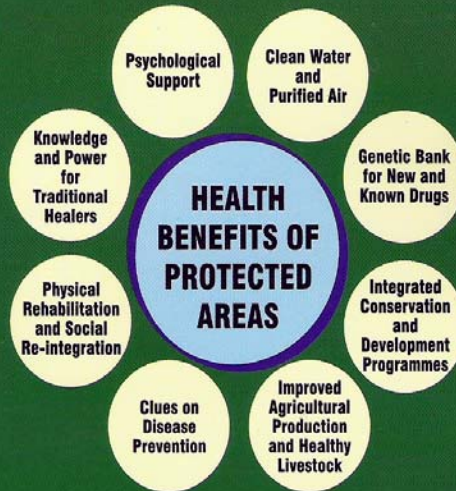


The main challenge facing professionals working in protected areas is to find ways of demonstrating that the conservation of biodiversity and its sustainable use have a fundamental relevance to the daily lives of people, including those who may never visit a protected area. There is also the need to emphasise the purposes of protected areas as contributing to the quality of life.



This book presents eight ways in which protected areas can improve human health. Four of these health benefits of protected areas are briefly described and remain as anecdotal evidence, while the other four are better explored through fieldwork in Brazil, Costa Rica, Poland and Kazakhstan. These health benefits of protected areas constitute a contribution to academics, decision-makers and protected-area managers interested in improving the relation between local communities and *in-situ* biodiversity conservation, world-wide.



**HEALTH, ENVIRONMENT  
AND DEVELOPMENT:  
HUMAN ECOLOGICAL FRAMEWORK**

**MANUEL CESARIO**

**IDÉIA/EDUFAC  
JOÃO PESSOA  
2004**

**ALL RIGHTS AND RESPONSIBILITIES RESERVED TO THE AUTHOR**

First Published in Brazil in 2004 by Manuel Cesario  
Copyright © Manuel Cesario, 2004

**EDITORIAL BUSINESS / LAYER**  
**MAGNO NICOLAU**

Original text review by Jill Knox  
Cover design by Clóvis Pereira  
Cover photo by André Pessoa

---

C421h      Cesario, Manuel.  
              Health, Environment and Development: human ecological framework.  
              / Manuel Cesario. - João Pessoa: Idéia e Rio Branco: EDUFAC, 2004.  
              161p.

ISBN 85-7539-160-7

1. Health 2. Environment 3. Development 4. Human Ecology

UFPB/BC

CDU: 61

---

**idéia**



EDUFAC

Editora da Universidade Federal do Acre

*This book, what it represents to me,  
and all the time and effort it took me,  
I dedicate*

*to my Parents, Vivi and Jorge,  
from whom I learned to love  
and to whom I owe my education;*

*to my Master, Ludovicus Tercius Guanabarinus,  
from whom I learned the passion for science  
and to whom I owe my academic vein;*

*to my Wife, Raquel,  
who wished upon a star  
to have a writer as her lover;*

*to my beloved Children, Rafa and Pipe,  
from whom I stole so much important time  
and to whom I wish a better world.*



# CONTENTS

<b>PREFACE</b> .....	11
<b>LIST OF TABLES</b> .....	20
<b>LIST OF ACRONYMS AND ABBREVIATIONS</b> .....	22
<b>CHAPTER I: OVERVIEW</b> .....	25
I. 1 - INTRODUCTION .....	25
I. 2 - CHOSEN PROBLEM, HYPOTHESIS AND RESEARCH QUESTIONS .....	26
I. 3 - BACKGROUND AND KEY-CONCEPTS .....	27
I. 4 - THE FOCAL THEORY .....	28
I. 5 - DATA .....	28
I. 6 - ASSESSMENT OF FINDINGS AND CONTRIBUTION .....	30
<b>CHAPTER II: BACKGROUND AND KEY-CONCEPTS</b> .....	31
II.1 - INTRODUCTION .....	31
II.2 - BACKGROUND .....	31
II.3 - HUMAN ECOLOGY .....	41
II.3.1 - CONCEPT .....	41
II.3.2 - METHODS IN HUMAN ECOLOGY .....	43
II.4 - BIOLOGICAL DIVERSITY .....	48
II.4.1 - CONCEPT AND IMPLICATIONS .....	48
II.4.2 - FORMS OF CONSERVATION OF BIODIVERSITY .....	50
II.4.3 - PROTECTED AREAS .....	50
II.5 - HUMAN HEALTH .....	62
II.5.1 - THE HOLISTIC AND OFFICIAL CONCEPT .....	62
II.5.2 - PARADIGM SHIFT .....	64
II.5.3 - A CONCEPTUAL ALTERNATIVE FOR SUSTAINABLE DEVELOPMENT .....	69
<b>CHAPTER III: HEALTH BENEFITS OF PROTECTED AREAS</b> .....	73
III. 1 - INTRODUCTION .....	73
III. 2 - IMPROVED AGRICULTURAL PRODUCTION AND HEALTHY LIVESTOCK .....	76
III. 2. 1 - DATA COLLECTION .....	76
III. 2. 2 - FINDINGS .....	76
III. 3 - DISEASE PREVENTION .....	77
III. 3. 1 - DATA COLLECTION .....	78
III. 3. 2 - FINDINGS .....	78

III. 4 - PSYCHOLOGICAL WELL-BEING .....	80
III. 4. 1 - DATA COLLECTION .....	80
III. 4. 2 - FINDINGS .....	80
III. 5 - SUPPORT FOR TRADITIONAL MEDICINE .....	82
III. 5. 1 - DATA COLLECTION .....	82
III. 5. 2 - FINDINGS .....	83
III. 6 - GENETIC BANK FOR NEW AND KNOWN DRUGS .....	85
III. 6. 1 - DATA COLLECTION .....	85
III. 6. 2 - FINDINGS .....	85
III. 7 - PHYSICAL REHABILITATION AND SOCIAL RE-INTEGRATION .....	89
III. 7. 1 - DATA COLLECTION .....	89
III. 7. 2 - FINDINGS .....	89
III. 8 - CLEAN AIR AND DRINKING WATER .....	93
III. 8. 1 - DATA COLLECTION .....	93
III. 8. 2 - FINDINGS .....	94
III. 9- INTEGRATING CONSERVATION-DEVELOPMENT PROJECTS .....	101
III. 9. 1 - DATA COLLECTION .....	101
III. 9. 2 - FINDINGS .....	101
III. 10- CONCLUDING REMARKS .....	102
<b>CHAPTER IV: ASSESSMENT OF THE SERRADA CAPIVARA ICDP ...</b>	<b>104</b>
IV. 1 - INTRODUCTION .....	104
IV.1.1 - SPECIFIC AIMS .....	104
IV.1.2 - CHOICE OF CASE STUDY .....	104
IV.1.3 - REPRESENTATIVENESS OF CASE STUDY .....	105
IV.1.4 - DATA COLLECTION .....	106
IV. 2 - THE CONCEPT OF ICDP .....	106
IV. 3 - THE REGION OF THE SERRA DA CAPIVARA NATIONAL PARK, BRAZIL .....	109
IV.3.1 - LOCATION .....	109
IV.3.2 - CLIMATE .....	110
IV.3.3 - WATER SUPPLY .....	110
IV.3.4 - VEGETATION AND FAUNA .....	111
IV.3.5 - HUMAN OCCUPANCY .....	111
IV.3.6 - LIFE STANDARDS BEFORE THE ICDP .....	113
IV. 4 - THE SERRA DA CAPIVARA ICDP .....	115
IV.4.1 - HISTORY OF CREATION OF THE SERRA DA CAPIVARA NATIONAL PARK ..	115
IV.4.2 - THE SERRA DA CAPIVARA ICDP AND ITS ACHIEVEMENTS .....	116
IV.4.3 - COMMUNITY PARTICIPATION .....	124
IV.4.4 - SUSTAINABILITY .....	125
IV.4.5 - CONCLUDING REMARKS .....	126



IV. 5 - SURVEY OF THE CHANGES TO PEOPLE'S QUALITY OF LIFE AND PEOPLE'S PERCEPTION TOWARDS THE SERRA DA CAPIVARA NATIONAL PARK .....	126
IV.5.1 - METHODOLOGY .....	126
IV.5.2 - ANALYSIS OF THE QUESTIONNAIRES .....	129
IV.5.3 - SUMMARY OF THE DATA ANALYSIS .....	131
<b>CHAPTER V: CONCLUSION</b> .....	134
V. 1 - ACHIEVEMENTS, LIMITATIONS AND DIFFICULTIES .....	135
V. 2 - SUGGESTED METHODOLOGY FOR APPROACHING THE INTERFACE SOCIETAL-NATURAL SYSTEMS .....	136
V. 3 - SUGGESTIONS FOR SYNERGETIC PROMOTION OF BIODIVERSITY CONSERVATION AND HUMAN HEALTH .....	137
V.4 - FINAL COMMENTS .....	138
<b>REFERENCES</b> .....	141



## PREFACE

This book resulted from my own effort to publish and widely distribute my Ph.D. Thesis, successfully defended on 26<sup>th</sup> January 1998 as a requirement to be admitted to the Degree of Doctor of Philosophy by the University of Edinburgh, which was entitled “Biodiversity Conservation, Human Health and Sustainable Development: human ecological framework for assessing the contribution of protected areas to human health”.

A Ph.D. Thesis is expected to represent a rigorous intellectual development, to be an original contribution to knowledge, and to be written in a scholarly way. Therefore, there is no room for emotions, feelings, or personal messages. However, I decided to allow them in here, otherwise it wouldn't be my thesis. In this Preface I tell why and how I arrived here, I thank all those who contributed to this journey, I acknowledge the support provided for my work, and I finish with a quotation from a Shakespearean tragicomedy, written some 400 years ago, depicting my life when I finished the Ph.D.

My mother has always been a good storyteller. Among her stories, the ones based on her father's life had a deep influence on my own life. I grew up amid vivid images of my grandfather as a country doctor, a hunter, and one of the most influential politicians of the 20's-30's Brazilian scene. My grandfather invariably visited his patients riding a horse and used to take back home eggs, chicken or pigs after performing surgery on the dining table of his patient's candle-lit cottages. He never accepted cash payment, because he believed that by doing so he would discourage poor people from coming to him. He also never saw the payment he received from the Parliament; it went directly to my grandmother to cover part of the home expenses, and to subsidise his medical practice. His only hobby was hunting, which he suddenly stopped when one of his

hounds got rabies and he had to cull the other fifteen to prevent the spread of the disease.

I was taught early and almost simultaneously, at the age of five, to horse-ride, to apply intramuscular injections and to hunt. Despite the fact that I have always lived in cities, my childhood-teenage holidays were spent in every regions of the Brazilian countryside. The hunting trips had to be, every season, deeper and deeper into the country - it was visibly more and more difficult to find game. I never doubted that I would become a country doctor - people and nature fascinated me.

At the age of seventeen, I was classified as the first among some forty students who entered the Gama Filho Medical School. Seven years later, when I became a Medical Doctor, I had five years of theoretical studies plus university practice in internal medicine, surgery, paediatrics and gynaecology-obstetrics; I had organised for myself extra-curricular placements in labs, X-ray clinics, and as auxiliary-surgeon in a penitentiary hospital; I had attended ten extra-curricular courses, four symposia, four international congresses and one postgraduate course in Paris; I was co-author of three scientific papers, and was already employed. But I had also had the experience which was the most decisive to my professional life: my father got ill and died after three operations and twenty-one days in hospital - this was the longest and hardest placement I had ever had. Therefore, I decided to avoid hospitals, treatment, surgeries, and also the risk of eventually having to ask patients for payment; but at the same time I wanted to stay close to people and health issues. I opted for Public Health.

The option for Public Health brought me many privileges: I had the best Master I could have - Prof. Dr. Luiz Fernando Ferreira, who introduced me to the passion for science, gave me my first jobs, and became one of my best friends; I started working in the most important Brazilian institution in the health field - Oswaldo Cruz Foundation, the Moorish castle from my dreams; I presented a Constitutional Suggestion related to health care for indigenous populations to the Brazilian Parliament; and I experienced working with more than a dozen indigenous groups in the Amazon region, including the Yanomamis - from each of them I learned new paradigms of health/disease, of development/dependence, and of quality of life. And I also learned that other professionals, such as anthropologists, development workers, conservation biologists, and decision makers have their own languages, methods, and

belief-systems. My experience as a hunter in rainforests, savannahs and swamps added to the knowledge brought by the contact with traditional communities and multidisciplinary teams raised my environmental awareness. I wanted to bridge my health and environmental interests. But to develop this link I wanted to find a scientific framework which could embrace different backgrounds, disciplines and methodologies. Then, I came across Human Ecology.

A short-term *latu-sensu* postgraduate course on “Human Ecology: Human Activities and its Impact on Health and Environment”, was being offered for the first time in Brazil, by the Oswaldo Cruz Foundation, in collaboration with the Vrije Universiteit Brussel, Belgium, and the Göteborgs Universitet, Sweden. My attendance on the course instigated my will to develop further my knowledge on Human Ecology. Since there was no long-term formal training in Human Ecology in Brazil, I started to search for this possibility abroad, and I was informed that there were three postgraduate programmes in Europe: Vrije Universiteit Brussels, the University of Edinburgh, Scotland, and the Göteborgs Universitet. I wanted to develop a research proposal encompassing health and environmental concerns, then I was remembered an interesting project involving a national park and health activities, in which my friends at the Oswaldo Cruz Foundation have been participating for a long time. I visited the *Serra da Capivara* project, found it very challenging, and was welcomed to carry out my research there. So I developed my research proposal and, for family reasons, I decided on Edinburgh.

While at the Edinburgh University I improved my understanding of Human Ecology; carried out my scientific research involving fieldwork in Brazil, Costa Rica, Kazakstan and Poland; furthered my knowledge on the interface between societal and natural systems; perceived that, even in “developed” countries and “civilised” cultures, politics - at both academic and governmental spheres - too often impinge upon the direction in which science develops. Because of my innovative research I was invited to give occasional lectures at three universities in the United Kingdom and two in Poland, and to deliver papers at international congresses and symposia in Austria, Brazil, Denmark, England, Poland, South Africa and Ukraine. My work was extensively circulated in academic circles, by means of Abstracts and Proceedings Books of the above mentioned conferences; by short notes in journals and newsletters; as well as by original scientific articles published in peer-reviewed journals.

The recognition of this work led me to become member, co-ordinator, or fellow, at another 10 academic institutions or professional organisations - in England, Italy, Japan, Scotland, Switzerland and the United States. I was also awarded a Fellowship to do the writing-up of my Thesis at the Institute of Advanced Studies of the United Nations University, in Tokyo, Japan, where I also became Visiting Scientist at the Department of Human Ecology of the Graduate School of International Health, Faculty of Medicine, University of Tokyo.

But none of these achievements would have been possible without the excellent quality of life that we, myself and my family, experienced in Scotland. I want to express my eternal gratitude to those who contributed to our wonderful experience in Edinburgh.

First of all to my ex-wife, Thais, with whom I went through all the wonderful and, sometimes, challenging moments in Europe. Certainly without her loving and continuous support I would never have made it. Thais was in Scotland the wife I always dreamed for. After six months of mutual suffering caused by the distance between Brazil and Japan, when we finally met in Brasilia we find ourselves very different from the ones we left in Scotland. Unfortunately our marriage did not survive my return to Brazil, but I hope our friendship will.

To Jayara and Thales, Priscilla and Paulo, and Beatriz and João Thomas for having sheltered us in their homes. To Elizabeth Martin not only for being the first Brit to invite us to her table, but also for her continuous love and attention to my family. To Anne and Eugênio, and Jill and Bob for their love, allowing ourselves to become part of their families. To Francesca and Ulrich for the special attentions devoted to us on many occasions. To Moira, Leslie and Erik, Elizabeth McLeish and Elizabeth Peplow for initiating our children into unique stages of their education and, at the same time, for extending to their schools the loving environment that my children were used to, at home. To Lou and Jo; Prafulla and Shanti; Diana and Gavin; Gisela and Roney; Anna; Robério; Vânia and Saturnino; Tânia and Alcimar; Courtney; Ben; Neneta and Marcos; Margaret and Tom; Marilu and Trevor; Fatima and Hans; May and Creig; and Norma and Alastair for the love given to my family, which allowed us to feel at home, even being abroad.

My special thanks to Robert Brydon for leading me into Templarism and for Paul McGowan for inviting me to become a Squire under the mantle of Master Bob Brydon.

But our experience in Edinburgh would not have been so nice if we had not had the support of our families and friends in Brazil. I thank my family - my aunt, my uncle, my cousins and, in a particular way, my mother for her altruistic love, her weekly calls, and specially for coming to visit us twice. I also thank my ex-wife's family for their comprehension, support, affection, and their visits.

I am also grateful for the friendly support that I had during my numerous travels. My warmest thanks go

to Margot Parkes and Luc Hens in Brussels, Belgium;

to José Galizia Tundisi, Humberto Barreto Filho, Wagner Canhedo Filho in Brasília, Brazil;

to Niède Guidon, Anne-Marie Pessis, Rosa, Ideni and Vânia in Recife and São Raimundo Nonato, Brazil;

to Luiz Fernando Ferreira, Pedro Paulo Pannunzio, Aduino Araújo, Márcia Chame, Ulisses Confalonieri and Natalina Jordão, in Rio de Janeiro, Brazil;

to Daniel Janzen and Roger Blanco, in Guanacaste, Costa Rica;

to Eugen Garbowitsch in Karlsruhe, and Hans Scharf in München, Germany;

to Lillian and Heitor Gurgulino, Janina Sjostrom, Johanna Trüstedt, Kiyomi Yamazaki, Olaf Unteroberdörster, Heike Schröder, Akiko and Yuki Yamaguchi, Iara and Tarcísio Della Senta, Takaya Kawabe, Janis Gravitis, Ruytaro Ohtsuka, Sachio Miura, in Tokyo, Japan;

to Andrey Verkhovod, Alice and Vladimir Uvarov, Konstantin Makarevich, Alma Akinova and the three Sergej(s), in Almaty, Kazakstan;

to Rafal Serafin, Anna Trojan, Jan Dobrowolski, the Pilch family, Lezek Preisner, Alexandra Wagner, Irina Norska-Borowka, and the people at the Ariel Hotel, in Kraków, Poland;

to Tetiana Hardashuk in Kyiv, Ukraine;

and to Liz Hughes and John Aitchinson in Aberystwyth, Wales.

I want also to acknowledge the financial and academic supports I had for my Ph.D. work.

The main financial support for the PhD work (1993-1997) was provided by the Brazilian National Council for Scientific and Technological Development (*Bolsa de Doutorado Pleno no Exterior - 200.651/93-5 - CNPq*).

Occasional additional funding was also made available by the following institutions:

- The British Council (Brasília, Brazil, and Edinburgh, Scotland, 1993-1994);
- The James Rennie Bequest Fund of the Division of Biological Sciences, University of Edinburgh (Edinburgh, Scotland, 1994);
- The Konrad Zweig Trust (Edinburgh, Scotland, 1995);
- The European Community, through its International Association for the Promotion of Co-operation with Scientists from the New Independent States of the Former Soviet Union; Pan European Scientific Network - INTAS 93-1877 Grant (1996);
- The Institute of Advanced Studies of the United Nations University (Tokyo, Japan, 1997-1998).

First supervision for my Ph.D. work was provided by Professor Colin Whittemore, while co-supervision by Professor Anthony Clayton and Professor Ian Swingland. They all deserve special thanks.

Professor Whittemore (Head of the Institute of Ecology and Resource Management, University of Edinburgh) for overcoming the impossibility of first supervision from the Centre for Human Ecology, at that time under his headship. His reliably prompt practical support was very helpful to the progress of my research plan throughout and to the eventual preparation of the Thesis. His ethical posture not only freed me from the requirement of co-authorship, in papers not related to his field of expertise, but also granted me total access to the bench fees provided by CNPq, to cover the costs of various research trips. He also reviewed the latter drafts of the Thesis, providing important comments, and his knowledgeable advice not only enhanced my scientific education, but will always be remembered in my scholarly life.

Professor Clayton (firstly, Honorary Fellow of the University of Edinburgh's Centre for Human Ecology; latterly, Co-ordinator of the University of Edinburgh's Environmental Teaching and Research Office; and finally, Professor at the University of the West Indies' Centre for Environment and Development) for meticulously reviewing papers and suggesting corrections; and for organising support for my statistical analyses with Miss Frances Provan (Statistical Support for the Social Sciences Faculty), to whom I am also deeply grateful.

Professor Swingland (Director of the Durrell Institute of Conservation and Ecology, University of Kent at Canterbury) for his encouragement and for welcoming me to his Institute at a very critical



moment, when the process which culminated with the exclusion of Centre for Human Ecology from the University of Edinburgh was threatening the success of my work.

Dr Rafal Serafin (Polish Environmental Partnership, Kraków) had an important role as unofficial Ph.D. supervisor. I thank him very much for helping me to focus my research problem in the international academic context. His intellectual support, reviewing my research proposal and the outline of my Thesis, was of immense value for my work. And his personal attention, facilitating my access to many Polish organisations and to the World Commission on Protected Areas (IUCN's WCPA), allows me to include him among my dearest friends.

My sincere thanks also to both of my Thesis examiners, Professor Fernando Ávila-Pires (External Examiner) and Professor Peter Furley (Internal Examiner), for converting a stressful oral examination into a fascinating learning process.

I would like to express my deep gratitude to Ulrich Loening and Alastair McIntosh of the Centre for Human Ecology for having welcomed me; and to Mags Beechey, Sally West, and Laura MacDonald, at Edinburgh University, as well as Monica Paterson and Sheyla Lumsden at the British Council, for their support beyond their duties.

This research benefited very much from the fieldwork in Costa Rica, Kazakstan and Poland, and would not have been possible without the in-depth case-study in Brazil. For those who supported this fieldwork, specially the people who participated in the interviews and conversations, my sincere thanks. And for Adauto Araújo, who introduced me to Anne-Marie Pessis and Niède Guidon, and specially for them who welcomed my research at the Museum of American Man Foundation - FUMDHAM - and facilitated my access to the *Serra da Capivara* National Park, and to local data, my eternal gratitude.

In Brazil, the statistical analysis also received a substantive support from Alexandre Xavier Ywata de Carvalho, to whom I am deeply grateful.

In every paper that I wrote, every conference that I gave, and also in the Thesis, the painstaking touch of Jill Knox has been present. Jill improved not only my written English, but also my pronunciation, and even the inflection of my oral presentations. I know that for her it was very hard work to convert a long-phrasing Latin writer into something closer to an Anglo-Saxon scholar. If the text is readable, thanks to Jill;

the faults are entirely due to my stubbornness. For Jill my professional respect, gratitude, and my love.

I would like to thank Andrey Verkhovod and Vladimir Uvarov, as well as Anthony Clayton, for dedicating their times to our joint papers: ‘Clean Air and Drinking Water: Protected Areas Contributing to Human Health in Kazakstan’, and ‘The Holistic Concept of Health: a framework for linking the medical community with the conservation community’, respectively.

And last, but not least, I would like to thank all those that, in one way or another, also contributed to my work. They were many, and it would be impossible to remember all their names. Nevertheless, I will mention some of them: Adrian Philips; Affonso Guidão; Albanita de Olivaira; Allister Kydd; André Pessoa; Antônio José Rocha; Bob Brydon; Bradnee Chambers; Brendan Hill; Catherine Laurence; Carlos Mario Rodriguez; Carlos Eduardo Q.G de Souza; Celia Hensman; Celúlia Mauri; Cezar Victor do Espírito Santo; Christoph Bey; Christóvão Buarque; Cristina Piedras; Dan Morgan; Darrel Posey; David Crane; David Reid; Derek Blair; Devra Davis; Dimitrii Chernavskii; Dulce Martinelli; Eduardo Oswaldo Cruz; Edmundo Lopes; Eiji Hiranaka; Eli Ribeiro; Elisabeth Kessler; Elvira Sancho; Emmanuel Planas; Ewa Wennerstrand; Fábio de Jesus; Gaudenz Silberschmidt; Gill; Gislaine Visconti; Gustavo A.G. de Souza; Guy Capdeville; Heitor Damazio; Heloíso Bueno de Figueiredo; Hugh Syngé; Irene Eichhorst de Mattos; Irene Taitson; Jane Rosegrant; Janis Gravitis; Jeffrey McNeely; Jessy Pinheiro; Joan England; John Jeffers; John Scott; Jonathan Patz; Josefina Bayochi; Juha Uitto; Laura Greenwood; Lilian Corra; Lucio Sibia; Luz Maria Romero; Manuel Dengo; Marcelo Trindade and Dora Nascimento; Maria Zupancic-Vicar; Mariela Molina; Mário Diniz; Mark Simmons; Marquita Baird; Martin Harvey; Masahiro Umezaki; Mike Walkey; Mike Wilson; Mitchel Pimbert; Nick Wilding; Olympio Barbanti Júnior; Osbert Lancaster; Patrick LaViollete; Pedro Rosabal; Peter Crawshaw Júnior; Peter Evans; Peter Furley; Peter Merry; Peter Sollich; Peter van den Hazel; Renato Mesquita Fonseca; Robert Muetzelfeld; Robert Somody; Roberto Romizi; Roy Ellen; Sandra Charity; Sigufredo Marín; Simon Phipp; Stefanie Teggemann; Susan Smith; Tara O’Leary; Tarciso Lima; Tessa and Philipa Haden; Thierry Vaissiere; Thomas Lovejoy; Valerie Chambers; Vicky Hilton; Wallace Heim; Werner Nussbaumer; Yassi Naficy; and also the other friends and colleagues at the Centre for Human Ecology (CHE), at the

United Nations University's Institute of Advanced Studies (UNU/IAS), at the Department of Human Ecology of the Faculty of Medicine, University of Tokyo, and at the Catholic University of Brasília.

Finally, I realised that after a four-year effort, started in the British Isles and finished in the Honshu Island, I found myself in the same situation depicted in Prospero's last speech, in the Epilogue of *The Tempest*:

Now my charms are all o'erthrown,  
And what strength I have's mine own,  
Which is most faint. Now 'tis true  
I must be here confined by you

...

In this bare island by your spell;  
But release me from my bands  
With the help of your good hands.  
Gentle breath of yours my sails  
Must fill, or else my project fails,  
Which was to please. Now I want  
Spirits to enforce, art to enchant;  
And my ending is despair  
Unless I be relieved by prayer,  
Which pierces so, that it assaults  
Mercy itself, and frees all faults.  
As you from your crimes would pardoned be,  
Let your indulgence set me free.

(William Shakespeare, Whitehall, London, 1 November 1611)



## LIST OF TABLES

1. Changes in the area and volume of the Tuyuksu glacier, from 1979 to 1990 (adapted from Vilesov *et al.*, 1994) ..... 99
2. Changes in the area and volume of the Bogdanovich glacier, from 1979 to 1990 (adapted from Vilesov *et al.*, 1994) ..... 100
3. National and international institutions whose have collaborated and/or are collaborating, directly or indirectly, with FUNDHAM 118
4. Significant findings regarding the changes when comparing the two villages of *Sítio do Mocó* and *Borda* ..... 132

## LIST OF ACRONIMS AND ABBREVIATIONS

BID - Banco Interamericano de Desenvolvimento (Interamerican Bank for Development)

BP - Before Present

CBD - Convention on Biological Diversity

CIDA - Canadian International Development Agency

CIS - Commonwealth of Independent States

CNPq - Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Council for Scientific and Technological Development)

CNRS - Centre Nationale de la Recherche Scientifique (National Centre for Scientific Research)

DNA - Desoxiribo-Nucleic-Acid

EHAA - Effectiveness of Health-Affecting Activities

EHESS - École des Hautes Études en Sciences Sociales (Scholl of High Studies in Social Sciences)

EMBRAPA - Empresa Brasileira de Pesquisas Agropecuárias (Brazilian Enterprise for Researches on Agriculture and Cattle)

EMRATUR - Empresa Brasileira de Turismo (Brazilian Enterprise of Tourism)

ENSP - escola Nacional de Saúde Pública (National School of Public Health)

FAO - Food and Agricultural Organization

FINEP - Financiadora de Estudos e Pesquisas (Studies and Projects Fund)

FIOCRUZ - Fundação Oswaldo Cruz (Oswaldo Cruz Foundation)

FUMDHAM - Fundação Museu do Homem Americano (Museum of the American Man Foundation)

GDP - Gros Domestic Product

HDI - Human Development Index

HH - Household

IBAMA - Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of the Environment and Renewable Resources)

ICD - Integrated Conservation-Development  
ICDP - Integrated Conservation-Development Project  
IMF - International Monetary Fund  
INBio - National institute of Biodiversity (in Costa Rica)  
IUCN - The World Conservation Union (formerly The International Union for Conservation of Nature)  
LBA - Legião Brasileira de Assistência (Brazilian Legion of Assistance)  
NACs - Núcleos de Apoio Comunitário (Community Support Centres)  
NAPE - National Association of Physicians for the Environment  
NFH - Need for Health  
NIH - National Institutes of Health  
NPSC - National Park of Serra da Capivara  
NSF - National Science Foundation  
PAHO - Pan American Health Organization  
PEC - Primary Environmental Care  
PIEMTUR - Empresa de Turismo do Piauí (Piauí Enterprise for Tourism)  
RNA - Ribo-Nucleic-Acid  
SOH - State of Health  
SUCAN - Superintendência de Campanhas (Superintendency of Campaigns)  
UK - The United Kingdom  
UN - United Nations  
UNCED - United Nations Conference on Environment and Development  
UNCSD - United Nations on Sustainable Development  
UNDP - United Nations Development Program  
UNED-UK - United Nations Environment and Development- United Kingdom  
UNEP - United Nation Environment Program  
UNESCO - United Nations Educational, Scientific and Cultural Organization  
UNICAMP - University of Campinas  
UNICEF - United Nations International Children's Emergency Fund  
US - The United States of America  
USA - The United States of America  
USTIC - United States Trade Industry and Commerce  
WCED - World Commission on Environment and Development (known as the Brundtland Commission)

WCPA – IUCN’s World Commission on Protected Areas

WCPA - World Commission on Protected Area (formerly Commission on National Parks and Protected Areas - CNPPA)

WHO - World Health Organisation

WRI - World Resources Institute

WWF - The World Fund for Nature (formerly The World Wildlife Fund)



## CHAPTER I

### OVERVIEW

#### *I. 1 - Introduction*

This study is primarily addressed to the academic community at the University of Edinburgh, in fulfilment of the thesis requirement for the Degree of Doctor of Philosophy. Therefore, it is written in accordance with the University of Edinburgh's Nature and Objectives of the Ph.D. Degree (1987), as well as with Russel (1992). Other authors also provided guidelines on how to write a Doctoral Thesis, such as Allan and Skinner (1993), Barrass (1995), Booth (1994), Becker (1992), Eco (1994), Kane (1991), Phillips and Pugh (1994), and Rey (1987).

