



LUND UNIVERSITY

What is Wrong with Extinction? - The Answer from Anthropocentric Instrumentalism

Persson, Erik

2006

Document Version:

Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):

Persson, E. (2006). *What is Wrong with Extinction? - The Answer from Anthropocentric Instrumentalism*. [Licentiate Thesis, Practical Philosophy]. Lund University.

Total number of authors:

1

General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Erik Persson

What is Wrong with Extinction?

*The Answer from Anthropocentric
Instrumentalism*



LUNDS UNIVERSITET

Contents

1. INTRODUCTION	3
1.1. BACKGROUND AND PURPOSE OF THE INVESTIGATION	3
1.2. THE PART OF THE INVESTIGATION PRESENTED IN THIS BOOK.....	5
1.3. THE DISPOSITION OF THE REST OF THE INVESTIGATION	6
1.4. ACKNOWLEDGEMENTS.....	7
2. ANTHROPOCENTRIC INSTRUMENTALISM.....	8
2.1. THE STANDARD ANSWER.....	8
2.2. THE RIGHT ANSWER?	11
2.3. SOME KINDS OF INSTRUMENTAL VALUE OF NON-HUMAN SPECIES FOR HUMAN BEINGS	12
2.3.1. <i>Food</i>	12
2.3.2. <i>Medicine</i>	15
2.3.3. <i>Materials and fuel</i>	17
2.3.4. <i>Indicator species</i>	24
2.3.5. <i>Some non-destructive uses of other species</i>	25
2.3.6. <i>Tourism</i>	27
2.4. TRADE OFF	30
2.5. CHOICE VALUE	36
2.6. TRANSFORMATIVE VALUE.....	40
2.7. ECOSYSTEM SERVICES.....	43
3. UNCERTAINTY.....	53
3.1. BIODIVERSITY AND UNCERTAINTY	53
3.2. DEALING WITH UNCERTAINTY	58
3.3. THE PRECAUTIONARY PRINCIPLE.....	61
3.3.1. <i>Promoting the positive versus avoiding the negative</i>	63
3.3.2. <i>Irreversibility</i>	65
3.3.3. <i>The value of human health</i>	70
3.3.4. <i>The cost of being late</i>	72
3.3.5. <i>False positives versus false negatives</i>	74
3.3.6. <i>Conclusions</i>	77
3.4. PROBLEMS WITH THE PRECAUTIONARY PRINCIPLE	78
3.4.1. <i>Is the precautionary principle ill-defined?</i>	79
3.4.2. <i>Is the precautionary principle anti-science?</i>	80
3.4.3. <i>Values instead of science</i>	83
3.4.4. <i>Favouring the status quo</i>	85
3.4.5. <i>Ignoring other risks</i>	87
3.4.6. <i>Does the precautionary principle lure us into a paradox?</i>	91
3.4.7. <i>How do we prove a negative?</i>	92
3.5. WHAT CAN THE PRECAUTIONARY PRINCIPLE DO FOR US?	93
4. FUTURE GENERATIONS.....	96
4.1. DO WE HAVE ANY DUTIES TO FUTURE GENERATIONS?	97
4.1.1. <i>The asymmetry problem</i>	97
4.1.2. <i>The non-identity problem</i>	106
4.1.3. <i>The problem of overwhelming sacrifice</i>	114
4.1.4. <i>Mental impossibility</i>	118
4.1.5. <i>Uncertainty</i>	119
4.1.6. <i>Democracy</i>	122
4.1.7. <i>Opportunity loss</i>	123
4.1.8. <i>Distance</i>	126
4.1.9. <i>Will they need our sacrifices?</i>	128
4.2. CONCLUSIONS.....	133
5. SOMETHING IS LACKING.....	134

6. SUMMARY AND CONCLUSIONS.....	137
REFERENCES.....	139

1. Introduction

1.1. Background and purpose of the investigation

No one really knows the rate by which species go extinct by the hands of human beings. The estimations differ,¹ but they seem to agree that it is a matter of extreme proportions. According to the Worldwatch Institute, we are now experiencing the worst case of mass extinction since the dinosaurs disappeared 65 million years ago.² For most of us, this is a depressing insight and many people seem to agree that to knowingly cause or significantly contribute to the extinction of entire species is (at least *prima facie*) not only bad, but *morally wrong*.

For someone with a philosophic curiosity, the question that immediately arises is: ‘Why is it wrong’?

Intuitively it seems obviously true that it is wrong, but why is it wrong, and how does it fit with formal ethical theories? These questions are more complicated than they may seem at the first glance and they have been the object of a heated debate among both ethicists and environmentalists. This fact alone should be reason enough to pursue the question, but there are other reasons too. The clearness of and the wide agreement about the intuition that what we are doing is at least *prima facie* wrong, makes the extinction problem an excellent test case that any theory should be able to deal with in order to be taken seriously as a moral theory.

Another quite obvious motivation for studying the question of why it is *prima facie* wrong to cause extinction, is that a better understanding of the ethical aspects of the extinction problem would increase our chances of dealing with the problem. Bryan G. Norton points out that environmentalists often put much effort in trying to explain why a species is instrumentally important for human beings, and they often use different approaches. This is a ‘strategy’ that usually gives a bad impression however. It also makes it

¹ For some estimations, see: Aniansson 1990 pp.21,25,65, Bennett et al 2003 p.136, Callicott 1986 p.138, Daily 2000 p.333, Ehrlich et al 1990 p.96,97,99, Heinzman 1990 p.5, James 2002 p.55, Kellert 1986 p.51, Lovejoy 1986 p.14, Millennium Ecosystem Assessment 2005 pp.v,2,3,4f,42ff, Niklasson & Nilsson 2001 p.19, Norton 1986:1 p.120, Norton 1986:2 pp.3,10, Norton 1987 p.65, Palmer 1995 p.31, Ricklefs 1997 p.597, Wramner 1990 p.5

² <http://www.worldwatch.org/topics/nature> 2004-06-04. Bennett et al (Bennett et al 2003 p.136) seems to reason along the same lines.

harder to reach the common goal of saving the species.³ Failures of the environmental movement that can be traced back to the difficulties in agreeing on why different species and ecosystems are important enough for us humans to be worth saving, leads Bryan G. Norton to conclude that we need what he labels “a coherent rationale for environmental protection.”⁴

This is underlined by Lori Gruen and Dale Jamieson who declare that:

It is ironic that the destruction of biodiversity, which may be the greatest of human crimes against nature, is also one of the least understood. We do not have a good philosophical account of why biodiversity matters, and the steps that would have to be taken to protect it are, in the present climate, politically impossible.⁵

Both Norton’s and Gruen/Jamieson’s remarks, tell us that there is quite a great deal of work to be done in the field, and they also tell us that the work is very important.

Finally, the problem of human-caused extinction also seems to be a good battleground for the more general question of what should count as criteria for moral standing. Actually, most of the ethical debate surrounding the extinction problem is concerned with this question, and this will also be salient in this investigation.

The present debate around this question is mostly performed in polemic between advocates of holistic theories on the one hand, and advocates of individualistic theories on the other.

The advocates of the holistic approach claim that we have moral duties directly to the species. They are primarily concerned that without a direct moral standing for the species, we will have to depend on its instrumental value for us humans.

The individualists on the other hand claim that only individuals can be moral objects. They are sceptical to the holistic approach, and to the possibility of ascribing moral standing to species. They especially find it difficult to comprehend how species can have morally relevant interests for us to consider. This book is the first part of an investigation that will scrutinise both the holistic approach and the individualistic approaches.

³ Norton 1982 pp.18f

⁴ Norton 1982 p.20

⁵ Gruen & Jamieson 1994 p.334

1.2. The part of the investigation presented in this book

In this book, I will examine the most common answer to why it is wrong to cause a species to go extinct, viz. because (and only because) the species is – directly or indirectly – instrumentally valuable to us human beings.

I will start with a general account of the idea. Then I will take a closer look at some of the ways in which other species can have instrumental value for us human beings, and at how these values can be expected to stand up in a trade off situation with other human values. I will then go on and investigate two special types of instrumental value that are suggested to be important in our relation with other species. It is also important not to forget that the species do not just supply us with value individually, but also in virtue of being a part of an ecosystem (or rather several ecosystems) and of the general biodiversity. I will therefore assign a part of the investigation to that kind of values.

Due to the large degree of uncertainty surrounding both the value and the function of species, I will assign one chapter especially to the issue of uncertainty. I will then both discuss the uncertainties as such, and how to deal with them. I will pay special attention to the so-called precautionary principle that has become increasingly popular as a tool for decision under uncertainty, but that is also subject to some serious criticism.

An important part of the problem of extinction is that typically, it is now living human beings who benefit while future generations of human beings have to live with the problems. I will therefore assign a chapter to the question of whether we have a moral duty to preserve species for the sake of future human beings.

As we shall see, many species as well as a generally high degree of biodiversity are quite important for us human beings – both present and future generations. This seems to account for some part of why it is morally problematic to cause extinction, but it will probably not give us the whole answer. Even though the instrumental value of many species for us humans seems to give us quite strong moral reasons to be restrictive in contributing to their extinction, it does not seem to be enough to motivate our strong feelings of moral indignation. We seem to need something more to explain why we should refrain from doing things that are e.g. economically lucrative only on the basis that these activities cause extinction of other species.

It is therefore necessary to continue the investigation in order to gain a complete answer to our question. This will be done in a coming extended publication containing the entire investigation.

In order to be as clear as possible as to how the investigation presented in this book fits with the whole, I will give a short account of the disposition of the rest of the investigation. The reader who is only interested in moral duties generated by the instrumental value of other species for human beings, can skip this part and go directly to chapter 2.

1.3. The disposition of the rest of the investigation

The rest of the investigation will consider the suggested answers to the question of “what is wrong with extinction” that are not based on the instrumental value of the species for human beings.

I will start with another of the major contestants, viz. the idea that we have moral obligations to the species themselves. This approach has some great advantages, but also its fair share of problems. I will start by presenting the idea, and then go through the problems one by one to see if they are real, and if so, how serious they are and whether they can be solved.

When analysing the idea of how species can have *intrinsic value*, we will find that this view might not be best expressed in terms of *moral standing* for the species, but in terms of *final value* of the species for human beings. We will thus turn back to the human-centred approach, but this time no longer just in an instrumental setting. By considering the final value of other species for human beings, we seem to be able to account for most of the intuitions referred to by the holistic approach without having to claim that the species have moral standing on their own. At the same time we will get a much more complete understanding of why it is wrong to cause extinction compared to what we could get by just referring to the instrumental value of the species for human beings.

Even this will not give us the full answer however. There will still be conflicts that cannot be fully explained in terms of human interests whether instrumental or final. In the last part of the investigation, I will widen the individualistic approach further by taking it beyond anthropocentrism. The case for moral standing for many non-human individual

animals is much easier to defend than both the idea that entire species have moral standing, *and* the idea that only human beings have moral standing. Nevertheless, this extended individualistic approach also has its share of problems. These problems will be scrutinised, and hopefully the combined results of the entire investigation will give a solid account of what is wrong with extinction.

1.4. Acknowledgements

Before I start presenting the investigation however, I wish to thank everyone who has been involved in the process. Not least my supervisor Dan Egonsson who has read my text several times and bestowed me with much useful feedback. I also wish to thank Agneta Åhs, Jonathan Linné, Wlodek Rabinowicz, Johannes Persson and Dennis Brice who have all read the whole or parts of the manuscript and provided me with many useful comments. A special thanks goes to the members of the PhD study group at the Lund University Centre for Sustainability Studies, and the philosophy seminar at the Royal Institute of Technology to whom I have presented parts of the text, and who's comments have been very useful. Finally I want to express my gratitude to Stiftelsen Oscar och Lilli Lamms minne, who has financed part of the work.

2. Anthropocentric Instrumentalism

2.1. The standard answer

I have chosen to call the first and most common answer to our question ‘anthropocentric instrumentalism’. ‘Anthropocentric’ because it only considers the value other species have for us human beings, and ‘instrumentalism’ because it does not conceive of other species as having value as ends in themselves, but only as a means to something else.⁶

This answer has historically been viewed as the most important reason for conservation,⁷ and if we scrutinise official national and international policy documents that discuss the issue of species loss, we can see that anthropocentric instrumentalism clearly dominates – when the question of a reason is at all discussed. In most documents, it is not discussed at all, or just barely. In some cases, the documents explicitly state other reasons than anthropocentric instrumentalism.⁸ It is however quite clear from the reasoning in the documents that anthropocentric instrumentalism is almost always assumed to be the sole basis for their concern about other species. When reasons are mentioned, they are with few exceptions only just that – mentioned – nothing more. The discussion, agreements, recommendations etc. (depending on the purpose of the document) are imbued with the attitude that other species only have value as a means for other things valued intrinsically or instrumentally by human beings.⁹

In scientific, educational or advisory articles or textbooks discussing species loss and/or giving advice on species preservation, the question of why we should protect threatened species is in general not discussed. When it is, it is common to talk about

⁶ Many authors do not acknowledge the possibility that other species can have intrinsic value for human beings and therefore use the term ‘anthropocentrism’ as equivalent to the way I use the term ‘anthropocentric instrumentalism’.

