WCMC Biodiversity Series No.10

A Global Review of Protected Area Budgets and Staff

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World Conservation Monitoring Centre

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A Global Review of Protected Area Budgets and Staffing

This document describes the first attempt to systematically review national expenditure on protected areas, and to assess staffing levels. As such it is a major contribution to assessing the cost of biodiversity conservation. The review has many shortcomings and gaps, but it provides a basis for assessment of commitment and needs during the last decade of the 20th century, and also provides a foundation on which future assessments can be based.

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EXECUTIVE SUMMARY

In 1993 & 1995 the World Conservation Monitoring Centre surveyed over 600 protected area agencies throughout the world to obtain data on their budgets and staffing levels. Budget data was provided by 108 countries with 3.7 million km² under protection (28% of global protected areas), and staffing data was provided by 78 countries with 3.0 million km² under protection (23% of global protected areas).

The global mean budget for protected areas is $893 per km² in 1996 US$. The developed countries mean is $2,058 per km² while the developing countries mean is $157 per km².

The global mean staff input in protected areas is 27 per 1000 km² protected. The developed countries mean staff input is 26.9 per 1000 km², slightly lower than the developing country level of 27.6 per 1000 km².

The global distribution of budgets and staffing is highly uneven. Budgets range from a mean of $12,308 per km² in East Asia to $24 in Africa (Western/Central). Staffing levels range from 432 per 1000 km² in East Asia to 4 in South America and Central America.

Financial shortfalls reported by developing country agencies suggest that protected area costs vary significantly by region. Lower cost regions include South America, Mexico, and Africa ($300 per km²); intermediate cost regions include Central America, South Asia, South-East Asia ($800 per km²); higher cost regions include Pacific, Caribbean, and the Baltic States ($3,000 per km²). Insufficient data were received to estimate costs for China and North Eurasia (former Soviet Union).

Protected area budgets and staffing levels are positively correlated with economic development (per capita income) and population density. Budgets (per km²) and staffing (per 1000 km²) are negatively correlated to mean protected area size and a country's biological richness.

Priority countries for financial assistance, identified based on low budget inputs and high biological richness, are clustered in the Congo river basin of Africa, the Indo-China peninsula, and Meso-America.

1 INTRODUCTION

Covering 13.2 million square kilometres, or more than 8.8% of the earth's land area, protected areas are at the core of global efforts to conserve biological diversity (Green and Paine, 1997). The effective management of these areas, however, depends greatly upon the adequacy of resources available to government agencies and other bodies charged with their management and protection. These agencies require resources for annual operating budgets, capital investment, staff training, community development, and public awareness among a wide range of other activities. Moreover, the control of unsustainable practices, such as wildlife poaching and the encroachment of agriculture and mining into protected areas places an additional burden on many management agencies.

The global level of protected area expenditure is not well documented, though often argued to be inadequate (McNeeley *et al*., 1990; IUCN, UNEP, WWF, 1991). While the geographical areas under protection are well defined (*e.g.* IUCN, 1994a, 1998), management intensity has not received regular assessment. Anecdotal evidence suggests that in many countries protected areas are often left unmanaged, a direct result of inadequate budgets and staffing by government agencies (*e.g.* WCMC, 1992a; IUCN, 1994b). However, a lack of information on agency budgets has hindered a systematic assessment of the adequacy of funding for the world's protected area system and setting of priorities for foreign assistance.

Government expenditure on protected areas, or biodiversity conservation more generally, is not reported in international financial statistics (IMF, 1988; 1998). Nor does such information appear in other major compendia of environmental data, such as OECD (1991), World Bank (1992), WRI (1994), WCMC (1992a, 1992b,1994a). Governments rarely have convenient access to budgetary data for most aspects of environmental protection expenditure, including biodiversity conservation. This reflects the relatively recent emergence of biological diversity on the political agenda, with statistical reporting systems lagging well behind the rising interest in the subject.

This study aims to address the gap in information on protected area resources by:

- Presenting data on protected area budget and staffing levels for a global cross-section of countries, drawing on WCMC surveys and other information.
- Estimating the shortfalls in protected area budgets and the cost of adequately conserving protected areas in different regions.
- Examining the factors that influence protected area budgets and staffing levels, such as country income, population density, protected area size, and biodiversity richness.
- Identifying countries for priority assistance.

The study comprises seven sections. The next section reviews previous studies of protected area expenditures. The data collection and presentation methods of this study are outlined in Section 3. In Section 4, the budget, staffing, and shortfall data are presented, which provide the basis for estimates of the cost of adequate protected area conservation in the developing countries. Priority countries for foreign assistance are identified in Section 5. Section 6 examines the impact of income, population pressure and other variables on protected area budgets and staffing. The final section summarises the principle findings and highlights the vital need for further research and establishing standard reporting procedures within the framework of the Convention on Biological Diversity.

2 PREVIOUS STUDIES OF PROTECTED AREA BUDGETS

Previous publications of protected area financial data include global reviews of protected areas and biodiversity conservation by WCMC and IUCN (WCMC,1992a, b; IUCN 1994b). The financial data in these reviews cover a large number of countries and were derived from a variety of published and unpublished sources. These data are not suitable for statistical analysis or international comparisons because they cover a wide spread of years and many different types of conservation activity. Despite their limitations, these early studies indicate that annual expenditure on protected areas in many developing countries is extremely low, amounting to only a few tens of thousands of dollars in some countries. They confirm the general impression that protected areas in tropical regions are under-funded, though shortfalls were not estimated with any degree of accuracy.

In addition, a number of studies on African protected area budgets have appeared in response to concerns about elephant and rhino poaching (Cumming *et al*., 1990; Barbier *et al*., 1990; AECCG, 1991; Leader-Williams, 1993). Cumming *et al.* (1984) estimated mean annual expenditure in African protected areas to be US $52 per km². Martin (1993) reported that only two of fourteen African countries spent over US $100 per km², with five countries nearer US $10 per km² per year. Dublin *et al*. (1994) found that less than US $5 per km² was spent annually on law enforcement activities in three quarters of the African countries sampled in 1993. In comparison to the low conservation budgets throughout the region, effective conservation in African protected areas has been estimated at between US$200 (Bell and Clark, 1984) and US$230 per km² (Leader-Williams and Albon, 1988).

Foreign assistance for biodiversity conservation in developing countries has been another focus of research, though little of it has addressed protected areas directly. Abramovitz (1991,1994) assessed US investments in biological diversity conservation and research in developing countries. Lake (1996) examined the OECD database of development assistance flows and found that total bilateral aid for biological diversity peaked in 1992 and has since declined. UNEP (1996) concurred with that finding and proposed several new initiatives to increase the flow of aid for biological diversity conservation in developing countries.

In addition, there is much unpublished “grey literature” that pertains to national and regional expenditures on protected areas. This literature includes reports on protected areas and the environment from foreign aid agencies and development banks, the annual reports of national conservation agencies, conference papers, auditor and management consultant reports. Some of this literature is held at WCMC and has contributed to this report, but in general this information is highly dispersed and unsuitable for international comparative studies.

3 STUDY METHODS AND DATA PRESENTATION

This study presents three new sets of data:

- National protected area budgets.
- National protected area staffing levels.
- Financial shortfalls in national protected area budgets.

The data were obtained from two global surveys of protected area agencies undertaken by WCMC in 1993 and 1995. In the two surveys, 812 questionnaires(Appendices 3 & 4) were mailed to 619 protected area agencies. The response rate was 30% (244 questionnaires returned). These survey data were supplemented and cross-referenced with published and unpublished information also held at WCMC. These secondary sources provided some extra financial data and information on agency structures and responsibilities.

The study is based on budgetary data from 123 conservation agencies in 108 countries. These agencies manage 3.7 million km² or 28% of the global protected area system. The staffing data set is somewhat smaller: 92 protected area agencies in 78 countries, covering 3.0 million km² or 23% of the global protected area system. Some of the major omissions from both data sets include: China, Japan, India, Indonesia, and the former Soviet Union.

Protected area budgets are presented on the basis of 1996 US dollars per square kilometre. The budgets pertain to the annual expenditures of each country's national protected area agencies, the full names of which appear in Appendix 1. The budgets include both operating and capital expenditures, and where possible the capital expenditures are identified separately. Foreign assistance, including that of non-governmental agencies, is also included in the budgets, and noted where possible. Agency expenditures not directly related to protected area management were identified in the survey questionnaires and removed from the reported budgets. Resources contributed by other agencies were also identified in the survey and included in the budgets, though this accounted for very little reported expenditure. In countries where protected area administration is divided between agencies, the analysis is based on the sum of the agencies' budgets. For further details, each agency's budget is identified separately in Appendix 1.

The protected area staff data are presented on the basis of number of staff per 1000 square kilometres protected. Where possible, field staff, administrative staff, and other staff are identified separately. In many cases, however, data allow the presentation of only an aggregate staffing level. Again, in countries where more than one agency administers protected areas, a mean is presented in the text and full details are available in Appendix 2.