Nevertheless, the author is also concerned with a wide market of scholars of the conservation community, as well as with planning and managing professionals, government personnel, non-governmental organisations, and community leaders who are seeking innovative ways for committing people to protected areas. The medical community, that needs to re-think the paradigm of health and shift the emphasis towards its holistic concept, is also envisaged.

The classical division of a scientific publication in "Material & Methods"; "Results"; "Discussion"; and "Conclusion" was intentionally avoided, because this Thesis does not describe a controlled experiment.

Instead, it is the result of a case-oriented approach to research in Human Ecology, called interactive-adaptive research (Serafin, 1991), that will be explained in detail when this author analyses the methods in Human Ecology. The Thesis is, thus, organised in five chapters, this first presenting an overview of the whole work, while Chapters II, III, IV, and V cover, respectively, what Phillips and Pugh (1994) call background theory, focal theory, data theory and contribution.

### ***I. 2 - Chosen Problem, Hypothesis and Research Questions***

The problem that was chosen for this work is the challenge facing professionals working in protected areas: to find ways of demonstrating that the conservation of biodiversity and its sustainable use have a fundamental relevance to the daily lives of people, including those who may never visit a protected area (IUCN, 1994); there is a need to emphasise the purposes of protected areas as contributing to the quality of life.

The hypothesis raised is two-fold : (1) *in-situ* biodiversity conservation, promoted by protected areas, benefits human health, whereas human health is holistically understood as quality of life; and (2) when quality of life is improved, people's perception towards the protected area is also improved. To check this hypothesis, a number of research questions apply:

- are there ways in which protected areas benefit human health ?
- if so, is it possible to find examples with different degrees of tangibility ?

- if so, can these examples be found in both developed and developing countries, and in different ecological and cultural systems, across the world?
- if so, is it possible to assess at least one of these examples in terms of the changes to people's quality of life and to people's perception towards their nearby protected area?

### ***1. 3 - Background and Key-Concepts***

The United Nations Conference on Environment and Development - UNCED (Rio de Janeiro, June 1992), reaffirming the Declaration of the United Nations Conference on the Human Environment (Stockholm, June 1972), adopted the Rio Declaration on Environment and Development, which proclaims: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature". It also states that "In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it." These principles are also expressed in other binding documents, such as the Agenda 21 and the Convention on Biological Diversity. They bolster the link between biodiversity conservation, human health and sustainable development: the framework of this Thesis, presented in Chapter II by means of a literature review.

The literature that covers the three key-concepts of this study - Human Ecology, Biological Diversity and Human Health - is also reviewed in Chapter II. The history, methods, scope and limitations of Human Ecology, as well as the implications, history and needs for *in-situ* conservation of Biological Diversity are highlighted. The holistic and official definition of Human Health is reinforced, as an choice to the

dominant disease-oriented approach, and its validity as a conceptual alternative for sustainable development is argued.

#### ***I. 4 - The Focal Theory***

Eight ways in which protected areas can improve human health are developed in Chapter III, in response to the first three research questions. Four of these health benefits of protected areas are briefly described and remain as anecdotal evidence, while the other four are better explored through fieldwork in Brazil, Costa Rica, Poland and Kazakstan.

These health benefits of protected areas constitute an original and innovative contribution to academics, decision-makers and protected-area managers interested in improving the relation between local communities and *in-situ* biodiversity conservation, worldwide. They represent the “Focal Theory” which, according to Phillips and Pugh (1994), is the generation of the narrow hypothesis, the use of the author’s own data and analysis to push forward the academic discussion, rather than a mere bibliographic review.

#### ***I. 5 - Data***

The example of the Integrated Conservation-Development Projects (ICDP) carried-out at the *Serra da Capivara* National Park, Brazil, is further scrutinised in Chapter IV, “to assess at least one of these examples in terms of the improvements to people’s quality of life and to people’s perception towards their nearby protected area” - the

last of the research questions. An in-depth case-study is performed, combining qualitative and quantitative data. The village that suffers more impact - both in terms of time and intensity of contact with the activities locally performed - is compared with a control-village. Changes in lifestyle, education levels, access to health-care, employment opportunities and health standards were evidenced by the qualitative data. The quantitative analysis suggested that the improvements in the housing conditions, water supply, storage and treatment, as well as in the perception of the villagers towards the Park and the ICDP activities were more significant in the village affected by the ICDP, than in the control village.

Case study methodology in Human Ecology is used to allow trans- and interdisciplinarity, integrated modes of enquiry, and the combination of the quantitative scientific data with qualitative data from the social sciences. Case study methodology applies when the investigator has little control over events and when the relevant behaviours cannot be manipulated; it also applies when the focus is on a contemporary phenomenon within some real-life context; and, especially, when the boundaries between phenomenon and context are not clearly evident. The case study methodology allows an investigation to retain the holistic and meaningful characteristics of real-life events; it copes with the technically distinctive situation in which there will be many more variables of interest than data points. It relies on multiple sources of evidence, such as documents, archival records, observation and interviews, as well as surveys, with data needing to converge in a multi triangulating fashion which incorporates multiple sources of evidence (data triangulation), of methods (methodological triangulation) and of perspectives (theory triangulation).

### ***I. 6 -Assessment of Findings and Contribution***

The assessment of the research findings and the contribution of this work are summarised in Chapter V. What has been discovered, by pulling together the research questions; the achievements, limitations and difficulties; as well as the opportunities for further work are identified.

## CHAPTER II

# BACKGROUND AND KEY-CONCEPTS

### *II.1 - Introduction*

This Chapter constitutes what Phillips and Pugh (1994) call background theory: a literature review providing background for the problem chosen, and presenting the state of the art (present developments, controversies, breakthroughs) of the three key-concepts on which this study is based - Human Ecology, Biological Diversity and Human Health.

### *II.2 - Background*

The United Nations Conference on Environment and Development - UNCED (Rio de Janeiro, June 1992), reaffirming the Declaration of the United Nations Conference on the Human Environment (Stockholm, June 1972), adopt the Rio Declaration on Environment and Development, which proclaims:

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature. ... In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be

considered in isolation from it. ... Indigenous people and their communities, and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices.

These three principles bolster the link between biodiversity conservation, human health and sustainability: the framework of this Thesis; as well as supporting the use of practical examples from local communities related to National Parks.

On the one hand, the need to better understand the interactions between health, sustainable living and environmental conservation has been supported by various scholars. Dubos (1970) recognised:

Understanding the effects of the environment forces on man is thus the fundamental basis of the physician's art; health is the expression of harmony among the environment, the ways of life, and the various components of man's nature.

With Norton (1991), the usefulness of a framework which integrates concepts of health promotion to environmental management can be better understood:

environmentalists and environmental managers, following Aldo Leopold, have often availed themselves of analogies from medicine to explain, at least metaphorically, a general standard that we should manage so as to protect the health and integrity of ecological systems. ... The health analogy suggests that the object of management, analogous to the human patient, is a dynamic, changing system rather than a static, unchanging machine. The health analogy and its associated organic metaphor lead us to another, equally fruitful analogy: because ecological systems are more like organisms than they are like machines, conservation biologists and environmental managers



are more like physicians than they are like mechanics. I think the analogy is useful, also, in understanding the role of environmental managers and conservation biologists in the larger society. On the one hand, like physicians, they act to protect and enhance the well-being of their “patients”, the living systems, which are the object of their therapeutic practices. But on the other hand, like physicians, managers also have a broader public responsibility. Because medical practice affects larger social goals and because the exact nature of human health is not a sharply defined concept, physicians have an obligation to participate in a public debate regarding the meaning of “health” and the goals of medical practice and health policy. Similarly, conservation biologists and environmental managers have a professional obligation to participate in public debate regarding the meaning to be attached by our society to ecosystem health and regarding the goals of conservation practice. ... Carrying this analogy of environmental managers with physicians further, it is possible to borrow concepts from the theory of medicine, in order to propose and illuminate important choices in the practice of environmental management. For example, the discussion of “holistic” medicine as an alternative or supplement to the usual reactive practices of treating specific illness as they arise may prove a useful formulation of important differences in management approaches. Another analogy, one that seems to have guided Leopold’s thinking in a number of situations, is an application of the idea of preventive medicine to management. It is tempting, then, to press forward with the analogies, and to examine substantive norms of human health as a guide to providing a definition of ecosystem health.

And, according to Sachs (1993), the task of combining social, ecological and economic concerns subordinated to an ultimate ethical regulation requires a major theoretical effort, and it is necessary for

every country to design a transition strategy towards socially equitable, ecologically prudent and economically efficient development adapted to its particular natural, cultural and socio-political environment.

On the other hand, several International binding agreements reaffirm the need to develop scientifically-sound strategies to implement, locally and nationally, international policies concerning both sustainable development and environmental conservation. Five international documents - the World Conservation Strategy; the Caracas Declaration on Protected Areas and the Human Future; the Agenda 21; the Convention on Biological Diversity; and Parks for Life: Action for Protected Areas in Europe - provided background to this research.

The World Conservation Strategy (IUCN/UNEP/WWF, 1980) is now seen as a key document aiming at reorienting “development” into a more sustainable form. When it comes to health matters, it calls for action to “provide the services that will promote a long and healthy life” (Action 3.3) arguing that:

one of the major benefits of economic development in the lower income countries should be improved health care. ... Primary health care needs to be strengthened in many countries as part of wider social policies.

Another important Action (3.5) requires development of more meaningful indicators of life and monitoring the extent to which they are achieved. The call is for governments, international organisations and the academic community to:

review the parameters (including environmental quality measures) that might be combined to measure the quality of life, support the improvement of the Human Development Index prepared by the United Nations Development Programme, undertake surveys to determine where and how far policies are succeeding in enhancing the quality of life and what the obstacles are to better performance.

The Caracas Declaration on Protected Areas and the Human Future (IUCN, 1992) is the basis for park and protected areas management and planning for the next decade. It recognises:

Many people must modify their styles of living and the world community must adopt new and equitable styles of development, based on the care and sustainable use of the environment, and the safeguarding of global life support systems. ... [Protected areas] provide major direct and indirect benefits to local and national economies and models for sustainable conservation which may be applied elsewhere in the world.

According to Robinson (1993), the Agenda 21 is a comprehensive and far-reaching programme for sustainable development and constitutes the centrepiece of international co-operation and co-ordination activities within the United Nations system for many years to come. The following eight chapters are directly related to this work, and some extracts are worth quoting:

#### CHAPTER 1 - PREAMBLE

The broadest public participation and the active involvement of the non-governmental organisations and other groups should ... be encouraged.... In the implementation of the relevant programme areas identified in Agenda 21, special attention should be given to the particular circumstances facing the economies in transition. It must also be recognised that these countries are facing unprecedented challenges in transforming their economies, in some cases in the midst of considerable social and political tension. ... Agenda 21 is a dynamic programme. It will be carried out by the various actors according to the different situations, capacities and priorities of countries and in full respect of all the principles contained in the Rio Declaration on Environment and Development. It could evolve

over time in the light of changing needs and circumstances. This process marks the beginning of a new global partnership for sustainable development.

### CHAPTER 3 - COMBATING POVERTY

... An effective strategy for tackling the problems of poverty, development and environment simultaneously should begin by focusing on resources, production and people and should cover demographic issues, enhanced health care and education, the rights of women, the role of youth and of indigenous people and local communities.... Activities that will contribute to the integrated promotion of sustainable livelihoods and environmental protection cover a variety of sectoral interventions involving a range of actors, from local to global, and are essential at every level, especially the community and local levels....

### CHAPTER 6 - PROTECTION AND PROMOTION OF HUMAN HEALTH

Health and development are intimately interconnected. Both insufficient development leading to poverty and inappropriate development resulting in over consumption, coupled with an expanding world population, can result in severe environmental health problems in both developing and developed nations.... Action items under Agenda 21 must address the primary health needs of the world's population, since they are integral to the achievement of the goals of sustainable development and primary environmental care. The linkage of health, environmental and socio-economic improvements requires intersectoral efforts. Such efforts, involving education, housing, public works and community groups, including businesses, schools and universities and religious, civic and cultural organisations, are aimed at enabling people in their communities to ensure sustainable development. Particularly relevant is the

inclusion of prevention programs rather than relying solely on remediation and treatment....Health ultimately depends on the ability to manage successfully the interaction between the physical, spiritual, biological and economic/social environment. Sound development is not possible without a healthy population; ... The health sector cannot meet basic needs and objectives on its own; it is dependent on social, economic and spiritual development, while directly contributing to such development. It is also dependent on a healthy environment ... Within the overall strategy to achieve health for all by the year 2000, the objectives are to meet the basic health needs of rural peri-urban and urban populations; to provide the necessary specialised environmental health services; and to co-ordinate the involvement of citizens, the health sector, the health-related sectors and relevant non-health sectors (business, social, educational and religious institutions) in solutions to health problems. As a matter of priority, health service coverage should be achieved for population groups in greatest need, particularly those living in rural areas.

## CHAPTER 7 - PROMOTING SUSTAINABLE HUMAN SETTLEMENT DEVELOPMENT

... The overall human settlement objective is to improve the social, economic and environmental quality of human settlements and the living and working environments of all people, in particular the urban and rural poor. Such improvement should be based on technical co-operation activities, partnerships among the public, private and community sectors and participation in the decision-making process by community groups and special interest groups. ... All countries, especially developing ones, should, as appropriate, formulate and implement programs to reduce the impact of the phenomenon of rural to urban drift by improving rural living conditions....

## CHAPTER 8 - INTEGRATING ENVIRONMENT AND DEVELOPMENT IN DECISION-MAKING

... New forms of dialogue are ... being developed for achieving better integration among national and local government, industry, science, environmental groups and the public in the process of developing effective approaches to environment and development. The responsibility for bringing about changes lies with Governments in partnership with the private sector and local authorities, and in collaboration with national, regional and international organisations.... Exchange of experience between countries can also be significant.

## CHAPTER 15 - CONSERVATION OF BIOLOGICAL DIVERSITY

... Our planet's essential goods and services depend on the variety and variability of genes, species, populations and ecosystems. Biological resources feed and clothe us and provide housing, medicines and spiritual nourishment. The natural ecosystems of forests, savannahs, pastures and rangelands, deserts, tundras, rivers, lakes and seas contain most of the Earth's biodiversity.... Urgent and decisive action is needed to conserve and maintain genes, species and ecosystems, with a view to the sustainable management and use of biological resources.... The participation and support of local communities are elements essential to the success of such an approach....

## CHAPTER 31 - SCIENTIFIC AND TECHNOLOGICAL COMMUNITY

... It is important that the role of science and technology in human affairs be more widely known and better understood, both by decision makers who help determine public policy and by the general public. The co-operative relationship existing

between the scientific and technological community and the general public should be extended and deepened into a full partnership. Improved communication and co-operation between the scientific and technological community and decision makers will facilitate greater use of scientific and technical information and knowledge in policies and programme implementation.... Existing multidisciplinary approaches will have to be strengthened and more interdisciplinary studies developed between the scientific and technological community and policy makers and with the general public to provide leadership and practical know-how to the concept of sustainable development. The public should be assisted in communicating their sentiments to the scientific and technological community concerning how science and technology might be better managed to affect their lives in a beneficial way.... The scientific and technological community and policy makers should increase their interaction in order to implement strategies for sustainable development on the basis of the best available knowledge. This implies that decision makers should provide the necessary framework for rigorous research and for full and open communication of the findings of the scientific and technological community, and develop with it ways in which research results and the concerns stemming from the findings can be communicated to decision-making bodies so as to better link scientific and technical knowledge with strategic policy and programme formulation. At the same time, this dialogue would assist the scientific and technological community in developing priorities for research and proposing actions for constructive solutions....

## CHAPTER 35 - SCIENCE FOR SUSTAINABLE DEVELOPMENT

... One role of the sciences should be to provide information to better enable formulation and selection of environment and

development policies in the decision-making process.... The sciences are playing an important role in linking the fundamental significance of the Earth system as life support to appropriate strategies for development which build on its continued functioning. The sciences should continue to play an increasing role in providing for an improvement in the efficiency of resource utilisation and in finding new development practices, resources, and alternatives.... There needs to be an increased output from the sciences in order to enhance understanding and facilitate interaction between science and society.... One key objective is to improve and increase the fundamental understanding of the linkages between human and natural environmental systems and improve the analytical and predictive tools required to better understand the environmental impacts of development options by: ... Integrating physical, economic and social sciences in order better to understand the impacts of economic and social behaviour on the environment and of environmental degradation on local and global economies....

The Convention on Biological Diversity recognises in its Preamble:

The close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources, and the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of its components. ... the importance of, and the need to promote international, regional and global co-operation among States and intergovernmental organisations and the non-governmental sector for the conservation of biological diversity and the sustainable use of its components. ... economic and social development and poverty eradication



are the first and overriding priorities for developing countries, aware that conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population.

Parks for Life: Action for Protected Areas in Europe (IUCN, 1994) forms a basis for European conservation over the next decade. The message of the Plan is that conservation and protected areas must be redefined to serve more explicitly the goal of sustainability of economy and society. It summarises:

The greatest challenge facing protected area professionals and all environmentalists today is to find new ways of demonstrating that the conservation of nature and the sustainable use of natural resources has a fundamental relevance to the daily lives of people, including those who may never visit a protected area.... Park and protected area managers need to emphasise the enduring human purposes of parks and protected areas as contributing to the quality of life.... If the aim is for all people to be for parks, then it must be demonstrated far more clear that parks are for people.

## ***II.3 - Human Ecology***

### **II.3.1 - Concept**

The term ecology was first used by Haeckel in 1866. The beginning of the XX Century saw the establishment of ecological societies, and since the '40s ecology evolved from a descriptive towards an experimental and applied science. The birth of Human Ecology (1890-1923) was the result of the contact between urban planners and ecologists, influenced by several fields of knowledge, such as plant

biology, sociology, geography, cultural and social anthropology, psychology, philosophy (ethics), as well as by applied sciences. Since the '60s, the confrontation with problems of pollution and resources management which could not be solved on a simple disciplinary basis led to the development of a broad and interdisciplinary approach. As a discipline Human Ecology is both science and art. As an applied discipline, it seeks to identify the forces which enhance human development, actualise human potential, optimise human functioning and improve the quality of life of people.

This author sees Human Ecology as:

- the study of the interactions between humans and their complete environment; these studies are principally directed towards (1) the natural circumstances of human societies, (2) the traditions, the social Organization and the technology which are basic elements of these societies and (3) the strategies which are useful for survival and development;
- the study of the ways in which the social structure adapts to the quantity and quality of natural resources. It sees the biological, environmental, demographic and technical conditions of the life of any human group as being interrelated factors which determine the form and function of their cultural and social system.

As in Tengstrom (1985), Human Ecology is an interdisciplinary field which emphasises the interaction between man and his total environment and stresses the holistic aspect of the knowledge.

Today, Human Ecology may involve engineering, architecture and landscape architecture, environmental planning, public health and social medicine, and nature conservation, among its many areas of interest. The complete and up-to-date position of Machado (1984) sees Human Ecology not as a synthesis of all the sciences, nor as a study at the fringes of other disciplines, nor yet, as the sum of limitations of other sciences. Above all, it is a new way of thinking of the attainments of different disciplines.

Avila-Pires (1983) agrees that Human Ecology embraces the study of the various dimensions of the human beings, usually fragmented in different disciplines. He understands that Human Ecology may involve environmental studies, cultural ecology, medical geography and medical ecology, and studies on the linkages between development and health.

### II.3.2 - Methods in Human Ecology

In Human Ecology the subject is interdisciplinary in character, that is, the field of research, including methods, is taken from different disciplines and the research questions are broader and might be seen as more innovative than in the specialist disciplines. The reason for this is that a new interdisciplinary field is not limited or bound by traditional theories, methods and research fields (Follér 1992). Jungen (1985) has pointed out that the great difficulty of Human Ecology is having to combine the quantitative data of science with the qualitative data from the social sciences or the humanities. For Tengstrom (1985) the choice of several instruments of work depends very much on the kind of study that has to be carried out: the collection of data (to be used or not by new systems of analysis), the critical assessment of literary sources, the use of mathematical methods, etc., there being a rich variety of methods associated with further development of Human Ecology.

The research method that seems to cope with this wide range of different requirements posed by the human ecological approach is the 'case study'. Yin (1994) understands that case studies are the preferred strategy when "how" or "why" questions are being posed, because such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence; when the investigator has little control over events and when the relevant behaviours cannot be manipulated; when the focus is on a contemporary phenomenon within some real-life context; and, specially, when the boundaries between phenomenon and context are not clearly evident.

The case study inquiry allows an investigation to retain the holistic and meaningful characteristics of real-life events - such as individual life cycles, organisational and managerial processes, neighbourhood change, international relations; copes with the technically distinctive situation in which there will be many more variables of interest than data points; relies on multiple sources of evidence, with data needing to converge in a triangulating fashion; and, benefits from the prior development of theoretical propositions to guide data collection and analysis. Rose (1993) refers to a study carried out by Buchanan and Body in 1983 in which case study was chosen to enable “fresh insights into new and poorly structured problems”, and “to collect data that was rich and interesting, rather than rigorous, and to generate ideas and hypotheses for future research.”

Regarding its “pros and cons”, Yin (1994) states: “Its unique strength is its ability to deal with a full variety of evidence: documents, artefacts, interviews and observations”, and continues:

The greatest concern about case study strategy has been the lack of rigor of case study research.... A second concern about case studies is that they provide little basis for scientific generalisation.... Case studies are generalisable to theoretical propositions and not to populations or universes. In this sense the case study ... does not represent a “sample”, and the investigators goal is to expand and generalise theories (analytic generalisation) and not to enumerate frequencies (statistical generalisation).... A third frequent complaint about case studies is that they take too long, and they result in massive, unreadable documents.

Nevertheless, Rose (1993) notes that a strategy of multiple triangulation, using multiple methods, multiple data sources, multiple observers and multiple levels of analysis may help to overcome a potential methodological weakness of case study strategy.

Regarding the number of cases to be studied, Yin (1994) understands that there are three rationales that serves as the main reasons for conducting a single case study:

One rationale for a single case is when it represents the critical case in testing a well-formulated theory.... To confirm, challenge, or to extend the theory, there may exist a single case, meeting all the conditions for testing the theory.... A second rationale for a single case is one in which the case represents an extreme or unique case.... A third rationale for a single case study is the revelatory case. This situation exists when an investigator has an opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation.

Regarding the choice of cases to be studied, Hammersley (1992) underlines:

It is worth noting that where the case study strategy is adopted cases are sometimes selected for investigation on the basis of their atypicality.... As the number of cases investigated is reduced, the amount of detail that can be collected on each case is increased, and the chances of being error in the information probably reduces too.... Even where we are carrying out an intensive study of one case, we may be able to make brief investigations of one more or other cases in order to assess the ways in which our primary case is or is not representative of the larger population that is of concern.

Finally, regarding the design of the study, Yin (1994) recognises that “a case study design is not something completed only at the outset of a study. The design can be altered and revised after the initial stages of a study”.

Nelson (1991), in his paper about interactive, adaptive approach to research in human ecology affirms:

Although all research - all serious inquiry - tends to be complex, this especially appears to be the case in ... human ecology.... With so much complexity and change, with so much cerebral baggage influencing us constantly, it is difficult to envision the selection of a research path which will lead without deviation to an anticipated end-point. Initial assumptions may come into doubt as the research proceeds or methods prove inappropriate or impractical.... Constant scooping of the research context is all the more important in complex and dynamic fields such as human ecology.... Researchers working in such context need a flexible mindset.... In addition to the more traditional academic, professional, or technical skills, such researchers can benefit from methods or techniques of working with people of varied backgrounds and interests in co-operative ways. Among the seemingly appropriate methods are small group meetings and workshops, and search conferences.

Serafin (1991) underlines that:

the value of interactive-adaptive research lies in its restatement of two principles long accepted in social research:

1. Field studies, research design and the collection and interpretation of data take place simultaneously and continuously. The process is always unfinished and incomplete. The researcher must therefore be adaptable and flexible to changing circumstances, constrains and opportunities;
2. The data gathered during the research process (interviews, observations, library work) depends on the actions and activities of the researcher, the theoretical framework adopted, and this framework changes during the course of the research. Social research is in many ways unavoidably about the mind, ideas and beliefs of the researcher. Some process of self-reference

or reflection is necessary to help the researcher to distinguish his or her own expectations and interpretations from those offered by interviewees, reports and other sources.

He also states:

Comparison of case study situations offers a way of examining a complex social phenomenon without reducing it to 'relationships between variables' that risks missing the central theme of interest. This means pursuing inquiry in a way that focuses on what those most closely involved and affected consider to be the holistic and meaningful characteristics of the complex social situation of which they are part.... The participative nature of research is important because understanding of key processes and relationships that involve people is not readily derived from counting things. Such understanding is rooted in stories of how the world works. The way to get such stories is to talk with knowledgeable people. That is to say, people who are involved in ... [a] situation of interest. They may either be responsible for making or be affected by the rules or invisible structures that interconnect.

To what extent and in what ways does the engagement of local communities in conservation activities result in life-style changes, which affect factors that impinge on health? To answer this question the theoretical framework to be used in this study must integrate medical, managerial, environmental and social issues, in a holistic approach. It has to come from an interdisciplinary field which emphasises the interaction between man and his total environment and stresses the holistic aspect of the knowledge - Human Ecology, as in Tengstrom (1985). "Human Ecology stands for the integration of concepts and a holistic view of the world. Therefore, it can form a link between science, technology and society", according to Berg (1991).

The idea of linking health to lifestyle, to the surrounding environment and, obviously, to medical care is neither original, nor new. It has been estimated, according to Follér (1992), that 50% of our health status is determined by lifestyle, 20% by environmental factors, 20% by genetic predisposition and 10% by the medical care system. From this analysis, it is clear that to design health promotion strategies to a determined population it is necessary to have information on, at least, the lifestyle and the environmental factors. “Airs, Waters and Places”, one of the most important treatises of Hippocratis can be regarded as a treatise on Human Ecology, and shows how the well-being of individuals is influenced by environmental factors, and that environmental effects are of primary importance in the Art of Medicine, according to Capra (1990).

Taking all this into consideration, the author decided to use in this study an interactive-adaptive approach, suitable to research in human ecology. This approach will guide and redirect, by means of the insights generated at scoping workshops and meetings with knowledgeable people throughout the research process, the design and extent of the data collection.

## ***II.4 - Biological Diversity***

### **II.4.1 - Concept and Implications**

The Convention on Biological Diversity, opened for signature in June 1992 at the United Nations Conference on Environment and Development (UNCED, the Rio “Earth Summit”), came into force on 29 December 1993. The Convention on Biological Diversity was inspired by the world community’s growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources.



The Convention stresses “the importance of, and the need to promote, international, regional and global co-operation among States and intergovernmental organisations and the non-governmental sector for the conservation of biological diversity and the sustainable use of its components”. It also recognises “that economic and social development and poverty eradication are the first and overriding priorities for developing countries, aware that conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population...” (UNEP, CBD 1994).

The Convention on Biological Diversity defines biological diversity as “the variability of all living organisms from all sources”, including “diversity within species, between species and of ecosystems”. It does not mean it is the sum of all ecosystems, species and genetic material. Rather, it is the variability between and among them. In fact, combining the diversity of genes, species and ecosystems together in one concept is a strange scientific notion. Biodiversity may be not a scientific concept, but it is the most powerful political concept ever invented for conservation. Its political incarnation - the Convention on Biological Diversity - has galvanised more people than any previous international conservation agreement. The provisions of the Convention reflect particularly well the difficult balance between conservation and development that every country has to tread. Countries are beginning to interpret the Convention in a holistic way, emphasising its social and economic aspects, rather than in solely scientific terms. Another remarkable feature of the Convention is how it has excited local communities. Community leaders see biodiversity not as a scientific issue but as a social and economic one, contributing to the development and well-being of their community. Indeed, some of the most successful projects to conserve biodiversity have been the ones implemented by local communities, pulling together all aspects of the biodiversity issue. The politicians have given support, the scientists have provided technical advice and know-how, but the local community has done the work and

carried the initiative forward (Akeroyd and Singe 1996).

