



The Political Economy of Protected Area Performance: A Framework for Evaluation

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A photograph of a dense tropical forest. In the foreground, there are several tall, slender trees with light-colored bark and dark green foliage. The background is filled with a thick canopy of green trees, and a misty or hazy atmosphere is visible in the distance, suggesting a mountainous or high-altitude environment. The overall scene is vibrant and lush.

Collaborators

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Protected Area

“Area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.”

**Source: UNEP and World Commission on Protected Areas (IUCN),
*World Database of Protected Areas.***

Global number and extent of protected areas

Category	No. of sites	Proportion of total no. protected areas (%)	Area Covered (km ²)	Proportion of total area protected (%)
Ia	4,731	4.6	1,033,888	5.5
Ib	1,302	1.3	1,015,512	5.4
II	3,881	3.8	4,413,142	23.6
III	19,833	19.4	275,432	1.5
IV	27,641	27.1	3,022,515	16.1
V	6,555	6.4	1,056,008	5.6
VI	4,123	4.0	4,377,091	23.3
No Category	34,036	33.4	3,569,820	19.0
Total	102,102	100.00	18,763,407	100.00

IUCN Categories

CATEGORY Ia: Strict Nature Reserve: science

Definition Ecosystems, geological or physiological features available primarily for scientific research.

CATEGORY Ib Wilderness Area: wilderness protection

Definition Unmodified area retaining natural character, managed to preserve its natural condition.

CATEGORY II National Park: ecosystem protection and recreation

Definition Natural area of land and/or sea designated to protect the ecological integrity for present and future.

CATEGORY III Natural Monument: conservation of natural features

Definition Natural/cultural feature of value because of its rarity, aesthetic qualities or cultural significance.

CATEGORY IV Habitat/Species Management Area: game reserves

Definition Active intervention to ensure the maintenance of habitats and/or specific species.

CATEGORY V Protected Landscape/Seascape: conservation and recreation

Definition Aesthetic, ecological or cultural value.

CATEGORY VI Managed Resource Protected Area: managed forests, sustainable use of natural ecosystems

Definition Providing sustainable flow of natural products and services.

Source: IUCN World Commission on Protected Areas

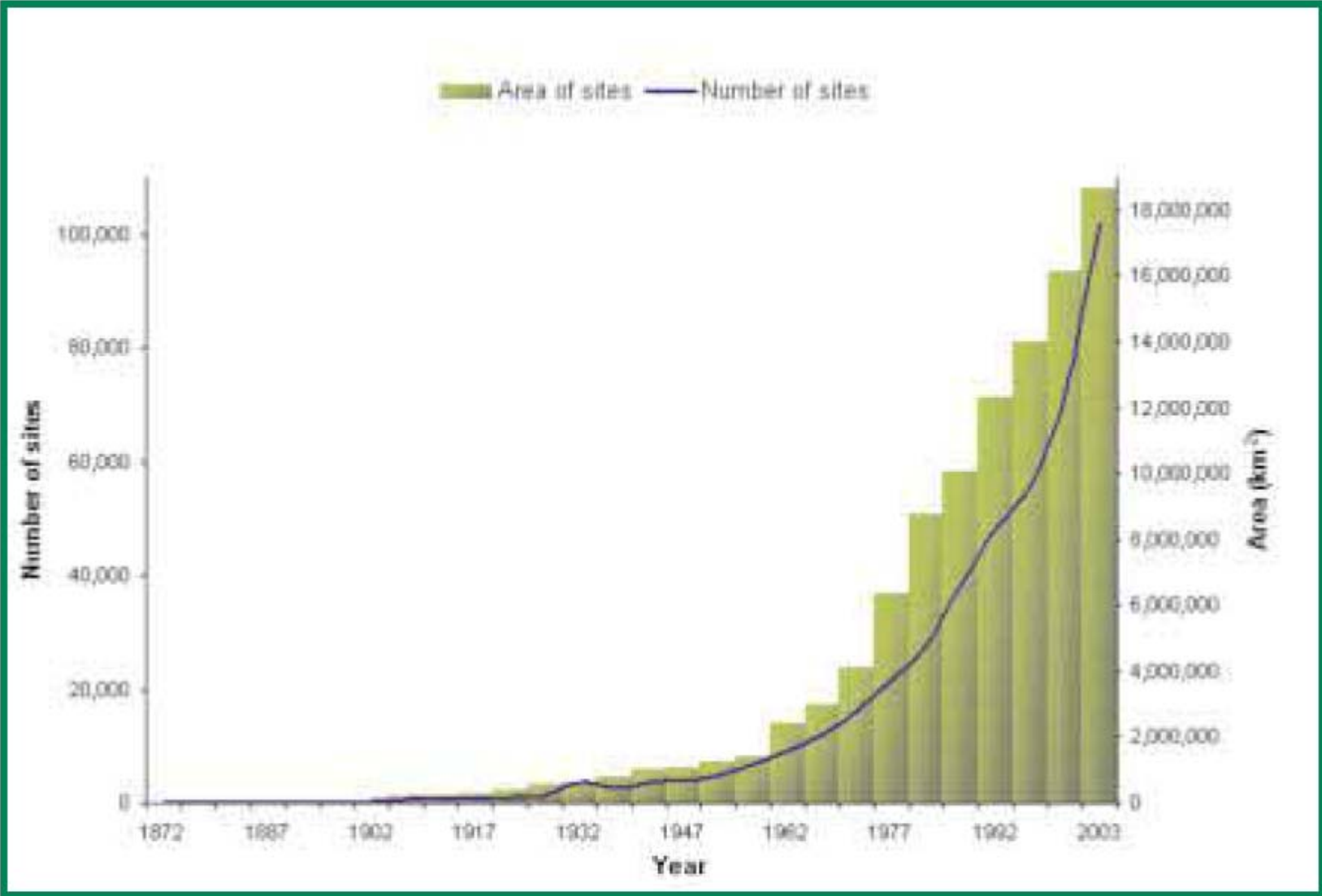
Land surface protected in each WCPA region:

Antarctica	0.0%	North Africa and Middle East	9.7%
Australia/NZ	9.6%	North America (includes Greenland and Hawaii)	18.2%
Brazil	18.3%	North Eurasia	7.2%
Caribbean	11.7%	Pacific	2.1%
Central America	24.8%	South America (Hispanic)	24.9%
East Asia	8.5%	South Asia	6.8%
Eastern and Southern Africa	14.6%	South East Asia	14.8%
Europe	13.1%	Western and Central Africa	8.7%

Protected areas in World Parks Congress years


Year	Number	Area
1962	9,214	2.4 million km ²
1972	16,394	4.1 million km ²
1982	27,794	8.8 million km ²
1992	48,388	12.3 million km ²
2003	102,102	18.8 million km ²

Cumulative growth in protected areas by 5-year increment: 1872–2003





**Criteria for Allocating Resources to
Biodiversity Conservation**



Decision Criteria Under Development at TNC

Allocation priorities based on four factors:

- 1. *Biological Significance*** -- mainly endemism.
- 2. *Habitat Condition*** – habitat in tact, patch size, fragmentation.
- 3. *Biodiversity Risk*** – Risk of future loss of eco-regional biodiversity, triage approach (stress *medium risk* situations.)



Decision Criteria Under Development at TNC (cont.)

4. *Enabling Conditions* – Socio-political and economic factors that influence the relative likelihood that conservation efforts will succeed over time. Measured by indicators of governance, corruption, rule of law, presence of non-governmental organizations.

GEF Allocation Formula for Biodiversity Protection

$$\text{Country's score} = GPI^{1.0} * GBI^{0.8}$$

GPI: index of performance on WB projects (20%), environmental institutions (60%), assessment of general institutional quality (20%).

GBI: index of species richness (55%), ecosystem richness (15%), species risk (20%), ecosystem risk (10%).

'Species risk' index assigns points to species that are extinct in the wild or critically endangered (10), endangered (6.7), vulnerable (1) and near threatened or 'least concern' (0). Ecosystem risk is another set of bonus points ranging from 1-4. GBI points (terrestrial) are assigned equally to all mammals, birds and amphibians (not to plants, reptiles, microbes, etc.)

Noah's Ark Criterion for Ranking Conservation Opportunities

$$R_i = \left(\frac{D_i + U_i}{C_i} \right) \Delta P_i$$

- $D_i + U_i$ = Diversity + consumption value of area i
 C_i = cost of protecting area i
 ΔP_i = **“PA performance”**: change in probability that area i survives as a result of project

Note:
 ΔP_i = $P_i(1)$: probability site i will survive with project
minus
 $P_i(0)$: probability site i will survive without project

Typical NGO Approach to Resource Allocation

- Focus on biologically rich areas: High $(D_i + U_i)$
- Focus on areas with high risk: Low $P_i(0)$

Needed Improvements

- Consider costs explicitly
- Acknowledge possibility that $P_i(1) < 1$.
- Forecast ΔP_i , *protected area performance, explicitly*
- *Implies need for predictive model of ΔP_i*

For reference:

$$R_i = \left(\frac{D_i + U_i}{C_i} \right) \Delta P_i$$



**How Effective are PAs at Conserving
Habitat and Biodiversity?**

A photograph of a tropical forest. In the foreground, a large, light-colored log lies horizontally across the frame. The ground is covered in brown soil and some sparse vegetation. In the background, a person is visible, standing near a structure or clearing. The forest is dense with tall, thin trees and lush green foliage. The overall scene suggests a logging operation or a clearing in a protected area.

Protected Area

“ dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources. and **managed through legal or other effective means.**”

Source: UNEP and World Commission on Protected Areas (IUCN), *World Database of Protected Areas*.



Research on Evaluation of Effectiveness

Bruner, Aaron G, et al “Effectiveness of Parks in Protecting Tropical Biodiversity”, *Science* Vol. 91 (5 Jan. 2001) 125-8.

Liu, Jianguo, et al, “Ecological Degradation in Protected Areas: The Case of the Wolong Nature Reserve for Giant Pandas,” *Science* Vol. 292 (6 April 2001) 98-101.

Brandon, Katrina, et al, *Parks in Peril: People, Politics and Protected Areas*, Washington DC, Island Press 1998.

World Bank/WWF Alliance for Forest Conservation and Sustainable Use, *Threats to Forest Protected Areas*, IUCN 1999.



Research on Evaluation of Effectiveness (cont.)

Singh, Shekar, *Assessing Management Effectiveness of Wildlife Protected Areas in India*, Indian Institute of Public Administration, New Delhi, 1999.

Curran, L. M., et al, “Lowland Forest Loss in Protected Areas of Indonesian Borneo” *Science* Vol. 303 (13 Feb. 2004) 1000-3.