Shortfalls in protected area budgets were obtained in response to two survey questions (Appendix 3, questions 6a and b). One question asked for an assessment of the extra funding needed for the agency to meet its stated conservation objectives. The other asked for an assessment of the extent to which their current budget met their agency needs: "not at all", "only partially", "about half", "mostly", or "fully". Answers to these questions provided a basis for an estimate of the financial shortfall in each agency. It should be stressed that these shortfall estimates do not represent "official" agency policy, but are WCMC estimates based on the opinions of survey respondents.

Marine protected areas are not included in the study.

4 RESULTS & DISCUSSION

4.1 PROTECTED AREA BUDGETS

Table 1 presents the budget data by country, including the total agency budget for the given year and, if available, capital investment and foreign assistance. In the table a zero indicates that the protected area agency reported that the amount was zero, whereas a blank indicates that no information was given by the agency. The total area column in the table refers to the protected areas for which data were available, rather than the entire protected area estate of the country.

The study identified $3.2 billion in agency budgets with a global mean protected area expenditure of US $893 per km². However, the range in budgets is extreme, with many countries reporting very low expenditures. Budgets range from less than $1 per km² (Angola, Cambodia, Laos) to over $1,000,000 per km² (St. Lucia). Budgets in 32 countries were below $100 per km², and below $10 per km² in 13 countries. Moreover, the wide range in budgets is evident in nearly every geographic region (Table 1). For example, in the Caribbean budgets range from $73 (Dominican Republic) to over $1 million per km² (St. Lucia) and in Europe from $199 (Slovak Republic) to $134,507 per km² (Malta).

Twenty six out of 70 developing countries, plus one developed country, receive foreign assistance for their protected area systems. Reported foreign assistance totalled $66.6 million. However, incomplete reporting means these figures significantly underestimate total foreign assistance to protected areas. The largest aid recipients in the study are Brazil ($21.6 million), Portugal ($20.8 million in EU funds), and Panama ($6.4 million). The next tier of aid recipients received between $1.0 and $2.6 million and included: Kenya, Zimbabwe, Madagascar, Mali, Mexico, Honduras, and Czech Republic. In most cases, foreign funds were directed towards capital investment projects.

The reporting of capital investment is also very patchy. Only 37 countries reported capital investment, which totalled $188.9 million. Another 13 countries reported zero capital investment for the year. No data was available for the remaining 57 countries. Some of the countries reporting large capital investments in protected areas include: Taiwan ($39.5 million), Portugal ($37.4 million), Sweden ($26.1 million), Thailand ($14.3 million), Norway ($13.4 million), Colombia ($6.5 million), Zimbabwe ($6.3 million), and South Africa ($3.3 million).

Perhaps the clearest finding of the study is the concentration of global protected area expenditures in the developed countries. The developed country regions are North America, Australia/New Zealand, Europe, and East Asia (which includes only Hong Kong, Taiwan, and South Korea). Mean expenditure in the developed countries is $2,058 per km², compared to only $157 per km² in the developing countries. The developed countries account for 90% of sampled protected area expenditure, but only 41% of the total area protected. The developing countries account for a mere 10% of expenditure but have nearly 60% of the area under protection.

Table 1: Protected area budgets and shortfalls in 1996 US$ per km² (budget includes capital investment and foreign assistance)

Region (WCPA) & Country	Year	Protected Area (km²)	Budget	Capital Investment	Foreign Assistance	Shortfall
North America						
Canada*	1991	295,345	1,104			
United States*	1993	693,765	2,560			
Mexico	1994	107,061	52	3	14	234
Central America						
Guatemala	1994	8,644	13			
Honduras	1995	21,450	108	2	96	288
Panama	1995	15,566	1,484	119	412	198
Caribbean						
Antigua & Barbuda	1996	24	9,259	0	0	7,716
Bahamas	1992	1,253	323			
Barbados	1993	0.2	434,311			
Bermuda	1996	111	86,568	4,071	0	3,604
Dominica	1995	166	6,500	2,513	2,643	2,167
Dominican Republic	1993	10,086	73			
Jamaica	1997	788	794	0	302	12,406
Montserrat	1993	8	5,472			
Netherlands Antilles*	1996	36	7,817	941		7,109
St. Lucia	1996	0.3	1,279,391	163,007	221,779	554,447
St. Kitts & Nevis	1991	26	4,433			
Trinidad & Tobago	1994	269	439		46	1,316
Turks and Caicos	1997	534	214	0	0	
South America						
Brazil	1995	179,098	224		121	176
Colombia	1995	90,988	130	71	14	43
Chile	1994	139,797	30	9	0	10
Peru	1996	164,974	8			
North Africa & Middle East						
Algeria	1995	2,350	1,226	0	0	1,226
Afghanistan	1991	1,834	31			
Bahrain	1995	6,800	201	0	0	201
Cyprus	1994	115	3,698	0	0	3,536
Israel	1993	3,929	550			
Morocco	1991	4,783	138			
Qatar	1993	139	1,502			
Saudi Arabia	1991	323,996	32			
Tunisia	1995	408	1,154		0	1,154
Turkey	1995	24,935	358	69	0	787
Yemen	1993	3,625	27			

Region (WCPA) & Country	Year	Protected Area (km²)	Budget	Capital Investment	Foreign Assistance	Shortfall
Africa (Eastern/Southern)						
Botswana	1992	100,250	56			
Ethiopia	1993	32,403	5			
Kenya	1996	32,726	94	60	71	94
Malawi	1994	10,585	53	0		
Namibia	1994	112,159	76			
Seychelles	1995	40	1,034	52	0	1,551
South Africa	1996	34,244	1,777	96	0	1,777
Tanzania	1994	41,131	182	47	19	60
Zimbabwe	1997	30,158	487	209	85	160
Africa (Western/Central)						
Angola	1991	81,812	>1			
Burkina Faso	1994	31,937	6		1	
Burundi	1994	1,135	200	0	0	194
Cameroon	1993	25,948	13			
Central African Republic	1991	46,949	4			
Chad	1995	124,884	6	0	4	5
Congo, Dem. Rep.	1992	100,262	4			
Cote d'Ivoire	1991	19,929	76			
Gabon	1993	18,170	7			
Gambia	1991	575	84			
Ghana	1993	12,681	157			
Madagascar	1996	13,903	138	53	115	138
Mali	1998	5,111	206	61	206	
Mauritius	1995	75	3,543	0	0	7,460
Niger	1995	84,163	8	7	7	34
Nigeria	1993	34,218	107			
Senegal	1993	10,127	65			
Sierra Leone	1996	1,744	13	0	7	1,147
Togo	1996	6,487	66	5	5	45
East Asia						
Hong Kong	1996	417	69,036	4,544	0	22,989
South Korea	1993	7,568	8,106			
Taiwan	1996	3,222	14,838	12,265	0	4,897
South-East Asia						
Brunei	1995	1,036	4,019	3,044	0	14,294
Cambodia	1995	32,672	0			
Laos	1994	24,400	>1		>1	
Malaysia	1994	2,658	2,061	617	48	
Myanmar	1995	3,622	74	9	0	55
Thailand*	1995	68,056	696	210	0	109
South Asia						
Bangladesh	1995	949	581	457	323	1,744
Bhutan	1994	6,606	122	83	91	
India	1994	1,011	277			
Nepal	1994	15,025	87			
Pakistan*	1997	5,881	48	8	13	239
Sri Lanka	1994	7,864	1,162	50	12	384

Region (WCPA) & Country	Year	Protected Area (km²)	Budget	Capital Investment	Foreign Assistance	Shortfall
Australia/New Zealand						
Australia	1994	21,199	1,335			
New Zealand	1996	89,978	961	82		0
Pacific						
Fiji	1991	9	3,503			
French Polynesia	1993	178	18,200	0		
New Caledonia	1994	518	51,451	14,543	0	34,472
Papua New Guinea	1993	10,448	229			
Vanuatu	1993	33	1,091			
Western Samoa	1990	234	231			
Europe						
Austria*	1994	23,136	1,074			
Belgium	1993	784	309			
Croatia	1992	3,929	464			
Czech Republic*	1995	12,806	1,287	60	110	301
Denmark	1990	2,422	21,951			
Estonia	1994	4,233	88			
Finland	1994	27,782	484	96		99
France*	1993	47,088	2,531			
Greece	1995	11,830	897	326		897
Hungary	1993	1,907	3,433			
Iceland	1993	3,148	1,259			
Latvia	1995	602	3,773	0	0	936
Lithuania	1995	927	722		0	3,332
Luxembourg	1995	660	1,520			980
Macedonia*	1996	1,939	434			
Malta	1995	1	134,507			10,268
Netherlands	1996	360	9,755			3,219
Norway	1994	20,677	935	650		935
Poland	1991	29,252	421			
Portugal	1995	5,107	12,763	7,315	4,086	4,212
Slovak Republic	1996	1,976	199			
Sweden	1995	35,143	1,086	743		952
UK*	1995	44,460	3,217			

*indicates multiple agencies: see Appendix 1 for further details

The disparity in budgets is illustrated further in Figure 1, which compares the mean protected area expenditure in geographic regions based on the IUCN World Commission on Protected Areas system. The figure shows that the developed country regions (North America, Europe, Australia/New Zealand) each have protected area budgets greater than the global mean. Interestingly, the newly industrialised economies of East Asia (Hong Kong, Taiwan, and South Korea) have the highest protected area budgets in the world.