## II.4.2 - Forms of Conservation of Biodiversity

Biodiversity conservation is accomplished in a number of ways. *Ex-situ* methods focus on species conservation in botanical gardens, zoos, gene banks, and captive breeding programs. *In-situ* methods use conservation areas as “warehouses” of biological information. Although viable populations of some organisms can be maintained *ex-situ* either under cultivation or in captivity, these methods are far less effective than *in-situ* methods, and, generally, they are extremely costly (Saunier and Meganck 1995).

## II.4.3 - Protected Areas

### II.4.3.1 - History and Evolution

The allocation and protection of areas for different types of current or even future use is not a new concept - conservation was already discussed in ancient Rome. Areas are set aside for hunting or as religious sanctuaries in many different cultures. The motive for making rules about the use of an area is often concern for future availability of a valued resource, such as timber or game. The nature conservation movement has, in contrast, often resulted in protection of areas for uses not based on extraction of resources, such as tourism, scientific research, and even the esoteric knowledge that an ecosystem is protected from human interference.

Protected areas, in the form of national parks and nature reserves, are an important element of the modern nature conservation movement. Before examining their current objectives and characteristics it is instructive to consider their history. Although the model for modern conservation policies and for the role of protected areas is generally believed to have originated in the United States (MacKinnon et al.

1986), local conditions and events independently shaped emerging nature conservation policies in the European colonies.

Conservation of forests and wildlife took the form of government intervention, with appropriation of land and imposition of regulations about the use of resources on that land. The earliest measures were forest reserves to ensure future timber supplies for national requirements. Later, areas were protected in response to largely urban, educated public opinion influenced by the aesthetic appeal of large mammals, by moral arguments that man's impact should not cause the extirpation of God's creatures, and by the long term and broader scale consequences of environmental degradation exposed by scientists. Those who maintained a livelihood or derived personal gain from continued access to the resources protested vigorously at their protection. It is clear that the extent of protection that resulted depended on the relative political power of the lobbies for and against conservation, and the ability of the Government to maintain protection once legislated.

The widespread creation of game reserves in Africa around the turn of the century is linked to the history of hunting in the continent (Mackenzie 1987). The first European economic interests in Africa were for slaves, gold and ivory. Although initially most trade took place at ports, relying on locals to procure the commodities, from the 1850s expeditions penetrated into the interior to find and exploit new sources. From this period adventurers came to Africa to seek fame and fortune, often supplied by large scale slaughter of elephant for ivory and rhino for its supposed aphrodisiac horn. As elephant populations declined other large mammals were increasingly targeted. Mackenzie defines three stages in the history of non-subsistence hunting in Africa, the first being commercial hunting and the second being hunting to support the period of European settlement and colonial expansion. Local favour was won by the provision of meat, to the extent that even missionaries found that their position and local acceptance were secured by hunting. Meat from wildlife also supported large work teams for colonial endeavours, notably for the construction of the railways.

The third phase of hunting history is described by Mackenzie

(1987) as “the Hunt”. Shooting large numbers of wild animals, preferably large mammals, became a fashionable sport. The drama of the huge expeditions, the impressive scenery, the plains teeming with game, the thrill of the hunt and the prestige of returning home with the trophies (horns, tusks and skins, often reassembled by taxidermists) all contributed to make “the Hunt” an emotive, romantic and highly respected activity. Some hunting was justified on scientific grounds, contributing to collections of the new Natural History Museums. The mythical qualities and social prestige of, “the Hunt” did much to promote the vision of Africa as an unpeopled wilderness where wildlife abounded, despite the fact that humans had been present in Africa for millions of years and were an integral part of the African landscape (Nash 1982, Mackenzie 1987).

Meanwhile the conservation movement was developing in America, perhaps from similar initial motives but with a different outcome. The first national park was established at Yellowstone in 1872, followed in the late 19th and early 20th century by others, including Yosemite, Sequoia, Rocky Mountain and Grand Canyon National Parks (Hays 1987). These areas were explicitly protected for the recreation and enjoyment of the general public (MacEwen and MacEwen 1982). Proposals for their protection came from East Coast urban, educated explorers, big game hunters and naturalists, who felt that the state should protect these scenic areas from private ownership and development that would deprive the nation of its assets. Local residents were suspicious of the national park concept until it became clear that the park would attract money-spending tourists (Nash 1982). With the advent of the railway and the increasing use of automobiles, the national parks and other wildlands were visited by increasing numbers of tourists, and the appreciation of nature, dramatic scenery and wilderness became a popular movement (Hays 1987). The first national parks created in Africa were Albert National Park in the Belgian Congo in 1925; and Kruger National Park in South Africa in 1926. The South African park was promoted by an English game warden, James Stevenson-Hamilton, who was concerned that protection of the Sabi Game Reserve was

ineffective, and persuaded the Government to confer greater protection using the economic arguments of potential income from tourism. The Albert National Park was rather different, as it was created in response to petitioning by scientists as a refuge to save the world's last gorillas and for scientific research. Entrance to the six million acre park was admitted only to research scientists and tourism was not allowed (Nash 1982).

Increasing public alarm over the disappearance of species as a result of man's activities has been an important factor in the growth of the conservation movement. The publicity given to the plight of some of the larger mammals, such as the elephant, the great whales and the giant panda, helped to fuel this alarm, and to stimulate campaigns for measures to be taken for their protection. One reaction has been to justify bringing them into zoos for captive breeding, and indeed some species which have become extinct in the wild, have been maintained in captivity, such as the California condor (*Gymnogyps californianus*) (Toone and Wallace 1994). However, such artificial conditions cannot be a viable long-term solution for all species, many of which probably require the conditions provided by their natural habitat for long term survival. A more satisfactory solution is to maintain their habitats. In this way many species may be "saved" in one area, including less obvious animals and plants such as endemic fungi, or insects which may not benefit from the same media attention. Many protected areas, like the Albert National Park, have been created to safeguard the habitat of an endangered species. Large mammals and other conspicuous organisms are still used as flagship species for fund-raising, and as indicators for monitoring the health of ecosystems, but many conservation organisations (such as World Wide Fund for Nature - WWF) have largely, dropped their single species approach and talk of protecting endangered ecosystems (WWF 1992).

#### II.4.3.2 - Present System

The World Conservation Strategy, prepared in 1980 by three

of the world's leading conservation agencies (The International Union for the Conservation of Nature - IUCN, WWF, and the United Nations Environment Programme - UNEP), marked a turning point for conservation. It stated that conservation of living resources is essential for human development, identifying three main objectives of conservation:

“to maintain essential ecological processes and life-support systems (such as soil regeneration and protection, the recycling of nutrients, and the cleansing of waters), on which human survival and development depend;

to preserve genetic diversity, on which depend the functioning of many of the aforementioned processes and life-support systems, the breeding programmes necessary for the protection and improvement of cultivated plants. Domesticated animals and micro-organisms, as well as much scientific and medical advance, technical innovation, and the security of the many industries that use living resources;

to ensure the sustainable use of species and ecosystems (notably fish and other wildlife, forests and grazing lands), which support millions of rural communities as well as major industries” (IUCN/UNEP/WWF 1980).

It realigned conservation motives, stressing utilitarian aspects and making a powerful case for conservation to go far beyond its previous wildlife protection sphere, to become a fundamental priority in all sectors. It argued that the future success of not only conservation, but also of development, relied on being able to integrate the two. It highlighted the case of developing countries, where natural resources may appear abundant but where large rural populations depend entirely upon their continued availability. These populations are growing rapidly,

and tropical ecosystems, such as rainforests, are often not resilient to disturbance (IUCN/UNEP/WWF 1980).

Within this new conservation ethos, protected areas are seen as a vital means to help safeguard the earth's biodiversity, and the old mantle of saving key species and representative ecosystems is assumed under this guise. However, their role in maintaining essential ecological functions, and as part of regional land use zones to promote sustainable use of resources, are also stressed. Many forest reserves do protect water catchment areas which supply water to extensive regions, supporting agriculture and other industries, as well as human populations in towns and cities. The continued presence of forest provides continuous, filtered water while clearance would cause drastic consequences such as flooding and drought. There is growing evidence that undisturbed forest helps to maintain local rainfall and keep down temperatures, which may be important for local agriculture. Protected areas may protect breeding grounds or enable seed dispersal of species harvested outside the area. For example mangrove areas are often important breeding grounds for fish and crustaceans on which fisheries depend (MacKinnon et al. 1986). A wide variety of types of protected areas are recognised, each type reflecting different motives and circumstances behind their creation (MacKinnon et al. 1986).

Through its World Commission on Protected Areas (WCPA, formerly called Commission on National Parks and Protected Areas, CNPPA), the World Conservation Union (IUCN) has given international guidance on the categorisation of protected areas for nearly a quarter of a century. As a first step, IUCN defined the term "national park" in 1969, and published a preliminary categories system in 1973. In 1978, IUCN published the report of the Commission on National Parks and Protected Areas, entitled "Categories, Objectives and Criteria for Protected Areas", which presented 10 categories. This system of categories has been widely used and has been incorporated in some national legislation, used in dialogue between the world's protected area managers, and has formed the organisational structure of the UN

List of National Parks and Protected Areas. Nonetheless, experience has shown that the 1978 categories system was in need of review and updating:

- the differences between certain categories was not always clear;
- the treatment of marine conservation needed strengthening;
- categories IX and X were not discrete management categories, but international designations generally overlain on other categories;
- some of the criteria have been found to be in need of a rather more flexible interpretation to meet the varying conditions around the world;
- and finally, the language used to describe some of the concepts underlying the categorisation needed updating, reflecting new understandings of the natural environment and of human interactions with it, which have emerged over recent years.

In 1984, therefore, CNPPA set up a task force to review the categories system and revise it as necessary. The report of the task force was presented to a CNPPA meeting in 1990, and was referred to a wider review at the Fourth World Congress on National Parks and Protected Areas, at Caracas, Venezuela, in 1992. An early production of guidelines to replace those adopted in 1978 was suggested, and were finally published in 1994. The new categories system presented 6 categories, as follows:

- 1A - Strict Nature Reserve (protected area managed mainly for science);
- 1B - Wilderness Area (protected area, managed mainly for wilderness protection);
- 2 - National Park (protected area, managed mainly for ecosystem protection and recreation);
- 3 - Natural Monument (protected area, managed mainly for conservation of specific natural features);
- 4 - Habitat/Species Management Area (protected area, managed mainly for conservation through management



- intervention);
- 5 - Protected Landscape/Seascape (protected area, managed mainly for landscape/seascape conservation and recreation) (IUCN 1994).

#### II.4.3.3 - Interaction with People

Many difficulties stem from the view of protected areas as wildlife sanctuaries that need protection from any direct human interference, and are managed by ecologists and scientists. In reality many protected areas are under pressure from continuing human use, and have been progressively eroded. In some cases the animals they were created to protect have been selectively extracted by poaching. In some areas resources outside the protected areas became degraded, making it inevitable that resources in the reserve would be used next. Such reserves clearly do not have good prospects for long term survival without intensive policing and law enforcement. Many developing countries simply do not have the resources, or in some cases the political will, to maintain expensive and unpopular support of protected areas. The clear fact is that conflicts exist over most protected areas.

Protected areas represent a store of often valuable resources such as agricultural land, protein, timber, firewood, or valuable minerals. Their use is usually either prohibited or severely restricted. There are often many groups that have an interest in gaining access to those resources, or indeed in maintaining the protected area, for example for tourist income or international prestige. Abel and Blaikie (1986) identified six different groups with conflicting interests and power with respect to the Luangwa valley protected areas system in Zambia: local hunter-cultivators, safari hunters, conservation pressure groups, international scientists, politicians and administrators, and commercial poachers.

In addition to this natural resource issue, the other main reason why protected areas are difficult to maintain is because of the differential power of the various parties. In other words, the issue is highly politicised.

Often those who make the decisions about the creation of protected areas are not aware of, or perhaps concerned about, the conflicting interests of other groups. Protected areas nearly always represent intervention by central government, and they have usually been created through appropriation of land and imposition of restrictions. The creation of a protected area may seem a very good idea at the national level, giving a government a good image internationally, encouraging financial and technical assistance, and visits by foreign tourists who bring valuable foreign currency into the country. However, the creation of a protected area may seem a devastating injustice to subsistence farmers who are deprived of valuable land for cultivation or pasture, and who in some cases are evicted from their ancestral homes. Although politically marginalised groups may not seem relevant when reserves are created, they become highly relevant many years later when it becomes clear that the reserves are unmanageable without their support.

Conflicts with local people are common around protected areas as a result of various pressures. Access to traditionally used resources is often restricted; in some cases involving displacement of villages (Hough 1988). Resource deprivation may be exacerbated by rising populations (Lusigi 1981, Prins 1992). There may be disruption of local cultures and economies by tourists and increased depredation on crops and livestock by wild animals (Owen-Smith and Jacobsohn 1989). Parks are often seen as the playgrounds of bureaucrats and tourists (Carew-Reid 1990). Benefits are reaped by others while costs are paid locally. For example, in a study in Zambia it was estimated that less than one percent of safari hunting income went to local people (Lewis et al. 1990). Such conflicts generate resentment and hostility toward protected areas, sometimes leading to setting destructive fires, damaging park property and threatening or even murdering park employees (Hough 1988). Local people often disregard park rules, continuing to use protected lands for cultivation, pasture and resource collection (Berkmuller et al. 1990). Commercial poachers may be aided and encouraged by (local people in return for some profit (Lewis et al. 1990). When there is local resentment to a protected area it is very

difficult, and expensive, for the area to remain protected. Although often not acknowledged in decision-making processes, local people do have power with respect to the protected area.

Nevertheless, there have been initiatives to promote a successful interaction between people and protected areas.

Biosphere reserves, for instance, are a form of bioregional management, where a strictly protected area (the core zone of the biosphere reserve) is surrounded by various forms of land use that are designed to be integrate the conservation objectives of the entire area with people's ways of living (Droste, 1995).

Ervin Zube (1995) describes four different kinds of relationships between protected areas and local populations, including local participation in a protected area, protected areas providing services and assistance to local communities, accommodating traditional land uses within a protected area, and local participation in tourism activities; examples are given from 14 protected areas in the United States.

England and Wales have 11 "national parks" that are IUCN Category V Protected landscapes within which some 250,000 people live. Michael Dower (1995) describes how the National Park Authorities developed sophisticated means whereby the purposes of conservation and recreation are pursued in close partnership with the residents.

In Zimbabwe it is the communal areas that largely surround the protected areas, and consequently it largely depends on the Department of National Parks and wildlife Management and CAMPFIRE to reconcile parks and communities. The CAMPFIRE program argues strongly in favour of sustained use as the springboard for large-mammal diversity integration into communal land-use practices. The buffer zone is not outside the park, but between the perceptions of central government and local people regarding appropriate use of local resources, according to Metcalfe (1995).

Managers of protected areas are well aware of the buffer zone concept. Management plans for traditional parks and multiple-use areas frequently refer to buffer zones, and several national strategies have

promoted the idea. The UNESCO man and Biosphere Program featured buffer zones as a key component of biosphere reserves model. Despite their intuitive appeal, however, buffer zones have not been adequately defined, and there are few working models. The term has been used to describe almost any initiative involving people that takes place near a protected area. As a result, there is still a lack of consensus on issues involving buffer zones: their objectives, their location, whether they should be inside or outside parks, what criteria should determine their area, shape and permitted uses. The buffer zone concept, however, remains a high priority for many conservation programs, a key component of traditional-park management plans, and an important component for Integrating Conservation-Development Programs (Wells and Brandon, 1992).

#### II.4.3.4 - Needs

Davis (1993) understands that “The success or failure of biodiversity conservation projects will in large measure depend upon the ways in which local people are brought into the protected area management process.... The fundamental question relates to how this can be achieved. What concepts, methods and strategies exist for incorporating local peoples and communities into the biodiversity conservation process?”

McNeely (1992) affirms that “... more effective means are required to ensure that conservation and local people can work together as partners rather than antagonists” and underlines that “New approaches to linking protected areas to surrounding lands are required if the appropriate benefits are to flow to society, and if the local people are to provide support”.

McNeely and MacKinnon (1989) state that the World Conservation Strategy, prepared by The World Conservation Union in 1980, recognises that under current conditions, nature is likely to prosper best when it serves the human interest. Conservation was

defined as “the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations”.

The principles of the World Conservation Strategy have been widely accepted by governments, development agencies, and conservation organisations. The question is no longer whether conservation is a necessary part of social and economic development, but rather how conservation can be achieved. The better that protecting natural areas serve basic human needs, the better are the chances of survival for natural areas. Linking protected areas together with human needs can support ecologically-sound development which takes on practical meaning for governments and local people.

The World Conservation Union - IUCN - was formed in 1948 and brings together over 800 states, government agencies and non-governmental organisations across some 125 countries. Every ten years it hosts a World Congress on National Parks and Protected Areas, during which a course of action for the following decade is charted. The IV World Congress on National Parks and Protected Areas (Caracas, Venezuela, February 1992) emphasised the challenge which the conservation community is facing: the need for protected areas to attract public and political support. It is necessary to show that the contribution of protected areas to society is relevant and important (Caroline and McNeely 1992). New strategies to link local communities to their neighbouring protected areas are necessary if the appropriate benefits are to be shared among society and if the local people are to provide support (McNeely 1992), and are to be brought into the protected area management process (Davis 1993).

The challenge facing professionals working in protected areas is to find ways of demonstrating that the conservation of biodiversity and its sustainable use have a fundamental relevance to the daily lives of people, including those who may never visit a protected area. There is a need to emphasise the purposes of protected areas as contributing to the quality of life. If the aim is for all people to be in favour of parks,

then it must be demonstrated far more clearly that parks are for people (IUCN 1994).

Caroline and McNeeley (1992) recognise that “In a changing world, the contribution of protected areas to society must be shown to be relevant and important. The needs of parks and protected areas to adapt and to attract public and political support was a fundamental theme throughout each of the major symposia at the Caracas Congress” and McNeeley (1993) reinforces that “Partnership between local human communities and protected area management agencies can benefit both protected areas and biodiversity, but this partnership faces formidable challenges”.

Linking Human Health with Biodiversity is a sound way of promoting the necessary commitment of the local communities to their neighbouring Protected Areas. This commitment is vital if we are to reverse the present threat which humankind created for its own survival, but it will be achieved only if we provide the local communities with a practical clue to understanding the importance of conserving the worlds’ biological diversity.

## ***II. 5 - Human Health***

### **II.5.1 - The Holistic and Official Concept**

Asclepius, the Greek god of medicine, symbolises the perfect physician. Purifying baths, anointments, abstinence, a religious atmosphere, and interpretation of dreams took the place of medical treatment in his beautiful temples. Hygieia (concerned with disease prevention and with the maintenance of health) and Panacea (specialised in the knowledge of drugs and in the treatment of diseases) were Asclepius’ daughters and symbolise two radically different yet complementary approaches to the control of disease. Hippocrates, a famous physician who lived around 400 Before Christ on the Greek island of Cos, practised and taught medicine as a lay Asclepiad. His

doctrines had a profound influence on the development of Western medicine, leading to the following conclusions: (1) the well-being of man is influenced by all environmental factors: the quality of the air, water and food; the winds and the topography of the land; and the general living habitats - understanding the effects of the environment forces on man is thus the fundamental basis of the physician's art; (2) health is the expression of harmony among the environment, the ways of life, and the various components of man's nature; (3) whatever happens in the mind influences the body and the body has a like influence on the mind. Mind and body cannot be considered independently of each other. Health means therefore a healthy mind in a healthy body – "*mens sana in corpore sano.*" It can be achieved only by governing all activities of life in accordance with natural laws so as to create an equilibrium between the forces of the organism and those of the environment (Dubos, 1970). According to Capra (1983), this fundamental interrelation of the body, mind and environment, emphasised in the Hippocratic tradition, is as strong in its appeal for our time as it was twenty-five hundred years ago. In fact, Capra (1990) understands that "Airs, Waters and Places", one of the most important treatises of Hippocrates, is a treatise on Human Ecology, and shows how the well-being of individuals is influenced by environmental factors, and that environmental effects are of primary importance in the Art of Medicine.

The holistic and official definition of health, coined in 1948 by the World Health Organisation and stated in the Preamble of its Charter, is that "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO/ UNICEF, 1978).

Although officially accepted by health professionals of some 185 countries, it has been criticised by some for being "unrealistic, picturing health as a static state of perfect well-being" (Capra, 1983). Others, such as Howe (1973) have agreed with the definition and understood it to imply a balanced relationship of the body and mind and a complete adjustment to the total environment.

Graham and Honary (1990), adapting the official definition,

understand health “as a sustainable state of total well-being, within sustainable ecosystems, within a sustainable biosphere” and reaffirm that “to individuals, good health means improved quality of life, less sickness and disability, a happier personal, family and social existence, and the opportunity to make choices in work and recreation”.

For Dubos (1970), “the all-inclusive and consequently vague meaning of the word health can be traced all the way back to its Anglo-Saxon root, which means ‘hale’, sound, ‘whole’. Health will be considered not as an ideal state of well-being achieved through the complete elimination of disease, but as a *modus vivendi* enabling imperfect men to achieve a rewarding and not too painful existence while they cope with an imperfect world. In this light, health cannot be defined in the absolute, because different persons expect such different things from life”.

Finally, Machado (1984), quoting Almerindo Lessa, reaffirms that “Humans are ecological beings; health is a social by-product; illness is a political fact; the sanitary attitude of a people expresses its culture”.

### II.5.2 - Paradigm Shift

Contrary to the above holistic understanding is the belief expressed by the famous phrase: “A healthy person is nothing but an unrevealed patient”(May, 1968).

This rather negative approach is called by Cesario and Clayton (1997) the “Disaster Remedy Approach” and is currently the dominant paradigm. It focuses on disasters for the individual, such as disease or infirmity, and disasters for public health, such as epidemics or major pollution incidents. Given that many individual and public disasters are, in fact, currently unavoidable, this approach can encourage a permanently beleaguered, defensive mind set. As attention and resources are then focused on areas defined by the need to respond to disasters, it is also possible that attention and resources are not being deployed to optimal effect. There is a question, for example, as to whether the medical profession should limit its role to responding to the depression, drug



dependency and effects of violence associated with patterns of mass unemployment, or whether the profession has some legitimate role in ensuring that the effects of particular economic policies are fully taken into account and in promoting positive alternatives.

According to Ekins et al. (1992), a high level of expenditure devoted to health services, reflected in such figures as the number of doctors and hospital beds available per thousand head of population, is often taken as the key indicator of public health-care commitment. But there are problems with this approach. First, it directs investments to treat illness rather than to prevent it. This is reinforced by the fact that high treatment levels yield more political advantages than low admissions, which could, in any case, be seen to be due to inadequate services provision rather than reduced need. Second, there appears to be no end to the demand for resources for the treatment of illness. This leaves little room for health promotion and prevention, and leads to the dominance of high-profile diagnostic procedures and hospital-based surgical and pharmaceutical treatments. Such methods derive, too, from modern medicine's mechanistic and interventionist approach to health care, which, throughout such slogans as "a pill for every ill", excludes holistic approaches and takes away the sense of personal responsibility for health. More recently, greater attention has been given to preventative medical care, concentrating on immunisation, vaccination, cancer screening, ante-natal care, and family planning. However, treating illness remains the main function of health services world wide.

In an economic system, illness is an instrument of economics dynamism, a source of good business. The search for solutions creates a movement of incomes, stimulate investments, helping to increasing GDP (Gross Domestic Product). Therefore it is not in the best interest of the system for disease to be avoided. On the contrary, health has been seen as a way to increase productivity and profits. The development plans always have a chapter on health, that is seen as an input to enhance the economy as a way to create the necessary infrastructure to supply the conditions of medical care. Even the work unions see health as an instrument of self-promotion. Development is

not a matter of having hospitals and medical doctors. Further more, it is a matter of using them to make the population healthy (Buarque, 1991).

In 1972, Culyer et al., reviewing “health indicators”, underlined the importance of the SOH - State of Health, as well the NFH - Need for Health and EHAA - Effectiveness of Health-Affecting Activities indicators, rather than the use of input measures as indicators of level of health, as proposed by WHO. But even referring to health, SOH indicators considered in this work - measures of mortality, morbidity, restriction of activity and composite measures - are indicative of the degree of ill-health rather than of the level of positive health of the population.

According to Eckholm (1977), the environment that influences health involves much more than the aesthetic state of our natural surroundings with which many associate the term. Social and economic policies that leave people too poor to purchase adequate diets, without access to safe water, or ignorant of the rudiments of sanitation all affect health. So do production processes and political decisions that permit the pollution of workplaces or neighbourhoods with dangerous substances. Individuals eating, drinking, smoking, and exercise habits form the roots of many major diseases; and these habits are in turn influenced by cultural traditions, economic institutions, and governmental policies. Major improvements in health will be not achieved, however, by pouring more and more funds into costly curative measures. Changes in the social structures and personal behaviour patterns that promote diseases will do far more than doctors and drugs can to minimise the burden of disease and the tragedy of early death. Identifying environmental threats to health is, of course, far easier than overcoming them. Unlike advanced medical technologies, the social changes essential to better health cannot usually be purchased, lent, or donated. An inquiry into environmental influences on health involves delving into economics, politics, personal lifestyles, and human’s relationships with their natural surroundings. The picture of health is, ultimately, a reflected image of society. It is in terms of their lifetime disease experiences that most people would characterise their own health. The expansive

definition of health nobly inscribed in the Charter of the World Health Organisation - “a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity” - is beyond the ken of statisticians and even stumps philosophers. Almost inevitably, “health” students wind up studying the causes and frequency of death. Mortality data give an admittedly incomplete picture of the health scene; but death is what statisticians like to call a “clearly defined event”, and every country tries to keep track of the ways its citizens die. Internationally, longevity correlates roughly with per capita income levels, although finer comparisons of incomes and mortality rates around the world prove that national wealth doesn’t always determine national health. What obstacles now keep individuals from enjoying the best possible health? Certainly they are not technological. The true obstacles to better health, then, are political failures - failures of nations to organise affairs to minimise environmental health threats, and failures of individuals to avoid self-destructive lifestyles. Significant improvements in health require massive attacks on today’s major sources of disease: unjust social systems, skewed investment priorities, carelessly used technologies, and reckless personal behaviour patterns.

Norton (1991) affirms:

The medical profession operates, despite these differing visions of health, within an adequate margin of shared comprehension about treatment goals because they share a privative conception of health. Although they cannot agree on what health is, they generally agree when some event or condition represent loss of health.

Nevertheless, “physicians now realise that in dealing with the problems of the ‘dis-eased’ person, subjective and social factors may be as important as the objective organic lesions or behavioural disturbances recognised by the pathologist or the psychiatrist”, understands Dubos (1970).

In practice, health polices and health services have been more

concerned with remedying sickness after the event rather than with positively improving the public health. This attitude has become pervasive, so that when people now talk about health they are usually referring to sickness. “Health services”, “health policies” and “health insurances” really mean sickness services, sickness policies and sickness insurances. This pervasive attitude partly explains why conventional economic activities and policies have not been concerned with creating a healthy economy. This has generated its own problems. Although economic developments over the last few centuries have markedly improved the health of many people, more people are suffering today than ever before from extreme malnutrition and the associated diseases. Meanwhile, new health hazards from pollution and man-made accidents are arising on an ever-increasing scale.

A healthy economy is defined here as one in which people are enabled, personally and as communities, to take greater control over their own lives and to create healthier living conditions and environments for themselves and each other. Such an economy will be one which frees people from as many of the health-damaging social and environmental hazards and stresses as possible; such things as the unemployment and pollution, which conventional economic development imposes. (Robertson, 1990).

The alternative point of view - the “Well-being Promotion Approach” is put by Nussbauber et al. (1992): “One of the main aims of our society, for the next years, will be to reconcile ecology and economy. We should no more wonder how much ecology is economically bearable, but, on the contrary, how much our economy is ecologically enduring”.

Similarly, Boyden (1990) has argued:

The human species is unlikely to overcome the ecological threats to its survival unless or until our society comes to recognise that a serious deficiency exists in its cultural soup and takes effective measures to reintroduce the critical missing ingredient. This missing ingredient is understanding of Nature and of the

human place in Nature - understanding, that is, of human situation (and of human situations) in biohistorical perspective. The biohistorical perspective, which deals with the common heritage and common dependencies and characteristics of all humankind, should be shared by all peoples of the world. It has meaning not only for our ecological problems, but also for our health.

Given the known health and other disadvantages of conventional forms of economic development, it would be both sensible and timely for the scientific community to shift the emphasis from “disaster remedy” to “well-being promotion”. Both health professionals and development professionals should focus on promoting well-being. Such a shift of emphasis should be based on a sound understanding of the systemic relations between health, conservation and development.

### II.5.3 - A Conceptual Alternative for Sustainable Development

The global debate about sustainable development presents a profound challenge to what has been called the “disaster remedy approach”, by Cesario and Clayton (1997). There are still many different definitions of sustainable development, as it is a relatively new and contentious concept (Holling, 1993), but the great majority of them make an explicit link between social, economic and environmental objectives, thus identifying a new consensus that we can no longer think of these objectives in isolation.