Hockings, Marc, et al, *Evaluating Effectiveness: A Framework for Assessing the Management Of Protected Areas*, IUCN World Commission on Protected Areas, 2000.

IUCN/WCPA/WWF/WB: Protocols for assessing effectiveness.



Social Determinants of **PA Performance**

Competing Uses for Land and Resources (determinants)

- Resource extraction (density and value of timber, game, minerals, forage for animals; proximity to roads, rivers)
- Subsistence agriculture (poverty, income levels, population density; soil quality, rainfall, slope; proximity to roads, rivers)
- Permanent agriculture (soil quality, rainfall, slope; access to markets, e.g., proximity to roads, rivers, population centers)



Social Determinants of **PA Performance** (cont.)

Cost of Protection

- Cost of protection inputs (labor, capital)
- Remoteness

PA Performance and Host Country Governance

- Presence or absence of corruption among managers/enforcers
- Adequacy of host government enabling policy
- Ability and incentive to commit to long-term conservation goals.

Social Determinants of **PA Performance** (cont.)

Some Governance-Performance Links May be Indirect and Work in Opposing Direction

- Road infrastructure possibly less extensive under autocratic or unstable government
- Instability may deter investments required for resource extraction
- Access of indigenous peoples may be easier under democracy
- Autocrat may favor PA protection in order to capture tourism revenue.

A satellite-style map of a tropical forest. The forest is shown in shades of green. A yellow line traces a path through the forest, possibly representing a road or a logging route. A large, irregular area in the lower right quadrant is highlighted in red, indicating a specific region of interest, likely related to hidden logging as mentioned in the caption.

Links from Governance to PA Protection

- **Corruption: Use of government resources or influence for personal gain**
- **Political instability: Frequent change in fundamental political, legal, policy institutions**
- **Nondemocratic governance: Rule by individuals, promoting the interests of narrow groups rather a broad majority**

Hidden logging in tropical forests



Links from Governance to PA Protection: I

Corruption: use of government resources or influence for personal gain

Examples:

- Bribes to harvest timber or mine minerals illegally
- Diversion of funds from NGOs and other external sources
- Payments to legislators for favorable policy decisions

Corruption and Illegal Logging

Illegal logging

- Harvesting in protected areas
- Harvesting protected species
- Harvesting in excess of concessions
- False reporting of harvests



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ITTO

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UPDATE

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A newsletter from the International Tropical Timber Organisation to promote the conservation and sustainable development of tropical forests

Forest crime: the mist clears

FOREST crime has been making some arresting headlines lately. In September last year, a ministerial-level international forum in Bali (reported in *TTU* 11/4) condemned illegal logging and pledged to stamp it out. Soon after, the Indonesian navy seized three cargo ships allegedly illegally transporting timber from the Indonesian province of Central Kalimantan.

Then, in October, the Brazilian authorities cancelled all harvesting, transportation and trade permits for mahogany logs and mahogany timber products amidst allegations of illegality (see *TTU* 11/4 and p 9 this edition). In November, the International Tropical Timber Council made a decision to increase its efforts in forest law enforcement. And last January an international workshop convened by ITCO in Rome discussed the policy options for improving the forestry sector's compliance with the law (p 26). Add to these developments the findings of the ITTO mission to Indonesia (p 18), and the critiques of non-governmental organisations such as the World Resources Institute (see, for example, p 3) and the Environmental Investigation Agency (p 21), and it is likely that the issue of forest crime has never had a higher international profile. >

Inside > combating forest crime > towards transparency > monitoring mahogany > more ...



ITTO

Numbing numbers

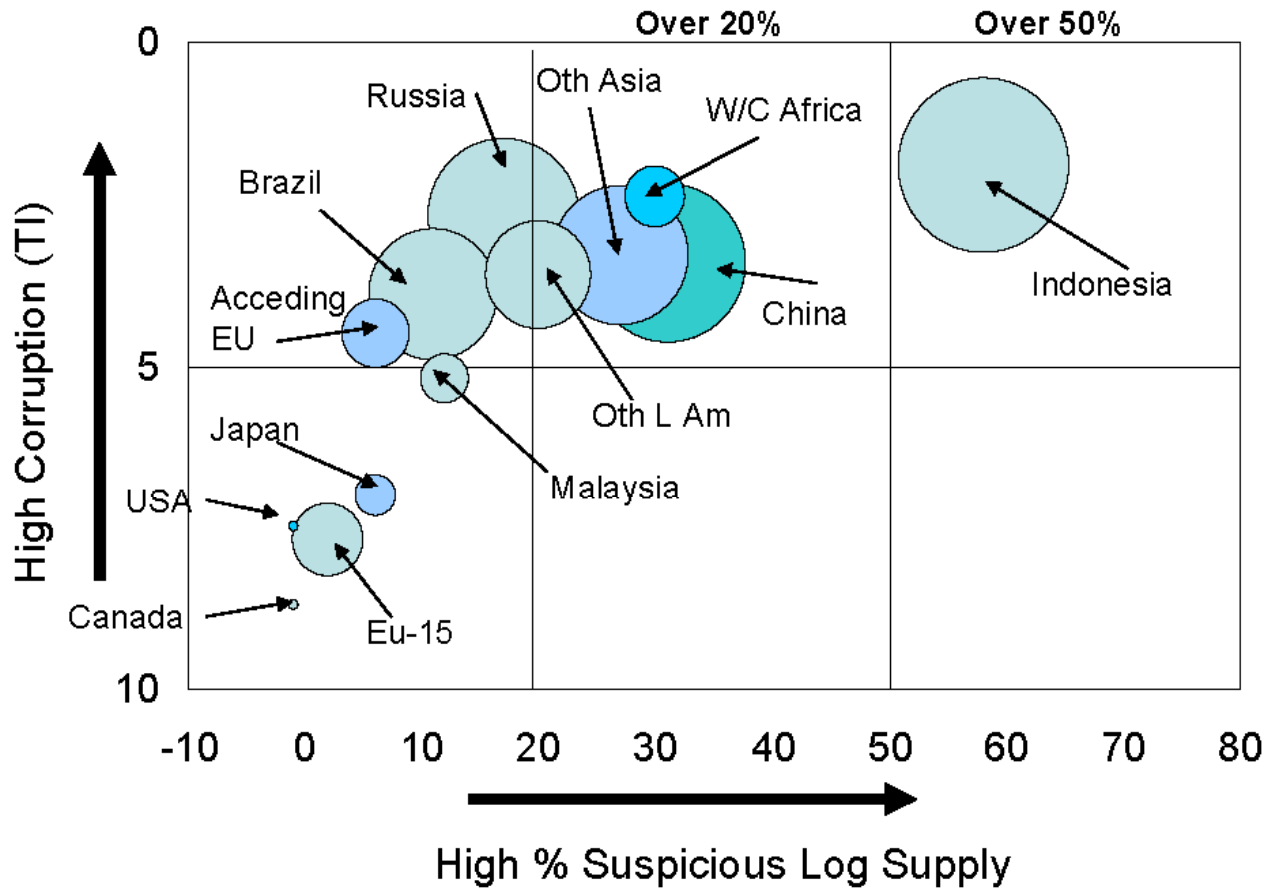
Table 1: Summary of existing estimates for some ITTO producer countries