⁷ Melin 2001 *passim*, Rundlöf 1999 p.12

⁸ Melin 2001 *passim*

⁹ For a more extensive investigation surrounding this, see Stenmark 2000 *passim*. Stenmark has studied several national and international policy documents and has reached the same conclusion as I have. See also Aniansson 1990 p.123. For a historical outlook from a Swedish perspective, see Melin 2001 *Passim*. For examples, see e.g. The Bern convention 1979 pp.2f, Cal/EPA 2003, Interview with EU commissioner Margot Wallström in *Sydsvenska Dagbladet* February 9th 2004 (<http://w1.sydsvenskan.se/print/printarticle.jsp?article=10074604>), Johansson 2003 pp.3,8,28, Millennium Ecosystem Assessment 2005 *passim*, Various statement by MA board members on the official website of the Millennium Ecosystem Assessment, The Rio Convention 1992 §1 and *passim*, World Commission on Environment and Development 1987 p.6:1ff and *passim*, Johansson 2006 p.10,15

“scientific”, “biological” or “ecological” reasons. What this means is seldom discussed, but it seems quite clear that these reasons are not conceived of as moral ones. In fact, most authors of this kind of texts do not recognise them as value judgements at all. Obviously, they are value judgements, but disguised as scientific statements. The reason judgements disguised as scientific statements are sometimes anthropocentric instrumental (“we need to study the species to determine how we can utilise them in the most effective way”, “ecology tells us that we need the species in order to survive” etc.). Sometimes the reasons are based on an anthropocentrically intrinsic attitude towards the species (“the species is fascinating in its own right and therefore intrinsically worthy of our attention”), and quite often ecocentric (“we must respect the species for its own sake”). Sometimes the authors contrast their “scientific”(etc.) reasons for preservation with what they call “moral” or “ethical” reasons. Why their own reasons are not moral, and what they mean by “moral” and “ethical” reasons, is not however clear. When they use these terms, they most often seem to refer to the kind of reasons for preservation that I will call anthropocentric intrinsic reasons. Sometimes they seem to be thinking of a certain type of anthropocentric instrumental reasons, according to which nature or certain species are important for aesthetic, cultural or religious reasons. It is not clear though why these values are seen as moral while the so-called “scientific” (or “biological” etc.) reasons for preservation are not. Sometimes the authors also contrast their “scientific”(etc.) reasons with what they call “economic” or “utilitarian”¹⁰ reasons. The latter seems to be identical with what I have labelled anthropocentric instrumental reasons. Authors of scientific, advisory or educational texts that discuss the question of why species preservation is important, are often very eager to find this kind of “economic” or “utilitarian” motive to justify their work, but it is in general also clear that this is seldom their own motives – at least not primarily.¹¹

Finding clear statements from non-governmental organisations (NGOs) concerning why preservation is important has proved to be surprisingly difficult.¹² Most NGOs are of

¹⁰ They clearly do not use the term ‘utilitarian’ the way it is normally used within ethics, but rather as a synonym to ‘instrumental’.

¹¹ For examples of how this kind of texts reason around the value of species preservation, see e.g. Aniansson 1990 p.31, Elmqvist et al 2005:2 pp.44ff, Farber 2000 pp.s492f, passim, From & Delin (ed.) 1997 p.5, Gärdenfors 2005 p.120,126, Ihse 2005 pp.62,66f,72, Johansson, Birgitta 2005:1p.39, Johansson Maria 2005 p.100, Niklasson & Nilsson 2001 pp.19f, Norton 1987 pp.6f, Ricklefs 1997 p.597, Spellerberg 14ff, Sörlin 1991 p.175.

¹² I have studied the official internet sites of the following organisations: BirdLife International (<http://www.birdlife.org>), BirdLife Malta (<http://www.birdlifemalta.org>), Defenders of Wildlife (<http://www.defenders.org>), Danmarks Naturfredningsforening (<http://www.dn.dk/>), Estonian Fund for Nature (<http://www.elfond.ee/index.php?keel=inglise>), European Centre for Nature Conservation (<http://www.ecnc.nl>), Friends of the Earth International (<http://www.foei.org>), Greenpeace

course focused on the means of protection, not the reasons, but it is still rather surprising that they do not spend more energy justifying their work. When they do, the reasons are typically anthropocentric instrumental,¹³ but just like in the scientific texts, they also mention “scientific”/“ecological” etc. reasons for species protection, and now and then they appeal to e.g. “ethical”, “aesthetical” or “cultural” reasons, or the “intrinsic value” of nature, ecosystems or species.¹⁴

Personal experience tells me however that many people active in NGOs have reasons for their work that go beyond the anthropocentric instrumental ones that are expressed in official national and international policy documents. Both anthropocentric intrinsic, ecocentric and individualistic non-anthropocentric (i.e. sentientistic,¹⁵ zoocentric¹⁶ or biocentric¹⁷) reasons are common.

To summarize: The question of why extinction is a problem is not very deeply discussed among policymakers, or among scientists and NGOs dealing with preservation issues. From what I have found, it seems that both the NGOs and the scientific authors seem to be willing to admit a wider range of reasons for protecting biodiversity compared with the official national and international policy documents, even though the authors of scientific texts are more prone to hiding their own value judgements behind pretended scientific statements. Both NGOs and scientific authors tend ultimately to justify their commitment to saving endangered species by anthropocentric instrumental arguments. I guess that the main reason for this is that this type of argument is supposed to have a greater impact among both the public and the decision makers. That anthropocentric instrumentalism is more commonly accepted among decision makers – at least among the most influential ones – seems to be confirmed by the official national and international policy documents referred to above.

(<http://www.greenpeace.org/international/>), Greenpeace Sweden (<http://www.greenpeace.org/sweden>), Miljöförbundet Jordens Vänner (<http://www.mjv.se>), Natur och Miljö – Riksorganisation för miljövard (<http://www.naturochmiljo.fi>), Norges Naturvernforbund (<http://www.naturvern.no>), Plantlife (<http://www.plantlife.org.uk>), Rainforest Action Network (<http://www.ran.org>), Svenska Naturskyddsföreningen (<http://www.snf.se>), Svenska Rovdjursföreningen (<http://www.rovdjur.se>), Sveriges Ornitologiska Förening (<http://www.sofnet.org>), Taiga Rescue Network (<http://www.taigarecue.org>), The World Conservation Union (<http://www.iucn.org/>), Wildlife Trust (<http://www.wildlifetrust.org>), World Wide Fund For Nature (<http://www.panda.org/>),

¹³ See e.g. Aniansson 1990 passim, Johansson, Birgitta 2005 2 p.106f Lindén p.72ff, Olsson 2004 p.43, Plantlife (<http://www.plantlife.org.uk>), Taiga Rescue Network (<http://www.taigarecue.org>), Wramner 1990 pp.4,7

¹⁴ See e.g. Aniansson 1990 pp.16f,58,80,108, BirdLife International (<http://www.birdlife.org>), Johansson, Birgitta 2005 1p.13, Johansson, Birgitta 2005 2 p.106f, Olsson 2004 p.43, Wramner 1990 pp.4,7

¹⁵ Sentientistic ethics assigns moral standing to all and only sentient beings.

¹⁶ Zoocentric ethics assigns moral standing to all and only animals.

2.2. The right answer?

Sverker Sörlin, who has studied our attitudes towards the environment from a historical perspective, claims that the best reason to believe that we will establish what he calls “a contract with nature” is that the arrogance we have shown towards nature will eventually be detrimental also to our own species and our culture.¹⁸ Sörlin thus seems to consider anthropocentric instrumentalism the correct – and the most instrumentally useful – answer to our question. He is apparently not alone in this. Steven Luper-Foy and Bryan Norton e.g. believe that anthropocentrism does give us strong reasons for becoming better at protecting nature.¹⁹

Is this judgement correct, and if so, is it sufficient to account for our moral intuitions concerning extinction? I.e.: To what degree can anthropocentric instrumentalism account for our moral intuitions against species extinction?

The rest of this book will be concerned with this question.

In order to answer it, we have to answer three sub-questions:

1. How important are other species to us human beings?
2. If other species are important to us, are they important *enough* in comparison to the values they have to compete with?
3. If so, can this be a *complete* explanation of why it is at least in general morally wrong to contribute to the extinction of a species?

I will start by trying to answer the first two questions by discussing different ways in which other species can have instrumental value for human beings, and by looking at some particular forms of instrumental value that are especially relevant for our investigation. When I have done that, I will approach the third question by investigating whether our moral intuitions concerning extinction can be completely satisfied with anthropocentric instrumentalism as the sole answer.

Let us however begin with the first of the sub-questions by looking at some ways in which other species can have instrumental value for human beings.

¹⁷ Biocentric ethics assigns moral standing to all and only living beings.

¹⁸ Sörlin 1991 p.273f

¹⁹ Luper-Foy 1995 p.91, Melin 2001 p.15 Just like Stenmark, Melin and many others, Luper-Foy does not distinguish between anthropocentric instrumental and anthropocentric intrinsic attitudes towards nature in the way I do in this investigation. Since I believe the two versions are relevantly different and because of a history of misunderstandings, I will be careful in keeping them separate.

2.3. Some kinds of instrumental value of non-human species for human beings

2.3.1. Food

All our nutrients come from other species directly and indirectly. Most of the species used directly for food are domesticated, but even wild species contribute to our food supply, especially in developing regions but even the most technologically advanced countries depend in many ways on wild species for their food.²⁰ All our domesticated species today originate from wild species, and some of today's wild species will probably be the basis for domesticated species in the future.²¹ Since it is assumed by anthropocentrism that only human beings have moral standing, the fact that we are killing the proximate source of our nutrients (including killing and eating sentient animals) is not in itself a problem according to anthropocentrism as long as the species continues to exist and supplies us with new individuals to eat. This will give us a strong incentive for conserving the species even without involving ethics. Rational selfishness alone is an incentive for conservation. If we also admit the moral responsibility not to deplete the food sources for other human beings, the argument will be even stronger. It also makes the argument more inclusive since we probably need more species to supply the whole of humanity with food. A species that is well suited for being farmed/hunted/gathered etc. in Sweden may not be equally well suited for the same activities in e.g. India.²²

This looks promising, but the case is not as simple as it looks above. That a species is found suitable as food for human beings has not always been good news from a preservation perspective. We have literally eaten a large number of species to extinction.²³ This is probably quite often a result of imprudence or irrationality rather than as something that necessarily follows from anthropocentric instrumentalism, but maybe we do not need to save all the sources of a particular nutrient to secure the supply of that nutrient? Maybe we do not

²⁰ Almered Olsson 2005 p. 53, Aniansson 1990 pp.57,59,68, Gärdenfors 2005 p.119, Ihse 2005 p.62, Lindén 1990 pp.73,77, Millennium Ecosystem Assessment 2005 pp.30f, Myers, 1990 pp.16,21f, Söderqvist 2005 p.74

²¹ Ehrlich et al 1990 p.102, Myers, 1990 p.16, Norton 1987 p.27

²² It has to be pointed out however that in the same way and for the same reasons that anthropocentrism provides a stronger incentive for preservation than egocentrism, an even wider account of who has moral standing – ecocentrism or non-anthropocentric individualistic theories – would provide an even stronger incentive for preservation but it would complicate the question of whether it is ethically acceptable to eat the source of the nutrition.

²³ For some examples see e.g. Ricklefs 1997 p.606

need to save all species that supply us with protein in order to secure our supply of protein e.g.? Economically, it may well be rational in many cases to replace natural species with bred or cultivated ones that are more productive and easier to manage (as long as the wild species are not important for other reasons).²⁴ This means that if we find one species that is a good provider of different nutrients and is easy to breed etc. we have a tendency to domesticate that species and breed large numbers of it. At the same time other species that play the same role but less effectively lose their importance.

It is also argued from an economic perspective that it can sometimes be perfectly rational to deplete a non-renewable resource if we know or at least have good reasons to believe that we can replace it with another resource. It may even be economically *required* to do so if extensive use of the first resource is necessary to drive the economical and technological development that is needed for us to develop the means of utilizing the other resource. If this is right, it substantially weakens the argument that we need to preserve any given species as sources of nutrients for human beings as long as there exist other species that can supply us with the same nutrients.

There is another reason why it might be a problem from a preservation perspective that a species turns out to be a valuable nutrient source for human beings: If we domesticate a species, we will probably change its genetic make up. The properties that make it more suitable for human utilization may well make the domesticated form less suited for a life in nature. If this is combined with the usual human fear of competition, the result can be that other species including the non-domesticated relatives of the species are eradicated in order to protect or give room for the domesticated version. This behaviour is quite common and has e.g. resulted in destruction of forests and wetlands to gain land for different types of agriculture, as well as to fierce eradication campaigns against everything from plants and animals competing for nutrients, via plants and animals competing for space, to all kinds of predators that see domesticated animals as easy prey.²⁵ Domesticated forms of different plants, grasses and animals have taken over large areas of the planet. This has contributed substantially to the extinction of wild species. One illustrative example is when rain forests are cut down to grow soy used as fodder to cattle in order to provide us with meat and milk.²⁶

Because of problems like those listed above, Robert Ricklefs concludes that the economic value of different species for agriculture is not a good basis for protecting natural

²⁴ Luper-Foy 1995 p.97

²⁵ Almered Olsson 2005 p.57, Ihse 2005 p.67, Williams 1996 p.169

²⁶ Almered Olsson 2005 p.57

biodiversity.²⁷ Since different species inevitably have different degrees of instrumental value for us, an anthropocentric instrumental approach will mean that some species will be favoured at the expense of others. Even if this does not mean that the less valuable species are turned into oblivion, they will be strongly repressed and diminished. The genetic diversity of the species will decrease and the repressed species will risk extinction in the long run.