The last official interpretation of sustainable development states that it “may be regarded as the progressive and balanced achievement of sustained economic development, improved social equity and environmental sustainability” (United Nations Commission on Sustainable Development - UNCSD, 1997). But this is only one of the more than 80 definitions identified by a brief literature review. To understand the problem fully, it is necessary to know when, how and what the concept was coined for, reviewing the two terms that form it.

On 20 January 1949, in his inauguration speech before Congress, the US President Harry Truman defined the largest part of the world as “underdeveloped areas”. For the first time, the new world-view was thus announced: all the peoples of the earth were to move along the same track and aspire to only one goal - development. Greater production was the key to prosperity and peace. European powers losing their colonial subjects signified a world which had fallen apart. The United States, the strongest nation to emerge from the war, was obliged to act as the new world power. For this it needed a vision of a new global order. The concept of development presents the world as a collection of homogeneous entities, not held together through the political dominion of colonial times, but through economic interdependence. Therefore, US hegemony had nothing to do with the possession of territories but everything to do with their openness to economic penetration. The independence process of young countries was allowed to proceed, in that they automatically fell under the wing of the US when they proclaimed themselves to be subjects of economic development. Development was the conceptual vehicle which allowed the US to behave as the herald of national self-determination, while at the same time founding a new type of world-wide hegemony, namely an anti-colonial imperialism. Truman’s “development” provided the cognitive base for both arrogant interventionism from the North and pathetic self-pity in the South. Development has changed the face of the earth, but not in the way it had intended. In 1960, the Northern countries were 20 times richer than the Southern, and in 1980 46 times. Suspicion grows that development was a misconceived enterprise from the beginning. Indeed, it is not the failure of development which has to be feared, but its success. Development cannot be separate from the idea that all peoples of the planet are moving along one single track towards some state of maturity, exemplified by the nations “running in front”. From the start, development’s hidden agenda was nothing else than the westernisation of the world. The result has been a tremendous loss of diversity. The world-wide simplification of architecture, clothing, and daily objects assaults the eye; the accompanying eclipse of

variegated languages, customs and gestures is already less visible; and the standardisation of desires and dreams occurs deep down in the subconscious of societies. Market, state and science have been the great universalising powers; adman, experts and educators have relentlessly expanded their reign. By now, development has become an amoeba-like concept, shapeless, but ineradicable. The term is hailed by the IMF and the Vatican alike, by revolutionaries carrying their guns as well as field experts carrying their briefcases. The term creates a common ground, a ground on which right and left, elites and grassroots fight their battles (Sachs, 1992; 1993).

On 20 March 1987, the World Commission on Environment and Development - WCED, known as the Brundtland Commission, published Our Common Future firmly establishing the concept of sustainable development: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The Brundtland Report goes further:

Meeting essential needs - food, clothing, shelter, jobs - depends in part on achieving full growth potential, and sustainable development clearly requires economic growth in places where such needs are not being met. ... Poverty reduces people's capacity to use resources in a sustainable manner; it intensifies pressure on the environment. ... A necessary but insufficient condition for the elimination of absolute poverty is a relatively rapid rise in per capita incomes in the Third World.

The way was thus cleared for the marriage between "environment" and "development": the newcomer could be welcomed to the old-established family. No development without sustainability; no sustainability without development is the formula which establishes the newly formed bond. "Development" emerges rejuvenated from this liaison, the ailing concept gaining another lease on life. This is nothing less than the repeat of a proven ruse: every time in the last 30 years when the destructive effects of development were recognised, the

concept was stretched in such a way as to include both injury and therapy. For example, when it became obvious, around 1970, that the pursuit of development actually intensified poverty, the notion of “equitable development” was invented so as to reconcile the irreconcilable: the creation of equity with the abolition of poverty. In the same vein, the Brundtland Report incorporated concern for the environment into the concept of development by erecting sustainable development as the conceptual roof for both violating and healing the environment. In its mainstream interpretation, sustainable development has been explicitly conceived as a strategy for sustaining “development”, not for supporting the flourishing and enduring of an infinitely diverse natural and social life (Sachs, 1993).

Max-Neef (1991) summarises affirming that only a transdisciplinary approach allows us to understand, for example, how politics, economics and health converged. Thus, we discover an increasing number of cases where poor health is the outcome of unsound politics and bad economics. If economic policies designed by economists, affect, which they do, the whole of society, economists can no longer claim that they are solely concerned with the economics field. Such a stance would be unethical, since it would mean avoiding the moral responsibility for the consequences of an action. If we do not devote considerably more energy and imagination to designing significant and consistent transdisciplinary approaches, our societies will continue to disintegrate.



## CHAPTER III

# HEALTH BENEFITS OF PROTECTED AREAS

### *III. 1 - Introduction*

As stated in the Overview of this Thesis, the challenge facing professionals working in protected areas is to find ways of demonstrating that the conservation of biodiversity and its sustainable use have a fundamental relevance to the daily lives of people; and to emphasise the purposes of protected areas as contributing to the quality of life - if the aim is for all people to be in favour of parks, then it must be demonstrated far more clearly that parks are for people (IUCN, 1994).

On the one hand, this author understands that linking Human Health with Biodiversity is a sound way of promoting the necessary commitment of the local communities to their neighbouring Protected Areas. This commitment is vital if we are to reverse the present threat which humankind created for its own survival, but it will be achieved only if we provide the local communities with a practical clue to understanding the importance of conserving the world's biological diversity.

On the other hand, it has been accepted that protected areas “provide major direct and indirect benefits to the local and national economies and models for sustainable conservation” (IUCN 1994). Nevertheless, when McNeely and MacKinnon (1989) identified 16 different kinds of benefits of protected areas for regional development they, surprisingly, did not list human health as one of the benefits.

Lovejoy (1997) underlines, in his Foreword to Biodiversity and Human Health, that the "links between biodiversity and human health have largely been ignored" until the setting of the first Conference on "Biodiversity and Human Health", in 1995. This conference was sponsored by the National Institutes of Health (NIH), the National Science Foundation (NSF), the Smithsonian Foundation, the National Association of Physicians for the Environment (NAPE), and the Pan American Health Organisation (PAHO), and held at the Smithsonian Foundation, in Washington, in 1995. It was attended by 250 registrants, from the fields of agriculture, biotechnology, chemistry, ecology, epidemiology, ethnobotany, immunology, law and systematics, as well as by physicians, policymakers and citizens, to open a dialogue on the significance of biodiversity to human health.

This author was among the attendants to the Conference, and was later invited to review the book Biodiversity and Human Health, edited by Grifo and Rosenthal (1997) as a follow-up to the Conference. His review was entitled Linking Human Health to Biological Diversity and published by the Boston University in the December 1997 issue of Conservation Biology. It poses that, unfortunately, the book stresses what Cesario and Clayton (1997) call the "Disaster Remedy Approach". Negative concepts such as famine; scarcity; deforestation; and losses in biological and cultural diversities are abundant. Despite the title, there is no actual reference to health; on the contrary, the term health frequently implies numerous forms of diseases - the official definition of health, already explored in Chapter II.5, was again completely neglected.

The review of the book Biodiversity and Human Health, together with Cesario (1994, 1995a, 1995b, 1996a, 1996b, 1996c, 1996d, 1997) and Cesario *et al.* (1997) as well as other three forthcoming articles in 1997 and 1998, shows that this author has been concerned with the links between health, biodiversity and protected areas at least since 1993.

"The fundamental relationship between biodiversity and human health is generally unappreciated by policymakers and the public, and as a result, the preservation of habitats and species is given a low

priority”, recognises Chivian (1997) in Global Environmental Degradation and Biodiversity Loss: Implications for Human Health. And he continues, arguing:

How can the importance of biodiversity become central to the concerns of policymakers and the public? There is a lesson to be learned ... with the issue of biodiversity - it is essential that people understand that their health and lives, and those of their children, depend so completely on the health of other species and of global ecosystems. Only then will they develop the motivation to support personal behaviours and public policies that protect biodiversity. There is no task more important for physicians, other health professionals, scientists, and concerned citizens than helping to promote this understanding.

To tackle this issue, eight ways in which protected areas can improve human health were developed, by this author, from personal insights which arose from various travels and from talks with knowledgeable people (as supported by Serafin 1991). These eight “Health Benefits of Protected Areas” are presented in this Chapter, in response to the first three research questions posed in Chapter I:

- are there ways in which protected areas benefit human health ?
- if so, is it possible to find examples with different degrees of tangibility ?
- if so, can these examples be found in both developed and developing countries and in different ecological and cultural systems across the world?

The first four “Health Benefits of Protected Areas” are here briefly described and remain as anecdotal evidences; they were originated from insights provided by actual facts in Costa Rica, England, Kenya and the USA. The last four “Health Benefits” were further developed through rapid assessments of field situations found in Brazil, Costa Rica, Kazakhstan and Poland. The Brazilian and the Kazakhstani

examples were published, respectively in *Ambio* and *Parks* (both in 1996), while the Polish example has been presented in Poland (one International Conference in 1995 and two lectures in 1997) and will be published soon (forthcoming Cesario 1998).

The “Health Benefits of Protected Areas” are:

### ***III. 2 - Improved Agricultural Production and Healthy Livestock***

The following examples provide evidence of the capacity that protected areas have to improve both agricultural production and the health of livestock.

#### **III. 2. 1 - Data Collection**

The anecdotal evidence for this case was provided, to this author, by unstructured interviews with (1) Roger Blanco, Scientific Officer at the Guanacaste Conservation Area, Costa Rica, in August 1995 at the Guanacaste Conservation Area (Costa Rica), and with (2) Bob Wishitemi, Director of the Kenya Wildlife Service, in March 1996 at the International Centre for Protected Landscapes (Wales). These examples await confirmation by future research.

#### **III. 2. 2 - Findings**

On the one hand, Vandermeer (1997) recognises that there are important links between the losses in biodiversity, agroecosystems and human health:

There are three primary issues involved in the interrelation of biodiversity and agriculture. First, there is far more biodiversity in agroecosystems than is usually acknowledged by those

concerned with biodiversity loss. Second, agriculture is probably the single most important force contributing to the general global decline in biodiversity. Third, the health of the human population is both directly and indirectly affected by agroecosystem biodiversity - by the biodiversity contained therein as well as by the biodiversity losses provoked by agriculture's transformation.

Positive links, on the other hand, between biodiversity conservation activities and agroecosystems can be shown in the following two examples.

The Guanacaste Conservation Area, in Costa Rica, has an experiment with a neighbouring citrus fruit plantation to show how a protected area can provide biological control to improve agricultural production.

The second example comes from the region of the Kakamega National Park, in Kenya, where the health of the livestock owned by the local community is improved by the presence of the protected area.

### ***III. 3 - Disease Prevention***

Protected areas are often the only safe habitat to many species in danger of extinction, and with the extinction of species even before we know them (only about 1.5 million species have been recorded and given scientific names, according to May 1988, out of an estimated 10 Million species on the planet, according to Grifo et al. 1997), "we are also losing valuable medical models that may help us understand human physiology and disease", underlines Chivian (1997) in Global Environmental Degradation and Biodiversity Loss: Implications for Human Health.

### III. 3. 1 - Data Collection

The first insights into the development of this section came in April 1995, during the Conference on “Biodiversity and Human Health”, held at the Smithsonian Institution, Washington. This author had the chance to discuss his work with several other participants, among them Dr Eric Chivian and Dr Thomas Lovejoy, and also to have early copies of some of the lectures given. Latter, the invitation to review “Biodiversity and Human Health”, for Conservation Biology, stimulated a bibliographic review of the most important papers on this field.

### III. 3. 2 - Findings

Understanding why bears can hibernate and stay immobile for four to five months or more without losing bone mass may help scientists find ways to prevent bone loss suffered by the inactive elderly, bedridden and paralysed patients and by astronauts. Chivian (1997) continues:

Bears also do not urinate for the months of denning, as they are somehow able to recycle their urea to make new proteins (Nelson, 1987; 1989). Humans, by contrast, unable to excrete their urinary wastes, die after a few days. If we understood how bears accomplish this feat, we might be able to find effective long-term treatments for those with chronic renal failure, who are now totally reliant on dialysis.

On the other hand, the thermal springs at the Yellowstone National Park, in the USA, that house a recently discovered heat resistant bacterial species, *Thermus aquaticus*, which was responsible for the Nobel Prize winning isolation of polymerase enzymes, have revolutionised DNA (Desoxiribo-Nucleic-Acid) and RNA (Ribo-Nucleic-Acid) research (Chivian, 1997; Lovejoy, 1997).

Another interesting example comes from the multispecies relationship present in the epidemiology of Lyme Disease (a kind of relapsing fever), which is well described by Lovejoy (1997) in his Foreword to Biodiversity and Human Health:

The host of the adult deer ticks, *Ixodes scapularis*, are white-tailed deer, essentially a forest edge species favoured (to a point of pest status) by land use changes which also bring human population closer to the cycle [in the wild]. A complex cycle involving oak mast (massive fruiting) years with super-abundant acorn crops, gypsy moths, and white footed mice, *Peromyscus leucopus*, has only recently been illuminated. Particularly intriguing is the role of biological diversity with implications for beneficial management. ... larval and nymph stages of the deer tick are less likely to become infected with the etiological agent, *Borrelia burgdorferi*, when there is a high diversity of hosts. When the host diversity is low and dominated by the super competent host for juvenile ticks, the white footed mouse, models indicate much higher transmission rates. The probable practical consequence (now in process of testing) is that transmission rates can be reduced more effectively by increasing the diversity of hosts of larval ticks rather than reducing populations of white-tailed deer which appear to be far from limiting to adult tick populations.

These three examples represent the insights of what could become a profitable scientific research field: the study of natural models, preserved by protected areas, which can be used to better understand physiological, as well as pathological conditions in humans. This research would be vital, not only to prevent diseases and suffering, but also to promote the necessary understanding that “peoples’ health and lives, and those of their children, depend so completely on the health of other species and of global ecosystems”, as stressed by Chivian (1997).

### ***III. 4 - Psychological Well-being***

There are also psychological benefits provided by protected areas. Much of the literature that suggests that human beings benefit from nature makes reference to “well-being”, although few authors specify what they mean by this term. It seems that the majority have in mind a psychological state. Psychological well-being is a rather vague concept that shares the problems of definition with the concept of “mental health”, to which it may be related.

#### **III. 4. 1 - Data Collection**

The unique comprehensive literature review prepared for English Nature by Rohde and Kendle (1994) was made available to this author through a direct contact with English Nature. This review of all psychological studies aimed at assessing the impacts of natural areas on “psychological well being” constitutes the main source for the present case.

#### **III. 4. 2 - Findings**

A review of the impact of natural landscapes and wildlife on human well-being, commissioned by English Nature, has conclusively revealed that wilderness holidays, walking in parks and communing with nature give people “existential moments”; these “existential moments” leave people happier, less stressed, more confident and more effective at work, improve self-esteem and increase altruism (Brazil, 1995).

Rohde and Kendle (1994), the authors of the above mentioned review, state that although much conservation work is directed by objective scientific criteria, habitats may be evaluated partly on the basis of their “intrinsic appeal”, since the majority of popular activity in the



UK is fuelled by an appreciation that people value wildlife, and in some way benefit from its presence or continued existence?. They highlight that “natural views exert their evident positive influences on human health through emotional effects” and understand that the production of stress hormones such as cortisol and corticosterone is decreased by “nature stimuli”.

These authors distinguish five areas in which the psychological effects that the contact with nature have on human well-being may happen: emotional; cognitive; behavioural; developmental; and social. But they also state, “this distinction is purely conceptual since in reality psychological functioning is holistic and a separation of its various components will rarely occur”. Some passages of Rohde and Kendle’s (1994) comprehensive review may help understanding how these areas interact, and deserve to be quoted:

Amongst the three types of definition of happiness or well-being were the effective ones, which stress pleasant emotional experience with a preponderance of positive over negative affect ... Since the evidence is that nature can enhance positive affect, and reduce some negative feelings, it would seem justified to conclude that it can indeed contribute to human well-being ... People not only react with their feelings to nature, they also respond with their thoughts or cognition ... if it could be substantiated that contact with nature evokes cognitive freedom and that this engenders a heightened sense of self-esteem, this would be another mechanism whereby nature may enhance psychological well-being ... there are other mechanisms besides that of cognitive freedom, whereby exposure to nature may influence people’s self-esteem. For example it has been pointed out by several authors that nature is “largely devoid of negative feedback” ... The liberation from feedback would allow the person to make a judgement about her/him self which is based upon a personal evaluation rather than on external opinion, even

if these opinions are objective and fair ... the cognitive benefits which people may derive from contact with nature are of two kinds: firstly their cognitive functioning may be improved (e.g. through better attention or less fatigue) and secondly favourable cognitive contents may arise (e.g. a high self concept and a sense of a symbiotic expansion of the self). In the first case the nature experience acts directly on the person's thinking processes, whilst in the second it sets the occasion for the emergence of positive thoughts. A similar distinction can be made with regard to the benefits which contact with nature may have on people's behaviour. On the one hand exposure to nature may exert a direct influence on the behaviour in which a person engages, and on the other it may provide a setting that encourages constructive behaviours, which enhance the person's psychological well being.

Finally, Rohde and Kendle (1994) conclude that "research on the psychological impact of nature on human beings, though still very scanty, suggests that people may derive considerable benefits from contact with nature."

### *III. 5 - Support for Traditional Medicine*

It is also important to recognise the part played by protected areas in providing models for the protection and sustainable utilisation of certain wildlife products which are used in local diets and in traditional medicines.

#### III. 5. 1 - Data Collection

The information for this case were initially provided, to this author, by an unstructured interview with Bob Wishitemi, Director of

the Kenya Wildlife Service, in March 1996 at the International Centre for Protected Landscapes (Wales). Later a literature review supported the original insights.

### III. 5. 2 - Findings

Today 80% of the world's people depend on traditional medicine for their primary health care needs (Cox, 1997). The greater part of traditional-medicine therapy involves the use of plant extracts or their active principles. Along with the depletion of natural resources goes the loss among indigenous peoples of their knowledge concerning uses of medicinal plants (Marwick, 1995). Cox (1997) states that "both indigenous knowledge systems and biodiversity are necessary to obtain optimal development of new plant-based pharmaceuticals", and he also emphasises that:

The lack of research on both biological species and cultures would be a concern in a situation of biological and cultural stasis, but in our current era of rapid extinction of both biological species and indigenous knowledge systems, it seems almost certain that potential new pharmaceuticals are disappearing each year before they can be "discovered". ... The discovery of new pharmaceutical compounds from studies of indigenous knowledge systems is only a single example of the possible ways that indigenous peoples can contribute to Western societies. ... Yet indigenous knowledge systems can have a greater beneficial impact on the health and well being of the world's population if we begin to study indigenous insights concerning conservation. ... Most indigenous people view the world as sacred and believe it a religious duty to protect entire ecosystems.

There are interesting examples, from around the world, of

experiences where traditional peoples manage conservation activities:

- the Kakamega Forest National Park, in Kenya, is used as a source of medicinal plants, while village elders (traditional healers) go to the Kaya Forest, in East Kenya, for religious ceremonies and a power recharge. Wilson (1993) believes that a “significant” amount of biodiversity has been protected in these sacred groves (called kaya);
- in Belize, one of the world’s first ethnomedicinal reserves - Terra Nova - is under the control of an organisation of local healers who use the forest as a source of medicinal plants and as an integral part of a new educational system to train herbalists (Balick and Cox, 1996);
- and extractive reserves, which are based on communal use of economically valuable species, have been established throughout the Amazon region (Piñedo-Vasquez *et al.*, 1990; Anderson and Ioris, 1992).

But it is not just in developing countries that medicinal plants are important. In the USA, for example, 25% of all prescriptions from community pharmacies between 1959 and 1980 contained materials from higher plants. Surprisingly, this figure did not vary more than about 1% in any of the 22 years surveyed (Farnsworth and Soejarto, 1985).

Nevertheless, “the use of traditional medicines can threaten biodiversity. Accordingly, strengthening such systems requires taking steps to ensure the sustainability of resource use”, highlights Reid (1997). The possibility of establishing a deep conservation ethic, based not on economic considerations but instead on a deep sense of stewardship rather than ownership, in the management of the natural world should be learnt from some traditional knowledge systems (Cox, 1997).

### ***III. 6 - Genetic Bank for New and Known Drugs***

Although today many people agree in recognising the pharmaceutical importance of protected areas for *in situ* conservation of biodiversity, for decades ecologists and environmentalists have been arguing that pharmaceutical and other commercial applications of biodiversity should help justify its conservation.

#### **III. 6. 1 - Data Collection**

The first insights into the development of this section also came in April 1995 (during the Conference on “Biodiversity and Human Health”, held at the Smithsonian Institution, Washington), where this author was, subsequently, invited by Dr Daniel Janzen to visit Costa Rica, which happened in August 1995. There, at the National Institute for Biodiversity (INBio) and at the Guanacaste Conservation Area, participant observation, unstructured interviewing and archival search were the main methods used to collect data. Latter, the opportunity of reviewing “Biodiversity and Human Health” added important information to the data collected on site.

#### **III. 6. 2 - Findings**

It has been stated (Reid, 1997) that among the 10 pharmaceuticals most prescribed in the USA, 9 have direct or indirect origin in nature, and some 25 percent of all prescriptions are filled with drugs whose active ingredients are extracted or derived from plants. In 1980 in USA the sales of plant-based drugs amounted to some US\$ 4.5 billion, estimated US\$ 15.5 billion in 1990. In Europe, Japan, Australia, Canada, and the USA, the market value for both prescription and over-the-counter drugs based on plants in 1985 was estimated to be US\$ 43 billion.

Grifo *et al.* (1997) demonstrate the long and complex process

which leads to a drug discovery, and state that 57% of the USA top 150 brand names prescribed from January through September 1993 contained at least one compound now or once derived or patterned after compounds derived from biological diversity. These drugs are used in diverse areas of medicine, such as Allergy/Pulmonary and Respiratory, Analgesics, Cardiology, Dermatology, General Medicine, Gastroenterology, Gynaecology, Haematology, Infectious Diseases, Ophthalmology, among others. These top 150 prescription drugs (that represent the top 99 prescribed components), originated from only 35 species (of either plants, fungus, bacteria, animals or marine source), out of an estimated 10 Million species on the planet. Since sales of prescription drugs, in the USA in 1990, were approximately US\$ 147 billion (USITC, 1991), biologically derived pharmaceuticals could reasonably generate excess of US\$ 80 billion in revenues per year (Artuso, 1997).

Although controversial, the first example of combining conservation of biodiversity with prospecting for new drugs, which has a paramount historical importance, is remembered by Artuso (1997):

Interest in the potential connection between biochemical prospecting and biodiversity protection was heightened in 1991 when Merck announced its contract with Costa Rica's Instituto Nacional de Biodiversidad (INBio) ... Other organisations, including the National Cancer Institute, Bristol Meyers-Squibb, Smith-Kline, Glaxo, and Pfizer have also agreed to provide or negotiate royalties and other forms of compensation for access to biological material in countries such as China, Surinam, Peru, Argentina, Mexico, Chile, Nigeria, and Cameroon.

This flurry of interest and enthusiasm in biodiversity prospecting is taking place in a policy vacuum. Virtually no precedent exists for national policies and legislation to govern and regulate wildland biodiversity prospecting. Yet, the 150 -plus countries that signed the

International Convention on Biological Diversity in 1992 must now pass implementing legislation that establishes just such a policy framework (World Resources Institute, 1993).

The institutional structure and current biodiversity-prospecting programme of INBio, its relation to both conservation and development objectives, as well as fundamental questions of ownership and access to biodiversity; economic opportunities provided by biodiversity; costs and benefits of public versus private control of the resource; and rights of indigenous people, are comprehensively addressed in Biodiversity Prospecting (WRI, 1993):

In September 1991, Costa Rica's National Biodiversity Institute (INBio) - a private, non-profit organisation - and the U.S.-based Pharmaceutical firm Merck & Co., Ltd., announced an agreement under which INBio would provide Merck with chemical extracts from wild plants, insects, and micro-organisms from Costa Rica's conserved wildlands for Merck drug-screening program in return for a two year research and sampling budget of \$1,135,000 and royalties on any resulting commercial products. INBio agreed to contribute 10 percent of the budget and 50 percent of any royalties to the government's National Park Fund for the conservation of national parks in Costa Rica, and Merck agreed to provide technical assistance and training to help establish drug research capacity in Costa Rica. ... This ground-breaking agreement also shows how companies can return a portion of the benefits of pharmaceutical development to the developing country where the chemical compounds originated. Further, it ensures that some of these proceeds will directly finance conservation while the remainder will indirectly finance through biodiversity research and development in association with the national parks. Coming as it did during the final negotiations of the International Convention on Biological Diversity, the Merck-INBio agreement validated

what was becoming - after heated debate - an underlying tenet of the Convention: the fair and equitable distribution of the benefits of the use of genetic resources among *all* those who invest in their continued existence. ... [but] three problems must be overcome if biodiversity prospecting is to contribute to national sustainable development and the long-term survival of wild-land biodiversity. First, growing commercial interest in biodiversity will not necessarily fuel increased investment in resource conservation. ... Second, there is no guarantee that the institutions created to capture the benefits of biodiversity will contribute to economic growth in developing countries. ... Finally, biodiversity prospecting is just one of many forms of biodiversity development that could take place in the countryside to help raise living standards there.

The book also explores the nature of collector-company contracts and one of the more contentious issues of biodiversity prospecting - Intellectual Property Rights. But these legal issues will not be analysed here since, although relevant, they are not under this author's expertise.

To better understand this pilot case and to argue its potential applicability to other tropical countries, this author conducted, as already stated, his field trip to Costa Rica. There, initial contacts with INBio provided some more information on the health benefit of protected areas as a genetic bank for new and known drugs. These contacts also led this author to a longer stay at the Guanacaste Conservation Area, where most of the related field activities are happening. Surprisingly, this visit to Guanacaste revealed, beyond the bioprospecting activities, an even richer example of Integrating Conservation-Development Projects, which comprises the focus of section III.9 of this chapter.



### ***III. 7 - Physical Rehabilitation and Social Re-integration***

Another commonly identifiable health benefit of protected areas is the scope for establishing “Individual Rehabilitation” facilities, such as sanatoria, nursing homes and spas. Their activities include physical rehabilitation as well as social re-integration.

#### **III. 7. 1 - Data Collection**

In December 1993, when delivering a paper at the International Conference: Training of Experts for European Co-operation on Protection of the Environment and Promotion of Sustainable Development, this author discussed his embryonic thesis with Dr Rafal Serafin and was, then, invited to conduct fieldwork in the Wysoka region (Poland). There, in September 1994, case study methods, such as participant observation, unstructured interviewing and bibliographic review provided the data for this section.

#### **III. 7. 2 - Findings**

A particular interesting example is found at the region of Wysoka, southern Poland, where ill children from highly polluted industrial areas come to health centres at the borders of the Babia Gora and Gorce National Parks to recover (Cesario, 1995).

From a conservation aspect, the Wysoka region is rich in protected areas (4 national parks, including 2 UNESCO Biosphere Reserves, several landscape parks and other protected reserves). Dissatisfaction with the effectiveness of these existing protected areas has led to an initiative to create a new cultural-landscape park that would provide landscape protection by connecting existing protected areas with one another, but also serve to involve local communities by drawing attention to the area’s rich cultural resources.

From a rural development aspect, the Wysoka region is interesting as it lies in a rapidly urbanising corridor connecting Kraków (the cultural capital of Poland) to Zakopane (the most important winter sports resort). The challenge is to retain the identity and rural character of the area in the face of growing pressures of tourism, residential development, traffic and road building proposals.

From a health aspect, the Wysoka region has become known as a national centre for convalescence and rehabilitation. The proximity to highly polluted areas, such as Silesia, and the clean air and rural character of Wysoka has prompted the development of major child health centres, notably in the towns of Rabka and Lipnica Wielka, which neighbour the Gorce and Babia Gora National Parks, respectively.

The lack of resources from the public sector, the increasing environmental awareness and the growing influx of children with diseases has prompted local physicians from Rabka to search for and adopt practices that add to, enhance and extend the services offered. One initiative under way is the 'Environmental Detoxification Programme' of the Paediatric Division of the Institute of Tuberculosis and Lung Diseases, in Rabka. Children come in groups of 40 from the polluted surrounding regions and stay for a three week program, which includes physical exercises (the neighbouring Gorce National Park is used for out-door activities), diuresis improvement through drinking large amounts of mineral water and the experimental use of a bee product - propolis (aiming at mobilising heavy-metals), as well as conventional medical care (Haluszka, 1994).

Another initiative is the "Mountain Haven Recuperation Centre", created in 1994 by the British Charity "Children in Crisis", at the border of Babia Gora National Park, near the town of Lipnica Wielka. The Centre accommodates groups of 30 children with leukaemia and other serious environmentally-related diseases, from the highly polluted Zabrze for a two week convalescence programme based on the use of local natural and cultural heritage. The children receive medical care and participate in out-door activities such as hillwalking, swimming, games,

bonfires and visits to a neighbouring ethnographic park. They re-experience a social life while benefiting themselves from the outstanding scenery and cultural values (Norska-Borówka, Kasznia-Kocot and Bursa, 1993; Children in Crisis, 1994).