Country	Estimated percentage of wood harvested illegally	Source
Bolivia	80	Contreras-Hermosilla (2001)
Brazil (Amazon)	85	Greenpeace (2001)
Cambodia	90	World Rainforest Movement and Forest Monitor (1998)
Cameroon	50	Global Forest Watch Cameroon (2000)
Colombia	42	Contreras-Hermosilla (2001)
Ghana	34	Glastra (1995)
Indonesia	51*	Scotland (2000)
Myanmar	80	Brunner (1998)

*Other estimates for Indonesia are higher

Source: *Tropical Forest Update*, Vol. 12 (1) 2002, p. 4.

Figure 2: Corruption and Illegal Forest Activity



Note: Size of bubbles represents volume of suspect roundwood, including imports. *Sources:* Transparency International; WRI/SCA estimates of illegal logging

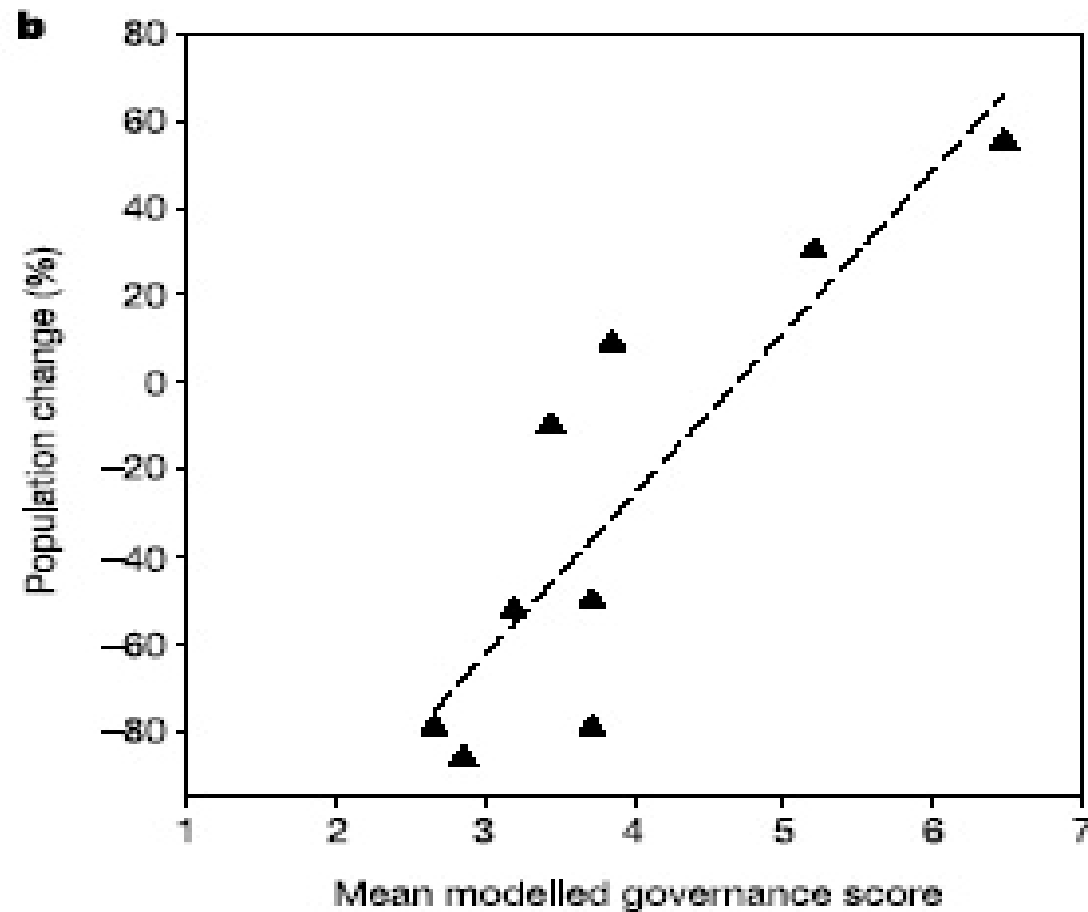


Figure 2 Mean modelled governance scores and changes in national populations of two species, 1987–94. **a**, African elephants; **b**, black rhinoceroses.