One good reason for conservation based on our need for food, is that a larger degree of biodiversity among species used for food (both wild and cultivated) increases the food security. If one species is hit by e.g. a disease, we can get the nutrients from another species.²⁸

Two other important aspects of the “nutrient-track” deserve to be pointed out: As we said in the beginning of this sub-section, all our cultivated species originate from wild species. This means that the larger the biodiversity, the larger the probability that we will find new species that can be useful for us.²⁹ It also means that in order to find new species to cultivate or to cross breed with our cultivated breeds, or just to transfer genes from, we need a supply of wild species.³⁰ As an illustration, Norman Myers mentions the great corn blight in the U.S. that destroyed half of their 1970 corn crop. The problem was dealt with by interbreeding the cultivated corn with corn from its original growing place in Mexico.³¹

This seems to be a good reason from the point of view of anthropocentric instrumentalism not to do things that might lead to the extinction of wild species, and may to some degree counterbalance the benefits we get from getting rid of competing species. Another thing we have to consider is that we really do not have any way of knowing today which genetic material will be useful in the future. This can be seen as an argument to conserve species “just in case”. I will however return to this strategy in chapter 3.

We should also consider the fact that natural evolution goes on all the time, and “invents” new properties in both plants and animals, properties that can turn out to be very useful for us. In order for this evolutionary process to continue, we need to protect not only the species that are potentially useful, but also the ecosystems in which they live and evolve,

²⁷ Ricklefs 1997 p.598

²⁸ Almered Olsson 2005 p.54

²⁹ Norton 1986:1 p.117f

³⁰ Almered Olsson 2005 p.54, Aniansson 1990 pp.59,68f,124, Johansson 2003 p.8, Myers 1990 pp.16f, Williams 1996 p.169

³¹ Myers 1990 p.16

and other species that may evolve useful traits in the future or just contribute to the selective pressure that drives the evolutionary process.³²

These last points are of course not just relevant when it comes to food, but also in other cases where nature contributes to human wellbeing. They are examples of so-called ecosystem services. The ecosystem services are important for our supply of food in several different ways. Most pollinators are e.g. wild insects and bats etc.³³ Wild species improve the quality of the soil or help to spread the seeds of plants.³⁴ A substantial degree of biodiversity is needed to keep the surrounding ecosystems working, to prevent our cultivated species succumbing to diseases and “pests” etc.³⁵ Monocultures can be very productive but they cannot sustain themselves for very long without human assistance. They need input of fertilisers and human intervention – generally powered by fossil fuels.³⁶ The “input” independently of how it is substantiated must come from somewhere and it is very often depends on some kind of ecosystem service.

The ecosystem services are also important for other things than food, and I will therefore discuss them separately and in more detail later.

Before that, I will discuss a couple of other specific uses of other species that might make it important for us to conserve the species from an anthropocentric instrumental perspective.

2.3.2. Medicine

Medical benefits are sometimes put forth as an important reason for preservation of species.³⁷ Many of the medical drugs we use today originate from plants.³⁸ In the future, these numbers are believed to increase. Most plants have never been checked for medically

³² Norton 1986:1 p.117f

³³ Ehrlich et al 1990 p.102, Millennium Ecosystem Assessment 2005 pp.25f, Johansson 2003 p.2, Myers 1990 p.21f, Prance 1990 p.57, Söderqvist 2005 p.75

³⁴ Johansson 2003 p.27, Johansson, Birgitta 2005:1 pp.8,12, Söderqvist 2005 p.75

³⁵ Almered Olsson 2005 p.55f

³⁶ Norton 1986:1 pp.129f

³⁷ Johansson, Birgitta 2005 2 p 107, Kellert 1986 p.53, Rundlöf 2000 p.13, Sober 1986 p.173

³⁸ Aniansson 1990 p.59, Daily 2000 pp.333f, Ehrlich et al 1990 p.101, Lovejoy 1986 p.17, Ricklefs 1997 p.598

useful substances,³⁹ and we will probably find many new medical drugs among wild species.⁴⁰

Can this account for at least part of why it is seen as morally problematic to contribute to the extinction of species? The situation seems to be very similar to the one we just discussed regarding food, and most of the aspects discussed in relation to food are also applicable here. One difference is that even though the human demand for medicine is large, it is probably not as large as the demand for food, which means that both the pros and the cons of referring to medical value are smaller in scope compared to when we refer to the value of species as sources of food as an explanation for why the causing of extinction is morally problematic from an anthropocentric instrumental point of view. Another difference is that even though many medical drugs originate in wild plants, the plants are in general not utilised in the manufacturing of drugs.⁴¹ This diminishes some aspects, but not others. The domestication and competition aspects as well as the depletion aspect that we brought up in the previous sub-section are much less of a problem when we talk about medicine. Wild species are said to be at least as important as future sources of medical drugs as they are as future sources of food. This means that protecting the basis of future evolution will also be at least as important in the medical case as in the food case.

I pointed out in the introduction that our intuitions tell us that it is *prima facie* wrong to contribute to extermination all things considered. This leaves room for saying that there may be cases when it is acceptable or even required to contribute to extermination. This is most salient when we deal with species that carry human diseases, like for instance the black rat (*Rattus rattus*), the malaria carrying mosquito (*Anopheles maculipennis* and other species in the *Anopheles* genus), and of course the malaria parasites themselves (a number of species of the genus *Plasmodium*) – not to mention several kinds of bacteria.

On the other hand, according to the Millennium report, a larger diversity of wildlife probably decreases the spread of many wildlife pathogens to human beings.⁴² If this is correct, it means that even though the battle against diseases can in some circumstances be an argument in favour of exterminating certain species, it can also be an argument in favour of preserving a generally high level of biodiversity.

³⁹ Aniansson 1990 p.59

⁴⁰ Aniansson 1990 pp.59,68f, Myers 1990 p.17, Norton 1987 p.27, Regan 1986 p.195

⁴¹ Lovejoy 1986 p.17

⁴² Millennium Ecosystem Assessment 2005 p.31, Myers 1990 p.17

2.3.3. Materials and fuel

Many of the materials we use in our daily lives come from living organisms.⁴³ Most notably wood that is used in everything from paper towels to houses, but also plenty of other materials.⁴⁴

Wood and other organic products are also important as fuel.⁴⁵ More than half of the fuel used in developing countries comes from wood. In some countries like Tanzania and Uganda, wood comprises four fifths of the fuel. Even in industrialised countries, wood is an important source of energy. In the relatively densely forested Sweden, it makes up 17% of the energy consumption.⁴⁶ Bio fuel is a renewable energy source that many people see as an important alternative to the present non-renewables.

In many respects, the harvesting of other species for material is similar to harvesting them for food. One difference is that once the material is extracted, it can be used for a longer period of time. Once food is eaten, it is gone and we need a new harvest. One might think that this makes the pressure on the supplying species smaller when it comes to material, but unfortunately it is not so. The demand for materials that we find valuable is often close to insatiable, and our use of material resources is usually very wasteful. Many species have disappeared and even more are threatened as a result of our “hunger” for materials. The use of wood as fuel, paper pulp, timber, etc. has e.g. led to the cutting down of a large portion of the world’s forests. The rainforest in particular. The latter is the world’s richest ecosystem, and many other species have been brought down in the fall. Cutting down the rain forest, both in order to exploit the trees, and in order to make room for agriculture, might even be the most important cause of extinction today.

Apart from wood, a number of animal and plant species are directly threatened because we value some material they supply. The use of wild animal products is in fact the primary factor behind the endangerment of many vertebrate species.⁴⁷ Ivory and rhinoceros horns e.g. have been very popular among human beings. This popularity has nearly caused the

⁴³ Ehrlich et al 1990 p.101, Ihse 2005 p. 62, Myers 1990 p.17, Norton 1987 p.27

⁴⁴ Aniansson 1990 pp.59,68, Daily 2000 pp.333ff, Gerstin 1990 p. 87, Myers 1990 p.17, Söderqvist 2005 p.74, Tucker 1990 pp.46f

⁴⁵ Norton 1987 p.27

⁴⁶ Millennium Ecosystem Assessment 2005 p.31

⁴⁷ Kellert 1986 p.68

extinction of both elephants and rhinoceroses.⁴⁸ Some other species have already disappeared because they have turned out to give us useful materials.⁴⁹

Maybe this can be explained as an effect of irrationality rather than as something that follows from anthropocentric instrumentalism? We are quite often very irrational in our use of resources, but I am not sure all cases of extinction due to our utilisation of the species can be explained this way. We discussed this problem briefly in the last sub-chapter when we talked about food and pointed out that there are probably cases where it is in fact rational from a strict anthropocentric point of view to use our sources of nutrient in such a way that some species go extinct. This is probably, at least sometimes, also the case with material and fuel.

There is another aspect of the use of other species as material or fuel that we have to take a closer look at. When discussing food, I mentioned that it might not always be irrational from an anthropocentric point of view to exploit a species to such a degree that it goes extinct. This may also be the case when we talk about material and fuel. This conclusion is difficult to establish however. Marian Radetzki believes that there are some identifiable cases where extinction has had negative economic effects. One such case is the over-fishing of cod in the north Atlantic. He does not believe that this is always the case however.⁵⁰ As we saw, some sources of nutrient can e.g. be substituted by other sources of nutrient. This is also the case with other resources such as materials of different kinds: One material can often be substituted by another that does the same job – maybe even better than the original.⁵¹

The possibility of substituting a resource is an important issue in this discussion. The possibility of substituting one material for another is usually overrated by economists due to the fact that in economic terms, everything is per definition replaceable by the right amount of anything else. This is of course not the case in the real world. None the less, materials are constantly replaced by other materials and this is something that has to be accounted for when we decide whether a certain species is expendable. This argument goes both ways however: It is also possible to substitute material and fuel from non-living nature with material and fuel from living organisms.⁵² If we try to consider also future generations,

⁴⁸ Ricklefs 1997 p.599

⁴⁹ Prance 1990 p.59

⁵⁰ Radetzki 2001 p.72f

⁵¹ Farber 2000 p.s495f, passim, Luper-Foy 1995 p.97, Radetzki 1990 p.51ff, Radetzki 2001 p.75, SLU 2006:1, SLU 2006:2, SLU 2006:3

⁵² SLU 2006:1, SLU 2006:2, SLU 2006:3

things become more complicated. It is very difficult – not to say impossible – to foresee what material will in the future be substituted by what other material. We can therefore never know if a species that does not seem very valuable at the moment will not turn out to be very valuable in the future.⁵³ To this one might of course answer that it does not matter as long as there are other materials we can use instead. In fact, since we have the ability to use materials from the non-living nature, we can always use that to substitute a species.⁵⁴ We have e.g. already substituted a lot of the wood used before with metal and various polymers. It might also be possible to genetically modify species to produce special materials more effectively than the natural species.⁵⁵ On the other hand, nature is very “inventive” and as with medical drugs, it sometimes produces materials that we would not have thought of ourselves or which would be very expensive to imitate. The economic value of these materials can probably not motivate a general ban of activities that might lead to extinction however even though it can motivate preservation of some very important species.

Maybe we can single out some important species and grow them in large monocultures. Would not that be a more effective and profitable way of getting hold of the material we need? The economist Marian Radetzki is very optimistic about this possibility.⁵⁶ After all, this is exactly what we have done with food, and it is in fact utilised in large scale with trees. This suggestion is very ecologically naïve however. Species do not work on their own but as parts of a system. A few monocultures clearly work, but only as long as there are natural environments in the vicinity. To substitute all natural environments with monocultures and to let all but the directly useful species go extinct would not work. The question that remains is how much of the natural environment can we turn into monocultures and how many species apart from the species we harvest do we need? The most probable answer is that we will not know that until we reach the limit.

If we take the point of view of particular individual human agents, it may be even more common that extinction follows as an effect of a completely rational behaviour than if we try to consider the interests of all human beings. Take a look at a simple cost-benefit analysis for a project. Suppose it turns out when everything is taken into account that the project will generate an income of \$10 000, while the costs will amount to \$1 000 000. Is this a good deal? The way I have described it here, it is obviously not a good deal, but let us make a

⁵³ Lovejoy 1986 p.17

⁵⁴ Radetzki 1990 p.51ff

⁵⁵ Radetzki 1990 p.51ff, Radetzki 2001 p.75

⁵⁶ Radetzki 2001 pp.74f

specification: Assume that the income from the project will fall on the decision maker while the costs will fall on the society as whole. Then the part of the costs that falls on the decision maker will be very small in comparison to the gain, and instead of making a great personal loss she will make a personal profit. An act that would look preposterous if all costs were taken into account may well look like a very good deal for the decision maker(s) if the profit falls on the latter while someone else has to pay the price.⁵⁷ Unfortunately, this way of making decisions is very common. The Millennium Assessment report on biodiversity for instance points out that many people have gained quite a lot from activities that have contributed to the disappearance of species, including for example forestry and agriculture.⁵⁸ It also points out however, that the gain often comes with a cost that has to be paid by someone else – often poor people – and which is not always factored into the decision.⁵⁹ This way of making decisions is in fact very common,⁶⁰ and the costs are paid both by other contemporary human beings, by future generations of human beings, and by other species.