Wysoka is especially attractive because in the “Manor on the Hill” there is an innovative project which searches for new ways of sustainable living. An innovative project to re-establish a local identity and provide a basis for regenerating local democracy and the economy is the Lute Academy. The initiative based at a specially refurbished manor house in Wysoka focuses on promoting renaissance values through song, theatre and the lute as ways of engaging local communities in a development process based on local heritage.

It was proposed to connect this project with the “Environmental Detoxification Programme of the Paediatric Division of the Institute of Tuberculosis and Lung Diseases”, in Rabka and with the activities of the “Mountain Haven Recuperation Centre” at Lipnica Wielka, expanding its benefits by offering the children the opportunity of living in a quiet and peaceful environment, experiencing renaissance music and values, which would not only improve the recovery of health by children but also preserve their cultural heritage.

Summarising, the Wysoka area represents a region where:

1. the conventional sectoral and managerial approaches to development are insufficient and are unlikely to provide a basis for sustainability;
2. the region’s natural and cultural heritage is under threat and needs to be protected as the capital for development;
3. several independent heritage-based development initiatives are already under way;
4. two independent projects aiming at increasing the recuperation of children with serious health impairment are, both, based on the beneficial use of the local natural and cultural heritage;
5. some social entrepreneurs have emerged among local communities and have settled in the area and are motivated to

- demonstrate by example that sustainable living is not just desirable but practically achievable;
6. the added value of institution and partnership-building in making ongoing projects interconnect with one another is recognised, and lays the foundations for a broader movement for a new kind of development; and
  7. amid the economic and political reforms under way in Poland, a new and practical civics-oriented approach to development can be forged.

This case was explored through fieldwork in the Wysoka area, conducted by this author, in September 1994, after previous contacts with the Polish partners since December 1993. The findings were first presented in an international conference in Kraków, in December 1995. Later, in April 1997, this author gave lectures, by invitation, at the Czestochowa University and the Polish Academy of Sciences, relating his research findings at the area to the problem of conserving the Polish biodiversity and, at the same time, improving people's quality of life. It was proposed that as a part of the conservation community rethinking the role of conservation of biodiversity in society and in the economy, the issue of health promotion, encompassing the concept of sustainable development, should be given higher priority. A joint project should be developed aimed at building local capacity for designing, implementing and sustaining a programme of development based on linking initiatives in the health, conservation and rural development fields. The idea was to interconnect innovative and locally-based projects in these three fields, for mutual benefit, by building capacity for sharing and learning from each others experiences, as well as with the experiences of other research and community groups by providing practically-oriented "problem-solving" opportunities in the heritage and environmental field in Poland and internationally (Serafin, 1993).

Indeed, much can be learned from the experience gained to date by the innovative projects in the conservation, health and rural

development fields which are already under way in Poland. Adding impetus to these efforts by creating opportunities for synergy among initiatives under way could provide much-needed momentum for achieving sustainability in the existing projects and be the inspiration for the design and development of others. This is an opportunity of adding to the definition of the role of protected areas the important aspect of the promotion of human health (physical rehabilitation and social re-integration).

### ***III. 8 - Clean Air and Drinking Water***

The health benefits of protected areas include their importance in purifying the air, absorbing pollutants, as well as providing and maintaining sources of clean water. In many places the water reservoir which serves a city, a town or a village is situated within a protected area. Air and water are closely related to human health. They act favourably to the maintenance of human health (when free from pollutants), being considered “biogenic complexes”. On the other hand, when contaminated, air and water can be considered “pathogenic complexes”, helping the spread of diseases or infirmities. (Sounis, 1985).

#### **III. 8. 1 - Data Collection**

The attendance to the International Symposium “Technological Civilisation Impact on the Environment: Situation in the Post Soviet Area” held at the Forschungszentrum Karlsruhe, April 1996 (Germany), provided the opportunity to discuss this author’s work with scientists from the former Soviet Union. This discussion led to an invitation to do fieldwork in the region of Almaty (Kazakhstan) in September 1996. For the joint paper by Cesario *et al.* published in “Parks” (1997), data from the glaciology studies was provided by the two Kazakhstani co-authors, while background information for linking water supply, health issues and national parks was the responsibility of this author.

### III. 8. 2 - Findings

Kazakhstan is the second largest country of the CIS - Commonwealth of Independent States (the Russia Federation is the largest). Its area of about 2.7 million km<sup>2</sup> extends from the Volga to the Altai mountains and from the plains in western Siberia to oasis and desert in central Asia. Its boundaries include the Russian Federation, the Caspian Sea, Turkmenistan, Uzbekistan, the Aral Sea, Kyrgystan and China. While the Kazak is the official language, two-thirds of its 17.4 million inhabitants speak Russian. The Human Development Report 1996 considers Kazakhstan as a country of “medium human development” (HDI rank number 72). It was classified after the Russian Federation (High Human Development, rank number 57), but before Turkmenistan (HDI rank number 90), Uzbekistan (HDI rank number 94), Kyrgystan (HDI rank number 99) and China (HDI rank number 108) (UNDP 1996). Up to 1995, Kazakhstan had only one national park: the Bayanaulsky National Park, created in 1985 (IUCN 1994). In 1996, three other national parks were created: the Altyn Emel State National Nature Park (in the south-east region), the Kokshetau State National Nature Park (in the northern region) and the Ele-Alatau State National Nature Park (near Almaty, the capital in the south-eastern corner of the country).

The Government of the Republic of Kazakhstan established the creation of the Ele-Alatau State National Nature Park in the Almaty region (Decree 228 of 22nd February 1996), with its 164,450 ha classified as “Forests of a National Nature Park”. The southern boundary of the park is within the Ele-Alatau mountain ridge (in Russian, Zailysky Alatau), that forms the border with Kyrgystan. The northern boundaries of the park are near the city of Almaty and the towns of Chemogan, Talgar and Turgen. The main goals for the creation of the park were “the conservation and rehabilitation of the unique natural complexes of the Ele-Alatau region that have distinctive ecological, historical, scientific, aesthetic and cultural values”. Within the concept of “unique natural complexes of the Ele-Alatau region” are included

the glaciers on the Ele-Alatau mountain ridge. They amount to more than 400 with a total area of about 510 km<sup>2</sup> and a moisture content of approximately 30 km<sup>2</sup> (Makarevich, 1985). Among them, the most studied is the Tuyuksu glacier.

The Tuyuksu glacier is presently 3.5 km long and has an area of about 2.5 km<sup>2</sup>. It is situated on the upper part of the Malaya Altmaatinka valley. It was discovered in 1902 and had been episodically observed until the International Geophysical Year - 1956, when it began to be systematically investigated (during the years 1957 to 1959 the investigations were carried out for 30 months). On-site annual measurements and reconstructions showed that prior to the 30's the mass balances of the Tuyuksu glacier were positive every year and from the 30's to the 70's the balances alternated positive and negative, with the total balance being slightly negative. But from 1972 and on, the annual mass balances of the glacier were always negative (Makarevich 1985). According to Vilesov *et al.*'s Aerophototopographical Monitoring of Modern Glaciation of the Northern Slops of the Zailyisky Alatau Mountain Range: "from 1979-1990 the area of the glacier had diminished 220,000 m<sup>2</sup>, while its volume decreased in 16 millions of m<sup>3</sup>."

Almaty, the capital of Kazakhstan (population 1.3 million) is located at the bottom of the valley in which the Tuyuksu glacier is found (Malaya Altmaatinka), and has a desert region on its northern side. This fact places Almaty in a very unique position in relation to two important complexes that have influence on human health: water and air.

It is known that the Ele-Alatau mountain ridge is the main supplier of water for Almaty, considering drinking purposes, hydroelectric power plans, irrigation for agriculture and industrial needs. Boldyrev (1996) states that up to 80% of Almaty's water originates in the mountains. Makarevich *et al.* (1984) affirm that during dry seasons the glaciers are, in fact, the only significant source of water for the mountain rivers.

According to Makarevich (1985), the Malaya Almaatinka river (which crosses Almaty and is one of the three main suppliers of surface water for the city) is formed by the normal melting of the Tuyuksu glacier. Melted ice water is up to 70% of the annual river runoff at its source, and up to 10-33% at its runoff down the mountains. Water originated from melted ice is of particular importance in the warm season, when moisture requirements are higher. During this period, the amount of melt water ranges from 16 to 48% at the river runoff and from 60 to 85% at the river source. The role of glaciers as suppliers of water for other rivers of the ridge is even more important. In the warm season melt water makes 60% and even more of the rivers runoff and the averages during the year are up to 40%. In October 1995, K. Sh. Amiryayev - the head of Almaty Committee of Hydro-ecology and Bio Resources - reported at the "Optimisation of Water Management Seminar" the main facts related to water supply of Almaty. According to this report, the first water supply system of the city was built in 1901. Until 1934 the water originated mainly from two sources: the Malaya Almaatinka and the Bolshaya Almaatinka rivers. Only in 1956 the first system for underground collection of water was built. The importance of this source of water increased from year to year. Presently, up to 70% of the water supply for the city emanates from underground. The remaining 30% is provided by three surface sources that originate from the glaciers: Malaya Almaatinka River, Bolshaya Almaatinka River and from the rivers which come from the Talgar valley.

Underground water is now the main source of water supply for Almaty. But it is known (Boldarev, 1996) that up to 80% of all water in the Ele-Alatau region originates in the mountains, including underground water. It is also accepted that the main source of underground water originates in the glaciers region, that at some point goes underground. Thus, glacier water is still the primary source of water for Almaty and the Tuyuksu glacier, being the most important glacier in the region, it is definitively one of the main suppliers of water for the city.

The second important complex that has an influence on human



health - air - also behaves in a particular way in the region of Almaty. It is widely accepted (Scorer, 1978) that a mountain/valley air circulation system observes the following typical pattern: ascending (anabatic) warm wind starts flowing up from the bottom of the valley shortly after sunrise and lasts usually all the day time; after sunset, the wind change its direction, and fresh air from the mountains flows down to the valley. As Almaty is in the lower part of the valley in which the Tuyuksu glacier lies at the top (the Malaya Altmaatinka valley), it would be expected that the fresh wind from the glacier would blow clean air down into the city, removing its pollution towards the desert. Surprisingly, this does not occur. According to experts from the Kazak Research Institute of Hydrometeorology (Helmgolts 1963), Almaty has its own specificity: when the fresh wind from the glacier blows from the mountain it is mainly prevented from going down low enough to enter the city, bypassing it over the top, and only a small amount of fresh air blows through the city's streets. Apparently, the many high buildings built in the last 30 years offer a physical obstacle. On the other hand, the other half of the mountain/valley air circulation system unfortunately happens. It then blows Almaty's pollution up the Malaya Altmaatinka valley to the Tuyuksu glacier, polluting the glacier and, ultimately, the main water supply of the city. The City's Department of Ecology and Bioresources states that the two main sources of pollution - stationary sources (industrial plants, power stations, etc.) and mobile sources (motorcars, buses, etc.) amounted to about 170,200 tons per year in 1995.

The aforementioned reduction on the area and volume of the Tuyuksu glacier together with the cumulative effect of a almost stable high rate of pollution poses a serious threat to the stability of the glacier. And this would affect the water supply for Almaty. Taking into account that Tuyuksu is one of the key components of the mountain/valley air circulation system, the glaciers' rapid deterioration may also have a disastrous effect on the atmospheric situation of Almaty. These two conditions would, consequently, have a negative impact on the health conditions of its citizens.

It is accepted that glacier monitoring provides the most

important evidence of 20th-century warming. Observed changes in the glacier mass allow experts to make direct comparisons between changes in glacier mass and anthropogenic enhancement of the greenhouse effect (United Nations Environment Programme - UNEP, 1992).

Nevertheless, if the alternated (and slightly negative) balances experienced by the Tuyuksu glacier from the 30's to the 70's could be explained by known global changes (including the decrease of precipitation observed from the 40', the increase of average annual temperature and the glacier own long-standing dynamics), the strictly negative annual balances since 1972 need more sophisticated arguments for their explanation. Tuyuksu's deterioration is also attributed to anthropogenic enhancement of the greenhouse effect. But another important reason may be the contamination of the glacier surface by different pollutants: (1) salty dust from the dried surface of the Aral Sea (located 1,500 km from the glacier); (2) industrial air pollution discharged by the Balkhash Cooper Plant (some 700 km from the glacier); and (3) highly polluted air of the nearby industrial Almaty (located some 30km opposite to the Tuyuksu glacier). All the above mentioned pollutants diminish to some extent the reflex capacity (albedo) of the glacier and, accordingly, this leads to the acceleration of ice thawing, evaporation and, finally, to the reduction of the glacier (Kotlyakov, 1984). The main question, then, is: what source of contamination is the major reason for albedo decreasing in Tuyuksu glacier?

The hypothesis raised by Verkhovod *et al.* (1996) is that the main contaminant is the polluted air blown up from Almaty. To test this hypothesis they choose the method of comparisons with a "control" glacier. For this control glacier the Bogdanovich glacier was chosen. It is only 5 km from the Tuyuksu glacier and has the same northern orientation. Both Tuyuksu and Bogdanovich belong to the same type of glaciers - both are "small valley" type. They also begin and end at almost the same altitudes and have close areas (see Tables 1 and 2). For this reason they fall into the same category: middle sized glaciers.

The main difference between the two glaciers is that they are located in orographically different valleys. Tuyuksu is on the Malaya Almaatinka valley which ends at Almaty city, while the Levyi Talgar valley (Bogdanovich glacier is in the upper part of this valley) ends at the small-rural-50,000 inhabitants Talgar. In spite of all similarities between the two glaciers, the pollution originated in Almaty is much bigger than the Talgar one.

It is clearly seen from Tables 1 and 2 that although being very similar to each other, Tuyuksu and Bogdanovich glaciers diminish at a different pace. Tuyuksu has decreased by 8% during the eleven years and Bogdanovich only by 5%, the difference being 38%. The difference in the glaciers' decrease is even more evident if the changes in the volumes of the two glaciers are taken into account.

Tuyuksu Glacier	Altitude (m)	Area (km <sup>2</sup> )		Volume (km <sup>3</sup> )	
		1979	1990	1979	1990
	3400-3500	0.16	0.083		
	3500-3600	0.32	0.317		
	3600-3700	0.30	0.291		
	3700-3800	0.87	0.841		
	3800-3900	0.42	0.393		
	3900-4000	0.28	0.238		
	4000-4100	0.26	0.243		
	4100-4200	0.10	0.091		
	4200-4300	0.01	0.003		
	Total	2.72	2.500	0.131	0.1150

**Table 1** - Changes in the area and volume of the Tuyuksu glacier, from 1979 to 1990 (adapted from Vilesov *et al.*, 1994).

UNEP, in its Glaciers and the Environment states that “Glaciers are important to the environmental health of the planet...” and affirms that “Seventy-five percent of the world’s freshwater is stored in glaciers, and the water they release is used to produce hydropower and provide

irrigation, which represents a considerable economic importance”.

Bogdanovich Glacier	Altitude (m)	Area (km <sup>2</sup> )		Volume (km <sup>3</sup> )	
		1979	1990	1979	1990
	3300-3400	0.01	-		
	3400-3500	0.08	0.029		
	3500-3600	0.16	0.154		
	3600-3700	0.18	0.180		
	3700-3800	0.20	0.200		
	3800-3900	0.17	0.170		
	3900-4000	0.30	0.300		
	4000-4100	0.13	0.130		
	4100-4200	0.09	0.090		
	Total	1.32	1.253	0.048	0.0477

**Table 2** - Changes in the area and volume of the Bogdanovich glacier, from 1979 to 1990 (adapted from Vilesov *et al.*, 1994).

The aim of this fieldwork (which resulted in a paper published in *Parks* by Cesario *et al.*, 1997) was to show that protected areas may also provide other benefits, on top of the economic ones. The health benefits which will result from a more efficient protection of the glaciers located within the Ele-Alatau State National Nature Park must be more clearly established locally. This would increase the awareness of the Almaty population in relation to their environmental problems, which would, in turn, help both local park managers and decision makers to work towards a more sustainable way of life. The local media is already focusing on the problem of water supply to Almaty. A recent interview given by the director of the Institute of Geography (Academy of Sciences/Ministry of Sciences) together with two other renowned Kazakhstani glaciologists to the most popular local newspaper, emphasised the gravity of the problem in the near future. The momentum for this discussion is presented in Kazakhstan, as it is present in other parts of the world.

### ***III. 9- Integrating Conservation-Development Projects***

The health benefits of protected areas are also encompassed by the opportunity to integrate conservation projects for protected areas with sustainable rural development projects for the human population directly affected by the existence of the protected area.

#### **III. 9. 1 - Data Collection**

This author's first contacts with the Integrated Conservation-Development Project (ICDP) developed by the Museum of American Man Foundation (FUMDHAM) for the *Serra da Capivara* National Park (north-eastern Brazil) goes back to 1992. The fieldwork which resulted in Ambio's "Contribution of Conservation to Sustainable Living through Health Promotion" (Cesario 1996a) was performed in January 1995. Additional data was gathered during a further survey performed in June-July 1996.

#### **III. 9. 2 - Findings**

Detailed information on this ICDP will be provided in the next Chapter, which represents an in-depth case study of this opportunity of integrating conservation projects with development projects.

Nevertheless, it is worth presenting here the conclusion published in Ambio (Cesario 1996a): the improvements in the health conditions of the communities neighbouring the *Serra da Capivara* National Park, Brazil, arose from the opportunity and ability specially present in this area. In other words, the need to conserve the local natural and cultural heritage, identified by a group of scientists, persuaded the Brazilian Government to create the national park now present in the region. The existence of a protected area facilitated the bringing together of a multidisciplinary team of specialists, which were interested in addressing the different problems found locally under a holistic approach. This multidisciplinary approach made possible the

design and implementation of a multidisciplinary project, which was aimed at protecting the local natural and cultural heritage by improving the health conditions of the local communities. By health conditions are understood the access to primary health care and, more importantly, to education, decent housing and work possibilities. Such improvements were not observed in other communities in the same area, which were not linked to the development activities described in this ICDP.

### ***III. 10 - Concluding Remarks***

Summarising, the findings presented in this Chapter suggested that protected areas can:

- improve the agricultural production and the health of livestock;
- provide clues on how to prevent diseases;
- boost psychological well-being;
- support traditional healers and their practices.

These four anecdotal evidences of less tangible benefits to human health and quality of life need further critical evaluation by means of a more detailed literature review and survey of the different field conditions.

It was also demonstrated that protected areas:

- represent a genetic bank for new and known drugs;
- attract sanatoria, nursing homes and spas aimed at promoting individual re-habilitation and social re-integration;
- help cleaning the air, absorbing pollutants, and maintain sources of drinking water;
- provide the conditions to integrate conservation projects with sustainable rural development projects for the human populations affected by the presence of such protected areas.

These eight ways in which protected areas can benefit human health represent much more than personal insights from travels and talks with people, or even isolated case studies. Rather, they represent the first attempt to provide a comprehensive list of the different positive impacts that *in-situ* biodiversity conservation can have on the quality of life. They have different degrees of tangibility, can be found in both developed and developing countries, and in different ecological and

cultural systems, across the world. Therefore, they may be a useful way to show that *in situ* conservation of biodiversity can have a practical meaning for people, ?even for those who may never visit a protected area?.

## CHAPTER IV

### ASSESSMENT OF THE *SERRA DA CAPIVARA* ICDP

#### *IV. 1 - Introduction*

##### IV.1.1 - Specific Aims

This Chapter is aimed at addressing the fourth research question presented in the Overview of this Thesis: would it be possible to assess one of the “health benefits of protected areas” in terms of the changes to people’s quality of life and to people’s perception towards their neighbouring Park ?

##### IV.1.2 - Choice of Case Study

On the one hand, by the year 2000, more than 50% of the world’s population will live in urban settlements. Increasing urbanisation is found in both developed and developing countries. In developed countries over 70% of people already live in cities; in developing countries the percentage of the population living in urban centres has risen from 17% in 1950 to 33% in 1991 and is expected to be about 50% in 2010 (Policy Studies Institute, 1991). “This rapid urbanisation [sic] will result in the ‘development’ of an estimated 24 mega cities, 16 of which will be in the developing world. ... Many such cities are “functioning” to the detriment of the population’s health and surrounding ecosystems...”. This statement by UNED-UK (1994) implies a need



for studies aimed at improving the living standards of populations living in rural areas, to reverse - or at least minimise - such urbanisation.

On the other hand, the importance of the *Serra da Capivara* National Park was internationally recognised in 1991, when it was declared a World Heritage Site by the United Nations Educational, Scientific and Cultural Organisation (UNESCO), and is vested in:

- (1) being the only National Park situated in the morphoclimatic dominion of *Caatingas* ;
- (2) possessing the greatest concentration of prehistoric sites in the country and the most important in the Americas, including the diggings at *Toca do Boqueirão do Sítio da Pedra Furada* that postulated the earliest known presence of man in the Americas; and (3) providing the contradiction to the ancient classic theory, which had established that the American man came originally from Africa, Europe and Asia, having crossed the Straits of Bering, passed through North and Central Americas and finally arriving in Brazil about 12,000 years Before Present (Fumdam/Terra Nuova 1992) (Parenti 1993a, 1993b, 1993c).

The results of the paleoparasitological research in this region were extremely important for the paleo-epidemiological understanding of ancylostomiasis in the Americas, showing that this infection has existed in prehistoric populations for at least 7 200 years. Additionally, this research established links and confirmed theories of migration and overseas contacts of prehistoric populations with the Americas. The presence of this infection in the American Continent demonstrated that the navigation had been achieved by man for 7 200 years (Araújo 1989) (Guidon and Arnoud 1991) (Parenti 1993a, 1993b, 1993c).

#### IV.1.3 - Representativeness of Case Study

Case studies are generalisable to theoretical propositions and not to populations or universes. In this sense, the case study does not

represent a sample, and the investigator's goal is to expand and generalise theories (analytic generalisation) and not to enumerate frequencies (statistical generalisation) (Yin 1994).

#### IV.1.4 - Data Collection

The description of the ICDP activities and achievements, as well as the background information on the location, climate, water supply, vegetation and fauna, human occupancy, and life standards before the ICDP was implemented, in April 1990 by FUMDHAM, resulted from:

- assessment of the literature concerning the region of the NPSC, as: Araújo (1989); Araújo (1990); Araújo et al. (1991); FUMDHAM/FIOCRUZ/TERRA NUOVA (1989); FUMDHAM/TERRANUOVA (1989), FUMDHAM/TERRANUOVA (1992), Gomes (1993); Guidon and Arnaud (1991); Macêdo (1991a, 1991b, 1992a, 1992b, 1992c, 1993); Parenti (1993a, 1993b, 1993c); as well as health and school files;
- unstructured interviews with the members of the FUMDHAM team involved with administration, archaeological research, tourism, apiculture, pottery, health and education programmes;
- participant observation in the town of *São Raimundo Nonato*; the villages of *Sítio do Mocó*, *Barreirinho*, *Borda* and *Coronel José Dias*; the NACs of *Sítio do Mocó* and *Borda*; the apiculture project; the archaeological sites; and the tourist trails in the Park.

#### ***IV. 2 - The Concept of ICDP***

It is now widely recognised that protected areas cannot be managed as biological islands but must be integrated within a broader ecological and human framework (Lusigi 1981, Western 1982,

Mackinnon et al. 1986, Wells et al. 1992), particularly within the context of the political economy (Marks 1984, Abel and Blaikie 1986, Anderson and Grove 1987). In particular, it is recognised that local people's needs and aspirations must be taken into account, and alternative resources or other benefits provided to reduce conflicts and even win their support. This approach to protected area management is referred to as integrated conservation and development projects, and are often termed ICDPs (Wells et al. 1992). Their aim is to ensure the long term stability of the protected area through the implementation of development activities within the area or its peripheral zone, so that pressure is alleviated from the reserve and people are assured of sustainable and improved livelihoods. These projects are supported by international funding and technical assistance. They intend that the protected area should be part of a multiple land use strategy which promotes environmental stability and the sustainable use of resources.

Development as part of integrated conservation projects may cover a wide range of activities aimed at, for example, increasing productivity and income generation from agriculture, forestry, fisheries, local crafts and nature tourism; provision of community services, employment, and improving access routes. Income generation and improved access to social services are often given a high priority (Wells et al. 1992). In some cases a proportion of the gate receipts paid by park visitors are given to local communities, often in the form of a fund intended for local development projects (Western 1982). However, provision of financial remuneration and social services have not always been successful in promoting good relations between a park and its neighbours (Parry and Campbell 1992; Heinen 1993). Amboseli National Park in Kenya was one of the first to share park revenue with local people, from a substantial tourist income, but there has been continuing resentment and illegal use of the park. Many of the difficulties stem from the fact that only a small proportion of the promised benefits have been delivered, and the Maasai living adjacent to the park received little benefit from the tourist revenues received by the District Council

(based 150 km away). At the nearby Maasai Mara Reserve better communication between park authorities and local people has alleviated much conflict (Talbot and Olindo 1990).

Hough (1988) advocates the use of conflict management techniques to improve relations between parks and local people. This approach encourages identification of stake-holders (including different groups within local communities), use of a third party negotiator, recognition of power differences, reduction in the degree of risk and uncertainty, and ensuring that agreements are binding and enforced. Although community participation and respect for traditional knowledge and values have persistently been shown to be fundamental to the successful implementation of development projects, the difficulties of ensuring that they occur must also be resolved.

As with all rural development projects the way in which they are implemented is fundamental to their success. Approaches to development have also evolved considerably during recent decades (Hough and Sherpa 1989). In the 1960s development was viewed by some as the inevitable consequence of the mobilisation of resources. The emphasis was on the transfer of Western technology and funds were invested in large scale projects like dams. Decisions were made at a high level and imposed on a location and its population. In the 1970s new models of development emerged based on redistribution and participation. Projects aimed to identify and provide basic needs such as adequate nutrition, water, shelter, health, education and employment. However, the planning was usually performed by educated urban bureaucrats working in government departments (Hough and Sherpa 1989). Such approaches were criticised for their inability to address the real issues of poverty and to reach the rural poor, and for creating dependency (Chambers 1983).

More recent approaches have aimed at community empowerment; enabling people to help themselves. Working through existing social institutions and catalysing local initiatives through which

people are able to improve their lives, while maintaining their self reliance, is believed to achieve a much more enduring change. A major difficulty in implementing such an approach is that it requires devolution of power over development resources. It also often requires longer time periods for implementation and considerable flexibility on the part of donors and planners.

However, improving living standards is not sufficient for success in these ICD projects, as they must also achieve long term stability of the regional ecosystem and maintenance of the protected area. The problem is essentially one of sustainable development. People living adjacent to protected areas in developing countries are often rural poor, distanced from health and education services and politically marginalised. How can investments be made to ensure lasting and secure livelihoods for local people that minimise resource depletion, environmental degradation, cultural disruption, and social instability? Development strategies must be ecologically sustainable over the long term, consistent with social values and institutions, and encourage grassroots participation in the development process (Barbier 1987). In addition to sustainable development, these projects must also achieve support for the protection of the protected area. In practice, the ranges of development benefits planned at many sites are not clearly linked to the maintenance of biodiversity, and in particular to the maintenance of the protected area (Wells et al. 1992).

### ***IV. 3 - The Region of the Serra da Capivara National Park, Brazil***

#### **IV.3.1 - Location**

The *Serra da Capivara* National Park is located in the Southeast of *Piauí* State, in the Northeast region of Brazil. It has a 214 Km perimeter and covers an area of 129,140 hectares. The total

population of the four municipalities (*São Raimundo Nonato*, *São João do Piauí*, *Canto do Bruítí* and *Coronel José Dias* (this last, since 1992, when *São Raimundo Nonato* was split into two) in which the Park is located amounts to 120,000 inhabitants. The village of *Sítio do Mocó* (253 inhabitants), where the nearest population to the Park is found, is some 26 Km away from the main town of *São Raimundo Nonato* (10,000 inhabitants). The State capital, *Teresina*, 530 Km away, is connected by a tarred road. (Araújo et al. 1991).

#### IV.3.2 - Climate

The average annual temperature is 28oC, with thermal amplitude of less than 5oC. The average annual precipitation is 689mm (200mm variation), with a rainy season from October until May, during which period 94% of the year's rain falls. The relative humidity varies between 80-90% during the rainy months, registering 70% during the dry months, with a minimum of 35% in August. Accordingly, the climate in the south-east region of Piauí State is classified as between arid and semi-arid (Class BSHw of Koppen) (Araújo et al. 1991).

#### IV.3.3 - Water Supply

The kind of climate described above results in permanent irregularity of the watercourses. In the region, no river is permanent. Many dams are made, but are frequently destroyed by flooding. Some wells supply water, which varies in quality. Other commonly used sources of water are the natural rock basins which collect rain water, and boreholes; both are used for drinking (by man and animals) and for washing.

#### IV.3.4 - Vegetation and Fauna

The vegetation of the Southeast region of *Piauí* is *Caatinga* - which is a collection of a wide variety of endemic species characteristic of the semi-arid region of north-eastern Brazil. The principal feature of *Caatinga* vegetation is periodic leaf-loss. The fauna of the semi-arid region is normally considered to be, by many authors, depleted and poor in endemic species, particularly mammals; despite new endemic species of birds, reptiles, amphibians and even mammals still to be identified. Rodents, lizards and invertebrates are numerous (Araújo et al. 1991).