Small island states also tend to have high protected area budgets. Both the Pacific and the Caribbean reported budgets above the global average, and were the only developing country regions to do so. The Pacific mean budget is influenced by the high expenditure in New Caledonia, which is assisted by the government of France. Some Caribbean island states with only a few square kilometres under protection have budgets that are among the highest in the world (St. Lucia, Barbados, Bermuda).

The remaining developing country regions each have protected area budgets considerably below the global mean. The lowest protected area budgets are found in Africa (Western/Central) (3% of global mean), North Africa and Middle East (8%), South America (11%), Africa (Eastern/Southern) (29%), South Asia (37%), South-East Asia (48%) and Central America (63%). Many factors, such as the lack of government resources, the geographic size of protected areas, and degree of population pressure, are responsible for the relatively low budgets. These factors will be examined further in Section 6.

4.2 PROTECTED AREA STAFFING

The study identified 83,141 protected area staff in all occupations: field staff, administrative personnel, and other. These staff were responsible for the protection of more 3 million km², or a global average of 27 staff per 1,000 km². Table 2 presents the protected area staffing data by occupation for each of the 78 countries sampled.

The global distribution of staffing is more even than for budgets. Overall, the developing countries have a staffing ratio of 27.6 per 1,000 km², slightly greater than that of 26.9 for the developed countries. The developing countries reported 56% of the total staff, compared to 10% of total expenditures. By comparison, the developed countries reported 44% of surveyed staff, but represented 90% of expenditures.

Data on staff occupation is available for 57 countries. In these countries, field staff accounted for 48% of total staff. The mean staff input in this subset of countries is 16 field staff per 1000 km and 32 total staff per 1000 km. The staffing ratios vary considerably by country and region, partly attributable to differing definitions of staff occupation by the reporting agencies.

The developed country regions tend to have a smaller proportion of staff in the field. The average field staff ratio is 38% in Europe and 25% in Australia (no other developed countries reported field staff). Two developing regions, North Africa and Middle East (30% field staff), South-East Asia (19%) also had lower than average proportions of field staff. In both of these cases, a high proportion of staff were reported in the "other" category, which if related to field operations would increase the ratios to 83% and 95%, respectively. Again, more detailed information is needed to accurately assess conservation efforts. Developing country regions reporting high proportions of field staff include Africa(Eastern/Southern) (68%), South Asia (77%), South America (80%), and Africa (Western/Central) (88%).

Table 2: Protected area staffing

Region (WCPA) & Country	Year	Protected Area (km²)	Total Staff	Field Staff	Admin. Staff	Other Staff	Total Staff (1000 km²)	Field Staff (1000 km²)
North America								
Canada*	1991	295,345	3,823				13	
Mexico	1994	107,061	401	301	100		4	3
United States*	1993	693,765	23,029				33	
Central America								
Honduras	1995	21,450	98	54	25	19	5	3
Panama	1995	15,566	51	43	8		3	3
Caribbean								
Antigua	1996	24	33	10	6	17	1,375	417
Bahamas	1992	1,253	11				9	
Barbados	1998	2.5	22	4	3	15	8,800	1,600
Bermuda	1996	111	103	91	12		928	820
Dominica	1995	166	95	85	10		572	512
Jamaica	1997	788	135	49	24	62	171	62
Montserrat	1993	8	6				714	
Nether Antilles*	1996	36	9	6	2	1	250	167
St. Lucia	1996	0.3	26	18	5	3	77,844	53,892
Trinidad &Tobago	1994	269	11	10	1		41	37
Turks & Caicos	1997	534	14	8	4	2	26	15
South America								
Brazil	1995	179,098	621				3	
Chile	1994	139,797	473	353	58	62	3	3
Colombia	1995	90,988	407	347	60		4	4
North Africa & Middle East								
Israel	1993	3,929	250				64	
Qatar	1993	9	25	23			2,778	2,556
Tunisia	1995	408	200	185	15		491	454
Turkey	1995	24,935	1,290	239	241	810	52	10
Africa (Eastern/Southern)								
Botswana	1992	100,250	581	486			6	5
Ethiopia	1993	32,403	77				2	
Kenya	1996	32,726	4,036	3,842	194		123	117
Malawi	1994	10,585	791	320			75	30
Namibia	1994	112,159	562	560			5	5
Seychelles	1995	40	26	24	2		649	599
South Africa	1996	34,244	4,454	920	572	2,962	130	27
Sudan	1993	187,000	6,577				35	
Tanzania	1994	40,300	1,400	1,298			35	32
Zimbabwe	1997	30,158	2,438	1,995	443		81	66

Region (WCPA) & Country	Year	Protected Area (km²)	Total Staff	Field Staff	Admin. Staff	Other Staff	Total Staff (1000 km²)	Field Staff (1000 km²)
Africa (Western/Central)								
Angola	1991	81,812	47				1	
Burundi	1994	1,135	259	243	9	6	228	214
Cameroon	1993	25,948	109				4	
Central African Rep	1991	46,949	415				9	
Chad	1995	124,884	165	135	22	8	1	1
Congo, Dem. Rep.	1992	100,262	1,733	1,615			17	16
Gabon	1993	18,170	50				3	
Ghana	1993	13,049	680				52	
Mali	1998	5,111	69	51	17	1	14	10
Niger	1995	84,163	68	24	15	5	1	
Sierra Leone	1995	1,744	45	29	4	12	26	17
Togo	1997	6,487	403	320	75	8	62	49
East Asia								
Hong Kong	1996	417	1,326	1,140	186		3,180	2,734
South Korea	1993	1,568	256				163	1
Taiwan	1996	3,222	668	215	320	148	207	67
South-East Asia								
Brunei	1995	1,036	171	147	24		165	142
Malaysia	1994	2,658	291	242	49		109	91
Myanmar	1995	3,622	674	533	75	66	186	147
Thailand*	1996	68,056	13,650	1,884	557	11,209	201	28
South Asia								
Bangladesh	1995	949	197				207	
Bhutan	1994	6,606	51	43	8		8	7
India	1994	1,011	94	69	22	3	93	68
Nepal	1994	15,025	879	834	45		59	56
Pakistan*	1997	5,881	540	326	58	156	92	55
Sri Lanka	1994	7,864	670	380	89	201	85	48
Australia/New Zealand								
Australia	1994	21,199	119	30	18	71	6	1
New Zealand	1996	89,978	1,350				15	
Pacific								
Fiji	1994	8	6	3	2	1	772	386
New Caledonia	1994	518	11	7	1	3	21	14
Pap. New Guinea	1993	10,448	147				14	

Region (WCPA) & Country	Year	Protected Area (km²)	Total Staff	Field Staff	Admin. Staff	Other Staff	Total Staff (1000 km²)	Field Staff (1000 km²)
Europe								
Croatia	1992	3,929	250	234			64	60
Czech Republic*	1995	12,806	1,002	548	288	166	78	43
France*	1993	47,088	1,124				24	
Greece	1995	11,830	104	34	10	60	9	3
Hungary	1993	1,907	481	255			252	134
Iceland	1993	3,148	177	25			56	8
Latvia	1995	602	88	76	6	6	146	126
Lithuania	1995	927	390	143	97	143	421	154
Luxembourg	1995	660	13				20	
Macedonia	1996	856	185	84			216	98
Malta	1995	1.4	16	8	2	3	11,747	5,874
Norway	1995	20,677	60	50	10		3	2
Portugal	1995	5,107	367				72	
Slovak Rep	1996	1,976	261				132	
UK*	1995	36,928	1,523	204	427	134	41	6

*indicates multiple agencies: see Appendix 2 for details

Figure 1: Protected area budgets: regional means in 1996 US$ per km² (not shown: East Asia, $12,308 per km²)