Effects that fall upon someone other than the decision maker are usually referred to by economists as *external effects*.⁶¹ That they are seen as external is of course a result of the perspective we assume when we make the decision – viz. an egocentric perspective: Effects only count to the extent that they fall on the decision maker. As long as decisions are made along these lines, it does not really matter whether it would in many or even in most cases of harvesting material, food, medical drugs etc. from other species be more rational from an anthropocentric point of view to preserve the species. The result will still be destruction if that is what gives the largest payoff for the individual who makes the decision, i.e. if it is the most rational thing to do from a strictly egocentric point of view. This may be an important explanation of many environmental problems. For our investigation, it means that many of the problems we have found in this and the preceding (as well as the following) sub-sections may be rooted not in *anthropocentrism* but in *egocentrism*. According to anthropocentrism (the way I use the term in this work), we do have moral duties to our fellow humans, and that is the basic idea behind using anthropocentric instrumentalism as an explanation of why causing extinction is a moral problem. Is it possible that the problems that have been imputed on anthropocentrism are in fact a result of egocentric and not anthropocentric thinking? Egocentrism and anthropocentrism are in my experience often unrightfully

⁵⁷ Millennium Ecosystem Assessment 2005 p.38

⁵⁸ Millennium Ecosystem Assessment 2005 pp.5f,30,40

⁵⁹ Millennium Ecosystem Assessment 2005 pp.5,30,40,80 See also Clarke 1995 p.43

⁶⁰ Luper-Foy 1995 pp.96f

⁶¹ Lovejoy 1986 p.21, Radetzki 1990 p.13, Radetzki 2001 p.22

conflated in discussions about environmental ethics and the distinction between them deserves to be pointed out. In this case, it is especially important since it means that some of the problems we have found may actually be the result of egocentric rather than anthropocentric considerations, and should therefore not necessarily count against anthropocentric instrumentalism as the answer to our main question.

It is sometimes proposed that the problem of external effects could be dealt with within a system of rational egoism by constructing a system of property rights.⁶² I.e. all resources should be owned by different legal persons. Usually, it is conceived of as ownership of land (and water) including animals, plants etc. that inhabits the area, though the resources can of course also be divided in other ways.

The idea that the problem can be solved by property rights is not universally agreed upon however – even among economists.⁶³ Even the most ardent advocates of strict property rights as a solution to the problem of external effects admit that such a system has limitations.⁶⁴ One of the problems is that individuals of many species migrate between different areas and different countries. This means that if one individual property owner preserves the individuals while they are on her land, someone else might harvest them when they reach his land.⁶⁵ Other problems include for instance that it would be very impractical to distribute property rights over things like species, and that it would probably be considered too unconventional to gain enough support.⁶⁶ To come to terms with these problems through a system of property rights would need a system of ownership of individual animals that trumps property rights connected to land ownership.

Specialisation may also be one explanation why privatisation has not been able to deal with the problem of external effects. When a resource is owned by someone with a particular interest, it is used in a way that best suits that interest while other goods and services from the species do not count. This may lead to a higher degree of exploitation compared to a system where many different interests have to co-exist.

There are also other suggestions of how to *internalise* externalities: Laws, taxes, fees, etc.⁶⁷ The best method for internalising external does not concern us here. What is interesting given our investigation, is whether any such measure can be motivated from a purely

⁶² Eliasson 2000 p.128,135, Radetzki 1990 p.27ff, Radetzki 2001 p.47, Randall 1986 p.90

⁶³ Randall 1986 pp.80

⁶⁴ Radetzki 2001 p.49ff

⁶⁵ Lovejoy 1986 p.24

⁶⁶ Randall 1986 p.90

⁶⁷ Hermele 2002 p.177,183,187f

egocentric point of view and still comply with the wider anthropocentric perspective. It is sometimes claimed that restrictions on our selfish behaviour can be rationally agreed on (at least hypothetically) for purely egocentric reasons.⁶⁸ As long as I am the only one making decisions in the way I outlined above it will be rational for me from an egocentric point of view. If everyone (or at least a substantial number) makes their decisions along these lines however, the total sum of costs imposed on me by them will be larger than the profit I will get from making decisions that way. Therefore, it seems to be in everyone's interest to agree on a system that does not allow for this kind of decision making.

If this claim is correct, the distinction between egocentrism and anthropocentrism is not important – at least when we deal solely with intra-generational relations.⁶⁹

Whether such a system really works, and whether it always or even in general makes it irrational from an egocentric point of view to cause extinction, remains to be shown however. The idea of rational egoism as a basis for moral principles as such is also very controversial. I will not go any deeper into this debate here since it would take us too far from the main purpose of the investigation. I will just point out some problems that are particularly relevant in connection to our investigation. One such problem is that the way of making decisions illustrated above is very common, and it is hard to believe that it would be that common if it were irrational from an egoistic viewpoint. Another difficult problem is that even though in the above example it would be more rational to adopt a system that everyone follows as compared to a situation with no agreement at all, it would be even better for each individual to break the agreement: A system where no one generates personal profit in a way that also generates large costs for the rest of society is better for everyone compared to a system where everyone does it. It is however *even* better for each individual to continue making a profit this way while everyone else does not. If everyone else goes on making a profit on other's expense, it is even *more* important for each individual to go on and make profit any way they can even when it imposes a great cost on others. I.e., we are in a prisoner's dilemma type of situation.

A very important problem surrounding the notion of a contract between selfish individuals is that it presupposes a situation with equal bargaining power. Such an assumption is far from realistic – if nothing else, it is effectively frustrated by evolution. The lack of such equality in the real world is probably an important explanation of why in so many situations it *is* in fact rational for the egocentric to make decisions that imposes the

⁶⁸ See e.g. Luper-Foy 1995 p.97

costs on others. This ought to be the case both for those with much power and for those with very limited power. Those with much power can get away with quite a lot without the risk of being subjected to the same treatment. Those with limited power do in some situations have to disregard the effects on others just in order to survive in the short term. As we will see later, it is also quite clear that this aspect is particularly severe when we deal with inter-generational relations – where the now living have all the power while future generations have absolutely no power.

What all of this has shown us is that it is probably after all often rational from the perspective of a rational egocentric agent with a limited lifespan to engage in projects where the costs are larger than the profit as long as the costs are external while the profit falls on the agent. This in turn shows us that at least some of the problems we have found should probably be imputed to egocentrism instead of anthropocentrism. This is good news for the advocates of anthropocentric instrumentalism as an explanation to why it is morally problematic to contribute to the extinction of other species.

We also have to remember that even if some external effects could be dealt with within an egoistic framework, the case for conservation would be even stronger if we *also* admitted that we have a duty to consider the interests of other human beings. We therefore have to admit that independently of the problems pointed out above, it is always – for purely numerical reasons – the case that anthropocentrism gives us a stronger reason for conservation than egocentrism. If we allow for duties to other people, the scope will also be wider as I pointed out when discussing other species as source of food, since people have different tastes and live in different environments with different conditions etc. This means that we need a larger selection of species for our consumption.

I do not believe that all problems we have found – and will find – can be pinned on egocentrism however. It would probably be naïve to believe that we could blame egocentrism or irrational behaviour (from the point of view of anthropocentrism) for all cases of depletion of material resources that cause extinction of species even though they could probably be blamed for many.

We also have to remember that if we would accept that not just human beings, but also non-human species and individuals have moral status, the case against the type of decision-making seen above would be even stronger. We showed above that even if extinction would be bad from the point of view of egocentrism, it would be even worse from the point of view

⁶⁹ I will return to the question of inter-generational issues in a later chapter.

of anthropocentrism. In the same vein, if we take one more step and accept a non-anthropocentric answer to the question of who has moral standing, then we have to admit that even more “payers” are paying even larger costs for our profits (often much larger costs since other species and individuals of other species are more strongly affected). This means that analogously we would find that even in cases where anthropocentrism favours conservation, non-anthropocentrism provides an even stronger argument for conservation. Therefore, if the scenario I have depicted above gives support to anthropocentrism rather than egoism as an answer to why extinction is wrong, it clearly gives an even stronger support to non-anthropocentrism rather than anthropocentrism as an answer to this question.

2.3.4. Indicator species

Some species are important as indicator.⁷⁰ I.e. they are particularly sensitive to some type of environmental change which if allowed to continue will affect us as well – directly or indirectly via other species or via a dramatic change of the ecosystem.⁷¹ These species can therefore be used as a kind of early warning system (in a way like canary birds were used in mines as indicators of a low oxygen level). This use gives certain species an extra dose of instrumental value for us.

This may look rather cynical, and seen in a broader (non-anthropocentric) perspective, it is. It is nothing we need to worry about for the moment, since we are investigating how far we can get with a purely anthropocentric approach. The conclusion must be that the “indicator-track” is a clear case – although of a limited scope – of value that can be a part of an explanation of why extermination is a problem from an anthropocentric instrumental point of view: It is a foretaste of what will happen to us, and if we do not want that to happen to us, we need to do something about the cause of the extinction of the indicator species. If we do not do that, it will harm us and is therefore immoral.

⁷⁰ Aniansson 1990 pp.59,116f, Ricklefs 1997 p.600

⁷¹ Johansson, Birgitta 2005 2 p.106

2.3.5. *Some non-destructive uses of other species*

Not all ways of using nature to promote human values are destructive. Non-human species also have instrumental values for us in ways that are best utilised by letting them be. I am thinking of values like recreation, inspiration, aesthetic experiences, silence, solitude, psychological amendment, knowledge of how the world around us works, a sense of history, identity, national or regional pride etc.⁷²

One could also mention things like religious worship, but I will not include that kind of value in the investigation since I want to avoid grounding the value of species on cosmologies or views of nature that are not supported by science.

Someone might be tempted to argue that some of the values mentioned above – such as aesthetic value – are in fact intrinsic and not instrumental. We could take time from the investigation discussing whether for instance aesthetic values are instrumental or intrinsic, and whether the value is in the object or in the experience. I will cut that discussion short here however simply because I do not think it is essential for our purpose. It is reasonable to assume that other species can have intrinsic value for human beings in many different ways, and I will investigate that possibility elsewhere.⁷³ Here when I talk about aesthetics and other values of the type listed above, what I have in mind is the instrumental value of the species as a means to aesthetic, recreational or other values. A tree as a *motive* for a painting or *inspiration* for a poem e.g. or an ant as an object of study that leads to increased knowledge. The knowledge, the painting and the poem may in their turn have intrinsic value and/or instrumental value in relation to something else that has intrinsic value etc. Either way, the value of the species is purely instrumental in relation to knowledge, aesthetic value etc. that we might gain from it. When the Millennium report talks about spiritual and cultural values, these types of value are not considered intrinsic values, but are seen as instrumental in relation to for instance social stability.⁷⁴ (It is not clear whether social stability in turn is seen as an intrinsic value.) This means that the species have instrumental value in relation to some other instrumental value, which in turn is instrumental in relation to something else, and maybe the chain continues even further.

⁷² See e.g. Aniansson 1990 p.57, Daily 2000 pp 333f, Farber 2000 p.s494, Gärdenfors 2005 p.119, Johansson 2003 p.24, Kellert 1986 pp.52f, Luper-Foy 1995 p.97, Millennium Ecosystem Assessment 2005 pp.31f, Melin 2001 pp.59f, Norton 1987 pp.15,18,27, Regan 1986 p.195, Sober 1986 p.173, Stenmark 2000 p.34, Söderqvist 2005 p.75

⁷³ To be published in the next book containing the whole investigation.

⁷⁴ Ihse 2005 p.65ff, Millennium Ecosystem Assessment 2005 p.31,32, Nordlund 2000 Passim

Can these types of non-destructive utilisation of other species be a part of an answer to our question? It seems quite clear that the values mentioned above are important to people, and it also seems quite clear that nature or different objects in nature can produce these values. Natural environments with much variation seem to improve the quality of human life,⁷⁵ and it is well known within environmental psychology that many people prefer environments with elements of nature.⁷⁶ In an investigation of attitudes regarding biodiversity among the inhabitants of Kristianstad in southern Sweden, non-destructive values turned out to be among the most widely held reasons for protecting biodiversity.⁷⁷

That the values are non-destructive gives them a much stronger position as potential bases for preservation. On the other hand, there is less demand for these values compared to other values we have discussed (food, medical drugs, material and fuel). This means that in a trade-off situation, they risk ending up quite far from the top of the priority-list. You can hear from time to time that it is impossible to enjoy a beautiful landscape with an empty stomach. In other words, in order to appreciate more subtle values, you need to first fulfil your more basic needs. This is probably not universally true, but it probably contains at least a large element of truth. At least, willingness to pay for this kind of values seems to increase with higher income. This in turn has fuelled a debate about protecting species. It happens e.g. that a preservation project with a good intention ends up as a conflict between the well-off who can afford the “luxury” of protecting aesthetic, historical etc. values, and the less well-off who want to harvest the species for food or fuel etc. This is particularly salient when the preservationists are Westerners whereas the species they want to preserve are located in the third world.⁷⁸ In this situation, the values we are discussing will not easily counterbalance the exploitative interests from a purely anthropocentric instrumental point of view.