The scarcity of biological information is due to the lack of studies on the vegetation and fauna of the region. The only known study on the fauna of the Park (which is an internal report to FUMDHAM, by Marcia Chame) was not made available to this author, despite many efforts. Similarly, there is no information on the conservation strategies or monitoring, for the Park. The official conservation authority (IBAMA) was used to have only one administrative manager and two rangers for the whole 129,140 hectares of the Park. Therefore, efficiency of conservation measures will not be assessed here. The proposed co-management of the Park (in implementation), between IBAMA and FUMDHAM, is expected to improve this situation by providing more resources (human and financial) to the Park.

#### IV.3.5 - Human Occupancy

Cave paintings evidence that the region was inhabited in pre-historic times first by hunter-gathers and later by ceramic/agricultural cultures (circa 3 500 - 3 000 years Before Present) (Parenti 1993b).

*Piauí* is one of the states in the interior of Brazil in which history began later; the region was colonised by farmers during the two richest periods in the history of Brazil: the sugar-cane period in the Northeast region and the gold mining period in *Minas Gerais*. The *Serra da*

*Capivara* region is one of those of which the information about the indigenous populations is very rare. The documents are limited to indicating the existence of the *Pimenteiras*, the *Acums* and the *Aris* (Araújo et al. 1991).

In 1832, the settlement of *São Raimundo Nonato das Confusões*, which had been established by *José Dias* was elevated to the category of village. During this period, the south of *Piauí* was economically thriving, having expelled the indigenous peoples and developed huge cattle farms. Around 1850, the farms declined and with them, all the south of *Piauí* (Araújo et al. 1991).

In 1912, when the village of *São Raimundo Nonato* was raised to the category of municipality, a scientific expedition visited the region. *Belisário Penna* and *Arthur Neiva*, researchers of the *Instituto de Manguinhos* - now *Oswaldo Cruz* Foundation, FIOCRUZ - mentioned the extreme poverty of the region and its inhabitants, and the enormous difficulties relating to water supply. They described the dry, but beautiful landscape, underlining the rocky formations, where vectors and reservoirs - bugs and rodents - of Chagas Disease have been found (Gomes 1993). All of the south-east of *Piauí* State remained isolated from the rest of the country until the arrival of television in 1978.

The 860,000 square kilometres *Caatinga* remains one of the least populous and certainly the poorest among the five major ecosystems of the country. The long cycles of severe droughts periodically force local populations to either migrate to slums in urban centres or to exhaust the region's natural resources. Illegal and uncontrolled hunting has resulted in the extinction of species of animals and plants. Tree-felling and fires, started by hunters or farmers, has destroyed extensive zones of primary vegetation (Araújo, A.J.G. 1989) (Araújo et al. 1991).

The great drought of the period 1980-1985 caused a substantial depletion of the resources of the small local farmers and caused many of them to return to being rural workers - searching daily for any kind



of work, extremely badly paid, and in conditions of health and hygiene that were ever more difficult. One of the sources of income is the extraction of limestone to make lime: massive blocks of karstic (limestone) are crushed with pieces of marble, put into a type of oven (lime-kiln) and then heated for 3 days before being transformed into lime. For the heating up to 7 trucks of wood are used. The blocks of limestone belong, in the main part, to proprietors who employ daily workers to transform the noble raw materials such as hardwood and marble into a cheap product, lime (Araújo, A.J.G. 1989) (Araújo et al. 1991).

Depletion of the natural resources was identified as an important threat to the local natural and cultural heritage and became the principle worry for FUMDHAM, the Museum of American Man Foundation, which intended to intervene in the region's development. A questionnaire answered by the villagers, in 1989, identified their main problem: the lack of local work possibilities, forcing the men to migrate to bigger towns and distant cities. The aim of the project was, therefore, to provide the local communities with the ability to carry out innovative activities which can succeed in the area, providing them with a sustainable livelihood, and further, to prevent the destruction of the archaeological sites and cave paintings (Araújo, A.J.G. 1989) (Araújo et al. 1991).

#### IV.3.6 - Life Standards before the ICDP

Local children had learning problems which affect their physical and intellectual development (Fumdhm/Terra Nuova 1989). Among the salient factors identified by Fumdhm/Fiocruz/Terra Nuova (1989) and Fumdhm/Terra Nuova (1989) influencing this situation were:

- (i) scarcity of food, which forced the children to go to school without having had any food in the morning;
- (ii) lack of clean water facilities, producing gastric-intestinal infections and enteroparasitosis, leading to malnutrition;
- (iii) an absence of contact with parents during the day;

- (iv) lack of stimulation for linguistic expression, in the context of a culture strongly founded in oral expression;
- (v) lack of stimulation to go to school, because of the inadequacy of teaching methods;
- (vi) poor physical state of repair of the school buildings;
- (vii) the absence of pre-school education.

A survey made by the Secretariat of Education of the municipality of *São Raimundo Nonato* showed that 48% of matriculated students in rural schools of the municipality, administrated by the prefecture, were not completing the school year - 35.4% fail exams and 13.1% abandoned school during the year (Fumdham/Fiocruz/Terra Nuova 1989 and Fumdham/Terra Nuova 1989).

Amongst the factors of “de-schooling” identified by Fumdham/Terra Nuova (1989) were:

- (i) the oldest students and even teachers abandoned lessons during the seasons of planting and harvesting;
- (ii) lack of clothing for children going to school;
- (iii) the lack of school lunches;
- (iv) the lack of teaching material, which, when it existed, was inadequate in the reality of local culture;
- (v) low level of competence of teachers who generally had scarcely completed (or did not have) primary level;
- (vi) the low salary of teachers, who received 50% of minimum wage in 1986, and only 20% of minimum wage in 1989.

In addition, the municipal rural schools were usually in a poor state of physical repair - showing cracks in the walls (where *Triatoma sp.*, vectors of Chagas Disease, could be found), without water or toilets, without systematic cleaning system, and having little school furniture for students and broken doors and windows (Fumdham/Terra Nuova 1989).

According to Fumdham/Fiocruz/Terra Nuova (1989), the

sanitary condition of the municipality does not differ from that observed in other rural areas of the majority of the municipalities of the Northeast of Brazil. Among the main findings were:

- (i) poor primary health care;
- (ii) low level of vaccination;
- (iii) high prevalence of infantile malnutrition;
- (iv) problems of dental health;
- (v) frequent diarrhoea.

#### ***IV. 4 - The Serra da Capivara ICDP***

##### **IV.4.1 - History of Creation of the *Serra da Capivara* National Park**

In 1963, the municipal governor of *São Raimundo Nonato* was visiting the archaeological exhibitions of the Museum of the University of *São Paulo*. He asked the person in charge - Niède Guidon, a Brazilian archaeologist - to look at some photographs of the existing paintings at the mountains of his region. She promptly realised that these cave paintings were different from anything already known. In 1970 when, for the first time, she saw the paintings, she confirmed the importance of the discovery. At that time, the local people were acquainted with just 4 or 5 sites. She asked them to look for new paintings. When she came back in 1973 they had found 55 new sites and in 1975, 52 more. A total of 362 sites had been recorded up to 1991: 242 presenting cave paintings; 76 are open-air sites representing hunter/gatherer settlements; 15 are ceramic/agricultural settlements; 23 are occupations in caves or shelters; 1 is a burial site; and 5 are archaeo-palaeontological sites. There are cave paintings dated 14,000 years Before Present. The diggings at *Toca do Boqueirão do Sítio da Pedra Furada* have postulated the earliest known presence of man in the Americas - circa 48 000 years BP (dated in France and the USA

by sedimentation and luminescence methods; using the C14 method, the oldest datation for this site is 48 700 years BP, according to Parenti 1993a, 1993b, 1993c). An abundance of fossilised plants found in the *Toca de Cima dos Pilão* cave, and fossil bones found in the *Antonião* site confirms the presence of mastodons, American horses, llamas, sloths and giant armadillos up to at least 12,000 years Before Present, when the climate began to change from tropical to arid, reducing the region's humidity as well as the chances of survival (Guidon and Arnaud 1991).

The archaeological research program, developed since 1970, showed the capital importance of the sites in the understanding of the colonisation process of Brazil; the ecological studies developed showed preserved areas of forests and *caatingas* (savannah), that were protecting endemic species of animals and plants, and some which were in danger of extinction. Niède Guidon's team had made an agreement with the Federal University of *Piauí*, in 1974, which resulted, in 1975, in the establishment of the French-Brazilian Mission. After three months of archaeological work, the team of specialists decided to communicate their important findings and the unique ecological features of the region to the Brazilian authorities, asking for the creation of a protected area. The *Serra da Capivara* National Park was created by Presidential Decree No. 83 548 of 5 July 1979 (Araújo et al. 1991).

#### IV.4.2 - The *Serra da Capivara* ICDP and its Achievements

The professionals involved in the *São Raimundo Nonato* research decided, under the direction of Dr Niède Guidon, to create, in 1986, the Museum of American Man Foundation - FUMDHAM, with the objective not only of interdisciplinary research, but also to lend support to the development and welfare of the local populations.

The formation of a team composed of the various types of researchers was, from the beginning, the work of Dr Niède Guidon and Dr Anne-Marie Pessis. By 1986 the FUMDHAM team consisted of 27 specialists of different areas of expertise.

The goals of FUMDHAM have been to sustain in *São Raimundo Nonato* the collections resulting from the interdisciplinary research carried out in the region since 1970; to display the results of this research in exhibitions, conferences and audio-visuals with an educational approach, covering the preservation of archaeological and paleontological sites and the environment; to build and maintain a Museum dedicated to the collections developed through the research of the team; to construct and set up the laboratories which would be necessary for the study of the remains and data collected in the region; to organise a book, photographic and film libraries to protect the documentation resulting from the work of the team; to encourage the study, teaching and research in the sphere of prehistoric anthropology and related sciences; to train technical personnel and contribute to the improvement of basic education; to construct a place projected to cultural and educational events, not only for the scientific community, but especially dedicated to the local population; to provide the visits of authorities in the relevant disciplines; to maintain the interchange with similar organisations both in the country and outside; to collaborate with government institutions to promote the economic development of the region; to provide all interested public institutions with the data and documents needed to program local development; to meet with public and private entities, national and foreign, with a view to financing the objectives; to publish bulletins, magazines, catalogues and books.

To reach these objectives, FUMDHAM, since its creation in November 1986 to the present, has signed various conventions and contracts, thus guaranteeing a fixed and accelerating rhythm in all of the included work. The construction of the Museum of American Man on a chosen site, is already in its initial phase, with the support of the Ministries of Education and of Culture of Brazil. The UNESCO has committed itself to the setting up of the Museum.

<b>American</b>	Centre for the Study of the First Americans – University of Maine.
<b>Brazilian</b>	Ministry of Education; Secretariat of Culture, Ministry of Social Action; CNPq – National Council for Scientific and Technological Development; FINEP - Studies and Projects Fund; IBAMA - Brazilian Institute of the Environment and Renewable Resources; National Fund for the Environment; National Secretariat of Sanitation; LBA – Brazilian Legion of Assistance; Bank of Brazil Foundation; EMBRATUR – Brazilian Enterprise of Tourism, National Historical Heritage Institute; EMBRAPA – National Enterprise for Researches on Agriculture and Cattle; ENSP - National School of Public Health of the <i>Oswaldo Cruz</i> Foundation - FIOCRUZ; Federal University of <i>Piauí</i> ; Federal University of <i>Pernambuco</i> ; State University of <i>Campinas</i> - UNICAMP; Museum of the University of <i>São Paulo</i> ; Secretariat of Culture of <i>Piauí</i> ; Secretariat of Education of <i>Piauí</i> ; PIEMTUR - Tourism Enterprise of <i>Piauí</i> ; Ford Foundation of Brazil; The Nicolas Ligeti Institution.
<b>Canadian</b>	Canadian International Development Agency – CIDA.
<b>French</b>	Ministerre des Affaires Etrangeres; Ministerre de l'Education; CNRS – Centre Nationale de la Recherche Scientifique; EHESS - École des Hautes Études en Sciences Sociales; Institute Français de Recherche Scientifique pour le Development et Co-operation; Université <i>Claude Bernard</i> - Lion I.
<b>International</b>	UNESCO; UNICEF; FAO; BID.
<b>Italian</b>	Centro Nazionale delle Richerche; Terra Nuova.
<b>Japanese</b>	Japanese Cooperation; Japan-Brazil Cultural Institute.

**Table 3** - National and international institutions whose have collaborated and/or are collaborating, directly or indirectly, with FUNDHAM.

FUNDHAM receives national and foreign trainees, giving precedence to researchers and students from conventional institutions. They use the provisional site of the Museum, the Centre of Interdisciplinary Research in *São Raimundo Nonato*, which consists of laboratories, deposits of materials, film, photography and book

libraries, a computer and video room, accommodation for researchers and fully equipped kitchen. Although FUNDHAM does not yet have a team of permanent staff, the researchers and post-graduate students of institutions which hold conventions keep the centre in constant activity throughout the year.

The *São Raimundo Nonato* region had, by 1993, produced a vast contribution in the fields of archaeology, anthropology, sociology, botany, zoology, paleoparasitology, paleontology, geology, besides the specific results in topography, and photographic record with more than 2,000 transparencies, films and videos, made by the BBC, German Television, Japanese Television and 3 made by Brazilian institutions: (1) FUMDHAM/ UNICAMP - Communication Centre; (2) Globo TV Channel - Globo Science; (3) Culture TV Channel.

The Management Plan designed for the Park by Araújo et al. (1991), incorporated the notion of the collaboration of the local population, whose active support is essential; besides this, it included the creation of a protected area and implied contemporaneous socio-economic development in harmony with the environment; in providing the possibilities of urban growth and the requisite growth of the underlying material infrastructure; and in offering professional training which will permit diversification of productive activities as substitutes for the 'plundering' activities, which are generally exercised because of lack of understanding and economic hardship.

The start of these activities was marked by the installation of analytic laboratories in *São Raimundo Nonato*. This period produced the course for the formation of Health Agents.

At the end of 1989 a program of education, production and rural expansion was begun with the training of inhabitants in apiculture activities. The beginning of 1990 saw the continuation of activities with the implementation of the Programs of the Ministry of Health, such as immunisation, hypertension, attention to pregnancy, infantile diarrhoea and acute respiratory infections, tuberculosis and malnutrition, as well as research into *Chagas* Disease and intestinal parasites. A registry of

Family-files was set up, with an auxiliary domestic questionnaire.

The development aim of the ICDP is being achieved through the implementation of sites of community action designated as “Community Support Centres” (in Portuguese: *Núcleos de Apoio Comunitário* - NACs), where the diverse activities which aim to benefit the local communities are concentrated. The objective is to increase the number of NACs around the Park in a manner such as to integrate the local communities with those activities which avoid depredation and which will create better conditions of life. In the NACs, professional courses such as embroidery, cabinet making, painting and design, ceramics, horticulture and goat-herding, can be offered to children, adolescents and adults, providing the means to break the cycle in which agriculture is the only productive activity available (Fumdhm/Terra Nuova 1992).

The first Community Support Centre, known as NAC of *Sítio do Mocó*, had its structures built on land, on the border of the National Park, given by FUMDHAM, and is made up of 3 parts: one to provide the functions of a school, the second for health activities and the third to accommodate the teachers and for the preparation of meals for the children. On the highest part of the land community lavatories have been installed, and the used water recycled to be re-used in the school garden. These taps are essential for the community because of the lack of sources of water available. A small artesian well was built to provide water for the NAC, and there are also 3 reservoirs for the collection of rain water during the rainy season.

Professional courses which can be offered to children, adolescents and adults, provide the implements to break the cycle in which agriculture is the only productive activity available: embroidery, cabinet making, painting and design, ceramics, apiculture, horticulture, goatherding and tourism.

Since the beginning of the ICDP, courses on the different stages of apiculture have been on offer to those interested in learning about this productive activity. Studies on the environment agree that the



development of apiculture produces highly profitable results to the preservation of the Park, because it favours the pollination of the many species existing in it. The production employs 2 to 6 people - some honey is used by the schools while the rest is sold. In the first year the production was 2,800 litres of honey, of which 2,500 litres were sold. This activity is already self-supporting. The beekeepers are assisting in the conservation of the vegetable gardens adjacent to the schools, which are irrigated by the water used in the community lavatories, taking advantage of the slopes of the terrain. The schoolchildren also help in taking care of the gardens, which provide vegetables for their meals (data collected during local interviewing and reported by Macêdo 1993).

In addition to these activities, the Educational Programme and the Health Programme form the basis of the ICDP, with each NAC having a school and a health centre. The Educational Programme and the Health Programme were designed to be interconnected, supporting the need to integrate health professionals, community health agents, school activities and parents (Fumdham/Terra Nuova 1989 and 1992).

The tourist potential of the region is enormous, with its natural beauty and archaeological sites with rock painting of great scientific and artistic value. The educational program supports the aspects of the preservation of the environment, such as the training of people to accompany tourists in the Park. A 16 room hotel (each room with air-conditioning, TV, telephone, fridge-bar and shower) for up to 36 guests, began operating in December 1992. It also has 2 small swimming pools and a good restaurant with seating for 56 people. This hotel, located in the town of *São Raimundo Nonato* provides work for 20 permanent staff and 9 occasional employees. It is already self-supporting (data collected during local interviewing and reported by Fumdham/Terra Nuova 1992).

The touching aspect of this project is the extraordinary impulse that the setting up of the Park has achieved. The educational program supports the aspects of the preservation of the environment, such as

the training of people to accompany tourists in the Park. In the same way it has become an incentive for artisans within the rural population, an activity already initiated by the nurse of the Health Team in *Sítio do Mocó*. The question of tourism only enlarges the debates between the teams in their relation with the population.

In view of the fact that an aim of the program is to create the conditions to enhance the educational standards of the population (in the face of drastic social, ecological and economical changes), it was important that educational questions were approached in an integrated way, so as to reach as many children as possible, in addition to groups of adults. The children remain in the NACs from 08:00 to 17:00hrs. On arrival at school, the first activity concerns personal hygiene. The children have a bath every day, because in their houses water is not available for this daily function. This routine of hygiene has encouraged different habits which benefit health generally. The practice of cleaning the teeth was, for them, a complete novelty. They are given breakfast, lunch and a drink of fruit juice before going home. Meals are prepared by teams of mothers, which in turn, benefits their children. The children receive lessons for one session, the next being used for light activities and sports. Special attention is given to environmental education. In the formal teaching plan, the concepts of environmental education are integrated with formal education programs and are presented in such a way as to continue the development of study programs. It has been decided that it is not necessary to create special courses, but that the impact is greater if the contents are introduced and delivered spontaneously, so as to be perceived naturally. In addition to these activities, a choir has been created, and basic English and French are learnt, which will enable the children to help in the growth of ecotourism.

At the end of children's lessons the school of each NAC begins the evening activities which are offered to the adult population which is largely illiterate - the opportunity to learn to read and write. Another educational initiative, brought about by the adult population of the villages, is the holding of community meetings, which complement other

programmed activities. In these meetings, questions and problems are presented and discussed by the people, who are asked for their participation, by suggesting ideas for their solution. Questions related to the Park are put forward and discussed by the population.

In the NAC of *Sítio do Mocó* in July 1993 there were 129 students comprising: 24 in the daily nursery, 17 in *kindergarten*; 18 in pre-school; 11 in 1st series, 17 in 2nd series, 16 in 3rd series and 26 in literacy-evening classes.

The Education Programme was considered, in July of 1993, by the United Nations Children's Fund (UNICEF), as 1 of 14 model programs in the world (Macêdo 1993), in part because of the following results:

- (i) illiteracy in adults was eradicated;
- (ii) the level of understanding of children of the NACs is much superior to that of children in other schools of the region, and the handwriting of students is noticeably better;
- (iii) basic English and French are learnt;
- (iv) the children remain in the NACs school from 08:00 AM to 5:00 PM, they have a bath every day - because in their houses water is not available for this function - and the practice of cleaning the teeth was, for them, a complete novelty;
- (v) they are given breakfast, lunch and a drink of fruit juice before going home; meals are prepared by teams of mothers, which in turn, benefits their own children;
- (vi) the children receive lessons for one session, the next being used for light activities and sports;
- (vii) in addition to these complementary activities, a choir has been created;
- (viii) the children are given an environmental education and accept the necessity of protecting the animals living in the Park. The children carry these messages to the parents, who absorb the information and make commentaries in the meetings of parents.

After just four years of existence of the Health Programme (Macêdo 1991a, 1991b, 1992a, 1992b, 1992c, 1993), the achievements include:

- (i) primary health attention available for all;
- (ii) all children aged between 0-5 years were within the official vaccination scheme and all children aged between 7-14 years were immunised against tetanus;
- (iii) not one case of vaccine-preventable disease had been reported since the last 4 years;
- (iv) disappearance of infantile malnutrition;
- (v) diminution of dental cavities;
- (vi) diminution of diarrhoeic diseases;

The transmission of policies of hygiene and behaviour for the prevention of illness, such as vaccination, are the most important in the project. Fortnightly videos are shown (made by the Secretariat of Health) related to the prevention of illness such as AIDS, leprosy and measles. These videos and lectures are attended by a very significant number of people, with as many adults as there are adolescents. The university nurse regularly participates in the community meetings, in which information designed to answer queries about public health is provided.

#### IV.4.3 - Community Participation

According to the data collected during local interviewing and reported by Fumdam/Terra Nuova (1992) and Macêdo (1993), the participation of the community in the work of the NACs was, at first, difficult to obtain, but after 4 years the changes were clear. At the beginning of the ICDP it was difficult to interest the mothers in the preparation of meals for the children. Today the initial posture has been replaced by the mother participating with interest in these activities.

Alternative methods of agricultural production, first regarded with suspicion, are now fully supported, in particular the bee-keeping

and pottery activities.

At the beginning, the vegetable gardens were regarded with suspicion by the adults and just one adult was growing his vegetables. After the success of the children's garden, with the surplus been sold and generating a profit for the children, the adults started growing their own vegetables, as well.

Certain community works have been and are being completed. In the NAC of *Sítio do Mocó*, building maintenance work is performed by the inhabitants, while the required materials were provided by FUMDHAM. In the NAC of *Barreirinho* the community participation has been more dynamic and enthusiastic from the beginning.

The structure of the buildings allows the members of the community to develop various recreational and school activities. In both NACs such activities are particularly well-developed at weekends. The community meetings, held fortnightly, are each time better attended; the participation is growing considerably, and involves the whole age spectrum. Conferences are developing and videos illustrating different themes are shown. The space in the NACs is being used more and more for community activities. Once a week a rented film from the town of *São Raimundo Nonato* is shown at the NACs and the attendance is massive (data collected during local interviewing and reported by Fumdham/Terra Nuova 1992 and Macêdo 1993).

#### IV.4.4 - Sustainability

During this first stage of the project, all activities have been funded by FUMDHAM, which in its turn raise the necessary funds from Brazilian and international funding agencies. Some activities, such as bee-keeping and the hotel, have already achieved the "break-even point" and now start to be self-sustained, paying its own costs and making profits (data collected during local interviewing and reported by Fumdham/Terra Nuova 1992 and Macêdo 1993).

#### IV.4.5 – Concluding Remarks

The four previous sections were aimed to show how the ICDP work, carried out by FUMDHAM at the *Serra da Capivara* region, developed over the years.

The data was collected during two field-work opportunities, and is now a few years old because it was not possible to go back to the field for a third time, due to financial constrains. The use of more recent data would imply the use of secondary data, intentionally avoided at this stage

It is worth saying that this project is very known and respected not only in Brazil, but internationally, and that it is one of the very few successful experiences of co-management of a protected area in Brazil. The amount of institutions and professionals involved, as well as the continuity of the work is difficult to match anywhere else within Brazil. This effort accounted for very distinctive improvements in the villagers' ways of living, educational and health standards, and citizenship, not found in the neighbouring regions outside the influence area of the project.

Nevertheless, the direct causality between the ICDP project and the improvements observed is difficult to establish using only qualitative data. In the next section, the use of quantitative data is aimed to better show this relationship, by comparing the village under the influence area of the project with a control village.

### ***IV. 5 - Survey of the Changes to People's Quality of Life and People's Perception Towards the Serra da Capivara National Park***

#### IV.5.1 - Methodology

When this author first arrived to the region of the *Serra da*

*Capivara* National Park in 1993, a survey entitled “Domiciliary Epidemiological Inquiry” was found. It was the only data available which pictured living and health conditions before the beginning of the ICDP. Therefore, the use of this secondary data was mandatory.

The “Domiciliary Epidemiological Inquiry” was prepared in 1989, on site, by two teachers, four masters’ students and one public health technician of the National School of Public Health of the Oswaldo Cruz Foundation - FIOCRUZ. It consisted of 42 objective questions coded for computer analysis and 34 open questions. The questions were about (a) housing conditions; (b) water supply; (c) the individual’s perception of health; (d) drug consumption; (e) traditional medicine; (f) employment; (g) working; (h) social network; (i) schooling; (j) mobility and (k) family organisation. The “Inquiry” had been answered by all the 54 households (HH) of *Sítio do Mocó*, and by all the 43 HH of *Borda* (in Oct. and Nov. 1989, before the beginning of the ICDP in 1990).

To allow the assessment of possible changes in quality of life, due to the ICDP, this author planned to re-administer this same “Inquiry” as part of his last fieldwork, in 1996. The “Inquiry” would be re-administered to all the actual households of *Sítio do Mocó* and *Borda*. This second village would be used as a control village, since the ICDP had not reached it.

But on his arrival to the region, this author found out that another survey, organised by FUNDHAM, had been carried out in all the villages around the Park, just two weeks before. The “Socio-economic Profile of the Area Surrounding the *Serra da Capivara* National Park” consisted of one questionnaire directed to the households and another to the individuals. The “House Questionnaire” consisted of 152 questions covering (a) housing conditions; (b) water supply; (c) the individual’s perception of health; (d) drug consumption; (e) traditional medicine; (f) employment; (g) working; (h) political life; (i) education and literacy; (j) mobility, and (k) family organisation. The “Individual Questionnaire”

consisted of 81 questions addressing personal choices related to family and social life, as well as perceptions and level of commitment in relation to the Park and to the ICDP carried out by FUMDHAM. The author, then, decided not to re-administer the “Domiciliary Epidemiological Inquiry” of 1989, but to use the secondary data provided by the survey developed by FUMDHAM, since he found common variables with the “1989 Inquiry”. The main reasons for this decision were to avoid increasing expectations from the local inhabitants, and to minimise the disruption on their daily life, recently caused by an extensive and recent survey. This strategy was supported by the adaptive-interactive research approach, described by Nelson (1991) and Serafin (1991).

The common questions between the two surveys were identified and organised as “Household Questionnaires”. The questions of the “Individual Questionnaire” that were related to the Park and to the ICDP carried out by FUMDHAM were listed apart as “Individual Questionnaire”. This “Individual Questionnaire” was available for both *Sítio do Mocó* and *Borda*, but only for 1996.

The data obtained with the two “new” questionnaires, in both *Sítio do Mocó* and *Borda*, was submitted to statistical tests to assess possible changes occurred between the two moments (1989 and 1996). The tests chosen were: (a) *chi*-square test (to compare changes in non-numerical variables); (b) two-sample *t* test (to compare means in numerical variables) and (c) Mann-Whitney test (to compare medians in numerical variables) (Hoffmann 1991). The two villages were compared with each other in 1989 and in 1996; and each of the villages was compared with itself at the two different times (1989 and 1996).

These statistical tests are applied when one intends to assess the differences in some characteristics of two different populations, through the use of random samples from the two populations. The reason for using these tests in the present case, when the survey was posed to the totality of the two populations, is twofold: (a) one can regard the total populations of *Sítio do Mocó* and *Borda* as samples of broader



universes, representing respectively the villages under the influence of the ICDP (like the *Sítio do Mocó*) and those outside the influence area (like *Borda*); (b) these statistical tests allow the researcher, through the comparison of the “*p*-values”, to infer if the differences between the two villages increased or decreased, for a given parameter, from time 1 to time 2 (1989 to 1996).

Most of the initial results were not statistically significant, because there were numerous answers for most of the questions. For the *chi*-square tests, in several cases the minimum expected frequency was smaller than 1 or more than 20% of the expected frequencies were smaller than 5, invalidating the approximation by the *chi*-square distribution (Hoffmann 1991). Therefore, all questions had their answers aggregated in positive and negative, regarding changes related to the ICDP - all answers considered positive, regarding the ICDP work, were grouped as “positive” and the same happened with the answers with negative implications. With this aggregation, into positive and negative, statistical significance and validation were achieved, and the main objective of the tests was maintained: to show positive or negative changes in lifestyle, behaviours and perceptions of the villagers related to their contact with the ICDP. The original answers for each question, the system used for the aggregation, as well as the calculations and graphics for the comparisons are available in Appendices A and B.

#### IV.5.2 - Analysis of the Questionnaires

From the “Household Questionnaire” it was analysed if there were significative differences regarding the evolution of the two populations, from 1989 to 1996. The *p*-value statistics of the *chi*-square tests, the two sample *t*-test, and the Mann-Whitney test were analysed, aiming at identifying, for each village, significative changes among given parameters at the two times. This analysis may be reinforced by the fact that, for some variables, the two populations were statistically similar in 1989, becoming different in 1996. Respecting the general methodology for hypothesis tests, figures of *p*-value bigger than 0.10

represented similarities between the populations, while figures smaller than 0.10, 0.05 and 0.01 indicated differences significative at 10%, 5% and 1% respectively.