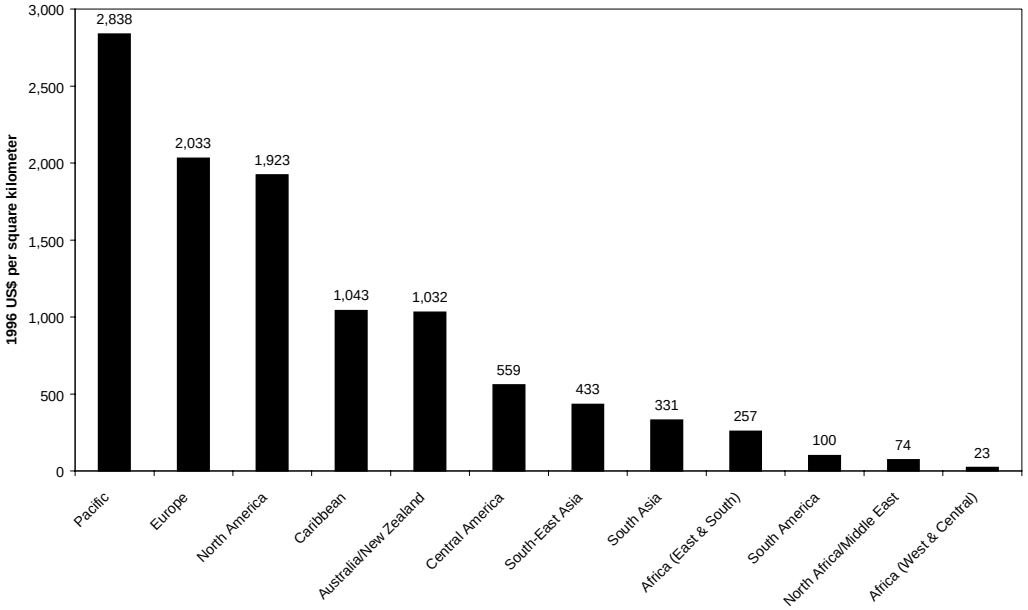
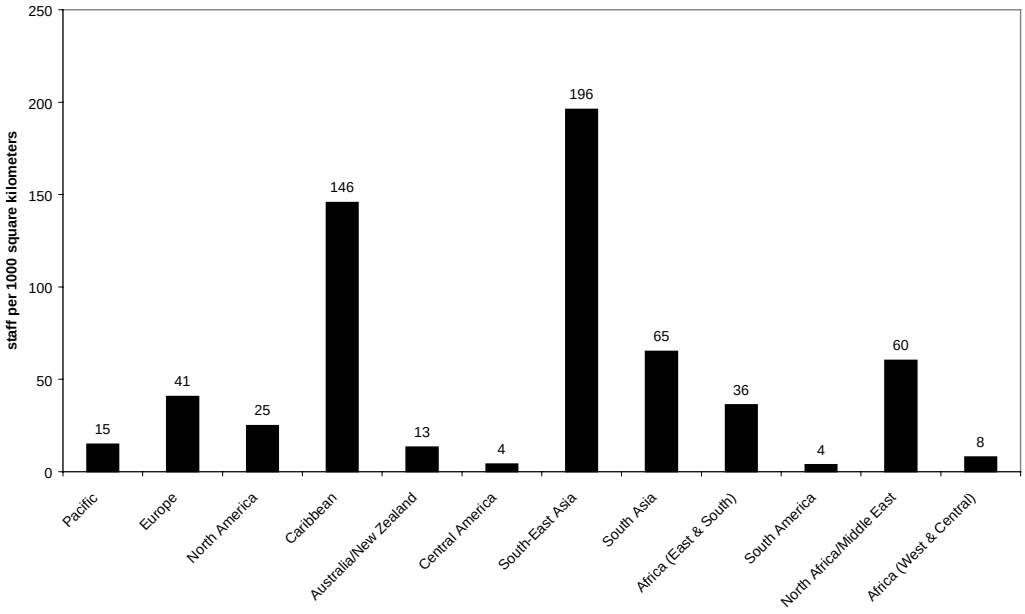


Figure 2: Protected area staffing: regional means of total staff per 1000 km² (not shown: East Asia, 432 per 1000 km²)



4.3 FINANCIAL SHORTFALLS AND REGIONAL FUNDING REQUIREMENTS

Estimates of financial shortfalls in protected area agencies are presented in Table 1. They are available for 51 countries, covering 1.25 million km² in protected area, representing a very incomplete data set (34% of the survey area, or 9% of global protected area), and caution must be used in interpreting the results. Many of the developed countries are not included in the estimates, including the US, Canada, Australia, the former Soviet Union, and many countries in Europe (UK, France, Germany, Italy). As a result, the following analysis is meant only to be suggestive of trends in some of the developing country regions.

In the 51 countries for which shortfall estimates are available, the study has identified total funding needs of $329 million, ranging from zero (New Zealand) to $60.9 million (South Africa). Developing country protected area agencies with annual needs of $5 million or more include: Brazil ($31.6 million), Mexico ($25.1 million), Turkey ($19.6 million), New Caledonia ($17.9 million), Thailand ($7.9 million), Honduras ($6.2 million), and Zimbabwe ($4.8 million).

An indication of the severity of under-funding in national conservation agencies can be obtained by expressing the shortfall amount as a percentage of the actual budget. By this measure, developing country agencies with severe shortfalls include Sierra Leone (shortfall is 88 times larger than actual budget), Mexico (4.5 times), Lithuania (4.5 times), Niger (4 times), Honduras (2.7 times), among others. Bangladesh and Pakistan had unmet financial needs of 3 and 5 times their actual budgets, which could be fully met with $1.7 million and $1.4 million of additional funds, respectively. Likewise, Trinidad and Tobago could reach its required tripling of funds for only $350,000 per year. While high relative to actual budgets, the funding shortfalls in developing countries are often not very great in absolute terms, particularly when compared to the aid budgets of donors.

The total funding requirements for protected area conservation in developing countries is projected in Table 3 (developed countries are excluded due to insufficient data). For each region, the total per square kilometre funding requirement for protected areas is assumed equal to the regional shortfall budget plus the regional actual budget. The analysis shows that conservation costs are highest ($3,000 per km²) in the Pacific, the Caribbean and the Baltic states where protected areas are small. Regions that tend to have large areas under protection have lower financial requirements, such as Africa and South America (around $300 per km²). Intermediate costs ($800 per km²) are estimated for South and Southeast Asia, North Africa and Middle East, and Central America. Insufficient data were received to construct estimates for the former Soviet Union minus the Baltic states, or for East Asia (developing), which includes China, Mongolia, and North Korea. The shortfalls in developing country regions can be extrapolated to estimate that additional financial requirements for protected area conservation in the developing counties is on the order of $2.7 billion annually (Table 3). This corresponds to an additional $353 per km² in expenditure, bringing mean developing country protected area budgets up to $526 km². This implies that protected area budgets are only 30% adequate, given their mean protected area budget of $157 km² (Section 4.1).

Table 3: Shortfall budgets and projected conservation costs in developing country regions (budgets, shortfall, and projected cost in 1996 US$ per square kilometre)

WCPA region	Actual Budget	Shortfall Estimate	Projected Cost	Protected Area (km²)	Additional Requirement
Lower Cost					
South America	100	90	190	1,838,826	165,779,757
North America (Mexico only)	52	234	286	159,669	37,423,635
Africa (East/South & West/Central)	114	215	329	2,074,451	446,061,174
Intermediate Cost					
South-East Asia	433	309	742	518,864	160,328,976
South Asia	331	413	744	212,924	87,937,612
North Africa & Middle East	74	715	789	1,037,576	741,833,426
Central America	559	250	809	86,049	21,540,227
Higher Cost					
Baltic States	575	2,389	2,964	19,403	46,348,738
Caribbean	1,043	1,949	2,992	108,637	211,739,462
Pacific	2,838	500*****	3,338	13,113	6,556,500
Insufficient Data					
East Asia (developing)		500*****		846,856	423,428,500
North Eurasia (former USSR)		500*****		638,532	319,266,000
Total	157	353	510	7,554,900	2,668,243,507

(figures with ***** are WCMC estimates)

5 PRIORITY COUNTRIES FOR FOREIGN ASSISTANCE

A set of priority countries for foreign assistance are identified in Table 4 based on the following criteria: (a) greater than average biological diversity (i.e. an NBI score of 0.11 or above); and (b) annual budget of less than 25% of the funding requirement. The NBI is a measure of biological richness based on the total number of species in each country (WCMC, 1994b). It should be emphasised, however, that this set of priority countries is not comprehensive as only about one half of the countries of the world appear in the sample. Other countries and regions may well rank as even higher priorities.

Table 4: Priority countries for foreign assistance (budgets and requirements in 1996$ per km²)

Country	Budget	Requirement*	Adequacy	NBI
Angola	>1	329	>1%	0.18
Cameroon	13	329	4%	0.19
Central African Rep.	4	329	1%	0.12
Cote d'Ivoire	76	329	23%	0.12
Ethiopia	5	329	1%	0.19
Gabon	7	329	2%	0.13
Guatemala	13	809	2%	0.13
Mexico	52	286	18%	0.48
Papua New Guinea	229	3338	7%	0.28
Peru	8	190	4%	0.40
Zaire	4	329	1%	0.30

*Requirement is lesser of estimated regional conservation cost (Table 3) or total cost as reported by agency (Table 1).

Six of the priority countries are in Africa, several of which lie within the Congo river basin, a globally important region of high species richness (Mittermeier and Werner, 1988; ICBP, 1992). The tropical forests of the region remain an important repository of global biodiversity because much of it remains relatively pristine (Hannah et al., 1995). However, the region is likely to experience the next wave of biodiversity loss from land clearance due to its high projected population growth rates (UN, 1993).

Central America is another priority region for foreign assistance, with Mexico and Guatemala appearing in Table 4. In addition, Honduras' budget is only 13% adequate, though its biodiversity is slightly lower than average (NBI 0.08). The region also includes El Salvador (no data) and Nicaragua (no data), where political instability has taken a toll on national

conservation efforts and impeded international assistance for protected areas. Factors threatening protected areas in the region are high population density and rapid population growth, and insecure land tenure, all of which tend to result in the expansion of agricultural land. Government investment in protected areas throughout much of the region has been so low since the 1980s that in many cases national and international NGOs, and even the private sector, have taken the lead in managing protected areas (IUCN, 1994b).