Another problem with the kind of values we are discussing here is that they have a tendency to get downplayed or even neglected in trade-offs. Anders Melin distinguishes between two types of anthropocentrism. One that accepts this kind of values (which he calls “non-material values”) and one that does not. He calls the former kind “ideal anthropocentrism”, and the latter kind “material anthropocentrism”.⁷⁹

⁷⁵ Norton 1986:1 p.129

⁷⁶ Johansson, Maria 2005 p.96

⁷⁷ Johansson, Maria 2005 p.99

⁷⁸ Andersson 2005 p.91, Sober 1986 p.191

⁷⁹ Melin 2001 p.23

One reason for why the non-material values tend to get downplayed is probably that they are difficult to assess in monetary terms.⁸⁰ This in turn is probably partly due to their relative abstractness: Food or timber is easier to see as a real commodity compared to inspiration or relaxation. I believe there is also another explanation: Things like food and timber are easier to trade since they represent roughly the same value for most people, while the values we are discussing here are more personal.

One way in which the non-destructive values can have economically measurable value and which is receiving more and more attention is in the form of tourism. It has become increasingly clear in most societies that the type of value we are talking about here represents a large economic value through its ability to attract tourists. In the next subsection, we shall take a closer look at this special case of combined experience-value/economic-value that might help tipping the scale in favour of preservation in at least some cases.

2.3.6. Tourism

Tourism is often put forward as an important instrumental reason for protecting species.⁸¹ A species can provide instrumental value for us humans both because it provides us as tourists with inspiration, recreation and the other non-destructive values discussed above, and because it generates income by attracting others as tourists to our area. The tourist and travel business is the world's third largest branch of business.⁸² Nature tourism in turn is one of the fastest growing branches of tourism and is a large source of income in many countries – not least in poor countries or areas.⁸³ The income from tourism tends to provide a very strong and very direct incentive for protection even for people who would not otherwise care for nature preservation, or would even be against protection of at least some species.⁸⁴ This goes for instance for big predators that might be a threat to human beings or their life stock, but that are also very attractive to tourists. In many cases, both these and

⁸⁰ Ihse 2005 p.70

⁸¹ Andersson 2005 p.93, Hellmark 2004:1 pp.133f, Johansson, Birgitta 2005 1p.8, Walsh 2004 p.65

⁸² Olsson 2004 p.35, Prosser 1995 p.118

⁸³ Charter for Sustainable Tourism 1995, Hanneberg 2004 p.59,63, Hellmark 2004:5 p.51, Lindén 1990 p.73, Ricklefs 1997 p.599

⁸⁴ Doole 2005, Hanneberg 2004 p.64,71, Hellmark 2004:6 p.75, Olsson 2004 p.43

other animals are actually more economically valuable alive as tourist attractions, then they are dead.⁸⁵

Another gain from a protection perspective is that nature tourism might – hopefully – also influence the tourists by increasing their interest in the animals or plants they see (maybe even in species they did not come to see but as a bonus get to see anyway). It might also increase their understanding of the communities in which the species live and make them more sympathetic towards conservation in general.⁸⁶

There is a risk that tourism also contributes to the destruction however,⁸⁷ which is why some initiatives have been developed to counter the environmental impact of tourism. Both the UN and other organisations have held conferences and compiled policy documents aiming at sustainable tourism.⁸⁸ The World Tourism Organization (WTO) discusses the matter actively, and there are several different types of labelling of environmentally friendly tourism – often referred to as “eco-tourism”.⁸⁹ Obviously, the big bulk tourism can never be in the form of eco-tourism, and even eco-tourism is not without negative impact. Just getting to the destination often requires using plenty of energy, mostly in the form of fossil fuels. This in turn means plenty of pollution including carbon dioxide that increases the greenhouse effect with a tremendous impact on the environment, including other species.⁹⁰

Setting the standards for what is to count as eco-tourism is not easy, and there will certainly turn up borderline cases where it is difficult to say how much encroachment is acceptable in order to stay in business.⁹¹ It is easy to fall victim to the “salami-principle” – i.e. finishing off the habitat one slice at a time, where every single slice is not in itself a cause of concern, and where it is impossible to say precisely at which slice we have gone too far.

⁸⁵ Doole 2005, Hanneberg 2004 p.64, Johansson 2005:2 p.110

⁸⁶ Hellmark 2004:5 p.48, Hellmark 2004:6 pp.75,76

⁸⁷ Delin 1997 p.9, Hanneberg 2004 p.69, Doole 2005, Hellmark 2004:2 p.25, Hellmark 2004:3 p.22, Hellmark 2004:6 p.74, Karlsson 2004 p.7, Olsson 2004 p.35,38,42, Prosser 1995 p.119, World Conference on Sustainable Tourism1995, World Ecotourism summit 2002 p.2

⁸⁸ Europarc Federation 2002, Prosser 1995 p.119, World Conference on Sustainable Tourism1995, World Ecotourism summit 2002

⁸⁹ Hellmark 2004:3 pp.15ff, Hellmark 2004:6 passim, http://www.ecotourism.org/index2.php?ecotourism_associations, <http://www.gdrc.org/uem/eco-tour/eco-tour.html>, Karlsson 2004 p.7, Olsson 2004 p.41f

⁹⁰ Hellmark 2004:1 p.134, Hellmark 2004:6 p.77, Olsson 2004 pp.39f

The Québec convention on ecotourism in fact calls for regulatory mechanisms regarding transport in connection with ecotourism: World Ecotourism summit 2002

⁹¹ Doole 2005, Fall, Carl-Axel 2004 passim, Hanneberg 2004 pp.59,69f, Hellmark 2004:6 p.76, Olsson 2004 p.43

An inherent problem with eco-tourism is that it can never be allowed to be too successful measured in number of tourists. With too many tourists, the wildlife experience will inevitably be lost even if the impact on the environment can be held at a low level. It will therefore never be able to include the large masses of tourists.⁹² It may, however, be able to influence mass-tourism by showing that it is possible to pursue tourism in a non-devastating form, and by influencing mass-tourism to raise their standards of consideration for the environment, even if their standards cannot be as high as that of the certified eco-tourism. Some believe that this might be the most important gain from eco-tourism.⁹³

One problem with tourism as an incentive for protection is that it is selective. Only some species are attractive enough for people to spend money and time to see them.⁹⁴ This means that tourism can only account for the instrumental value of a limited number of species, but, as pointed out above, one spin-off may be that tourists widen their interest to include a larger number of species. Therefore, in order to entice the customers to come back, the enterprises must consider a larger number of species than the original “target species”. It is also obvious that the popular species cannot survive in the wild in a vacuum. They need a habitable environment, which includes a large array of other species that thereby indirectly also becomes instrumentally valuable to us.

One risk we have to consider regarding both eco-tourism and other forms of tourism is that the tourists get an oversimplified or maybe romanticised view of the area they visit.⁹⁵ The opposite is of course also a risk: That the inhabitants of the area get an overly romanticised view of life in the west by continually seeing rich westerners on vacation.

Apparently, tourism too has pros and cons as a reason for preservation. Like many of the previously suggested instrumental values, it is partly self-defeating in that it will destroy its own basis if it becomes too popular. This is a strong argument for proceeding with caution, but it might not be strong enough in a trade off between non-exploiting (or more correct “less-exploiting”) eco-tourism and more exploiting mass-tourism.

The effect on people’s minds may be the most important contribution of tourism. This change of mind can however as we saw go in both directions. Things and events that have the effect of changing people’s minds concerning what they value have been labelled “transformative value” by Bryan G. Norton, and it might play an important role of its own

⁹² Doole 2005, Fall 2004 p.155, Hellmark 2004:1 p. 134, Hellmark 2004:3 p.23, Hellmark 2004:5 p.48, Hellmark 2004:6 p.77, Olsson 2004 pp.38f,45

⁹³ Hanneberg 2004 pp.70f, Hellmark 2004:1 p.134, Hellmark 2004:6 p.75

⁹⁴ Ricklefs 1997 p.600

⁹⁵ Doole 2005, Hellmark 2004:3 pp.22f, Olsson 2004 p.42

when it comes to accounting for our intuitions concerning extinction. We will therefore devote a section of its own to that kind of value later in the book.

2.4. Trade off⁹⁶

We have seen that many species do have instrumental value for human beings, but we have also seen that it is not always easy to tell whether this value is strong enough to explain the moral indignation when our encroachments in nature cause species to go extinct. Encroachments that contribute to the extinction of other species are done for a reason, and the instrumental value of the threatened species has to be weighed against the value of the things we will have to abstain from if we are to protect the species. I.e. the instrumental value of a species has to compete with other instrumental values.⁹⁷ To preserve species can also be quite expensive,⁹⁸ and it is at least not inconceivable that in a number of such situations the instrumental value of the destructive alternative may be greater for us than the instrumental value of the destructed species. Even though this in many cases may be a matter of short-sightedness,⁹⁹ we cannot assume that it is always so. It might be that the alternative that contributes to extinction is sometimes more instrumentally valuable even if we consider the long-term effects.

Alan Randall is conservatively optimistic regarding the outcome of trade-offs between human values that favour preservation and human values that favour exploitation. He argues that cost-benefit analyses¹⁰⁰ often turn out in favour of the “pro-environment” alternative.¹⁰¹ He does not (understandably) attempt to estimate how often this happens, but he draws the

⁹⁶ I am aware of the immense problems of finding a common unit in which to compare different goods. To transform all values into monetary value is something that many economists are working on not least when it comes to different kinds of value in nature. The problems involved are great and I do not take stand here on whether it is possible to solve them. In this section as well as in all other cases of comparison between different values I will just assume that it is possible to compare the intrinsic value of different goods on an intuitive level.

⁹⁷ Johansson, Birgitta 2005:1 pp.8,14,17, Melin 2001 p.114

⁹⁸ Bodegård 2005 p.22, *passim*, Johansson, Birgitta 2005 1p.8,9, Melin 2001 p.15,114

⁹⁹ As pointed out by e.g. Ricklefs 1997 p.598

¹⁰⁰ In the cases Randall discuss, benefits are stated in terms of “willingness-to-pay” and costs are stated in terms of “willingness-to-accept”.

¹⁰¹ Randall 1986 p.95. “Pro-environment” can of course mean different things, but since the paper is about preservation, I assume that the meaning of the term in the context it appears is not totally irrelevant to our question.

relatively modest though very important conclusion that “... commercial interests do not hold a monopoly on economic arguments.”¹⁰²

Norman Myers supplies us with a real life example of a fruit called ‘durian’. It is native to Southeast Asia, and is said to be most exquisite. It contributes (1990) with \$100 million a year to the local economies. The problem is that it is pollinated by one particular species of bat, which is threatened by different kinds of human encroachment. The swamps where the bats find most of their food (apart from the nectar from the durian tree), is claimed for human buildings. Human constructions also threaten the caves where the bats live since the caves are exploited for limestone used to make concrete.¹⁰³

In order then to find out whether the disappearance of the tree and the bats is a bad thing according to anthropocentric instrumentalism, we have to weigh the positive effects of the buildings against the negative effects of losing the durian fruit. The negative effects for human beings are that many people will no longer be able to enjoy this exquisite fruit, and that the local economies will lose about \$100 million a year. The positive effects for human beings are not clearly spelled out by Myers, but there ought to be a non-negligible economic gain. People in the area will get access to new apartments, and there will be quite a few jobs on the line. Given the information we have got, it is not possible to say what the total result will be. It illustrates however that it is seldom quite obvious whether conservation or exploitation is the most rational option in a particular situation from the point of view of anthropocentric instrumentalism. This is obviously a problem for the usefulness of this theory when it comes to explaining why extinction is generally seen as morally problematic – especially since this intuition often appears as very clear.

Some of those who have thought about the subject of trade-offs between preservation and other values are quite pessimistic:

Thomas Lovejoy believes that a choice between the economic value of a particular species and the economic value of an encroachment turning out to favour the species does not happen very often.¹⁰⁴

Petra Andersson considers it “not unbelievable” that if we cut down the forest of the Parc des volcans national park in Rwanda, and have it cultivated by human beings, the total sum of happiness would be larger than if we keep it protected.¹⁰⁵

¹⁰² Randall 1986 p.95. By ‘commercial’ I assume the author in this context means something like “exploitative”.