Note: Higher governance score indicates 'better' institutions.

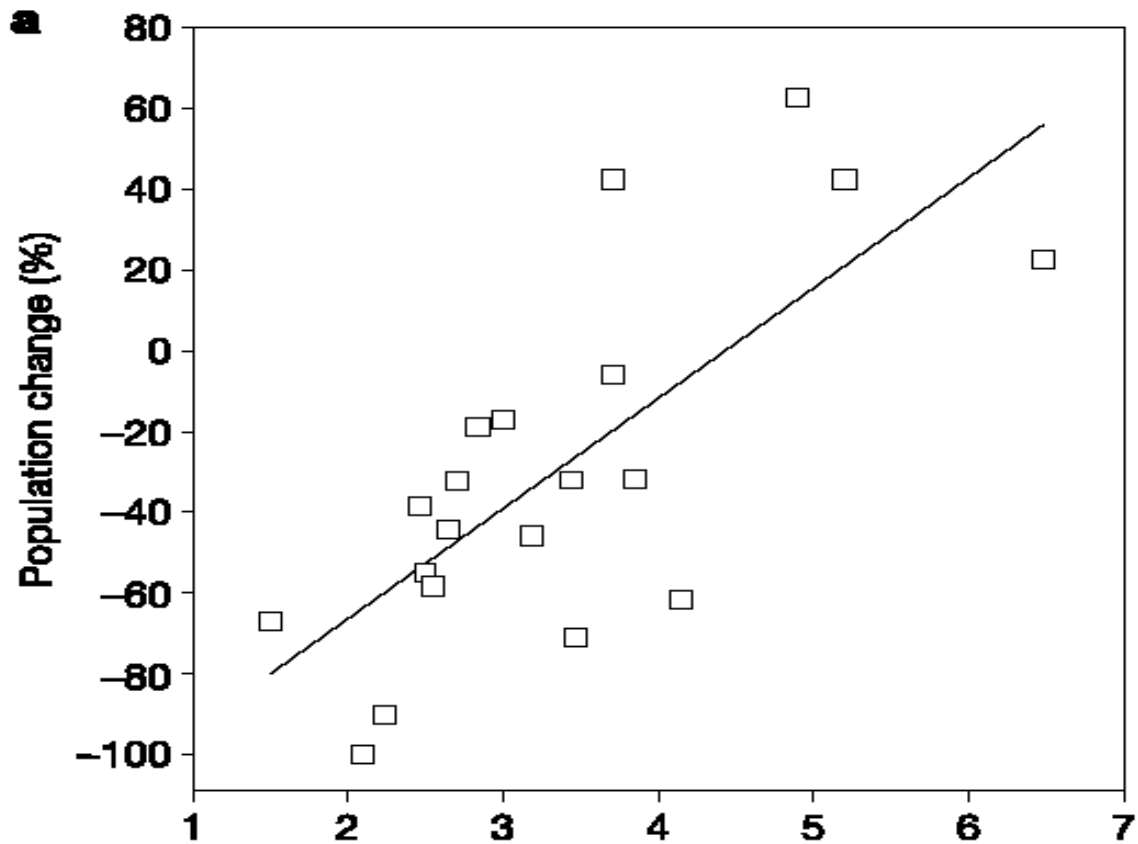


Figure 2 Mean modelled governance scores and changes in national populations of two species, 1987–94. **a**, African elephants; **b**, black rhinoceroses.

Note: Higher governance score indicates 'better' institutions.



Links from Governance to PA Protection: II

Political instability: frequent change in fundamental political, legal, policy institutions

Consequences

- Government unable to enforce laws and protect property
- Government cannot commit to long-term conservation goals
- Environmental NGOs unwilling to invest
- Refugee flight to PAs to avoid strife



Conservation and Political Instability

“Many conservation and development projects are destined to fail in a statistical sense, given their unstable social or political contexts. Wars and the breakdown of civil administration . . . have led to the partial or complete collapse of nature reserves, the destruction of habitat, and the local extinction of endangered species. **The frequency of events such as wars should be built into the planning processes of responsible agencies and organizations.**”