A potential priority region for foreign assistance is the Indo-China peninsula. The protected area budgets of Laos and Cambodia are less than 1% of the requirements for South–East Asia, though their biodiversity levels are not significantly above the global mean (NBI 0.10 and 0.07, respectively). Myanmar, a country with high biodiversity, reported a budget of only $74 per km². Other recent reviews endorse the inadequate level of funding for protected areas in these countries (IUCN, 1994b; ABC and WCMC, 1997). With the exception of Thailand, all countries on the Indo–China peninsula are in the lowest income category (World Bank, 1997) and are undergoing rapid population increase (UN, 1993). Further, these countries contain the largest expanse of unexploited land suitable for agriculture in the region (FAO, 1995).

6 DETERMINANTS OF PROTECTED AREA BUDGETS AND STAFFING

The relationship of protected area budgets and staffing to per capita income, population density, total area protected, and the national biodiversity index are presented in a set of scatter plots in Figures 3 and 4. The correlation coefficients for these relationships are compared in Table 5.

Here the protected area budgets and per capita income are expressed in 1996 US$ adjusted for purchasing power parity (World Bank, 1997). Purchasing power parity (ppp) adjusts dollar values to reflect the substantial difference in relative prices among countries. A dollar expressed in $ppp has the same purchasing power in every country, thus providing a standard basis of comparing agency budgets in economically diverse countries.

Table 5: Correlation of budgets and staffing with income, population density, protected area size and biodiversity (all variables log transformed except NBI)

	Per Capita Income	Population Density	Total Area Protected	NBI
Budget $ppp per km²	0.54	0.54	-0.57	-0.20
Staff Per 1000 km²	0.17	0.64	-0.75	-0.31

Protected area budgets are more highly correlated with per capita income than are staffing levels. This possibility was implied in Figure 2 which showed many developing country regions with substantial staffing levels. This result suggests that budgets are a potentially misleading indicator of conservation efforts, particularly in developing countries. Further, the substantial deployment of staff in these countries might provide donor countries with a foundation for investments in institutional capacity building.

Both protected area budgets and staffing are positively correlated with population density, a measure for potential human threats to protected areas. The relationship between staffing and density is slightly closer than that for budgets, indicating that countries may be responding to greater population pressure by increasing protected area staff.

The strongest correlation for budgets and staffing is with the country's total protected area. Budget and staff inputs per square kilometre are negatively related to the total area under protection. This means that smaller protected area systems require greater budgetary and staffing inputs per unit area, i.e. there is an economy of scale in protected area management: the less area under protection, the higher the per square kilometre costs (and vice versa).

Lastly, protected area budgets and staffing are both negatively correlated with the country's biological diversity, measured by its national biodiversity index (WCMC, 1994b). High biodiversity countries tend to have lower per square kilometre budgets and staffing of their protected areas. This result is most likely attributable to the higher than average biological richness in many tropical developing countries, where resources for managing protected areas are more limited.