¹⁰³ Myers 1990 p.21f

¹⁰⁴ Lovejoy 1986 p.22

¹⁰⁵ Andersson 2005 p.91

The economist Kenneth Hermele believes that there is an opposition between economic growth and species preservation, at least in a short perspective, but he indicates some pessimism even in the long turn.¹⁰⁶

On top of that, Bryan G. Norton – who in general is positive towards the idea that anthropocentrism favours species preservation – points out that in a future with more humans, the negative instrumental value of a species that e.g. competes with human beings for food or habitat, will increase and maybe even override its positive instrumental value. Therefore, anthropocentric instrumentalism will according to Norton be a continuously weaker reason for preservation.¹⁰⁷

The scenarios of the Millennium Assessment report on biodiversity show that many of the things we need to do in order to counter human poverty and enhance development, are likely to further impoverish biodiversity.¹⁰⁸ The report indicates that the development paths for relieving today's poverty, hunger and health problems for human beings during the next 50 years also mean continued loss of biodiversity (even though the worst scenario in terms of achieving the human welfare goals is also worst in terms of for instance species loss).¹⁰⁹ This means that in at least some situations where we have to choose between preservation and extinction, the alternative that implies extinction will from an anthropocentric instrumental point of view actually be preferable.

The Millennium assessment group also points out that even though it is often possible for a community to make money through preservation by e.g. ecotourism or a sustainable use of forest products, the communities would in general make *more* money by exploiting the area in a way that can lead to a loss of species.¹¹⁰ They also believe that if we only consider what they call “utilitarian”¹¹¹ reasons for protecting biodiversity, we will actually get by with a lower diversity than we have today.¹¹² This means that even though we will need some species, we will apparently not need all of them.

The millennium assessors conclude that win-win situations may not be as common as has been hoped in situations where both conservation and development is at stake. They also

¹⁰⁶ Hermele 2002 p.153

¹⁰⁷ Norton 1982 pp.18,21f

¹⁰⁸ Millennium Ecosystem Assessment 2005 p.77

¹⁰⁹ Millennium Ecosystem Assessment 2005 p.15

¹¹⁰ Millennium Ecosystem Assessment 2005 p.12,90 The same thing is indicated by Doole 2005 describing a visit to a Chinese village where the inhabitants have exchanged logging for ecotourism. They manage to make a living from ecotourism but their income had fallen as a result of the change. The number of tourists were growing and the village leader believed that they would gain income in a longer perspective.

¹¹¹ ‘Utilitarian’ in reports like these generally means ‘instrumental’, and should not be confused with the normal meaning of the term ‘utilitarian’ in ethics.

tell us that conflict between the two is more common than interplay, and they finally claim that it would be naïve to believe that we can always have both. The Millennium assessors therefore advice us to think more of how to make trade-offs between development and species protection.¹¹³

This list of pessimistic assessments concerning the outcomes of trade off-situations shows that we may do well in being careful in what we can expect from anthropocentric instrumentalism as a basis for preservation.

Norman Myers writes that our lifestyle with “cheap supplies of hamburger beef, hardwood timber, and other tropical forest products” is a large threat to the rain forest.¹¹⁴ This goes not just for the rain forest, but for many other habitats and their species as well. Since our demands for food and other utilities from nature historically have been the main cause of human induced extinction, maybe references to these demands are not the best basis for a defence of biodiversity?

On the other hand, Myers also claims that

the continuing decline of tropical forests [and we might add other ecosystems and species] will eventually levy a heavy price on our temperate-zone lifestyles, through the loss of many potential sources of new foods, drugs, industrial raw materials, even sources of energy.¹¹⁵

This is also an important point that seems to be right in line with the statements by Sörlin in the beginning of this chapter. It also underlines the point we have made earlier that it is not necessarily always the case that our wasteful use of natural resources follows from anthropocentric instrumentalism. On the other hand, we could not exclude that what looks like short-sighted and wasteful use may in some cases actually be the most rational from a strictly anthropocentric instrumental viewpoint. In order to be able to continue to utilise other species we have to be aware not to use them faster than they can reproduce themselves. If we demand large quantities at a low cost of whatever it is that a certain species supplies, and the species cannot sustain that demand in the long term, we have to ask another question: Is it better to satisfy the demand to a high degree for a short time, or to satisfy it to a lower degree for a longer time? The answer is not as obvious as proponents of a “wise use”

¹¹² Millennium Ecosystem Assessment 2005 p.7

¹¹³ Millennium Ecosystem Assessment 2005 p.74

¹¹⁴ Myers 1990 p.22

of natural resources often assume. It looks quite obvious that the latter option is the best one in the long term especially if the total amount of good we can get from the species in the long term is much larger than what we can get if we choose the more “short-sighted” alternative. If we take the actual behaviour by consumers and suppliers as an indicator of their interests however, the answer seems to be that they quite often prefer a high degree of satisfaction of a demand for a short time rather than a low degree of satisfaction for a long time. This could of course be explained by saying that people are irrational, but it might also be explained by the instability of people’s preferences – at least of their instrumental preferences. There may be different ways of satisfying our intrinsic preferences, and if the favoured ways of satisfying the consumers’ preferences shift – as we know they do – then our case for conservation will turn out to be weak. The durian fruit mentioned by Myers may be exquisite, but there are many delicious fruits, as well as other means of pleasing our taste buds, and human taste tends to shift. So maybe in some situations it is best from an anthropocentric instrumental point of view to get as much as possible out of a species while it is in fashion even if it means that it will disappear eventually.

One aspect that may be important is that the less common something is the higher is usually the price. This in turn means that it is often in fact more economically worthwhile to exploit threatened species.¹¹⁶ On the other hand, the exploitation also often means a larger cost since it takes more effort to collect the last specimens of a species. This is not always true however. Lovejoy uses whales as an example of this phenomenon, but not all species are scattered over the world’s oceans. Technological improvement should not be underestimated either when it comes to increasing our capacity to exploit smaller and more scattered resources.

It seems that the answer to whether sustainable use or fast exploitation of a species is the best option from an anthropocentric instrumental point of view depend to a large degree on the nature the instrumental value of the species – and especially on whether it is exchangeable. Some demands can only be satisfied in one way. We should therefore distinguish between exchangeable and non-exchangeable instrumental value. Exchangeable instrumental value comes in degrees. The size of an instrumental value is in part determined by the size of the intrinsic value it serves as a means to, and in part of how effective a means it is to promote this value, but it is also determined by the availability and effectiveness of alternative means to promote the same intrinsic value. Non-exchangeable instrumental value

¹¹⁵ Myers 1990 p.22

has only the first dimension: Its value is decided by the size of the intrinsic value it is a means to.

Some things of course have both instrumental and intrinsic value, and many things have instrumental value in relation to more than one intrinsic value. Often we are also dealing with chains of instrumental value. Finally, some (or most) things seem to have both positive and negative values that have to be weighed together.

The fact that there are non-exchangeable functions does not necessarily mean that there are non-exchangeable species, but it is not implausible that there are. To identify them will however probably be quite difficult and it will certainly not apply to all species.

One thing that has to be remembered when we talk about exchangeability is that it excludes the possibility of assigning a monetary value to non-exchangeable entities. To assign monetary value to something implies that we have also decided how many or how much of some other entity it takes to achieve the same value. If we put a monetary value on breathable air, no matter how high, it is always possible to accumulate enough of something with a lower value that can outweigh the value of the air. This would be absurd. If we assign the value of \$1 000 000 000 to breathable air we would in fact be able to say that we could substitute the breathable air if we instead manufacture one billion copies of a \$1 pen. That would obviously be absurd since if we do not have any air to breath, we cannot utilise the things we have manufactured anyway. The only thing that could replace breathable air would be something that can produce *the same* benefit, not something that just produces something else of *equal* economic value, and it is very unlikely that we could find something that can give us the same benefits as clean air.

This complicates further the already complex process of making a rational trade-off according to the principles of anthropocentric instrumentalism. My points are that it is hard to know the outcome of all trade-offs between acts that preserve and acts that contributes to extinction, and in some instances it might not even be practically possible. When it is possible, we can however expect that a number of trade-offs might favour encroachments that contributes to extinction if we look at them from a purely anthropocentric instrumental perspective even though they intuitively seem at least morally problematic, and often as clearly wrong. This in turn seems to weaken the usefulness of anthropocentric instrumentalism as a way of answering our question.

¹¹⁶ Lovejoy 1986 p.21

One thing we have to consider though is that there is no consensus in ethics that the rather utilitarian way of calculating we have used in this chapter is the correct way of making ethical decisions. If we accept a more deontological approach to ethics, we have to consider the fact that sometimes the best total trade-off can imply unacceptable costs to certain individuals. It might for instance at some occasions be the case that a project that leads to the extinction of a species turns out to give the best total outcome, but also turns out to be a death blow to a small rain forest tribe whose life is dependent on the species. In that case, it might still be the case that extinction is deemed to be immoral. On the other hand, this argument can sometimes also go in the opposite direction. It might e.g. turn out that a certain insect species supplies humanity on the whole with more positive than negative effects, but at the same time causes great havoc for the local populations of humans. In cases like that a deontological ethic may conclude that the best thing to do after all would be to exterminate the species.

2.5. Choice value

The Millennium report points out that the stability of ecosystems is apart from its other values, also important for what they call “freedom of choice and action”, defined as “opportunity to be able to achieve what an individual values doing and being”.¹¹⁷ We can call this type of value ‘choice value’ since it gives us a larger array of choices. The definition of ‘choice value’ will thus be: ‘The instrumental value something has because it increases the array of choices for human beings.’ Having a large array of choices can have both instrumental and intrinsic value. For many it seems to have a quite high degree of intrinsic value.¹¹⁸

Bryan Norton reasons along the same lines as the millennium assessors, but focuses more directly on the choice value of species. He points out that if we sacrifice a species for short-term gains, we also sacrifice what he calls “future options of the human race”.¹¹⁹

The value – both intrinsic and instrumental – of having a large array of choices may be an important reason for why it is seen as immoral to contribute to the extinction of species.

¹¹⁷ Millennium Ecosystem Assessment 2005 pp.19,25,30

¹¹⁸ See e.g. Daily 2000 p.335

Losing biodiversity tends to imply a loss of choices.¹²⁰ In agriculture, larger biodiversity gives the farmers a wider array of choices with regard to future crops. Thereby the farmers also become less vulnerable to changes, and gain a sense of control. We could argue in the same way concerning most of the usages of other species. A larger selection of species gives us more options to choose from. This is interesting since it gives us a way of dealing with one of the more tricky problems we have encountered in the previous chapters, viz. exchangeability. We noted that there might be non-exchangeable species, and there certainly are non-exchangeable functions, but we have also noted that some goods can be supplied by more than one species, and even that some things like for instance many materials can be substituted by non-living substances. We can call this ‘the redundancy problem’ since it indicates that some species may be redundant. If a large array of choices has a value however, the redundancy problem will be much smaller. A species that has an instrumental value and is exchangeable will thereby automatically also have a choice value through its contribution to our array of choices. It will therefore never be really redundant even if there are several other ways of getting hold of the same good. If we lose the species, we have still lost choice value. The service can be upheld even if one of the species that supplies it disappears, but our array of choices between different suppliers of the service is diminished. Redundancy will therefore be something positive by giving us a larger array of choices.

On the other hand, in many cases we lose species because of a process that generates something else that increases our array of choices in another way or another area. Money is a kind of universal instrumental value. Money can be transformed into many kinds of instrumental or intrinsic values. This means that money is in a way the “ultimate choice value”. This makes money a very difficult competitor in all cases of trade-off when we strive for a large array of choices. In today’s society it seems like this particular quality in money – its exchangeability into most other values – has made it the most sought after commodity. We spend most of our lives giving other people what they want in order for us to get – not things we value intrinsically – but money.¹²¹ We can then exchange the money for the things we want. This looks like a detour, but instead of aiming directly for what we want, we go via money not only because we know that we can get more of what we value by earning more money (we could achieve that without going via money), but because the money represents

¹¹⁹ Norton 1987 p.63

¹²⁰ Millennium Ecosystem Assessment 2005 p.32

¹²¹ Money can of course be valued intrinsically, but here we will only talk about its instrumental value, and in particular its choice value.

many different values. If we exchange a horse for a cow we have got a cow, but if we exchange a horse for money we can choose what to buy for the money. By exchanging a service or a commodity for money instead of another service or commodity, we gain choice value. Exchanging goods or services for money has been a manifestly successful way for individuals to increase their array of choices. So successful even that it has a tendency to make people forget about the areas where our choices get diminished by the process. Sometimes it seems that we are so eager in our hunt for “the ultimate choice value” that we do not notice the intrinsic or instrumental values we lose along the way.

The question we have to answer is if the loss of choice value in the form of lost species is so bad from an anthropocentric instrumental perspective that encroachments that contribute to the extinction of species can be seen as morally problematic for that particular reason. In the light of what I just said about money as the ultimate choice value, it can be difficult to maintain that we all in all lose more choice value than we gain by so to speak “transferring species into money”.

One thing that talks in favour of our case is the quite obvious fact that in order for money to keep its choice value, the things we like to buy for the money have to exist. The choice value of money is only as large as the number of things you can buy with the money. That is why printing more money leads to a decrease of the value of the currency. In the same way, the more things we can buy with the money, the larger the money’s choice value.

We therefore have to distinguish between (A) situations where I get money from you in exchange for giving you my work or some existing goods or goods that have been transformed in a reversible way – and (B) situations where I get money through an act that leads to depletion of something else (like a species). In both cases, I increase the number of options for my own part by getting more money to choose how to spend. The difference is that in (B), I decrease the choice value of money as well as the total choice value for everyone (including me). I take away one thing from the world permanently and thereby make it impossible for everyone to utilise it.¹²²

When you make money in a way that causes a species to go extinct, you may gain in net choice value for your own part since the choice value of the money may be larger for you personally than the choice value of the species would have been. You are however also decreasing the number of things that the money represents (in the form of choices of food, material, aesthetic experiences etc.) for everyone. You therefore in one way decrease the

¹²² Adapted from Williams 1969 p.173

general choice value of money by taking away a species. It is my impression that this aspect is often neglected in trade-off situations even when choice value is considered.

