</i> | √ | |
| <i>Impact</i> of exotic trees (primarily Eucalyptus) on <i>springs</i> | | √ |
| Enhanced <i>run-off</i> through impermeable layers of leaf litter | | √ |
| <i>Impact</i> of certain trees on <i>water taste</i> | √ | |
| <i>Problems Indirectly Related to Agroforestry:</i> | | |
| Drying and contamination of watering points & spin-offs (conflict, disease, labour) | √ | √ |
| Periodic <i>drought</i> & <i>drying</i> of valley bottoms | √ | √ |
| Limited access to irrigation water (poor management, limited quantity) | (√) ^a | √ |
| Individual ownership of land around springs | √ | √ |
| <i>Soil fertility decline</i> resulting from decreased availability of fuel wood and use of dung for fuel | √ | |

^a Parentheses denote problems not identified by farmers during diagnostic activities, yet nevertheless known to be true for the site.

III. FINDINGS

II. Local Knowledge on Tree Compatibility

Table 2. Trees Identified by Highland Residents as ‘Harmful’

| Species | Site(s) | Reasons |
|---------------------------------|---------|---|
| <i>Eucalyptus spp.</i> | All | Drains the soil of water, competes with crops for nutrients, dries springs and valley bottoms, has a negative affect on soil, changes the taste of water |
| <i>Eucalyptus robusta</i> | TZ | Out-competes other tree species |
| <i>Acacia mearnsii</i> | UG, TZ | Drains the soil of water, competes with crops for nutrients, arrests undergrowth; increases run-off, destroys soil for subsequent uses; out-competes other tree species |
| <i>Persea americana</i> | UG | Drains the soil of water. |
| <i>Cupressus lusitanica</i> | ET, KY | Shallow rooted, dries soil, dries springs, competes with adjacent crops, has a negative affect on soil |
| <i>Erythrina abyssinica</i> | KY | Massive root system, competes with crops |
| <i>Albizia spp.</i> | TZ | Arrests undergrowth; increases run-off |
| <i>Olea europaea</i> | TZ | Arrests undergrowth; leaves bad for crops/soil; heavy feeder on water; out-competes other tree species; dries up valley bottoms |
| <i>Allanblackia stunlammani</i> | TZ | Leaves bad for crops/soil |

III. FINDINGS

II. Local Knowledge on Tree Compatibility (cont'd)

Table 2. Trees Identified by Highland Residents as 'Harmful'

| Species | Site(s) | Reasons |
|------------------------------|---------|--|
| <i>Solanecio mennii</i> | TZ | Leaves bad for crops/soil; heavy feeder on water |
| <i>Ocotea usambarensis</i> | TZ | Heavy feeder on water; dries up valley bottoms |
| <i>Ficus thonningii</i> | TZ | Out-competes other tree species |
| <i>Markhamia obustifolia</i> | TZ | Dries up valley bottoms |
| <i>Olea africana</i> | ET | Dries springs |
| <i>Vernonea auriculifera</i> | ET | Changes the taste of water |
| <i>Senecio gigas</i> | ET | Changes the taste of water |