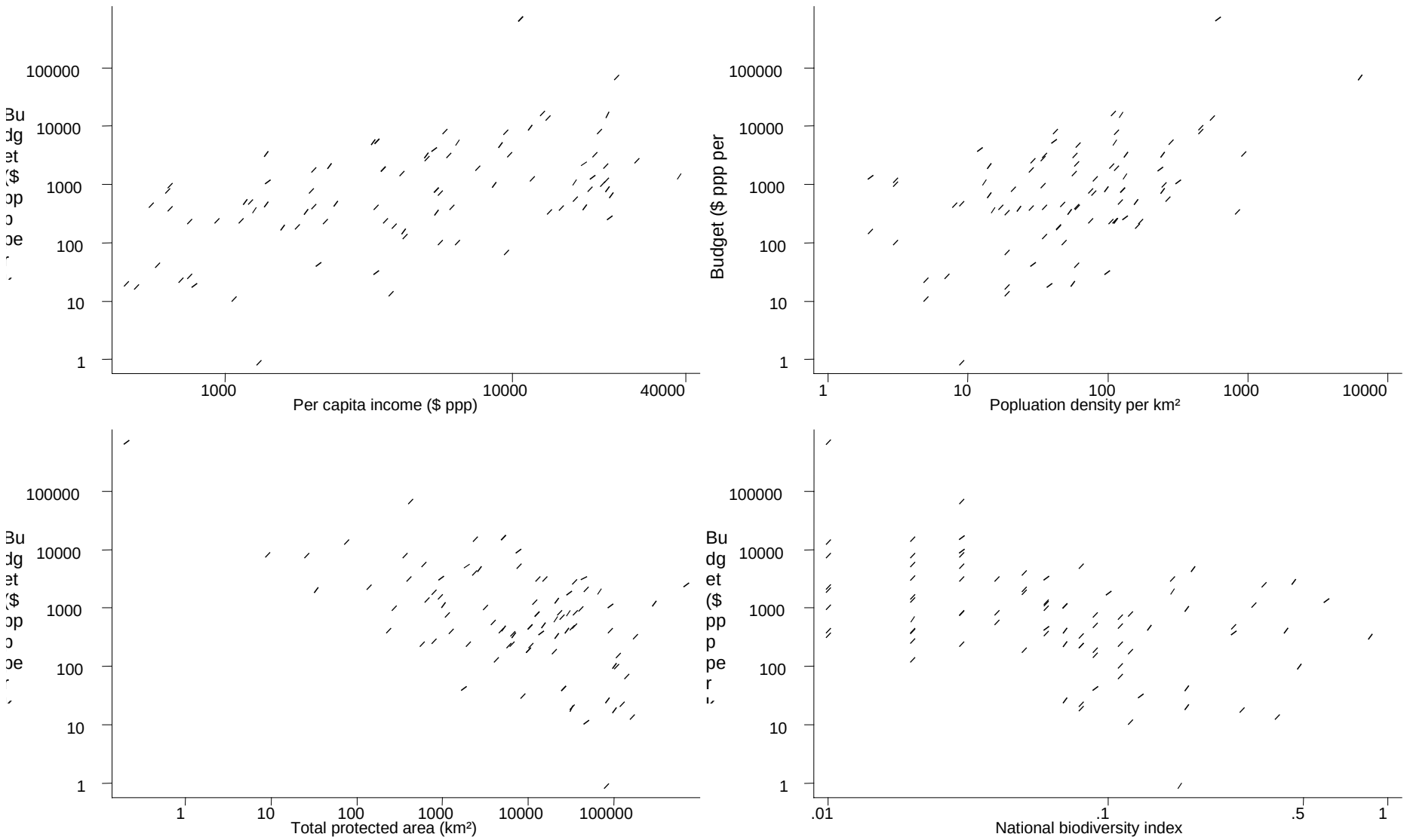


Figure 3: Protected area budget relationships

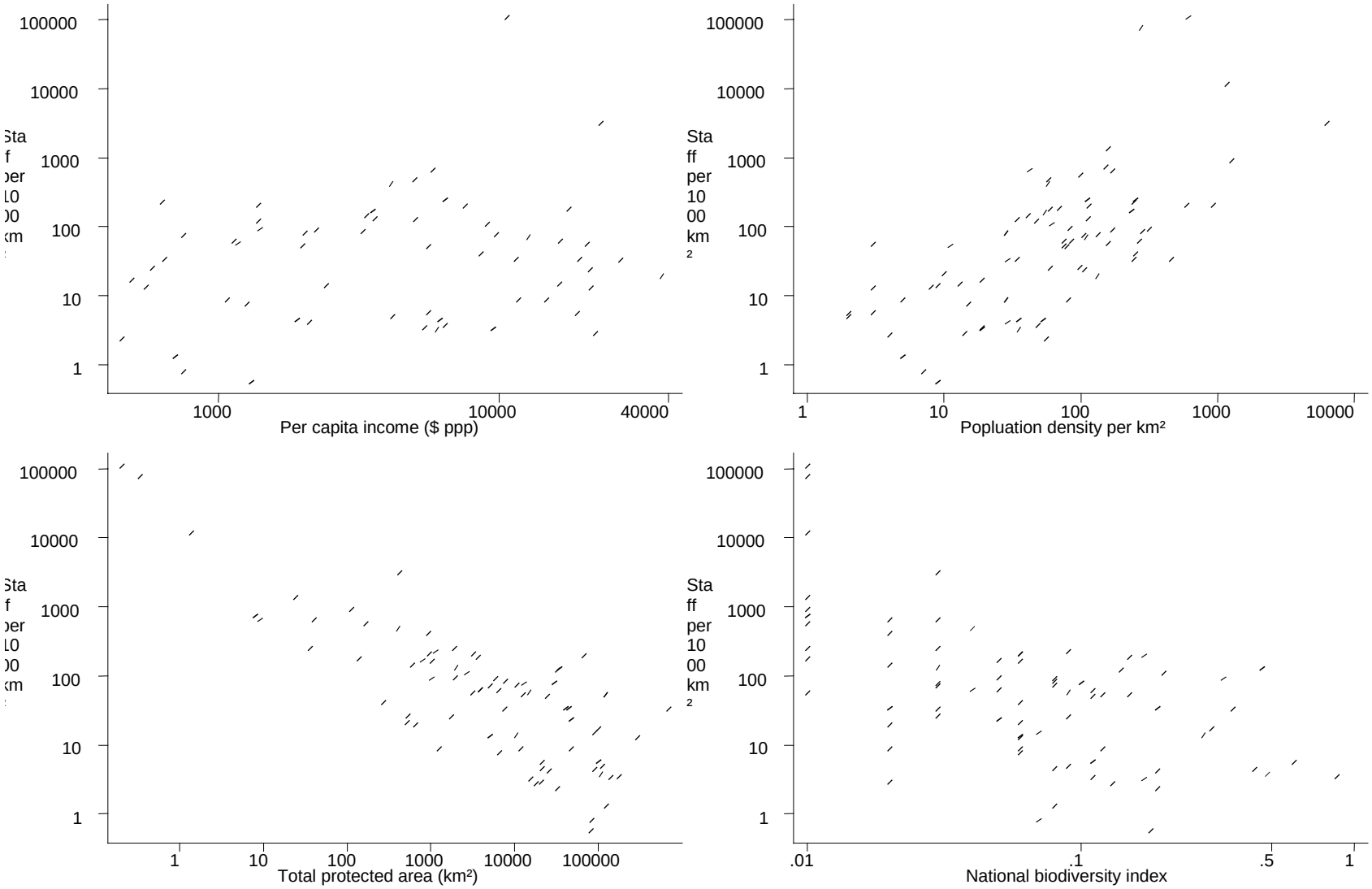


Figure 4: Protected area staffing relationships

7 CONCLUSION

An initial global survey such as this one inevitably contains a great many limitations and omissions, particularly with respect to the figures in Tables 1 & 2. However, the inherent weaknesses clearly demonstrate the acute need to collect protected area budget and staffing data on a regular and standardised basis. Without such data, comparisons of conservation expenditure between countries, the identification of priority areas for foreign assistance, and the assessment of global financial requirements for biological diversity conservation will continue to be elusive.

Better data are needed on both the depth and breadth of the survey coverage. The number of countries and agencies included in the study cover less than 30% of the global protected area estate, and excludes important areas of species richness and endemism such as Indonesia, India, China, and the former Soviet Union. In Australia, data were available from only one of several protected area agencies, covering about 15% of the country's protected area estate.

Another area is the level of detail in the information provided by individual countries. Part of the absence of detail stems from the fairly simple design of the survey questionnaires (Appendix 3). As a result, questions remain regarding the allocation of budgets and staff to various protected area activities. Furthermore, information is weak on the expenditures or staff contributed by other agencies, such as transport and forestry departments, or the military. While the survey asked for such data, little was actually provided.

Site-level data on protected area expenditures would also reveal important information. A follow up study might ask agencies to identify protected areas, either individually or by category, that do not receive active management ("paper parks"). While it is widely acknowledged that paper parks are widespread, there is no comprehensive accounting of where these areas are located. Secondly, site level data would allow a more precise econometric analysis of the costs of achieving conservation goals in protected areas.

Another area requiring more detailed reporting concerns the tracking of foreign assistance to protected areas, an issue of critical concern for the Parties to the Convention on Biological Diversity. At present there is no mechanism for collecting standardised, annual data on foreign assistance to either protected areas or to biological diversity conservation projects more generally (RSPB, 1996). This study found anecdotal evidence of significant foreign assistance to protected area agencies, though it was spread over an number of different years, and many developing countries were omitted from the sample.

As a result of the severe constraints to the data, few, if any, firm conclusions can be drawn as to the funding and staffing of protected areas world wide. Nevertheless, two points are noteworthy. First, protected area conservation costs vary considerably by region and are positively related to economic development levels, population pressure, the degree of protected area fragmentation. However, high biodiversity countries tend to spend less on their protected area systems, a widely suspected fact confirmed by this study. Second, many of the developing countries appear to have well staffed protected area agencies, despite their relatively meagre budgets. It suggests that, despite the lack of funds, developing countries do make a valuable contribution to the global protection, which could be greatly enhanced by donor funding to develop existing institutional capacity.

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APPENDICES

Appendix 1: Protected area budget information (financial data in 1996 US$, protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected area	Total Budget	(Capital Investment)	(Foreign Assistance)	Funding Shortfall
North America								
Canada	Parks Canada & Wildlife Svc		1991	295,345	326,182,423			
Mexico	National Institute of Ecology	C. J. de la Maza	1994	107,061	5,604,951	365,106	1,537,301	25,093,163
United States	National Parks Service		1993	324,405	1,124,118,350			
United States	Fish and Wildlife Service		1993	369,360	652,131,379			
Central America								
Guatemala	Gen. Directorate of Forestry		1994	8,644	109,214			
Honduras	AFE-COHDEFOR	Victor Archaga	1995	21,450	2,316,483	36,034	2,059,096	6,177,288
Panama	Nat Inst Renewable Nat Res	Erasmo Vallester	1995	15,566	23,102,670	1,853,186	6,407,584	3,088,644
Caribbean								
Antigua Barbuda	National Parks Authority	Ann Marie Martin	1996	24	222,222	0	0	185,185
Bahamas	Bahamas National Trust		1992	1,253	404,851			
Barbodos	Barbados National Trust	P. H. Roach	1993	0.2	86,862			
Bermuda	Dept Ag, Fisheries and Parks	John Barnes	1996	111	9,609,000	451,900	0	400,000
Dominica	Forestry and Wildlife Div	David Williams	1995	166	1,079,794	417,539	439,041	359,931
Dominican Rep	Directorate of National Parks		1993	10,086	739,794			
Jamaica	Natural Res Cons Authority	Juliette Nelson	1997	788	625,472	0	237,679	977,613
Montserrat	Montserrat National Trust		1993	8	43,773			
Netherlands Ant	Saba Marine Park		1996	10	77,222			51,739
Netherlands Ant	Bonaire Marine Park		1995	26	212,588	35,279		212,588
St. Lucia	St. Lucia National Trust	Giles Romulus	1996	0.3	427,317	54,444	74,074	185,185
St. Kitts &Nevis	Conservation Commission		1991	26	115,263			
Trinidad & Tobago	Wildlife Section	N. Nathai-Gyan	1994	269	117,973	0	12,280	353,918
Turks and Caicos	Dept Envir and Coastal Res	Judith L. Garland	1997	534	114,234	0	0	

Appendix 1: Protected area budget information (financial data in 1996 US$, protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected area	Total Budget	(Capital Investment)	(Foreign Assistance)	Funding Shortfall
South America								
Brazil	IBAMA/DIREC/DIGER	Lucia Lima	1995	179,098	40,152,373		21,620,509	31,607,124
Chile	CONAF (SNAPSE)	Pedro J. Araya	1994	139,797	4,226,021	1,193,575	0	1,408,674
Colombia	National Parks Admin	German Corzo	1995	90,988	11,811,805	6,483,674	1,247,194	3,937,268
Peru	Gen Dir of Forestry & Wildlife		1990	164,974	1,395,655			
North Africa and Middle East								
Algeria	Nat Nature Cons Agency	Kadik Bashir	1995	2,350	2,880,325	0	0	2,880,325
Afghanistan	Dir Wildlife and National Parks		1991	1,834	57,632			
Bahrain	Directorate of Fisheries		1995	6,800	1,369,094	0	0	1,369,094
Cyprus	Forestry Department	L. Peonides	1994	115	425,977	0	0	407,329
Israel	Nature Reserves Authority	Shlomo Dolberg	1993	3,929	2,162,866			
Morocco	Hunting, Fishing & Nat Prot		1991	4,783	661,670			
Qatar	Conservation Section		1993	139	208,803			
Saudi Arabia	Nat Com Wildlife Conservation		1991	323,996	10,442,817			
Tunisia	Dir For, Hunting, Nat Parks	A R Fekih Salem	1995	408	470,526		0	470,526
Turkey	Nat Parks, Hunting & Wildlife	Sami Yasar Olcer	1995	24,935	8,926,777	1,710,552	0	19,616,417
Yemen	Gen Dir of Forest and Range		1993	3,625	98,707			
Africa (Eastern/Southern)								
Botswana	Dept Wildlife & National Parks		1992	100,250	5,580,760			
Ethiopia	Wildlife Conservation Org	Tegest Dachew	1993	32,403	145,857			
Kenya	Kenya Wildlife Service	Dadson Mugwe	1996	32,726	3,082,070	1,974,000	2,310,980	3,082,070
Malawi	Dept Nat Parks and Wildlife	J. N. B. Mphande	1994	10,585	556,606	2,591		
Mauritius	Forestry Service	A. W. Owadally	1995	75	264,343	0	0	556,512
Namibia	Min Environment and Tourism		1994	112,159	8,547,738			