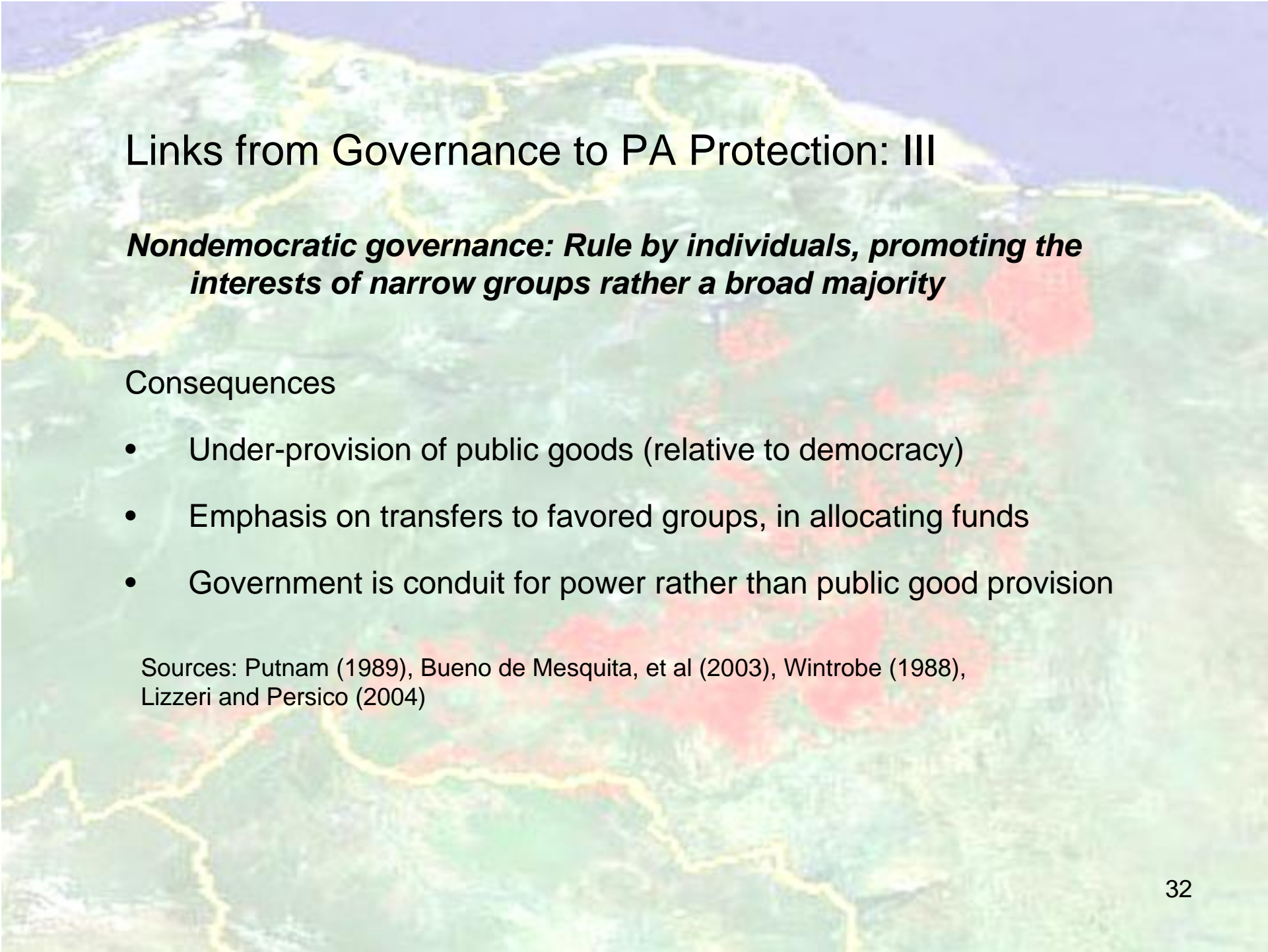
Michael E. Soule, “Conservation: Tactics for a Constant Crisis”, *Science*, Vol. 253, 744-50 (emphasis added).



Evidence on Political Instability and Resource Use

- Deforestation more extensive in countries with frequent regime changes, coups, civil wars, constitutional change.
- Exploitation of oil and natural gas less rapid and extensive.
- Accounts of how instability has affected PAs in D.R. Congo, Sierra Leone, Panama, Uganda, Rwanda.

Sources: Bohn and Deacon (2000), Van Schaik (2001).



Links from Governance to PA Protection: III

Nondemocratic governance: Rule by individuals, promoting the interests of narrow groups rather a broad majority

Consequences

- Under-provision of public goods (relative to democracy)
- Emphasis on transfers to favored groups, in allocating funds
- Government is conduit for power rather than public good provision

Sources: Putnam (1989), Bueno de Mesquita, et al (2003), Wintrobe (1988), Lizzeri and Persico (2004)



Governance and Public Good Provision

Controlling for income and other factors:

- Public health and public education indicators are substantially (22-50%) lower under dictatorship than democracy
- Air pollution generation and concentrations are significantly higher under dictatorship than democracy

Sources:

Deacon and Saha (2006), Barrett and Graddy (2000), Deacon (2005), Lake and Baum (2001)



Economic Assessment of PA Effectiveness

(Work in Progress)

**Goal: Predictive Model Linking PA Effectiveness
to Local Economic and Political Factors**



Economic Assessment of PA Effectiveness

- I. Analysis of Satellite Data on Forest Loss in PAs
 - Covers 198 highly protected PAs in 45 countries
 - Examine forest loss in PAs and buffer areas during 1980-2000
- II. Survey of Individual PAs to Determine:
 - Rates of habitat loss and species abundance
 - Political and economic conditions in local areas



Phase I: Examine Forest Cover Data

Source: DeFries, et al, 2005. "Increasing Isolation of Protected Areas in Tropical Forests over the Past 20 Years," *Ecol. Applic.*, 15(1) 19-26.

Data: Satellite images from multiple sources indicating extent of forest habitat and loss over 1980-2000 in 198 highly protected areas

Conclusion: 25% of PAs examined and 68% of buffer areas around them (50 km.) experienced significant forest cover loss.