III. FINDINGS

II. Local Knowledge on Tree Compatibility (cont'd)

- **MDS Output** – *Trade-Offs Associated with Species Choice*

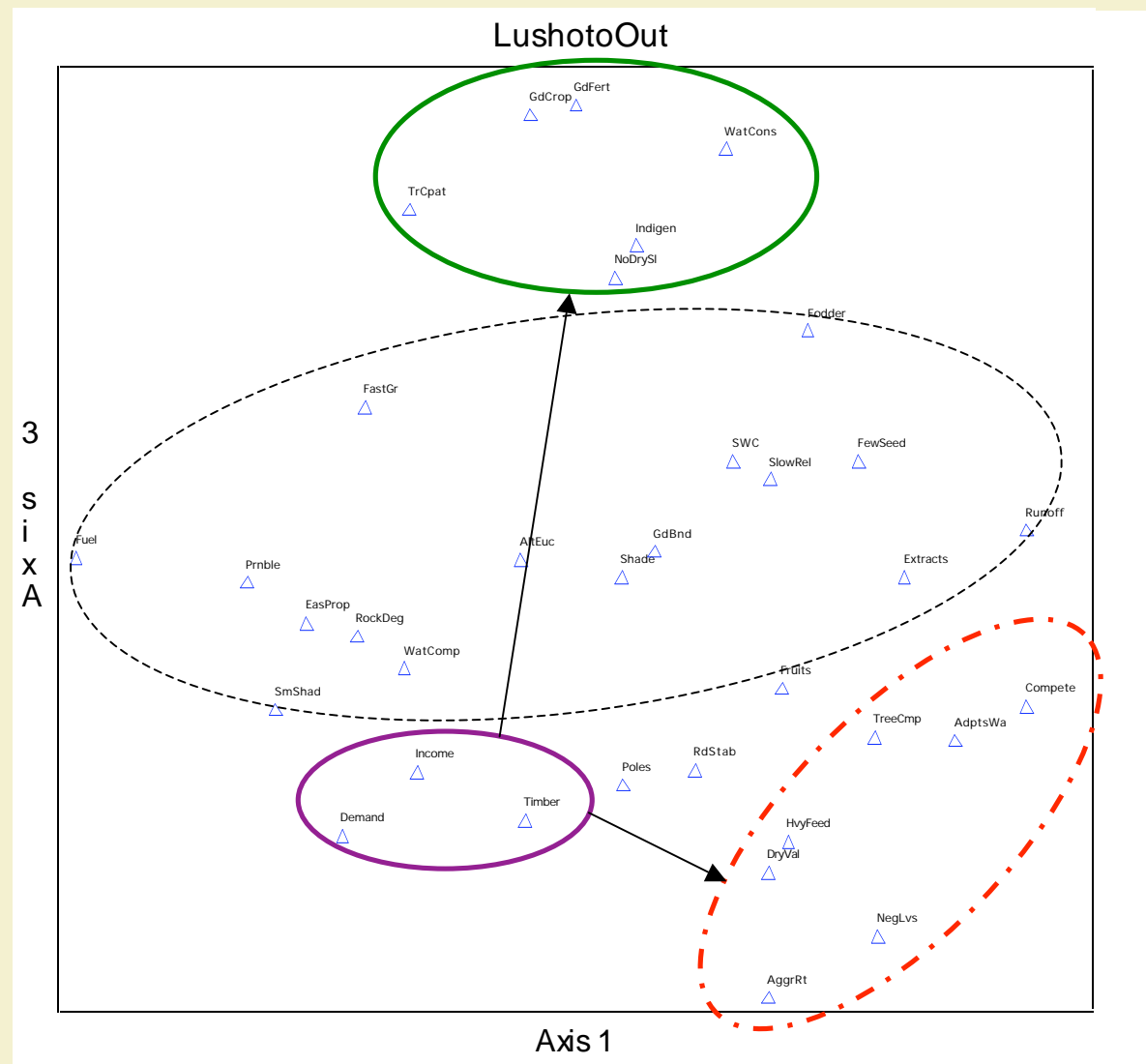
Figure 1. Clusters of Tree Species Characteristics in Multidimensional Space, Lushoto Site (30 species)

Key:

Red – Negative impacts

Green – Positive Impacts

Purple – Income



III. FINDINGS

III. Participatory By-Law Reforms

Table 3. Livelihood Consequences of Commonly Proposed By-Laws

| Problem | Proposed Solution | Livelihood Consequence |
|---------------------------------------|---|--|
| Incompatible trees on farm boundaries | Ban on Eucalyptus; minimum distance for other spp. | Lost income from trees |
| Declining quantity & quality of water | Ban on land use within certain distance of riparian zones | Owners of land near springs, waterways lose productive value of land |
| Crop destruction from grazing | Ban on free grazing | Loss of fodder by livestock free owners |

Improved Governance Restricts Livelihood Options → Low Enforcement

III. FINDINGS

III. Participatory By-Law Reforms

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Improved Governance Restricts Livelihood Options → Low Enforcement

***PES (Rewards/Incentives)** an Alternative to Regulation for Reconciling Environmental + Livelihood Goals ??*

IV. PRECAUTIONARY PRINCIPLE for R/PES

Key Challenge: Operationalizing Market-Based Conservation (Carbon payments) without Exacerbating Trade-Offs Already Common to the Region