Questions related to floor covering in the house (number 4), existence and type of toilet (number 6), and storage and treatment of drinking water inside the house (number 11) showed improvements in both populations. However, the  $p$ -values for the *Sítio do Mocó* were smaller than the ones for the *Borda*, indicating improvements more significative in the *Sítio do Mocó*. Regarding the storage and treatment of drinking water inside the house (question number 11), the populations were similar in 1989 and different, with a level of significance of 5%, in 1996. The occurrence of ownership of- or employment in- commercial activities in the village (question number 13) increased significantly only in the *Sítio do Mocó* (level of significance of 10%), while there were no changes in the *Borda*.

Considering the water supply for the houses (question number 10) the *Borda* got worse from 1989 to 1996, while the *Sítio do Mocó* did not show negative changes. The occurrence of domestic servants (question number 16) diminished in both villages, but the diminution was more evident for the *Borda*.

Regarding the numerical variables, both tests (two sample  $t$ -test and Mann-Whitney test) indicated an increase in the total number of people (question number 17), and also in the number of men (question number 18) and women (question number 19) for the *Sítio do Mocó*, between 1989 and 1996 (all tests significative at 1%). There were no indication of changes in those numbers for *Borda*.

None of the questions related to type of fuel for cooker (question number 7), literacy (questions number 24 and 25), and distance from home to school (question number 26) presented significative evolution for any of the villages. Data for illumination (question number 8) and occurrence of farm animals (question number 9) was inconclusive, due to weakness of the approximation by the  $\chi^2$ -square distribution.

For the “Individual Questionnaires”, the two villages were compared in 1996. In this case, the aim was to analyse the differences in the perceptions of the individuals from each village in regard to the Park and the ICDP. It was expected that the people at Sítio do Mocó would have a more favourable perception and understanding. As in the “Household Questionnaires”, differences with a *p*-value smaller than 10% were considered significative.

The perceptions and understanding of the villagers for the following issues were more positive in the Sítio do Mocó, to the level of 1% of significance (except for question number 5, which was significant to the level of 10%):

- Question (4): acquaintance of the Park;
- Question (5): perception about the Park;
- Question (7): perception on the impact of tourism;
- Question (9): acquaintance of the FUMDHAM;
- Question (10): knowledge on the ICDP activities;
- Questions (13) and (14): experience of having worked for FUMDHAM;
- Question (15): provision of paid work.

The expectation was higher in the *Borda*, concerning question number (12): activities that should be developed by the FUMDHAM.

Questions related to the impact of the Park on the community (question number 6), willingness to work voluntarily for the community (question number 8) or for the FUMDHAM (question number 11), and to possible benefits gained by FUMDHAM from the ICDP activities (question number 16), did not present significative differences between the two populations.

#### IV.5.3 - Summary of the Data Analysis

The following table summarises the significant findings regarding the changes when comparing the two villages (the first 9 items are from the House-hold Questionnaire, and the last 8 are from the Individual Questionnaire):

QUESTION NUMBER	QUESTION ITEM	<i>SÍTIO DO MOCÓ</i>	<i>BORDA</i>
H-h 4	Floor covering	Improved more	Improved
H-h 6	Existence and type of toilet	Improved more	Improved
H-h 10	Water supply for the houses	No change	Got worse
H-h 11	Storage and treatment of water in the house	Improved more	Improved
H-h 13	Commercial activities	Improved	No change
H-h 16	Occurrence of domestic servants	Got worse	Got much worse
H-h 17	Total number of people	Improved	No change
H-h 18	Number of men	Improved	No change
H-h 19	Number of women	Improved	No change
IQ 4	Acquaintance of the Park	Improved	No change
IQ 5	Perception about the Park	Improved more	No change
IQ 7	Perception on the impact of tourism	Improved	No change
IQ 9	Acquaintance of the FUMDHAM	Improved	No change
IQ 10	Knowledge on the ICDP activities	Improved	No change
IQ 12	Activities that should be developed by FUMDHAM	No change	Improved
IQ 13-14	Experience of having worked for FUMDHAM	Improved	No change
IQ 15	Provision of paid work	Improved	No change

**Table 4** - Significant findings regarding the changes when comparing the two villages of *Sítio do Mocó* and *Borda*.

The first 9 items, from the House-hold Questionnaire showed that:

- floor covering, toilet existence, and domestic water storage and treatment improved in both villages, but mostly in *Sítio do Mocó*;
- the existence of commercial activities improved in *Sítio do Mocó*, while did not change in *Borda*;
- the water supply for the houses did not change in *Sítio do Mocó*, while got worse in *Borda*;
- the occurrence of domestic servants diminished in both villages, mostly in *Borda*;
- the total number of people, and both men and women separately, increased in *Sítio do Mocó*, while did not change in *Borda*;
- all the above findings suggest that the improvements observed at *Sítio do Mocó* and not in *Borda* were related to the ICDP activities;

and the last 8, from the Individual Questionnaire, showed that:

- the acquaintance of the Park, the perception about the Park, the perception about the impact of tourism, acquaintance of the FUMDHAM, the knowledge on the ICDP activities, the experience of having worked for FUMDHAM, and the provision of paid work were all increased at the *Sítio do Mocó*, while did not change in *Borda*, suggesting a causal link between the ICDP activities and the occurrence of the improvements;
- the only thing that increased in *Borda* while did not change at *Sítio do Mocó* was the expectation on the activities that should be developed by FUMDHAM, showing that in *Borda* the villagers still lack the improvements observed by the villagers of the *Sítio do Mocó*.

The information provided by the qualitative and the quantitative data shows that life standards and the understanding on the ICDP activities improved more at *Sítio do Mocó* than in *Borda*, and suggests that these improvements were related to the ICDP activities, since the two villages were similar in the first moment and there were no other inputs at the two villages than the ICDP activities.

## CHAPTER V

### CONCLUSION

Every society has its own sicknesses reflecting the socio-economic conditions of the society itself. They reflect not only economic, social and hygienic circumstances, not only the individual's way of living or their environment, but deeper values, norms and cultural patterns, as in Follér (1992). In the case of *Sítio do Mocó* society, the supporting projects carried out by FUMDHAM have certainly led to changes: in the local economy, information and communication; in the psycho-social environment as well as in the physical environment; in the life-style; and in the health status.

The concept that changes in traditional house-building affects the health situation is found in Follér (1992). Based on the study of the relation of diseases and features of housing design made by Weil *et al.* (1990) and on the improvements observed, this author believes that the health situation at *Sítio do Mocó* is moving towards a higher standard. The improvements observed in the educational level, in the employment and working conditions also support this belief.

Coimbra (1990), in his work on environmental changes and disease in the Amazon region underlines three points which appear to have been considered by FUMDHAM's projects: (1) short-term economic growth frequently does not consider environmental side-effects of new technologies introduced in the region; (2) more research in the fields of ecology, epidemiology and social sciences is needed to provide

both the necessary base line for regional development planning, and also to monitor ongoing changes; and (3) it is well established that a healthy worker is necessary to ensure productivity - the paradox is that regional development projects, ideally designed to enhance the overall living conditions and wealth of local populations, fail to enlist the majority of peasants and natives.

The intention of increasing tourist activities in the NPSC must take into account that the regional and local supply of fresh potable water represents a limiting factor to the growth. Studying the impact of tourism on the environment of small islands, Briguglio (1991) presents considerations which may be applied to the region in question: (a) tourism is a very good source of foreign exchange, earnings and employment; (b) it cannot be denied that the development of tourism does add problems to the environment, and even pro-environmental activity itself generates pollution; (c) among the negative factors is the need to increase building demand (generally hotels, which also implies the need to add to sanitation installations and resources to deal with effluent and garbage), more use of environmentally dangerous products such as plastic containers and chemicals, and increased atmospheric and noise pollution.

### *V. 1 - Achievements, Limitations and Difficulties*

The conceptual link between conservation of biodiversity and promotion of human well-being has been presented in this Thesis. The eight ways in which protected areas can improve human health has also been well documented. Those achievements have been recognised by the international academic community on a number of occasions, and this has encouraged and rewarded this author throughout this work.

Due to time and funding limitations, four of the links between protected areas and human health were left as anecdotal evidence. Further work should include developing and testing those links in the

field.

The main challenge of the work was the interdisciplinary character of Human Ecology, as a field of knowledge. The right balance between the use of social science methods and quantitative methodology was never easy to find.

Scientists are convinced that mathematical and statistical methods are not only necessary to give scientific credibility to a study, but that they should also provide the kind of data which is helpful for decision-takers and policy-makers. The use of sophisticated artificial intelligence methods, capable of dealing with large amounts of complex data was even considered for this work. But this consideration faced two main obstacles: (1) representatives of the conservation community argued that the use of such complex methods could promote an even bigger gap between local communities and the management of protected areas; and (2) in field-work situations, specially in the developing world, the main problem was not to deal with large amounts of data, but on the contrary, with small populations and irregular information.

Scientists criticise the lack of rigour frequently associated with the use of social sciences methods. But on the other hand, the use of case studies to understand field situations and report them to other academics, managers or politicians is more and more frequent.

## ***V. 2 - Suggested Methodology for Approaching the Interface Societal-Natural Systems***

Flexibility, but at the same time replicability, are necessary to work on the interface societal and natural systems. Replicability is a pre-requisite of science. But when one works on the field, specially with rural populations in the developing world, flexibility is fundamental to adapt to changes and cope with the need to re-structure the design of the work, when faced by a situation outside the researchers control.

Another important aspect of the work with local people is the



need to involve them in the processes, from the very beginning.

A methodological approach to be developed in human ecology, to deal with the interface between local communities and conservation-development projects should include:

- assessment of the documentary sources of information available;
- participatory methods of inquiry for working with local communities;
- flexibility when designing quantitative surveys;
- development of computer interfaces, by multidisciplinary groups, able to minimise the barriers between developers and users;
- rigour when reporting the methods used and the findings.

All these techniques, but the “development of computer interfaces, by multidisciplinary groups”, were used with varying degrees of success in the present research. The combination of such techniques is possible under a Case Study approach, and desirable to overcome the methodological existent gaps due to interdisciplinarity and to provide a formal methodological approach for research in human ecology.

### ***V. 3 - Suggestions for Synergetic Promotion of Biodiversity Conservation and Human Health***

The concept of integrating conservation and development projects (ICDP) is powerful and works synergistically. Participation of the local community is crucial from the very beginning of the project to guarantee interest and to take into consideration the real needs and aspirations of the people involved.

Where universities are involved in these projects it helps immeasurably because the continuous supply of researchers - both masters and doctoral students - ensure the continuity of the work. The multidisciplinary environment of an university provides a valuable bank

of different specialists. This should be taken into account from the start, so that the project is designed specifically to promote this strong multidisciplinary contact between researchers.

The use of the concept of health to translate ‘abstract’ terms, such as sustainable development, may help to promote improvements in the quality of life. The holistic and official concept of health, based on well being as opposed to disease, should be promoted.

#### *V.4 – Final Comments*

According to Reid (1997), human health concerns, more than any other biodiversity-related issue, can help restore the need for conservation of the world’s natural and cultural heritage as an important societal goal. Health concerns have important attributes. First, they embrace the entire scope of biodiversity values and threats. Second, all people care deeply about health. Caring for health is a universally shared goal, whereas the notion of conserving and wisely managing the natural and cultural heritage is a salient issue for only a small minority of people. And last but not least, health concerns often help to promote behavioural changes; they have been used for increasing awareness relating to environmental pollution, and for the development of environmental-related concepts, such as Primary Environmental Care - PEC (which evolved from Primary Health Care), Ecosystem Health and the Gaia Theory of Planetary Medicine.

There are many opportunities for future research to be carried-out by the medical and conservation communities, envisaging practical applications for professionals and decision makers.

Among the medical community, public health professionals should engage themselves in trying to identify the importance that cleaner air and water and less contaminated food have on the health standards of given populations; ethno-botanists could focus on the importance of traditional therapy on the health of indigenous communities; medical

anthropologists would focus on the opportunity to connect conservation projects with development projects for rural communities, where development implies primary health care; epidemiologists should study how the loss and/or the conservation of biodiversity can impact on the cycle of diseases, specially the ones which have part of their cycles in the natural world; physicians may evaluate how important the drugs originating from the natural world are for their therapeutic arsenals; psychiatrists and psychologists have a fertile field studying how nature affects mental health; social workers can study the importance of spas and sanatoria located near natural areas on the re-habilitation of patients; and health economists should be able to translate all these benefits into monetary units.

On the other hand, conservation managers would profit from more advanced studies in the above mentioned fields and from the dissemination of the results of such studies. Environmental educators should aim at increasing awareness about the benefits that the biodiversity, present in a given protected area, can bring to the health of the community related to such an area, as well to the human health in general. Once the people are aware of the importance of biodiversity for their own well-being - physical, mental and social - they will be in favour of conserving biodiversity and it will be easier for them to commit themselves to the better management of their neighbouring protected areas.

The most promising lines of future research in solving the outstanding problems presented in this work are:

- buffer zones and ICDPs - concept, limitations and applications;
- holistic and official concept of health – application, as opposed to the dominant disease oriented understanding;
- combination of qualitative and quantitative techniques – methodology for human ecology.

The problem chosen for this Thesis was the need to find ways of demonstrating that the conservation of biodiversity and its sustainable

use have a fundamental relevance to the daily lives of people, including those who may never visit a protected area. The hypothesis raised was two-fold : (1) *in-situ* biodiversity conservation, promoted by protected areas, benefits human health, whereas human health is holistically understood as quality of life; and (2) when quality of life is improved, people's perception towards the protected area is also improved. To check this hypothesis, a number of research questions were posed:

- are there ways in which protected areas benefit human health ?
- if so, is it possible to find examples with different degrees of tangibility ?
- if so, can these examples be found in both developed and developing countries, and in different ecological and cultural systems, across the world?
- if so, is it possible to assess at least one of these examples in terms of the changes to people's quality of life and to people's perception towards their nearby protected area ?

The ways in which protected areas may benefit human health were shown by the development of the eight health benefits of protected areas, and the examples from both the developed and developing world, with different degrees of tangibility, were given in Chapter 3.

The assessment of the *Serra da Capivara* ICDP, Chapter 4, showed that both the quality of life and the villagers' perceptions regarding the Park were most significantly improved at *Sítio do Mocó* - where the contact of the villagers with the ICDP was more intense than in the control village.

Therefore, this work achieved its initial goal, answered the research questions and advanced the methodology to deal with the interface societal/natural systems.

## REFERENCES

- Abel, N. and Blaikie, P. "Elephants, people, parks and development: the case of the Luangwa Valley, Zambia". Environmental Management, Vol. 10, No. 6, (1986), pp. 735-751.
- Adams, J.S. and McShane, T.S. The Myth of Wild Africa: Conservation without Illusion. London: W.W. Norton, 1992.
- Akeroyd, J. And Singe, H., 1996. "What Really Is Biodiversity ? Biodiversity Makes Good Politics But Poor Science". Plant Talk 4 : 2.
- Allan, G. and Skinner, C. eds. Handbook for Research Students in the Social Sciences. London: The Falmer Press, 1993.
- Amend, S. and Amend, T. eds. National Parks without People? The South America Experience. Quito: IUCN, 1995.
- Anderson, A.B. and Ioris, E.M.. "Valuing the Rain Forest: Economic Strategies by Small-Scale Forest Extractivists in the Amazon Estuary", Human Ecology (1992) 20(3): 337-369.
- Araújo, A.; Pessis, A.M.; Marasciulo, A.C.E.; Guerin, C.; Olmos, F.; Parenti, F. and Pellerin, J. Plano de Manejo do Parque Nacional da Serra da Capivara. Brasília: Sema-PI/Ibama/Fumdham, 1991.
- Araújo, A.J.G. Relatório de Atividades da Coordenação de Saúde Fumdham/Terra Nuova/Fiocruz - São Raimundo Nonato - Piauí , 1990 (Mimeo).
- Araújo, A.J.G. Saúde e Desenvolvimento em São Raimundo Nonato - Sudeste do Piauí, 1989 (Mimeo).
- Artuso, Anthony. "Capturing the Chemical Value of Biodiversity: Economic Perspectives and Policy Prescriptions". In Biodiversity and Human Health. Edited by Francesca Grifo and Joshua Rosenthal.

Washington, DC: Island Press, 1997.

Avila-Pires, F.D. Princípios de Ecologia Humana. Porto Alegre: Editora da Universidade, UFRGS/Brasília, CNPq, 1983.

Balick, M.J. and Cox, P.A.. Plants, People and Culture: The Science of Ethnobotany. Scientific American Library, New York: W.H. Freeman, 1996.

Barrass, R. Scientists Must Write: a guide to better writing for scientists, engineers and students. London: Chapman & Hall, 1995.

Barzetti, V. ed. Parks and Progress: Protected Areas and Economic Development in Latin America and the Caribbean. Gland: The World Conservation Union - IUCN, 1992.

Basnet, K. "Conservation Practices in Nepal: Past and Present". Ambio, Vol. 21, No. 6, (1992) p. 390-393.

Batisse, M. "The Biosphere Reserve: a Tool for Environmental Conservation and Management". Environmental Conservation. 9 (2): 101-111, 1982.

Baumann, M., Bell, J., Koechlin, F. and Pimbert, M. ed. The Life Industry: Biodiversity, People and Profits. London: Intermediate Technology Publications, 1996.

Becker, Howard S. Métodos de Pesquisa em Ciências Sociais. 2<sup>nd</sup> ed. Translated by Marco Estevão and Renato Aguiar and revised by Márcia Arieira. São Paulo, Brazil: Editora Hucitec, 1992.

Benson, K. "Experimental Ecology on the Pacific Coast: Victor Shelford and his Search for Appropriate Methods". History and Philosophy of Life Sciences 14: 73-91, 1992.

Berg, P.O. "Human Ecology as a Way To Improving Science Education, A Modest Proposal". In: New Voices In Human Ecology, Pp. 1-11, Göteborg: Göteborgs Universitet, 1991.

Blaikie, P. and Jeanrenaud S. Biodiversity and Human Welfare. Geneva: United Nations Research Institute for Social Development (UNRISD), 1996.

Boldyrev, V. M. Investigation and Calculation of Flowthrough of Mountain Rivers of Kazakhstan. Thesis of Doctor of Sciences. Almaty, 1996

(Mimeo).

Booth, V. Communicating in Science: writing a scientific paper and speaking at scientific meetings, Cambridge: Cambridge University Press, 1994.

Borden, R.J. ed. Human Ecology: A Gathering of Perspectives. Selected Papers from the First International Conference of The Society for Human Ecology. Maryland: The Society for Human Ecology, 1986.

Boyden, S. "The Health of Humans and of Ecosystems". Journal of Human Ecology 2 (1-2):3-13., 1990.

Boyden, S.; Millar, S.; Newcombe, K. and O'Neil, B. The Ecology of a City and its People - The Case of Hong Kong, Canberra, Australia: National University Press, 1981.

Brazil, M. "An Ecotourism Case Study." In: Japan Ecotimes: For Environmental Awareness, 1 (5): 17-19, 1995.

Briguglio, L. "Tourism Impact on the Environment of Small Islands". In: Environment, Lifestyle, and Health, (M-L. Follér ed.). Stromstad: Forskningsradsnamnden, 1991.

Brown M. and Wyckoff-Baird, B. Designing Integrated Conservation and Development Projects. Washington: Biodiversity Support Program, 1992.

Buarque, C. O Colapso da Modernidade Brasileira e uma Proposta Alternativa. São Paulo: Editora Paz E Terra, 1991.

Buarque, C. The End of Economics? Ethics and The Disorder of Progress. London and New Jersey: Zed Books Ltd., 1993.

Burdge, R.J. "Community Needs Assessment and Techniques". In: Social Impact Assessment Methods. Beverly Hills/London/New Delhi: Sage Publications, Inc., 1983.

Burdge, R.J. ed. A conceptual Approach to Social Impact Assessment: collections of writings by Rabel J. Burdge and colleagues. Middleton: Social Ecology Press, 1994.

Caldecott, J. Designing Conservation Projects. Cambridge: Cambridge University Press, 1996.

Capra, F. The Turning Point: Science, Society, And The Rising Culture. London: Flamingo, 1983.

Carew-Reid, J. "Conservation and Protected Areas on South Pacific Islands: the Importance of Tradition". Environmental Conservation, Vol. 17, No. 1, (1990) pp. 29-38.

Carley, M.J. "Social Indicators Research". In: Social Impact Assessment Methods. Beverly Hills/London/New Delhi: Sage Publications, Inc., 1983.

Caroline, M. and McNeely, J. A. "Managing Parks For The 21st Century: Advice From The Parks Congress". Parks, 3 (2): 13-21, 1992.

Casley, D.J. and Lury, D.A. Data Collection in Developing Countries. Oxford: Clarendon Press, 1981.

Cesario, M. "Human Ecology Broaching Environment, Lifestyle And Health - Serra da Capivara – Brazil". In: Proceedings International Conference: Training of Experts for European Co-operation on Protection of the Environment and Promotion of Sustainable Development. Kraków, Poland: University of Mining and Metallurgy, 1994.

Cesario, M. "Conservation, Sustainability and Health: Lessons from Serra da Capivara, Piauí - Brazil". In: Abstracts Brazil 95: Biodiversity And Environment. London: The Royal Botanic Gardens, Kew, 1995.

Cesario, M. "Conservation, Sustainability and Health: Lessons from the Wysoka Region, Southern Poland", In Abstracts - International Conference: Integration for Sustainable Development and Primary Prevention, Focused on European Perspectives . Kraków, Poland, 1995.

Cesario, M., "The Contribution of Conservation to Sustainable Living, through Health Promotion", Ambio 25(1) : 39-43, 1996a.

Cesario, M. "Proposal for an Additional Reference Section on Human Health and Biodiversity within the ISDE Documentation Centre", Doctors For The Environment: An International Bulletin 1/96 Vol. (1) : 31-34, 1996b.

Cesario, M. "Human Health and Biodiversity", In Abstracts - Plants For Food And Medicine (Joint Meeting of The Society for Economic Botany and The International Society for Ethnopharmacology, 1-6 July 1996, Imperial College, London, England), 1996c.



Cesario, M. "Human Health and Biodiversity: Interdisciplinary Opportunities for Conservation", In Abstracts - Ecological Summit '96 Conference, organised by The International Society of Ecological Modelling, International Ecological Engineering Society, International Society of Ecosystem Health, International Society of Ecological Economics, Elsevier Science Bv, SAS-Institute Denmark and International Lake Environmental Committee, 19-23 August 1996, The Royal Danish School of Pharmacy, Copenhagen, Denmark, 1996d.

Cesario, M. "Linking Human Health to Biological Diversity", Conservation Biology 11(6): 1459, 1997.

Cesario, M., Verkhovod, A., and Uvarov, V. "Clean Air and Drinking Water: Protected Areas Contributing to Human Health in Kazakhstan", Parks 6 (3): 26-34, 1997.

Chambers, R. "Shortcut and participatory methods for gaining social information for projects". In Putting People First: Sociological Variables in Rural Development. (2nd Edition) Oxford: Oxford University Press, 1991.

Children In Crisis. Annual Review 1993/94, 1994 (mimeo).

Chivian, E. "Environmental Health Perspectives", Journal of The National Institute of Environmental Health Sciences, (1995), 103 (6).

Chivian, E. "Global Environmental Degradation and Biodiversity Loss: Implications for Human Health". In Biodiversity and Human Health. Edited by Francesca Grifo and Joshua Rosenthal. Washington, DC: Island Press, 1997.

Chivian, E. ed. Critical Condition: Human Health and the Environment. Massachusetts: Massachusetts Institute of Technology, 1993.

Cocklin, C.R. "Methodological Problems in Evaluating Sustainability". Environmental Conservation, Vol. 16, No. 4, pp. 343-351, 1989.

Coimbra, C.E.A. "Environmental Changes and Human Disease: a View from Amazonia". Journal of Human Ecology, 2 (1/2): 15-21, 1990.

Colchester, M. Salving Nature: Indigenous Peoples, Protected Areas and Biodiversity Conservation. Geneva: United Nations Research Institute for Social Development (UNRISD), 1994.

Cox, Paul Allan. "Indigenous Peoples and Conservation". In Biodiversity and Human Health. Edited by Francesca Grifo and Joshua Rosenthal. Washington, DC: Island Press, 1997.

Culyer, A.J.; Lavers, R.J. and Williams, A. "Health Indicators". In: Social Indicators and Social Policy, Heinemann Educational Books Ltd., 1972.

Davis, S.H. "Introduction" to The Social Challenge Of Biodiversity Conservation, Washington: Global Environmental Facility, 1993.

Dower, M. "Working with People who Live in Protected Areas". In Expanding Partnerships in Conservation, edited by Jeffrey A. McNeely. Washington, DC: Island Press, 1995.

Droste, B. "Biosphere Reserves: A Comprehensive Approach". In Expanding Partnerships in Conservation, edited by Jeffrey A. McNeely. Washington, DC: Island Press, 1995.

Dubos, R. Man, Medicine And Environment, London: Penguin Books Ltd., 1970.

Eco, H. Como se faz uma Tese, São Paulo: Editora Perspectiva S.A., 1994.

Eckeholm, E.P. The Picture of Health - Environmental Sources of Disease, New York: W.W. Norton and Co., 1977.

Ekins, P. and Max-Neef, M. "Constructing an Indicator Framework". In: Real-Life Economics, London: Routledge., 1992.

Ekins, P.; Hillman, M.; and Hutchison, R. Wealth Beyond Measure - An Atlas of New Economics, London: Gaia Books, 1992.

Fanning, O. "New Survey Shows Majority of Drugs Originate in Nature as well as in Laboratory". Internal Medicine World Report, May (15-31):16, 1995.

Farnsworth, N.R. and Soejarto, D.D. "Potential Consequences of Plant Extinction in The United States, on the Current and Future Availability of Prescription Drugs". Economic Botany, 39:231-240, 1985.

Follér, M. "Social Determinants of Health and Disease: the Role of Small-Scale Projects Illustrated by the Koster Health Project in Sweden and Ametra in Peru". Cadernos de Saúde Pública, 8 (3): 229-239, 1992.

Follér, M. Environmental Changes and Human Health: A Study of the Shipibo-Conibo in Eastern Peru. Göteborg: University of Göteborg, 1990.

Forster, R. ZOPP Marries PRA ? Participatory Learning and Action - A Challenge for our Services and Institutions. Workshop Documentation. Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit, 1996.

Fumdham/Fiocruz/Terra Nuova. Impressões Preliminares do Processo Saúde/Doença nas Comunidades do Sítio do Mocó e do Barreirinho - São Raimundo Nonato - Piauí 1989. (mimeo).

Fumdham/Terra Nuova. Programa Educativo no Sítio do Mocó, 1989 (mimeo).

Fumdham/Terra Nuova. Relatório Bial sobre o Convênio Fumdham-Terra Nuova - 1991/1992 - São Raimundo Nonato - Piauí, 1992. (mimeo).

Furze, B. Culture, Conservation and Biodiversity: the Social Dimension of Linking Local Level Development and Conservation through Protected Areas. West Sussex: John Wiley and Sons Ltd., 1996.

Ghimire, K.B. and Pimbert, M.P. ed. Social Change and Conservation: Environmental Politics and Impacts of National Parks and Protected Areas. London: Earthscan Publications Limited, 1997.

Ghimire, K.B. Parks and People: Livelihood Issues in National Parks - Management in Thailand and Madagascar. Geneva: United Nations Research Institute for Social Development-UNRISD, 1991.

Goldsmith, F.G. and Warren, A. Conservation in Progress. West Sussex: John Wiley and Sons Ltd., 1993.

Gomes, M.A.T. Potencial de Transmissão da Tripanossomíase Americana nas Localidades do Sítio do Mocó e Borda, Município de São Raimundo Nonato, Sudeste do Piauí. MSc Thesis, Rio de Janeiro: Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz., 1993.

Graham, J. and Honari, M. "Human Ecology and Health Advancement: the New Castle Experience and Implications". Journal Of Human Ecology, 2 (1-2):197-215, 1990.

Grifo, F. and Rosenthal, J. Biodiversity and Human Health. Washington: Island Press, 1997.

Grifo, F. et al.. "The Origins of Prescription Drugs". In Biodiversity and Human Health. Edited by Francesca Grifo and Joshua Rosenthal. Washington, DC: Island Press, 1997.

Guidon, N. and Arnaud, B. "The Chronology of The New World: Two Faces of One Reality". World Archaeology 23 (4), P. 167-168, 1991.

Haluszka, J. On the Importance of Well-Adapted Environmental Conditions in Medical Treatment of Children, 1994. (mimeo).

Hammersley, M. What's Wrong With Ethnography ?, London: Routledge, 1992.

Hanson, L.O. and Jungen B. Human Responsibility and Global Change. Göteborg, Sweden: University of Göteborg, 1992.

Harmon, D. ed. Coordinating Research and Management to Enhance Protected Areas. Gland: The World Conservation Union-IUCN, 1994.

Hays, S. Beauty, Health and Permanence: Environmental Politics in The United States 1955-1985. Cambridge: Cambridge University Press, 1987.