Governance Indicators

- **Corruption:** TI Corruption Perceptions Index
From surveys of businesses and country analysts regarding perceptions on degree of corruption.
- **Political Instability:** Bohn & Deacon (2000)
Statistical association between investment rate and frequency of revolutions, coups, guerrilla warfare, constitutional change, etc.
- **Democracy/Autocracy:** 'Polity' index from Marshall & Jaggers (2004)
Judgments regarding effectiveness of political competition, openness of political recruitment, limits on chief executive.

Note: Higher values indicate 'better' institutions for all indicators.

Differences in Mean Governance Attributes for High vs. Low Deforestation PAs

	Defor. Rate		N	<i>Pr. > t </i>
	High	Low		
Corruption	2.53	3.25	170	.002
Political Instability	12.87	14.21	183	.003
Democracy	-.52	2.98	195	.016

Note: Higher values of all indicators indicate 'better' institutions.

Notation and Motivation

F_t = forest cover (% of land area) in period t ;

Π_t = political variables in period t ;

X_t = economic, demographic, etc. variables in period t ;

E = vector of environmental variables (constant over time).

Assume steady state forest cover, F^* , is determined by long run political, economic, demographic, etc. variables and by environmental conditions:

$$F^* = F^*(P_t, X_t, E)$$

Notation and Motivation (cont.)

Hypothesis: Between periods $t-1$ and t , F_t moves the fraction λ of the way to its steady state value F^* :

$$F_t = \lambda F^*(P_t, X_t, E) + (1 - \lambda)F_{t-1},$$

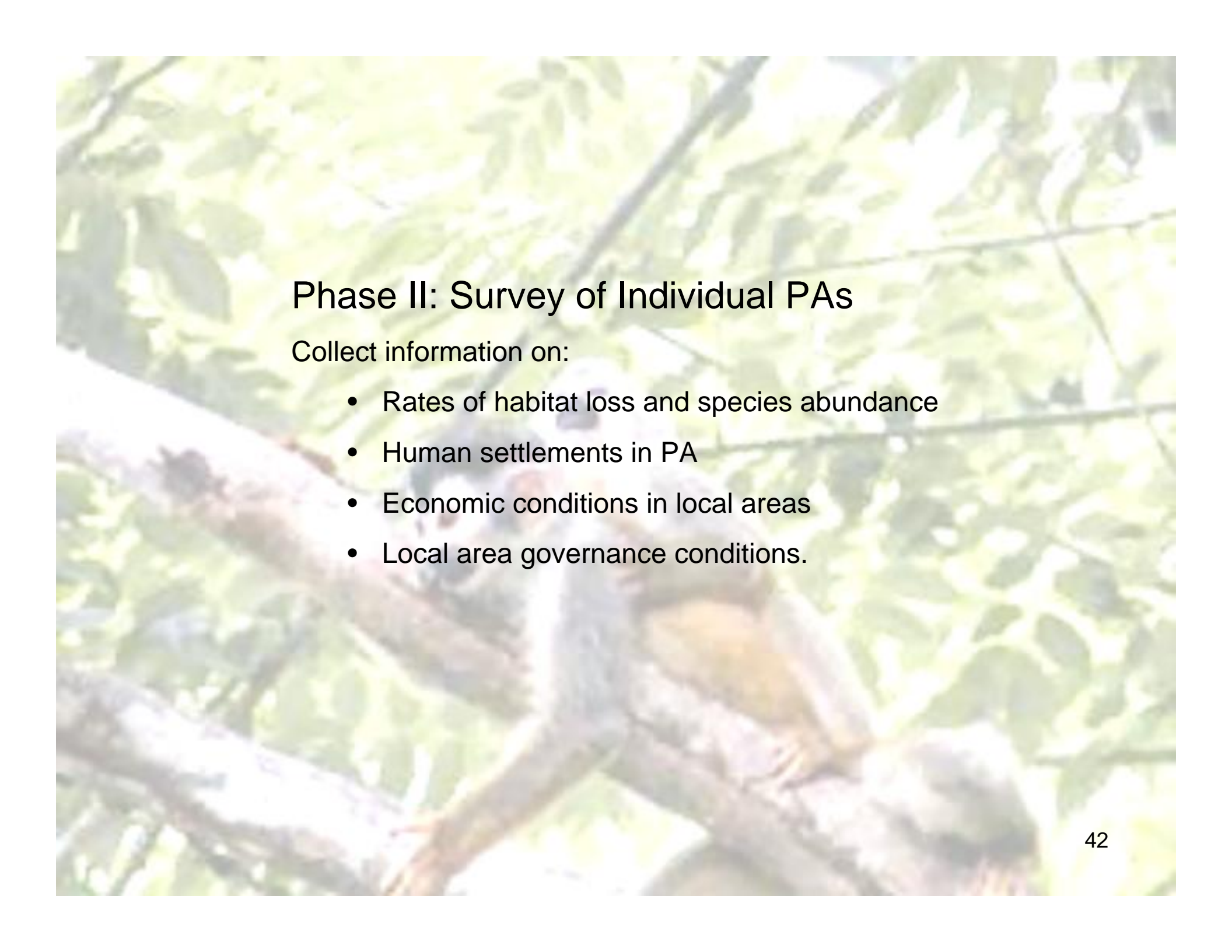
where λ is the speed of adjustment. Rearranging yields an empirical model for (minus) the deforestation rate:

$$D_t \equiv F_t - F_{t-1} = \lambda F^*(P_t, X_t, E) - \lambda F_{t-1}$$

Estimates of PA deforestation

	(1)	(2)	(3)
Buffer Defor.	-.3844	-.4079	-.3397
Initial F (F_0)	.2753*	.2465*	.27425*
Corruption	-5.1277*		
Democracy		-.8214 [†]	
Political instability			-2.5421*
F	0.05	0.0004	.0625

Notes: * indicates significant at 5%; † indicates significant at 10%. Higher values of all indicators indicate 'better' institutions. IV estimates, robust standard errors, N=42.