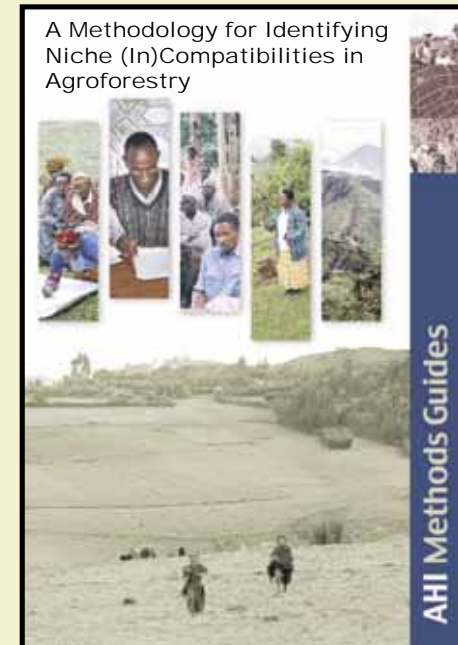
Proposal: A Precautionary Approach to ES Rewards/Payments

IV. PRECAUTIONARY PRINCIPLE for R/PES

Proposed Steps:

Step 1 – Synthesis of Farmer and Scientific Knowledge on ‘Harmful Trees’

- *Niche Compatibility Study* (identify “environmental signatures” of prevalent species, emphasizing compatibility with local livelihood and environmental service values)
- *Archival research* (scientific research on negative effects of prevalent species)



IV. PRECAUTIONARY PRINCIPLE for R/PES

Proposed Steps:

Step 1 – Synthesis of Farmer and Scientific Knowledge on ‘Harmful Trees’

- *Niche Compatibility Study* (identify “environmental signatures” of prevalent species, emphasizing compatibility with local livelihood and environmental service values)
- *Archival research* (scientific research on negative effects of prevalent species)

Step 2 – Development of Participatory Scenarios

- *Stakeholder identification*
- *Participatory scenario analysis* with identified stakeholders to envision desired future states and associated indicators following the steps:
 1. Identification of change of historical eras
 2. Identification of focal questions
 3. Identification of driving forces
 4. Creation of narratives and images
 5. Presentation and discussion
 6. Refinement and analysis of impacts
 7. Follow through

IV. PRECAUTIONARY PRINCIPLE for R/PES

Proposed Steps:

Step 3 – Desktop Analysis

- Consolidate set of social and environmental *indicators* from different stakeholders to monitor

| Instrument | Complementary Instrument | | |
|--------------------------------|---|--|---|
| | <i>None</i> | + <i>Regulation</i> | + <i>Water</i> |
| Carbon incentives | <ul style="list-style-type: none"> · Expansion of fast-growing exotics and their negative effects · ES of global priority supported at the expense of local ES values | <ul style="list-style-type: none"> · Negative spin-offs of fast-growing spp. ameliorated through regulation (if enforced) · Increased tension between divergent aims (income <i>vs.</i> governance to enhance equity and local ES functions) | <ul style="list-style-type: none"> · Negative spin-offs of fast-growing species ameliorated through incentives for water-compatible spp. (if enforced) · Increased tension between divergent aims (local vs. global ES functions) |
| Water incentives | <ul style="list-style-type: none"> · Moderate shift away from fast-growing exotics to water-compatible and indigenous spp. | <ul style="list-style-type: none"> · Reduction in conflict and trade-offs from tree cultivation (if enforced) | N/A |
| Regulation (policies, by-laws) | <ul style="list-style-type: none"> · Reduction in conflict and trade-offs from tree cultivation (if enforced) | N/A | <ul style="list-style-type: none"> · Reduction in conflict and trade-offs from tree cultivation (if enforced) |

IV. PRECAUTIONARY PRINCIPLE for R/PES

Proposed Steps:

Step 3 – Desktop Analysis

- *Consolidate set of social and environmental indicators* from different stakeholders to monitor
- *Develop scientific scenarios* to identify potential trade-offs and synergies of incentive and regulatory mechanisms applied alone and in combination:

Step 4 - Negotiation Support and Planning

- Support multi-stakeholder negotiations to select the most viable ‘bundle’ of incentive and regulatory mechanisms to reconcile stakeholder interests
- Design strategy (mechanisms, indicators, implementation, monitoring system) to reach negotiated future states and balance environmental service provision with livelihood goals

IV. Conclusion

- **Environmental values of global community vs. local residents: not always reconcilable**
- **More attention is needed on how new rewards/payments will intensify or minimize existing social and environmental trade-offs.**

Thank you for your attention.