Heinen, J.T. "Park-people Relations in Kosi Tappu Wildlife Reserve, Nepal: a Socio-economic Analysis". Environmental Conservation Vol. 20, No.1, pp.25-34, 1993.

Helmholts, N. F. The Mountain/Valley Circulation in the Northern Slopes of Tien Shan Range. Kazakh Research Institute of Hydrometeorology, 1963 (mimeo).

Hoffmann, R. Estatística para Economistas. São Paulo: Livraria Pioneira Editora, 1991.

Holling, C.S. "New Science and New Investments for a Sustainable Biosphere". In: Investing in Natural Capital: Why, What and How ? Solomons, MD: Isee Press, 1993.

Howe, G.M. "The Environment, its Influences and Hazards to Health". In: Environmental Medicine, London: William Heinemann Medical Books Ltd., 1973.

Hoyte, H.D. "Rediscovering Respect for Nature: an Imperative for Ecological Policy and Sustainable Development". In: Human Ecology, Environmental Education and Sustainable Development, Edinburgh: Falcon Press, 1991.

International Institute for Environment and Development. Methodological Complementarity - Number 28, PLA Notes - Notes on Participatory Learning and Action (Formerly RRA Notes). London: International Institute

for Environment and Development (IIED ), 1997.

International Society of Doctors for the Environment. 3rd Meeting of the International Society of Doctors for the Environment. In: Doctors For The Environment, Arezzo, Italy: ISDE, 1992.

International Union for Conservation of Nature and Natural Resources. Parks for Life: Report of IVth World Congress on National Parks and Protected Areas. Gland, Switzerland: IUCN, 1993.

Jeffers J.N.R. Design of Experiments. Institute of Terrestrial Ecology - Natural Environment Research Council - Statistical Checklist 1. Southampton: Hobbs The Printers of Southampton, 1978.

Jeffers J.N.R. Modelling (Outline Studies in Ecology). London: Chapman and Hall Ltd., 1982.

Jeffers J.N.R. Modelling. Institute of Terrestrial Ecology - Natural Environment Research Council - Statistical Checklist 3. Aberystwith: Cambrian NewsLtd., 1980.

Jeffers J.N.R. Sampling. Institute of Terrestrial Ecology - Natural Environment Research Council - Statistical Checklist 2. Southampton: Hobbs The Printers of Southampton, 1978.

Jeffers, J.N.R Rule Induction Methods in Forestry Research. Newcastle Upon Tyne: The University of Newcastle. (mimeo).

Jeffers, J.N.R. An Introduction to Systems Analysis: with ecological applications. London: Edward Arnold, 1978.

Jungen, B. Integration of Knowledge in Human Ecology, Göteborg: Göteborgs Universitet, 1985.

Kane, E. Doing your own Research, London: Marion Boyars Publishers, 1991.

Kemf, E. ed. The Law of the Mother: Protecting Indigenous Peoples in Protected Areas. San Francisco: Sierra Club Books, 1996.

Kiss A. (ed.) Living with Wildlife: Wildlife Resource Management with Local Participation in Africa. World Bank Technical Paper No.130, Washington DC: World Bank, 1990.

Latouche, S. "Standard of Living". In: The Development Dictionary - A

Guide To Knowledge As Power, Johannesburg: Witwatersrand University Press; London And New Jersey: Zed Books Ltd., 1993.

Lewis, D., Kaweche, G.B. and Mwenya, A. "Wildlife Conservation Outside Protected Areas: Lessons from an Experiment in Zambia". Conservation Biology Vol.4, No.2, pp.171-180, 1990.

Lusigi, W.J. "New Approaches to Wildlife Conservation in Kenya". Ambio, Vo1.10 No.2-3, pp.87-92, 1981.

Macêdo, R.E.N. Análise da Situação Atual das Crianças nos Núcleos de Apoio às Comunidades Sítio do Mocó e Barreirinho, 1993 (mimeo).

Macêdo, R.E.N. Relatório das Atividades do Posto de Saúde do Sítio do Mocó - Agosto, 1991a (mimeo).

Macêdo, R.E.N. Relatório das Atividades do Posto de Saúde do Sítio do Mocó - Dezembro, 1991b (mimeo).

Macêdo, R.E.N. Relatório das Atividades do Posto de Saúde do Sítio do Mocó Mocó - Janeiro, 1992a (mimeo).

Macêdo, R.E.N. Relatório das Atividades do Posto de Saúde do Sítio do Mocó - Agosto/Setembro, 1992b (mimeo).

Macêdo, R.E.N. Relatório das Atividades do Posto de Saúde do Sítio do Mocó - Dezembro, 1992c (mimeo).

MacEwan, A. and MacEwan, M. National Parks: Conservation or Cosmetics. London: Allen and Unwin, 1982.

Machado, P.A. Introdução à Ecologia Humana. Brasília: Cnpq, Editora Cortez / Editora Autores Associados, 1984.

MacKenzie, J.M. "Chivalry, Social Darwinism and Ritualised Killing: the Hunting Ethos in Central Africa up to 1914" in Conservation in Africa: People, Policies and Practice. Cambridge University Press, Cambridge, UK. (1987).

Makarevich, K. G. Tuyuksu Glacier. Alma-Ata: Kainar, 1985.

Makarevich, K. G. Tuyuksu Glaciers (Northern Tien Shan). Leningrad: Hydrometeo Izdat, 1984.

Marwick, C. "Scientists Stress Biodiversity-Human Health Links". Journal of the American Medical Association - Jama, 273 (16):1246, 1995.

Max-Neef, M.A. "Development and Human Needs". In: Human Scale Development - Conception, Application and Further Reflections. New York/London: The Apex Press, 1991.

Max-Neef, M.A., Elizalde, A. and Hopenhayn, M. "Development and Human Needs". In: Human Scale Development - Conception, Application And Further Reflections, New York/London: The Apex Press, 1991.

May, J. "The Ecology of Human Disease". In: Environments of Man. Massachusetts/California: Addison-Wesley Publishing Company, 1968.

McCay, B.J. "Systems Ecology, People Ecology, and the Anthropology of Fishing Communities". Human Ecology, Vol.6, No.4, pp.397-422, 1978.

McCay, B.J. and Acheson, J.M. "Human Ecology of the Commons". In The Question of the Commons: the Culture and Ecology of Communal Resources. Arizona: University of Arizona Press, 1987.

McMichael, A.J. ed. Planetary Overload: Global Environmental Change and the Health of the Human Species. Cambridge: University Press, 1993.

McNeely, J. A. "People and Protected Areas: Partners in Prosperity". In: The Law of the Mother: Protecting Indigenous Peoples in Protected Areas, San Francisco: Sierra Club Books, 1993.

McNeely J.A.; Miller, K.R.; Reid, W.V; Mittermeier R.A. and Werner T.B. Conserving The World's Biological Diversity. Gland, Switzerland: The World Conservation Union-IUCN, 1990.

McNeely, J. A. and MacKinnon, J.R. "Protected Areas, Development, and Land Use in the Tropics". Resource Management And Optimization, 7 (1-4): 89-206, 1989.

McNeely, J.A. "Protected Areas and Human Ecology: How National Parks Can Contribute to Sustaining Societies of the Twenty-First Century". In: Conservation For The Twenty-First Century, New York: Wildlife Conservation International/New York Zoological Society, 1989.

McNeely, J.A. "Protected Areas in a Changing World: The Management Approaches that will be Required to Enable Primates to Survive into the 21st Century". In Topics In Primatology, Vol. 2, Behaviour, Ecology, And Conservation, Tokyo: University of Tokyo Press, 1992.

McNeely, J.A. ed. Expanding Partnerships in Conservation. Washington: Island Press, 1995.

Metcalf, S. C. "Communities, Parks, and Regional Planning: a Co-Management Strategy based on the Zimbabwean Experience". In Conservation of Biodiversity and the Regional Planning, edited by Richard E. Saunier and Richard A. Meganck. Washington, DC: Organization of the American States and IUCN, 1995.

Miles, I. "Social Indicators For Real-Life Economics". In: Real-Life Economics, London: Routledge, 1992.

Milton, K. Environmentalism: The view from Anthropology. London, Routledge, 1993.

Moeller, D.W. "The Scope of Environmental Health". In: Environmental Health, Boston: Harvard University Press, 1992.

Munasinghe, M. "Biodiversity Protection Policy: Environmental Valuation and Distribution Issues". Ambio, Vol. 21, No. 3, pp. 227-236, 1992.

Myers N. "Two Key Challenges for Biodiversity: Discontinuities and Synergisms", Biodiversity and Conservation No.5 (1996) pp.1025-1034.

Nash, R. Wilderness and the American Mind. 3rd edition. New Haven: Yale University Press, 1982.

Nash, R.F. American Environmentalism: Readings in Conservation History. 3rd Edition. New York: McGraw-Hill Publishing Company, 1990.

National Environmental Secretariat, Egerton University, Clark University and Center for International Development and Environment of the World Resources Institute. Participatory Rural Appraisal Handbook: Conducting PRAs in Kenya. Washington: World Resources Institute Center of International Development and Environment, 1991.

Nelson, J.G. "Research in Human Ecology and Planning: an Interactive, Adaptive Approach". The Canadian Geographer/Le Géographe Canadien, 35, No 2 (1991): 114-127.



Nicholas, R. ed. Agenda 21: Earth's Action Plan. Oceana Publications, Inc., 1993.

Norska-Borówka, I., Kasznia-Kocot, J. and Bursa, J. "Environmental Hazards in Katowice-District and the Influence on Infant Mortality and Morbidity Rates". Sonderdruck Aus Sozialpaediatric In Praxis And Klinik 15, Nr. 2, pp. 119-121 . Mainz: Verlag Kirchheim, 1993.

Norton, B.G. "Ecological Health and Sustainable Resource Management". In: Ecological Economics: the Science and Management of Sustainability, New York: Columbia University Press, 1991.

Nussbaumer, W.; Romizi, R. and Gabrielli, A. "The Environmental Problems". In: Doctors For The Environment, Arezzo, Italy: ISDE, 1992.

Olaczek, R. "Wild Nature in the National Treasury". In: Polskie Parki Narodowe. Krakow: Oficyna Wydawnicza Parol Sp. Z O.O., 1994.

Oldfield and J.B. Alcorn (eds) Biodiversity: Culture, Conservation and Ecodevelopment. Boulder: Westview Press, 1996.

Organizacion Mundial de la Salud. Preparacion de Indicadores para Vigilar los Progressos Realizados en el Logro de la Salud para Todos en el Ano 2000. Ginebra: Organización Mundial de la Salud, 1981.

Owen-Smith, G. and Jacobsohn, M. "Involving a Local Community in Wildlife Conservation: a Pilot Project at Purros, South-Western Kaokoland, SWA/Namibia". Quagga, Vol. 27. pp. 21-28, 1989.

Pan American Health Organization. Biodiversity, Biotechnology, and Sustainable Development in Health and Agriculture: Emerging Connections. Washington: Pan American Health Organization-PAHO, 1996.

Parenti, F. "Le Gisement Préhistorique du Pleistocène Supérieur de Pedra Furada (Piauí, Brésil): Considérations Chronostratigraphiques et Implications Paléanthropologiques". Actes de la Table Ronde Européene Paléontologie et Stratigraphie D'amerique Latine, Lyon 1992. Docum. Lab. Géol. Lyonn. 125, 1993a.

Parenti, F. "Le Premier Peuplement Américain". Archeologie, No. 295, P.54-59, 1993b.

Parenti, F. Pedra Furada: le Point sur le Peuplement de l'Amérique. Paris:

Musée de l'homme, N. 2, 1993c.

Pearce, D.; Markandya, A. and Barbier, E.B. Blueprint For A Green Economy, London: Earthscan Publications, 1992.

Phillips, E. M. and Pugh D. S. How to Get a PhD: A Handbook for Students and Their Supervisors, 2nd. Edition. Buckingham- Philadelphia: Open University Press, 1994.

Pimbert, M.P. and Pretty, J.N. Parks, People and Professionals: Putting Participation into Protected Area Management. Geneva: United Nations Research for Social Development - UNRISD, 1995.

Piñedo-Vasquez, M., Zarin, D., Jipp, P. and Chota-Inuma, J.. "Use values of Tree Species in a Comunal Forest Reserve in Northeast Peru", Conservation Biology (1990) 4(4):405-416.

Policy Studies Institute. "Britain In 2010". In: Policy Studies Institute Report 704, London, 1991.

Postel, S. "Introduction to Part Two - Wealth and Well-being". In: Wealth Beyond Measure - An Atlas Of New Economics, London: Gaia Books, 1992.

Prins, H.H.T. "The Pastoral Road to Extinction: Competition Between Wildlife and Traditional Pastoralism in East Africa". Environmental Conservation, Vol. 19, No. 2, pp. 117-123 (1992).

Pye-Smith, C. and Feyerabend, G.B. ed. The Wealth of Communities. London: Earthscan Publications, 1994.

Rackham O. Trees and Woodland in the British Landscape. J.M. Dent. London, 1976.

Rapport, D. et al.. Ecosystem Health. Blackwell Science, Inc.. Malden, MA, 1998.

Reid, D. From Nature Conservation to National Sustainable Development Strategies: A Review of the Literature of Nature Conservation, Sustainable Development and Sustainability - 1966-93. Master's Thesis, Centre for Human Ecology, The University of Edinburgh, 1993.

Reid, W.V. and Miller K.R. Keeping Options Alive: The Scientific Basis

for Conserving Biodiversity. Washington: World Resources Institute, 1989.

Reid, W.V. et al.. Biodiversity Indicators for Policy-Makers. Washington: World Resources Institute, 1993.

Reid, Walter V.. "Opportunities for Collaboration between the Biomedical and Conservation Communities". In Biodiversity and Human Health. Edited by Francesca Grifo and Joshua Rosenthal. Washington, DC: Island Press, 1997.

Rey, L. Planejar e Redigir Trabalhos Científicos. São Paulo, Brazil: Edgard Blücher, 1987.

Robertson, J. Future Wealth - A New Economics For The 21st Century, Cassell Pub., 1990.

Rose, H. "Case Studies". In: Handbook For Research Students In The Social Sciences, London: The Falmer Press, 1993.

Russel, T. M. "Essays, Reports and Dissertations: guidance notes on the preparation and presentation of written work". Edinburgh: Edinburgh University Library, Library Guide 42, 1993.

Sachs, I. "Foreword" to The End of Economics? Ethics and the Disorder of Progress, London and New Jersey: Zed Books, 1993.

Sachs, L. "Causality, Responsibility and Blame: core issues in the cultural construction and subtext of prevention". Social Health 18 (5): 632-652, 1996.

Sachs, W. "Bygone Splendour". In: Real-Life Economics, London: Routledge, 1992.

Sachs, W. "Development". In: The Development Dictionary - A Guide To Knowledge As Power, Johannesburg: Witwatersrand University Press; London And New Jersey: Zed Books, 1993a.

Sachs, W. "Environment". In: The Development Dictionary - A Guide To Knowledge As Power, Johannesburg: Witwatersrand University Press; London And New Jersey: Zed Books, 1993b.

Sachs, W. "Introduction" to The Development Dictionary - A Guide To Knowledge As Power, Johannesburg: Witwatersrand University Press; London And New Jersey: Zed Books, 1993c.

Saunier, R.E. and Meganck, R.A. eds. Conservation of Biodiversity and the New Regional Planning, Washington: Organization of American States, 1995.

Scorer, R. S. Environmental Aerodynamics. New York: Halsted Press, 1978.

Scrimshaw, S. Rapid Assessment Procedures for Nutrition and Primary Health Care. Los Angeles: The Regents of The University of California, 1987.

Serafin, R. Institutions, Environment, Development: The Politics of Communication in Three Environmental Programs in the Great Lakes Region. Waterloo: a PhD Thesis, University of Waterloo, 1991.

Serafin, R. Using National Parks and Protected Areas for Management Research and Education: Experience from the Heritage Research Program, Progress and Business Foundation, Kraków. Paper Delivered at the International Conference “Training of Experts for European Cooperation on Protection of the Environment and Promotion of Sustainable Development”, Kraków, Poland: University of Mining and Metallurgy, 1993.

Shepard P. and McKinley D. ed. The Subversive Science: Essays Toward an Ecology of Man. Boston: Houghton Mifflin Company, 1969.

Shiva, Vandana. “Women, Ecology and Health: An Introduction”. Development Dialogue, 1992 (1-2): 3-12.

Simon, D. “?Sustainable Development: Theoretical Construct or Sustainable Goal”. Environmental Conservation, Vol.16, No.1, pp.41-48, 1989.

Skerratt, S. A Critical Appraisal of The Socio - Economic Evaluation of Agri - Environmental Policy. The Case of ESAs. Edinburgh: a PhD Thesis, IERM, The University of Edinburgh, 1995.

Smith, J.H. “What Are Examiners Looking For ?” In: Handbook For Research Students In The Social Sciences, London: The Falmer Press., 1993.

Sounier, Richard E. and Meganck, Richard A. eds. Conservation of Biodiversity and Regional Planning. Washington: Organization of American States and The World Conservation Union - IUCN, 1995.

Sounis, E. Epidemiologia. Rio de Janeiro e São Paulo: Livraria Atheneu, Editora da Universidade Federal do Paraná, 1985.

Stapledon, G. Human Ecology. 2nd Edition . Classics of Human Ecology Vol. 1. London: Charles Knight and Co.. Ltd., 1971.

Starfield, A.M. and Bleloch, A.L. Building Models for Conservation and Wildlife Management. New York: MacMillan Publishing Company, 1986.

Suzuki, S.; Borden, R. and Hens, L. Human Ecology - Coming of Age: An International Overview. Brussels: VUB - Press, 1991.

Talbot, L. and Olindo, P. "The Maasai Mara and Amboseli Reserves, Kenya". In Living with Wildlife: Wildlife Resource Management with Local Participation in Africa. World Bank technical paper 130, Washington: The World Bank, 1990.

Taylor, P.; Chandiwana, .K.; Govere, J.M. and Chombo, F. "Knowledge Attitudes and Practices in Relation to Schistosomiasis in a Rural Community". Social Science and Medicine, 24 (7): 607-611, 1987.

Tengstrom, E. Human Ecology-A New Discipline?, Göteborg: Göteborgs Universitet, 1985.

The Commonwealth Human Ecology Council. Human Ecology, Environmental Education and Sustainable Development. Report of the 9th Commonwealth Conference on Development and Human Ecology. University of Edinburgh. London: The Commonwealth Human Ecology Council, 1991.

The Interim Secretariat for the Convention on Biological Diversity. Convention on Biological Diversity - UNEP/CBD/94/1. Geneva: The Interim Secretariat for the Convention on Biological Diversity, 1994.

The International Union for Conservation of Nature and Natural Resources; United Nations Environment Program; and World Fund for Nature. World Conservation Strategy: Living Resource Conservation for Sustainable Development. Gland, Switzerland: The International Union for Conservation of Nature and Natural Resources (IUCN), 1980.

The World Conservation Union. Caracas Declaration on Protected Areas and the Human Future, 1992.

The World Conservation Union. 1993 United Nations List Of National Parks And Protected Areas. Prepared by WCMC and CNPPA. Gland, Switzerland: IUCN, 1994.

The World Conservation Union. Guidelines for Protected Area Management Categories. Gland, Switzerland: The World Conservation Union - IUCN, 1994.

The World Conservation Union. Parks for Life: Action for Protected Areas in Europe. Gland, Switzerland: IUCN, 1994.

The World Conservation Union. Report of the Global Biodiversity Forum. Gland, Switzerland: IUCN, 1994.

The World Conservation Union; United Nations Environmental Program; and World Fund for Nature. Caring for the Earth: Strategy for Sustainable Living. Gland, Switzerland: IUCN, 1991.

The World Conservation Union; World Fund for Nature; and Foundation for Nature and National Parks in Europe. Parks for Life: Action Plan on European Nature and National Parks. Gland, Switzerland: IUCN, 1994.

Thrupp, L.A. New Partnerships for Sustainable Agriculture. Washington: World Resources Institute, 1996.

Tolba, M.K. "Foreword" to The Picture of Health - Environmental Sources of Disease, New York: W.W. Norton and Co., 1977.

Toone, W.D. and Wallace, M.P. "The Extinction in the Wild and Reintroduction of the California Condor (*Gymnogyps californianus*)". In Creative Conservation: Interactive Management of Wild and Captive Animals. London: Chapman and Hall, 1994.

UN Commission on Sustainable Development. Overall Progress Achieved Since The United Nations Conference on Environment and Development. The United Nations, 1997.

United Nations Conference on Environment and Development. "The Rio Declaration on Environment and Development". In: Earth Summit '92. London: The Regency Press Corporation, 1992.

United Nations Development Program. Human Development Report 1996. New York and Oxford: Oxford University Press, 1996.

United Nations Environment and Development - UK Committee. Round Table: Health and the Environment's Report to the Commission on Sustainable Development, 2nd Session, New York, May 1994. London: UNED-UK, 1994.

United Nations Environment Program / Convention on Biological Diversity. Convention on Biological Diversity, Switzerland: Interim Secretariat for the Convention on Biological Diversity, 1994.

United Nations Environment Program. Glaciers and the Environment. UNEP/GEMS Environment Library No 9. Nairobi, Kenya: UNEP, 1992.

United States International Trade Commission (USITC). "Global Competitiveness of U.S. Advanced Technology Manufacturing Industries: Pharmaceuticals." In World Competition (1991) 15 (2):27-45.

University of Edinburgh. Nature and Objectives of the PhD Degree, (mimeo), 1987.

Unschuld, P. "Plausibility or Truth? An Essay on Medicine and World View". Science in Context 8 (1): 9-30, 1995.

Veras, F.M.F. "Atenção Primária em Saúde". In: Epidemiologia e Saúde.

Rio de Janeiro: Medsi - Editora Médica e Científica, 1986.

Verkhovod, A.B., Kaltaev, A. and Uvarov, V.N. Abstracts - International Symposium of the Technological Impact on Civilization. Karlsruhe, 21-26 April 1996. Karlsruhe Forschungszentrum, 1996.

Vilesov, E. N., Uvarov, V.N. And Khonin, R.B. Aerophototopographycal Monitoring of Modern Glaciation of the Northern Slops of the Zailyisky Alatau Mountain Range. Report issued by the Institute of Geography. Almaty: Institute of Geography, 1994 (mimeo).

Vilesov, E. N., Uvarov, V.N. and Khonin, R.B. Degradation of Glaciation of the Northern Slope of the Zailyisky Alatau Mountain in the Latter Part of the 20th Century. Almaty: Kasgu Vestnik, (In Press).

Wathern, P. Environmental Impact Assessment: Theory and Practice. London: Routledge, 1988.

Wathern, P. Environmental Impact Assessment: Theory and Practice. London: Routledge, 1988.

Weil, D.E.C.; Alicbusan, A.P.; Wilson, J.F.; Reich, M.R. and Bradley, D.J. The Impact of Development Policies on Health - a Review of the Literature. Geneva: World Health Organization, 1990.

Wells, M., Brandon, K., and Hannah L. People and Parks: Linking Protected Areas Management with Local Communities. Washington: The International Bank for Reconstruction and Development/ The World Bank, 1992.

Western, D. "Amboseli National Park: Enlisting Landowners to Conserve Migratory Wildlife". Ambio, Vol. 11, No. 5, pp. 302-308, 1982.

Wilson, Alison. "Sacred Forests and the Elders". In: The Law of the Mother: Protecting Indigenous Peoples in Protected Areas. Edited by Elizabeth Kemf. San Francisco: Sierra Club, 1993.

Wilson, E. and Peter, F.M. Biodiversity. Washington: National Academy Press, 1988.

World Commission on Environment and Development. Our Common



Future, Oxford: Oxford University Press, 1987.

World Fund for Nature. WWF Madagascar Country Plan FY 92/93 - FY 93/94. Third draft, September 1992. Gland, Switzerland: WWF., 1994 (mimeo).

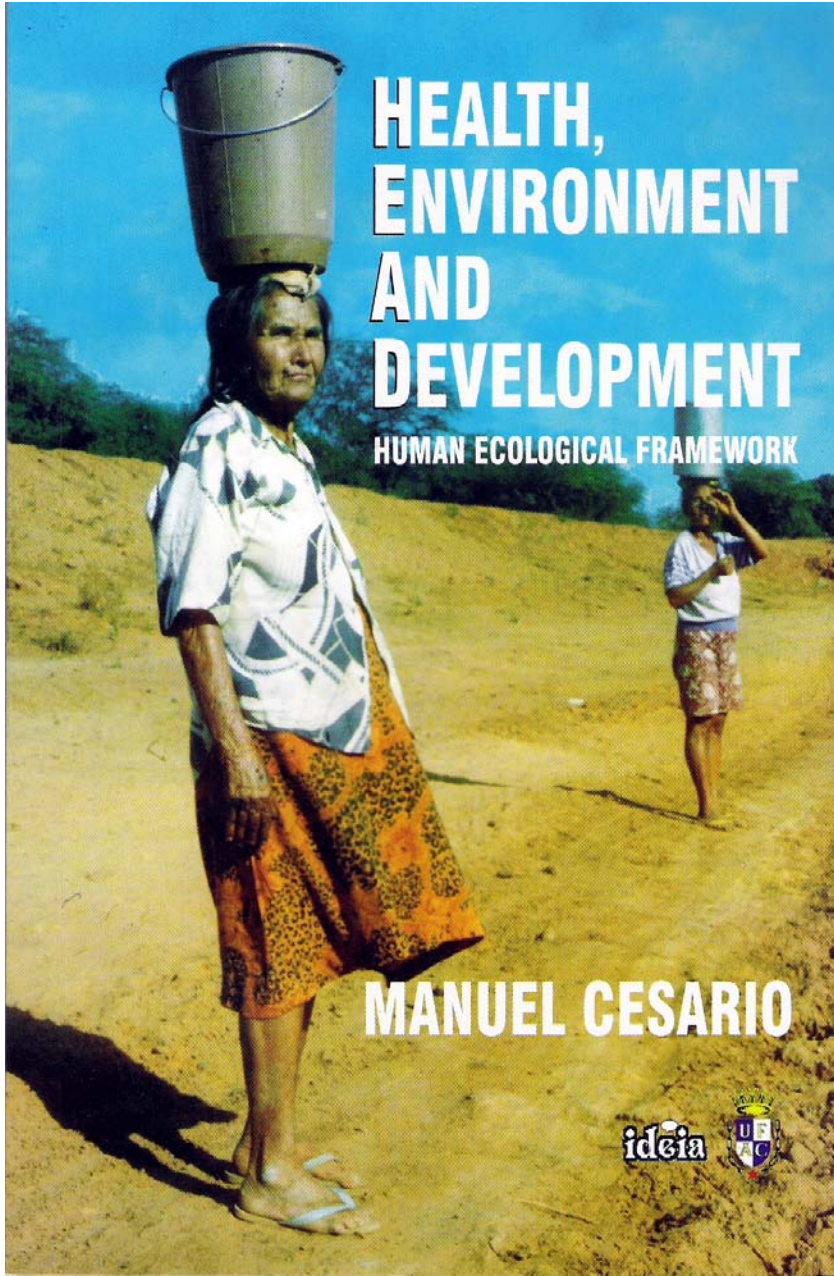
World Health Organization. Report of the International Conference on Primary Health Care, Alma-Ata - USSR, 6-12 September 1978. World Health Organization and United Nations Children's Fund, 1978.

World Resources Institute. Biodiversity Prospecting. Washington: World Resources Institute, 1993.

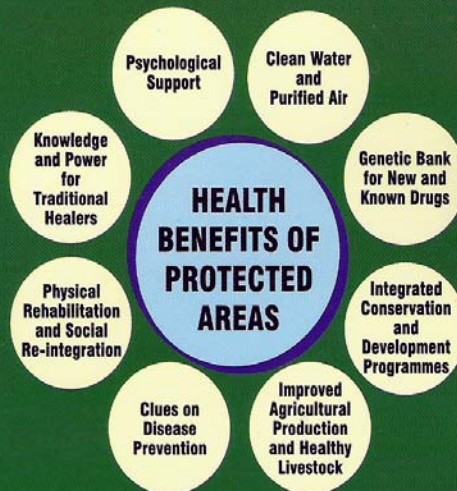
World Resources Institute, The World Conservation Union and United Nations Environment Programme. Global Biodiversity Strategy: Guidelines for Action to Save, Study, and Use Earth's Biotic Wealth Sustainably and Equitably. Washington: World Resources Institute, 1992.

Yin, R.L. Case Study Research: Design and Methods, Thousand Oaks, London, New Delhi: Sage Publications. 1994.

Zube, E. "No Park is an Island". In: Expanding Partnerships in Conservation, edited by Jeffrey A. McNeely. Washington, DC: Island Press, 1995.



The main challenge facing professionals working in protected areas is to find ways of demonstrating that the conservation of biodiversity and its sustainable use have a fundamental relevance to the daily lives of people, including those who may never visit a protected area. There is also the need to emphasise the purposes of protected areas as contributing to the quality of life.



This book presents eight ways in which protected areas can improve human health. Four of these health benefits of protected areas are briefly described and remain as anecdotal evidence, while the other four are better explored through fieldwork in Brazil, Costa Rica, Poland and Kazakhstan. These health benefits of protected areas constitute a contribution to academics, decision-makers and protected-area managers interested in improving the relation between local communities and *in-situ* biodiversity conservation, world-wide.

ISBN 85-7539-160-7