Phase II: Survey of Individual PAs

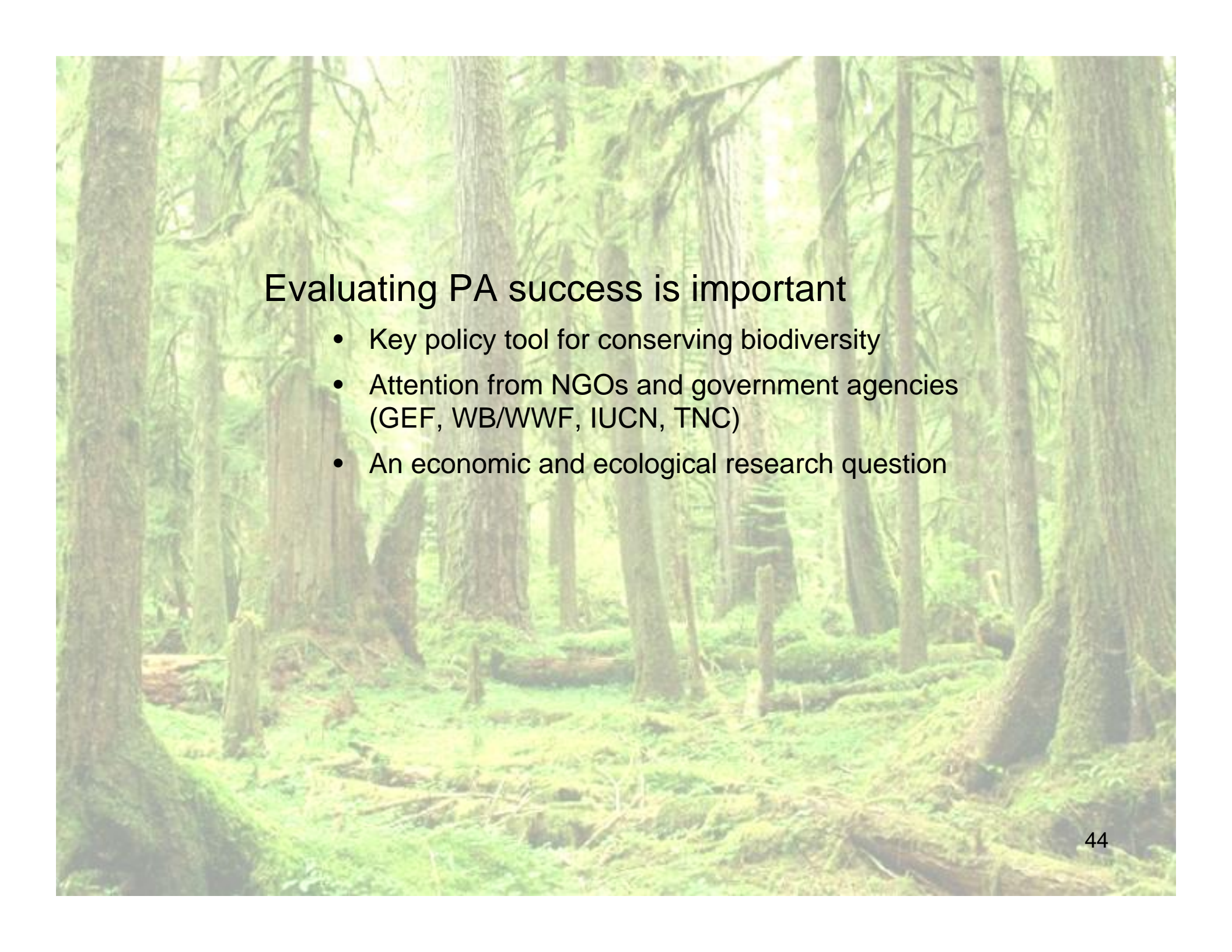
Collect information on:

- Rates of habitat loss and species abundance
- Human settlements in PA
- Economic conditions in local areas
- Local area governance conditions.

A photograph of a dense forest with tall, moss-covered trees and a mossy forest floor. The trees are covered in green moss, and the ground is also covered in a thick layer of moss. The lighting is soft and green, suggesting a lush, moist environment.

Conclusions and Research Needs

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A photograph of a dense forest with tall, thin trees and a mossy forest floor. The trees are mostly conifers, and the ground is covered in green moss and fallen branches. The lighting is soft and dappled, suggesting a shaded forest environment.

Evaluating PA success is important

- Key policy tool for conserving biodiversity
- Attention from NGOs and government agencies (GEF, WB/WWF, IUCN, TNC)
- An economic and ecological research question

A photograph of a dense forest with tall, thin trees and a mossy forest floor. The trees are mostly evergreens, and the ground is covered in green moss and fallen branches. The lighting is soft and dappled, suggesting a canopy overhead.

Research Needs

- Comparable, quantified evaluation studies
- Micro level data on links from political and economic conditions to PA success
- Empirical models for predicting PA success
- Quantitative, empirically based allocation models