Furthermore, when you take away a species you take it away forever. It is sometimes argued that encroachments that destroy nature but increase economic growth may not be a big problem since it is always possible to use the money we gain to repair the damage.¹²³ This is not possible when we talk about extinction – at least not yet and it might never be.¹²⁴

There are attempts to resurrect extinct species by cloning, but there has not yet been any success. Even if it will eventually work, there are other problems however. One important limiting factor is that cloning is only possible if there are preserved DNA. Another problem is that some species are so to speak “more than their genes”. I.e., some of the information that govern their behaviour (and thereby among other things constitute their role in the ecosystem) is stored not in their genes but in their brains, and is passed on from generation to generation by the older animals showing the young. This information will inevitably be lost even if the information in the genes can be retrieved. An additional problem is that the environment might have changed while the species was gone. This means that it may not be possible to reintroduce it. Even reintroductions of species that are gone from one area but still exist in other areas has a low success rate and are very costly.¹²⁵ Reintroduction of species that have been extinct, and have therefore not had the chance to evolve during this time must reasonably be even more difficult and may even cause new problems since it in practice means that we are introducing a species that is not adapted to the system and the system is not adapted to.¹²⁶ If the species on the other hand had existed in the environment during the changes, it might have been able to adapt (unless of course the changes go too fast).

Because of these and probably also other hitherto unknown problems, reviving species through cloning may never be a real alternative on a larger scale even if it is technically possible. The irreversibility of extinction is thus something we must consider a reality. There is (in general) no such thing involved when we lose money. If we miss an opportunity to make money, we can probably make money some other time and some other way. If we destroy a species, we can probably never get it back no matter how much money we have.

¹²³ See e.g. Radetzki 2001 p.87

¹²⁴ Ulf Gärdenfors at “Artdatabanken” that compiles the red list for Sweden, clearly denies the possibility of ever getting back a species once it is gone: Gärdenfors 2005 p.120

¹²⁵ Norton 1986:1 p.121

¹²⁶ See Crichton 1991 for a thought provoking fictional illustration of this.

That a loss is forever seems to be a very important psychological factor when we deal with species extinction.¹²⁷ The discussion we have seen here may be one possible explanation.

There is one more thing we have to keep in mind when we talk about choice value: Choice value for human beings is clearly important, but “choice value” for evolution is even more important. If we diminish biodiversity, the evolutionary process will have fewer genomes to “choose” from. This in turn means that we decrease the probability that the particular species with the particular property we need for food or medicine or any of the other uses we have discussed earlier, will turn up. It also means that possibilities for the biological communities to adapt to future changes – human induced or not – will be smaller. Some species obviously do not have any choice at all. They are totally dependent on one type of food, host, pollen distributor, etc. Other species however do have a choice. When one or more of the species they utilise disappear, they have less of a choice. This in turn can make things more difficult for them in the long run. The species might be less abundant and they may eventually disappear. If this species is important for us, it means it is also important for us not to diminish the number of choices for the members of the species. We will discuss the matter of ecosystem stability and adaptation soon but before that, we will discuss another type of value other species can have for human beings.

2.6. Transformative value

Bryan Norton distinguishes between strong and weak anthropocentrism. Both are instances of what I would call anthropocentric instrumentalism, but they differ from each other in that the weak version includes a type of value not included by the strong version.

Strong anthropocentrism the way it is defined by Norton, only sees nature as valuable to the extent that it satisfies *demand values*. Weak anthropocentrism also admit for nature to have value for us by providing *transformative value*. A demand value is something that can provide satisfaction for a felt preference. Transformative value on the other hand is a type of value that makes us examine, and possibly alter a felt preference.¹²⁸

¹²⁷ See e.g. Elmqvist et al 2005:2 p.46

¹²⁸ Norton 1987 p.9ff

To illustrate the concept of transformative value, he gives us two examples:

The first example features a teenager who really wants to go to a rock concert, but instead of a ticket to the rock concert, she receives a ticket to a concert with a symphony orchestra. As a result, she becomes very disappointed. The ticket does not represent a demand value for her – i.e. it does not satisfy any of her preferences – and she wants to give the ticket away. After having been persuaded by her parents to attend the classical concert, she acquires a taste for classical music, which continues to give her much pleasure. Thanks to the ticket, she alters her set of felt preferences concerning music, from only including rock music to also including classical music. The ticket therefore represented a transformative value for her.

Norton also uses an example of a child whose friends are bad for him. The time spent with these people ultimately changes the demand values of the child in a direction that relative to some other basic value¹²⁹ is negative for him. It is therefore an example of a negative transformative value.¹³⁰

I interpret Norton's use of the term 'weak anthropocentrism' based on these examples as a kind of anthropocentric instrumentalism according to which nature, other species etc. has instrumental value for us not just as a means for achieving what we already value, but also as having the potential to change these values. Thereby giving us the opportunity to value different things (that hopefully are more worthy of our preferences), or to value more things. Nature or different species therefore has instrumental value according to Norton not just for satisfying existing intrinsic values but also for supplying us with new ones.

By including transformative value in the realm of anthropocentric values, Norton hopes to be able to increase the use of anthropocentric arguments in favour of preservation. Others seem to believe the opposite. The economist Marian Radetzki does not use the terminology introduced by Norton, and he does not go through the more intricate philosophical aspects of it, but he still seems to be thinking of something very similar to the transformative values identified by Norton. Radetzki believes that lack of the things we value in nature might transform our preferences so that we in the end will not miss them but rather be glad that they are gone and replaced by whatever we have got instead. Future generations might e.g. according to Radetzki acquire a taste for the barren artificial

¹²⁹ Norton discusses the nature of what distinguishes a positive transformative value from a negative transformative value. I do not believe that he manages to fully answer the question, but I will not go into that question here since it would take us too far away from our own question.

¹³⁰ Norton 1987 p.10f

environments they may have to live in and eventually even come to prefer that type of environment to the natural environment. In order to support his assumption, he points out that many people today prefer swimming pools to the ocean even at seaside resorts despite the water in the ocean being as clean as the water in the pool.¹³¹ One might also add that the number of people who spend their time off at the mall is much larger than the number of people who spend it at the nearest public wilderness area.

I am not convinced that this really grants Radetzki's conclusion however. The facts seem undisputable but the logic is not convincing. Even if many people today actually prefer the barren monocultures of a modern city, they might in the same way learn to appreciate a richer environment with larger biodiversity if they became exposed to it in a proper way and were provided with the basic understanding of biology that makes it possible to get more pleasure from the experience. This is in fact parallel to Norton's example: Most young people today would not freely go to a classical music concert, but if they were exposed to it and got to learn about it at least a good part might acquire a taste for this kind of music and as a result have a wider selection of music to enjoy. The transformative value of a ticket to a concert does therefore not necessarily consist just in changing the taste of the concertgoer. It might well – as it did in Norton's example – consist in *adding* to the tastes she already has, and therefore increasing choice value.¹³² The thing is that if you start appreciating experiencing other species you do not have to stop experiencing the pleasures of modern civilisation. In the same way, by getting access to the latter, you do not have to give up the former. By learning to appreciate both, you will rather have more things to appreciate (increased choice value). Radetzki's argument seems to rest on the assumption that we can transform *away* preferences and so to speak “get over” things we do not have access to anymore, while Norton's seem to rest on the idea that we through transformation can both increase and refine our set of preferences. Both directions are probably possible, but Norton's direction (towards an increase of demand values) clearly seems more enriching while Radetzki's seems to make our lives less rich. Even if we learn to appreciate what we

¹³¹ Radetzki 1990 p.55, Radetzki 2001 p.79

¹³² Maybe we can describe the relation between transformative value and other types of value thus: ‘Something has transformative value if it enhances something's value – not by transforming the object of value but by transforming the valuer’. The relation between the two types of value discussed in this and the previous chapter will thus be: ‘One way in which something can have transformative value is by enhancing something's choice value – not by transforming the object of value but by transforming the valuer’. It may also be a good idea to distinguish between positive and negative transformative value, where the former transforms the valuer into valuing something she did not value before (or valuing it more than she did before), while the latter transforms the valuer into not valuing something (or valuing it less). This means that choice value is only increased by positive transformative value.

have got, it seems quite clear that it would be even better if we got more to appreciate. All in all it seems clear that the existence of transformative values talks clearly in favour of diversity: With more diversity we can learn to appreciate more things and therefore have a richer life, as with the teenage girl in Norton's example who learned to appreciate both rock and classical music. Radetzki's reasoning might be of some comfort if we lose diversity, but Norton's reasoning shows us that more diversity is still better. This ought reasonably to go for biological diversity as well as for diversity in musical styles.

I think the distinction between demand values and transformative values is quite interesting, and it seems very reasonable to include transformative values among our reasons to preserve other species from an anthropocentric perspective.

2.7. Ecosystem services

In this section, I will take a closer look not at the instrumental value of individual species, but at the systems that the species are part of. The ecosystems too supply us with a substantial set of services. These services are often referred to as "ecosystem services" and some of them are extremely important.¹³³ The ecosystem services include regulation of the oxygen content in the atmosphere, running the water, coal, nutrient, and other cycles, photosynthesis, pollination, seed dispersal, pest control, regulation of the climate, keeping the soil productive, taking care of waste products, etc.¹³⁴ It is quite clear that we as human beings to a large degree are dependant on biodiversity in general, and on some species in particular, to uphold the ecosystem services. The coral reefs alone are said to provide ecosystem services amounting to hundreds of millions of dollars by providing habitats for fish, cycling nutrients, protecting human settlements against waves etc.¹³⁵ Some calculations indicate that the economic value of ecosystem services is twice the size of the worlds total

¹³³ The term 'ecosystem services' is sometimes used in a way that covers all services we get from nature. I think however that it is useful to distinguish between the services and goods we get directly from the species and the services we get from the system – even though there is a large grey zone between them.

¹³⁴ Daily 2000 pp.333ff, Ehrlich et al 1990 p.99,102f, Elmqvist 2005:1 p. 32, Farber 2000 pp.s494f, Gärdenfors 2005 p.119, Johansson 2003 pp.2,24, Johansson, Birgitta 2005:1 pp.8,236, Kellert 1986 p.53, Lovejoy 1986 pp.17f, Luper-Foy 1995 0.97, Millennium Ecosystem Assessment 2005 passim, Norton 1986:1 p.128, Söderqvist 2005 p.75, Prance 1990 p.64

¹³⁵ Millennium Ecosystem Assessment 2005 p.25 See also Lindén 1990 p.73

GNP.¹³⁶ The climate is affected in many ways by biodiversity, especially by trees. Many trees are very “thirsty” organisms, which means they play an important role in the water cycle. Through their roots, the trees draw a lot of water from the ground – water that is then evaporated into the atmosphere.¹³⁷ Cutting down trees can mean drought in some places, and flooding in others.¹³⁸ Ehrlich and Ehrlich mention drought in Rwanda and Egypt, and flooding in India and Bangladesh as results of deforestation.¹³⁹ Trees also bind large amounts of carbon, which means that they play an important part in regulating the amount of carbon dioxide in the atmosphere. This in turn means that trees are important in regulating the greenhouse effect and thereby the climate.¹⁴⁰ They also contribute to climate control in other ways. The leaf surface for instance affects the amount of sunlight that is reflected back from earth.

We could go on for quite a long time listing ecosystem services from trees, but to sum it up, we can without any doubt conclude that trees are important for the ecosystem services, and thereby for human life as we know it.

The same type of reasoning can in different degrees be applied to organism after organism. The ecosystem services are in general as basic and as important as food, and are probably more important than many of the other uses we have discussed. Among the ecosystem services are the basic life enabling services like photosynthesis and the circulation of nutrients without which our kind of life would be impossible.

In fact, our wellbeing is more dependent on the biotic community than many people are aware.¹⁴¹ Some authors in fact recommend that we consider the value of biodiversity *primarily* in terms of ecosystem services rather than as suppliers of different kinds of goods.¹⁴² For instance, Bryan G. Norton suggests that the goal of species preservation should be “conceived as the goal of protecting total diversity”.¹⁴³ He even argues that the value all species have by being part of the total diversity, is sufficient for seeing them as worthy of protection.¹⁴⁴

He is not thereby denying that the different species also have instrumental value for us because of their particular features, but he sees this almost as a bonus – a value that can be

¹³⁶ Gärdenfors 2005 p.119

¹³⁷ Millennium Ecosystem Assessment 2005 p.29, Myers 1990 pp.17ff

¹³⁸ Ehrlich et al 1990 p.103, Lovejoy 1986 p.15, Myer 1990 p.19

¹³⁹ Ehrlich et al 1990 p.103

¹⁴⁰ Walsh 2004 p.65

¹⁴¹ Lovejoy 1986 p.24

¹⁴² Bandyopadhyay et al. 1990 pp.68ff, Prance 1990 p. 64

¹⁴³ Norton 1987 p.34

added on top of the general value the species has as being a part of biodiversity.¹⁴⁵ Apparently, by taking departure in total biodiversity, Norton wants to lay a ground ensuring that all species have at least a basic equal value that we can mount towards the value of other human projects that might be detrimental to one or more species. The “bonus” value that many species have on top of that just strengthens its position in relation to other human values, even further.