Appendix 1: Protected area budget information (financial data in 1996 US$, protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected area	Total Budget	(Capital Investment)	(Foreign Assistance)	Funding Shortfall
9Africa (Eastern/Southern)continued								
Seychelles	Cons & National Parks Sect	John Collie	1995	40	41,435	2,072	0	62,152
South Africa	National Parks Board	Peter Fearnhead	1996	34,244	60,866,780	3,299,530	0	60,866,780
Tanzania	Tanzania National Parks	Asukile R. Kajuni	1994	41,131	7,471,760	1,949,609	789,421	2,465,681
Zimbabwe	Dept Nat Parks Wildlife Mgmt	Cecil Machena	1997	30,158	14,695,829	6,299,387	2,570,339	4,821,350
Africa (Western/Central)								
Angola	Forestry Department		1991	81,812	23,096			
Burkina Faso	Dir NP, Wildlife, Hunting Res		1994	31,937	177,599	0	39,466	
Burundi	Nat Inst Envir & Conservation	Bikwemu Gaspard	1994	1,135	226,498	0	0	220,235
Cameroon	Dept Wildlife and Prot Areas		1993	25,948	343,646			
Central Afr Rep	Water, For, Hunt, Fish, Tour		1991	46,949	167,727			
Chad	Dir Nat Parks & Wildlife Res	Zakaria Hoski	1995	124,884	740,821	0	489,546	595,116
Congo, Dem R	Institute for Nature Cons		1992	100,262	438,714			
Cote d'Ivoire	Dir Nat Prot, Fisheries, Water		1991	19,929	1,522,622			
Gabon	Dir Hunting and Wildlife		1993	18,170	132,172			
Gambia	Dept of Wildlife Conservation		1991	575	48,570			
Ghana	Game and Wildlife Dept	David G. Kpelle	1993	12,681	1,985,420			
Madagascar	ANGAP		1996	13,903	1,914,000	730,000	1,598,000	1,914,000
Mali	DNRFFH	Bourama Niagate	1998	5,111	1,050,449	310,488	1,050,449	2,550
Niger	Dir. Wildlife and Fisheries	Salaou Barmoli	1995	84,163	661,239	589,304	589,304	2,888,743
Nigeria	Nigeria National Parks	Lawan B. Marguba	1993	34,218	3,671,898			
Senegal	Department of National Parks		1993	10,127	657,903			
Sierra Leone	Wildlife Conservation Branch	Kalie Bangura	1996	1,744	22,716	0	12,175	2,000,000
Togo	Dir National Parks and Res	A. K. Moumouni	1996	6,487	431,140	30,934	30,934	288,719

Appendix 1: Protected area budget information (financial data in 1996 US$, protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected area	Total Budget	(Capital Investment)	(Foreign Assistance)	Funding Shortfall
East Asia								
Hong Kong	Agriculture and Fisheries Dept	C. W. Lai	1996	417	28,782,412	1,894,601	0	9,584,543
South Korea	National Parks Authority		1993	7,568	61,345,277			
Taiwan	Dept of National Parks	Ching-Fen Hsiao	1996	3,222	47,809,406	39,519,512	0	15,777,104
South Asia								
Bangladesh	Forest Directorate	M. A. Sattar	1995	949	552,112	433,615	306,555	1,656,335
Bhutan	Nature Conservation Division		1994	6,606	805,495	546,400	600,971	
India-Sikkim	Wildlife Wing, Forest Dept	C. Lachungpa	1994	1,011	280,081			
Nepal	Dept Nat Parks Wildlife Cons	Shyam Bajimaya	1994	15,025	1,303,451			
Pakistan-AJK	Wildlife, Fish, Tourism & Arch	Y. Q. Mohammad	1997	491	177,526	48,372	77,396	193,489
Pakistan-NWFP	NWFP Wildlife Department	M. Mumtaz Malik	1997	5,390	103,492	0		1,209,307
Sri Lanka	Dept. of Wildlife Conservation	C. P. Attanayake	1994	7,864	9,142,122	395,162	91,848	3,016,900
Laos	Protected Area & Wildlife Div	B. Phanthavong	1994	24,400	14,960		4,603	
Malaysia	Sabah Parks	Francis Liew	1994	2,658	5,478,351	1,639,523	128,650	
Brunei	Forest Department	Haji Mohd Yassin	1995	1,036	4,161,934	3,152,008	0	14,801,471
Cambodia	Forestry Department		1995	0	10,295			
Myanmar	Nature and Wildlife Cons Div	U Than Nwai	1995	3,622	267,730	33,703	0	200,797
Thailand	Wildlife Conservation Division	Prawat Thanadka	1996	27,840	10,700,000	2,870,000	0	7,200,000
Thailand	National Park Division	P. Chansiritanon	1995	40,216	36,374,360	11,323,187	0	
Australia/New Zealand								
Australia	Australian Nat Cons Agency	Peter Bridgewater	1994	21,199	28,311,194			
New Zealand	Department of Conservation	Wren Green	1996	89,978	86,482,313	7,380,952		

Appendix 1: Protected area budget information (financial data in 1996 US$, protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected area	Total Budget	(Capital Investment)	(Foreign Assistance)	Funding Shortfall
Pacific								
Fiji	National Trust for Fiji	Birandra Singh	1991	9	31,794			
French Polynesia	Delegation a l'Environnement	Laurent Borde	1993	178	3,241,452	0		
New Caledonia	Service de l'Environnement	Marcel Boulet	1994	518	26,651,736	7,533,096	0	17,856,663
Papua N Guinea	Nature Conservation Division	Gaikovina R. Kula	1993	10,448	2,395,094			
Vanuatu	Environment Unit		1993	33	35,999			
Western Samoa	Dept of Ag, For & Fisheries		1990	234	54,075			
Europe								
Austria	Lander parks	F. Galle	1994	20,404	18,169,294			
Austria	National Parks	F. Galle	1994	2,732	6,688,304			
Belgium	WWF-Belgium	Roland Schaetzen	1993	784	242,437			
Croatia	Dept of Nat Cons & Nat Parks		1992	3,929	1,823,696			
Czech Rep	Krkonose NP Biosphere Res	Jiri Flousek	1995	547	9,257,086	0	1,284,687	2,385,847
Czech Rep	Sumava NP & Prot Landscape	Nouza Jan	1995	1,673	6,613,348	765,857	15,490	1,101,160
Czech Rep	Prot Landscape Areas Admin	Starka Ludoz	1995	10,586	605,638	0	110,116	367,053
Denmark	Nat Forest and Nature Agency		1990	2,422	53,165,738			
Estonia	Department of Nat Protection		1994	4,233	372,243			
Finland	Forest and Park Service	Marja Hokkanen	1994	27,782	13,451,588	2,653,715		2,745,222
France	Parcs National de France		1994	3,572	33,610,536			
France	Reserves Naturelles		1993	1,479	19,248,359			
France	Cons de l'Espace Littoral		1994	162	26,758,955			
Greece	Gen Sec Forests & Nat Envir	P. Drougas	1995	11,830	10,612,792	3,859,197		10,612,792
Hungary	Nature Conservation Agency		1993	1,907	6,546,784			
Iceland	Ministry of the Environment		1993	3,148	3,962,441			
Latvia	Min Envir Prot & Reg Develop	Valts Vilnttis	1995	602	2,270,912	0	0	563,621
Lithuania	Department of State Parks		1995	927	669,206		0	3,088,644
Luxembourg	Nature Conservation Service	J.-M. Sinner	1995	660	1,002,450			646,742
Macedonia	Inst Prot of Natural Rarities		1995	1,083	92,738	0		53,179

Appendix 1: Protected area budget information (financial data in 1996 US$, protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected area	Total Budget	(Capital Investment)	(Foreign Assistance)	Funding Shortfall
Europe (continued)								
Macedonia	Mavrovo and Pelister Nat Park		1992	856	748,027			
Malta	Argotti Botanic Garden	Joseph Borg	1995	1	183,199	0		13,985
Netherlands	Nat Ref Center Nature Mgmt	Johan Thissen	1996	360	3,511,905			1,158,929
Norway	Directorate for Nature Mgmt	Fin Kateras	1994	20,677	19,333,936	13,447,858		19,333,936
Poland	National Parks Service		1991	29,252	12,314,225			
Portugal	Inst Conservacao da Natureza	Joaquim Marques	1995	5,107	65,181,520	37,355,898	20,869,217	21,509,902
Slovak Republic	Nature Landscape Prot Div	Jan Zuskin	1996	1,976	392,927			
Sweden	Environmental Prot Agency	Marta Misterewicz	1995	35,143	38,156,201	26,106,875		33,470,352
UK-England	National Parks Authorities (7)	Wendy Thompson	1995	9,631	36,882,529			
UK-N. Ireland	Environment Service	Michael Meharg	1994	4,126	16,010,033			
UK-Scotland	Scottish Natural Heritage		1994	23,171	60,171,939			
UK-Wales	Countryside Council	I. R. Bonner	1994	7,532	29,967,915	1,628,691		732,911
UK-Falkland Is.	Falklands Conservation	Mike Bingham	1994	86	65,148			
UK-St. Helena	Agriculture and Forestry Dept	A. B. Hill	1994	75	172,967			

Appendix 2: Protected area staffing information (protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected Area	Total Staff	Field Staff	Admin. Staff	Other Staff
North America								
Canada	Parks Canada & CWS		1991	295,345	3,823			
Mexico	National Institute of Ecology	C. J. de la Maza	1994	107,061	401	301	100	
United States	USNPS & USFWS		1993	693,765	23,029			
Central America								
Honduras	AFE-COHDEFOR	Victor Archaga	1995	21,450	98	54	25	19
Panama	Nat Inst Renewable Nat Res	Erasmo Vallester	1995	15,566	51	43	8	
Caribbean								
Antigua Barbuda	National Parks Authority	Ann Marie Martin	1996	24	33	10	6	17
Bahamas	Bahamas National Trust		1992	1,253	11			
Barbados	Barbados National Trust	P. H. Roach	1998	2.5	22	4	3	15
Bermuda	Dept Ag, Fisheries and Parks	John Barnes	1996	111	103	91	12	
Dominica	Forestry and Wildlife Div	David Williams	1995	166	95	85	10	
Jamaica	Natural Res Cons Authority	Juliette Nelson	1997	788	135	49	24	62
Montserrat	Montserrat National Trust		1993	8	6			
Netherlands Ant	Saba Marine Park		1996	10	3	2	1	
Netherlands Ant	Bonaire Marine Park		1995	26	6	4	1	1
St. Lucia	St. Lucia National Trust	Giles Romulus	1996	0.3	26	18	5	3
Trinidad & Tobago	Wildlife Section	N. Nathai-Gyan	1994	269	11	10	1	
Turks and Caicos	Dept Envir and Coastal Res	Judith L. Garland	1997	534	14	8	4	2
South America								
Brazil	IBAMA/DIREC/DIGER	Lucia Lima	1995	179,098	621			
Chile	CONAF (SNAPSE)	Pedro J. Araya	1994	139,797	473	353	58	62
Colombia	National Parks Admin	German Corzo	1995	90,988	407	347	60	

Appendix 2: Protected area staffing information (protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected Area	Total Staff	Field Staff	Admin. Staff	Other Staff
North Africa and Middle East								
Israel	Nature Reserves Authority	Shlomo Dolberg	1993	3,929	250			
Qatar	Conservation Section		1993	9	25	23		
Tunisia	Dir For, Hunting, Nat Parks	A R Fekih Salem	1995	408	200	185	15	
Turkey	Nat Parks, Hunting & Wildlife	Sami Yasar Olcer	1995	24,935	1,290	239	241	810
Africa (Eastern/Southern)								
Botswana	Dept Wildlife & National Parks		1992	100,250	581	486		
Ethiopia	Wildlife Conservation Org	Tegest Dachew	1993	32,403	77			
Kenya	Kenya Wildlife Service	Dadson Mugwe	1996	32,726	4,036	3,842	194	
Malawi	Dept Nat Parks and Wildlife	J. N. B. Mphande	1994	10,585	791	320		
Namibia	Min Environment and Tourism		1994	112,159	562	560		
Seychelles	Cons & National Parks Sect	John Collie	1995	40	26	24	2	
South Africa	National Parks Board	Peter Fearnhead	1996	34,244	4,454	920	572	2,962
Sudan	Wildlife National Park Forces		1993	187,000	6,577			
Tanzania	Tanzania National Parks	Asukile R. Kajuni	1994	40,300	1,400	1,298		
Zimbabwe	Dept Nat Parks Wildlife Mgmt	Cecil Machena	1997	30,158	2,438	1,995	443	
Africa (Western/Central)								
Angola	Forestry Department		1991	81,812	47			
Burundi	Nat Inst Envir & Conservation	Bikwemu Gaspard	1994	1,135	259	243	9	6
Cameroon	Dept Wildlife and Prot Areas		1993	25,948	109			
Central Afr Rep	Water, For, Hunt, Fish, Tour		1991	46,949	415			
Chad	Dir Nat Parks & Wildlife Res	Zakaria Hoski	1995	124,884	165	135	22	8
Gabon	Dir Hunting and Wildlife		1993	18,170	50			
Ghana	Game and Wildlife Dept	David G. Kpelle	1993	13,049	680			
Mali	DNRFFH	Bourama Niagate	1998	5,111	69	51	17	1
Niger	Dir. Wildlife and Fisheries	Salaou Barmoli	1995	84,163	68	24	15	5

Appendix 2: Protected area staffing information (protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected Area	Total Staff	Field Staff	Admin. Staff	Other Staff
Africa (Western/Central) (continued)								
Sierra Leone	Wildlife Conservation Branch	Kalie Bangura	1995	1,744	45	29	4	12
Togo	Dir National Parks and Res	Abdou Moumouni	1997	6,487	403	320	75	8
Zaire	Institute for Nature Cons		1992	100,262	1,733	1,615		
East Asia								
Hong Kong	Agriculture and Fisheries Dept	C. W. Lai	1996	417	1,326	1,140	186	
South Korea	National Parks Authority		1993	1,568	256	1		
Taiwan	Dept of National Parks	Ching-Fen Hsiao	1996	3,222	668	215	320	148
South Asia								
Bangladesh	Forest Directorate	M. A. Sattar	1995	949	197			
Bhutan	Nature Conservation Division		1994	6,606	51	43	8	
India-Sikkim	Wildlife Wing, Forest Dept	C. Lachungpa	1994	1,011	94	69	22	3
Nepal	Dept Nat Parks Wildlife Cons	Shyam Bajimaya	1994	15,025	879	834	45	
Pakistan-Ajk	Wildlife, Fish, Tourism & Arch	Y. Q. Mohammad	1997	491	118	93	20	5
Pakistan-NWFP	NWFP Wildlife Department	M. Mumtaz Malik	1997	5,390	422	233	38	151
Sri Lanka	Dept. of Wildlife Conservation	C. P. Attanayake	1994	7,864	670	380	89	201
South-East Asia								
Brunei	Forest Department	Haji Mohd Yassin	1995	1,036	171	147	24	
Malaysia	Saba Parks	Francis Liew	1994	2,658	291	242	49	
Myanmar	Nature and Wildlife Cons Div	U Than Nwai	1995	3,622	674	533	75	66
Thailand	Wildlife Conservation Division	Prawat Thanadka	1996	27,840	4,064	564	194	3,306
Thailand	National Park Division	P. Chansiritanon	1995	40,216	9,586	1,320	363	7,903

Appendix 2: Protected area staffing information (protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected Area	Total Staff	Field Staff	Admin. Staff	Other Staff
Australia/New Zealand								
Australia	Australian Nat Cons Agency	Peter Bridgewater	1994	21,199	119	30	18	71
New Zealand	Department of Conservation	Wren Green	1996	89,978	1,350			
Pacific								
Fiji	Fiji National Trust	Birandra Singh	1994	8	6	3	2	1
New Caledonia	Service de l'Environnement	Marcel Boulet	1994	518	11	7	1	3
Papua N Guinea	Nature Conservation Division	Gaikovina R. Kula	1993	10,448	147			
Europe								
Croatia	Dept of Nat Cons & Nat Parks		1992	3,929	250	234		
Czech Rep	Krkonose NP Biosphere Res	Jiri Flousek	1995	547	374	244	33	97
Czech Rep	Sumava NP & Prot Landscape	Nouza Jan	1994	1,673	401	284	75	42
Czech Rep	Prot Landscape Areas Admin	Starka Ludoz	1995	10,586	227	20	180	27
France	PN, PNR, RN, CERL		1993	47,088	1,124			
Greece	Gen Sec Forests & Nat Envir	P. Drougas	1995	11,830	104	34	10	60
Hungary	Nature Conservation Agency		1993	1,907	481	255		
Iceland	Ministry of the Environment		1993	3,148	177	25		
Latvia	Min Envir Prot & Reg Develop	Valts Vilnttis	1995	602	88	76	6	6
Lithuania	Department of State Parks		1995	927	390	143	97	143
Luxembourg	Nature Conservation Service	J.-M. Sinner	1995	660	13			
Macedonia	Mavrovo and Pelister Nat Park		1996	856	185	84		
Malta	Argotti Botanic Garden	Joseph Borg	1995	1.4	16	8	2	3
Norway	Directorate for Nature Mgmt	Fin Kateras	1995	20,677	60	50	10	
Portugal	Inst Conservacao da Natureza	Joaquim Marques	1995	5,107	367			
Slovak Rep	Nature Landscape Prot Div	Jan Zuskin	1996	1,976	261			
UK-England	National Park Authorities (7)	Wendy Thompson	1995	9,631	765	204	427	134
UK-N. Ireland	Environment Service	Michael Meharg	1994	4,126	120			

Appendix 2: Protected area staffing information (protected areas in square kilometres)

Country	Agency	Respondent	Year	Protected Area	Total Staff	Field Staff	Admin. Staff	Other Staff
Europe (continued)								
UK-Scotland	Scottish Natural Heritage		1994	23,171	638			
UK-Wales	Countryside Council	I. R. Bonner	1994	7,532				