When we talk about ecosystem services, we should not forget that evolution itself is a kind of ecosystem service. The natural evolution goes on all the time, and “invents” new properties in both plants and animals, properties that can turn out to be very useful for us. More species also increase the chance of finding new useful species.¹⁴⁶ This means that all species contribute to biodiversity in two ways: By being a part of the diversity, *and* by interacting with other species and thereby contributing to their survival and evolution.¹⁴⁷ When a species goes extinct, it therefore also means a change in the evolutionary process since it affects the selection pressure on the remaining species.¹⁴⁸ In order for this evolutionary process to continue, we need to protect not only the species that are potentially useful, but also the ecosystems in which they live and evolve, and other species that may evolve useful traits in the future or that just contribute to the selective pressure that drives the evolutionary process. As Alan Randall points out, we could talk about preservation of *evolutionary processes* just as we talk of preservation of *species*.¹⁴⁹ This kind of ecosystem service is seldom mentioned, but should not be underestimated.

Norton reasons along these lines when he points out that species with no direct instrumental value may still be indirectly useful by just contributing to the evolution and thereby to the emergence of new species that may be useful in a more direct way. His idea is that diversity contributes to diversity, and at least some yet to be evolved species will be useful for us. Therefore, all species are important by merely being part of the competition that drives evolution and contributes to future diversity.¹⁵⁰

One important conclusion one might draw from this reasoning is that it is therefore not enough to preserve a species in one of the areas where it occurs, or in a zoo or a national

¹⁴⁴ Norton 1986:1 p.111

¹⁴⁵ Norton 1987 p.35

¹⁴⁶ Norton 1986:1 p.128

¹⁴⁷ Norton 1986:1 p.127

¹⁴⁸ Vermeij 1986 p.40

¹⁴⁹ Randall 1986 p.100

¹⁵⁰ Norton 1987 pp.61,63

park. It is important to preserve it in every ecosystem in which it plays a part.¹⁵¹ Even if a species is not globally extinct but only locally, the humans living in the area where it is gone still suffer the consequences of living in an environment with lower biodiversity.¹⁵² Ulf Gärdenfors from “Artdatabanken”¹⁵³ makes an analogy with human professions. It is good that we have physicians but is not enough that they exist somewhere in the world. We need physicians in the area where we live.¹⁵⁴

It has been suggested that we might be able to replace some ecosystem services by artificial means just as we can replace e.g. some materials with materials from non-living nature.¹⁵⁵ This is probably not the case with most ecosystem services. It seems in fact to be an important feature of ecosystem services that they are typically non-exchangeable.¹⁵⁶ Lovejoy contends the weaker but probably sufficiently strong idea that to artificially maintain the ecosystem services by a human design would take a planning effort that is totally overwhelming both scientifically and socially, and that it will not be possible in the near future.¹⁵⁷

The exchangeability was one of the things that posed a problem for the anthropocentric instrumental approach when we discussed the use of other species as resources in some of the previous sections. The fact that this does not apply to the same degree to ecosystem services makes them a stronger basis for preservation according to anthropocentric instrumentalism, than is the case with many of the other areas of use. To take away an irreplaceable service ought in short to be more wrong from an anthropocentric instrumental perspective than to take away something that can be substituted.

However, even though the ecosystems services are in general not exchangeable, some of the species that make the ecosystems work might be exchangeable. Let us return to the trees for a moment: Trees are important, but there are many tree species, and there is a lot of overlapping in their ability to provide different ecosystem services. This means that even though we need trees to regulate for instance the climate, we probably do not need all existing tree species for this purpose. In fact, since some species are better at this than others, this particular ecosystem service could provide an argument to cut down trees of less effective species and substitute them with trees from the more effective species. Things are

¹⁵¹ Lovejoy 1986 p.23

¹⁵² Gärdenfors 2005 p.116,118, Norton 1986:1 p.121

¹⁵³ The Species Information Centre at the Swedish University of Agricultural Sciences.

¹⁵⁴ Gärdenfors 2005 p.118

¹⁵⁵ Farber 2000 p.s495f, passim, Radetzki 2001 pp.43,75,77f

¹⁵⁶ Daily 2000 p.334, Ehrlich et al 1990 p.102

not that simple however. There are many different types of environments on the planet and not all tree species thrive in all types of environment or play exactly the same roles in all types of environment. This means that even if we do not need all presently existing tree species for climate regulation, we definitely need a fair number of them. To this we should also add that species depend on other species for their continued existence,¹⁵⁸ and some tree species on other tree species. In Sweden, Pedunculate oak (*Quercus robur*) e.g. depends on Norway Spruce (*Picea abies*) to be able to propagate: The oak propagates by acorns that grow after they have been hidden by the Eurasian jay (*Garrulus glandarius*) who use them as winter food but sometimes forget where they have hidden the acorns. If the acorn is not buried, it will probably be eaten by squirrels (*Sciurus vulgaris*), deer (different species of *Cervidae*) or mice (different species of *Muridae*) before they get the chance to grow. The jays in turn do not nest in oak trees but need thick spruce forests to nest, so therefore the spruce is important for the oak.¹⁵⁹

We also have to remember that trees play a role in many ecosystem services – not just climate regulation – and they played a large role in many of the previous discussions, (see the sub-sections *Food, Material and fuel, Medicine*, and *Tourism*, not to mention *Some non-destructive uses of other species* above). The tree species that have the highest instrumental value for one particular service are not necessarily the same species that best performs another particular service. Some species are very important in some ecosystems but not in others.¹⁶⁰ We will therefore still need quite a large selection of species to fulfil the different roles. It has also turned out that monocultures are not very sustainable, which means that we need more than one species for each type of ecosystem. Actually, we need quite a lot of species to get a working ecosystem – and not just tree species. Trees are heavily dependent on pollination, seed dispersal (see the example above that not only tells us that oak depends on spruce, but also that oak depends on jays), micro fauna in the soil, fungus that live in symbioses with many trees, etc. In short, to secure the ecosystems services, we need species that are not directly involved in the services in question, but that are necessary for the system to work. Agriculture has showed us that even though monocultures can be very productive, they cannot sustain themselves for very long without human help. They in fact depend on the ecosystem services they are replacing.¹⁶¹ Thus, the function of things in nature tends to

¹⁵⁷ Lovejoy 1986 pp.20f

¹⁵⁸ Gärdenfors 2005 p.116

¹⁵⁹ Johansson 2003 p.27, Johansson, Birgitta 2005:1 pp.8,12, Söderqvist 2005 p.80

¹⁶⁰ Daily 2000 p.336

¹⁶¹ Norton 1986:1 pp.129f

depend on there being other things functioning in a certain way.¹⁶² This should not be a surprise since the properties of different species have evolved as a result of interplay with the environment in which they live. There seems in short to be a very intricate web of dependency relations. This means that we also have the problem of what we might call “domino effects”. One extinction can lead to another and then to a third and so on.¹⁶³ The disappearance of one species can have quite large effects and a small change of the ecosystem might lead to a bigger change in the long term. This means that even if the species that goes extinct as a result of our actions is not useful for us per se, it can lead to another species that *is* important for us going extinct further down the line as a result of the first extinction.¹⁶⁴ Something that complicates it further, is that we do not have enough knowledge about the connections in nature to say that the extinction of a certain species will not lead to a downward spiral of extinction.¹⁶⁵

Norton also argues that even though most cases of dependence is not absolute, loss of species makes the system less stable, and often involves a decrease in the population of the dependant species, which makes it more vulnerable to environmental changes.¹⁶⁶ This in turn can affect other species and may eventually push some species over the edge.¹⁶⁷ For instance, when deforestation affects the water cycle this may lead to further extinctions.¹⁶⁸ In a simulation performed by Plotnick & McKunney 1993, the result was even worse. It turned out that an ecosystem could, depending on the relative rates of speciation and extinction, fall into a situation where the death of a single species could lead to a mass extinction.¹⁶⁹

According to many biologists and environmentalists, a larger biodiversity in general tends to increase the stability of the ecosystems, while a lower biodiversity in the same vein decreases the stability.¹⁷⁰ According to one study by David Tilman and J.A. Downing published 1994, spots with a larger number of species had a higher resilience against drought.¹⁷¹ Another study by Tilman from 1996 indicates the same thing.¹⁷² Marine biologists Thomas Elmqvist and Kerstin Johannesson claim in a paper from 2005 that it is becoming

¹⁶² Bandyopadhyay et al. 1990 pp.77, Myers 1990 p.22ff, Prance 1990 p.64

¹⁶³ Norton 1986:1 pp.114ff, Vermeij 1986 p.40

¹⁶⁴ Norton 1986:1 p.118

¹⁶⁵ Norton 1987 p.62

¹⁶⁶ See the reasoning on choice value for other species above.

¹⁶⁷ Norton 1987 pp.62f

¹⁶⁸ Lovejoy 1986 p.16

¹⁶⁹ Kaufman et al 1998 p.522

¹⁷⁰ See e.g. Aoki et al 2001 p.65, Elmqvist et al 2005:2 p.47, Ihse 2005 p.64, Johannsson, Birgitta 2005 1p.41, Norton 1986:1 pp.122f

¹⁷¹ Referred to by Ricklefs 1997 p.599

¹⁷² Tilman 1996 pp.254ff

increasingly clear that the loss of biodiversity is a threat to the production of food and different materials *but also* to the supply of ecosystem services.¹⁷³ They refer to reports from several European studies that indicate that larger biodiversity means increased biomass production (and thereby to a larger amount of coal bound by the trees which is important for counteracting the increasing greenhouse effect), smaller leakage of nutrients from the system, smaller risk of invasion by alien species, and larger stability over time.¹⁷⁴ They are not sure however if the results can be generalised to the majority of the earth's ecosystems.¹⁷⁵ They also mention the existence of several cases where ecosystems have "flipped" (changed dramatically), and where decreasing biodiversity has been part of the cause.¹⁷⁶ It is considered beyond doubt that biodiversity is important for the marine ecosystems but biologists are not sure precisely how.¹⁷⁷ Elmqvist and Johannesson claim that more species makes the ecosystem more stable,¹⁷⁸ though Johannesson believes that far from all existing species are necessary for the ecosystems to work.¹⁷⁹ In an investigation of aquatic trophic systems, Ichiro Aoki and Takahisa Hamamatsu show that an increase of biomass diversity (which is not strictly the same as species diversity although they often coincide) in aquatic ecosystems increases the whole systemic stability,¹⁸⁰ but point out that most investigations regarding the relation between diversity and stability only deal with one trophic level (in general herbivorous societies), and that we still need more thorough investigations of the relation between diversity and stability in whole systems involving different trophic levels.¹⁸¹ In a simulation study performed by Kaufman et al, the authors conclude that the best strategy to optimise the chances of survival for all species is to preserve a high degree of diversity.¹⁸²

The greatest importance of species richness when it comes to ecosystem services, are according to some sources to be found in its contribution to the long time stability and resilience of the ecosystems.¹⁸³ Other sources deny any connection between species richness and stability, while some even claim that there is a negative connection – for instance that the high degree of specialisation in ecosystems with many species means that the species are

¹⁷³ Elmqvist et al 2005:2 pp.49f

¹⁷⁴ Elmqvist et al 2005:2 pp.47f

¹⁷⁵ Elmqvist et al 2005:2 p.48

¹⁷⁶ Elmqvist et al 2005:2 pp.48f

¹⁷⁷ Johannson 2003 p.22

¹⁷⁸ Johannson, Birgitta 2005:1 p.10

¹⁷⁹ Johannson, Birgitta 2005:1 p.17

¹⁸⁰ Aoki et al 2001 passim

¹⁸¹ Aoki et al 2001 p.65

¹⁸² Kaufman et al 1998 p.531

¹⁸³ Millennium Ecosystem Assessment 2005 pp.25,64

extra sensitive to changes – which ought to make systems with a higher degree of biodiversity less instead of more stable, and less instead of more resilient.¹⁸⁴

David Tilman presents a list of investigations with very differing conclusions. Some support the idea that larger diversity means a higher degree of stability. Some point in the opposite direction, and some have found no connection. It should also be remembered that relatively few investigations have been done in this field.¹⁸⁵

The Biodiversity syntheses from the Millennium Assessment Report, concludes that there is what they call “established but incomplete” evidence that a lower biodiversity means a lower resilience to, and ability to recover from, disturbances.¹⁸⁶ They also acknowledge that some species are much more important than others, and that the *composition* of species has turned out to be at least as important as the sheer *number* of species.¹⁸⁷ The latter point has also been made by Norton who none the less sees the number as the important question to concentrate on when we discuss preservation.¹⁸⁸

To sum up before we slide too far away from ethics and too deep into ecology: In order to secure the ecosystem services we need working ecosystems, and in order to secure working ecosystems in the long term, we inevitably need at least some degree of biodiversity.¹⁸⁹ However, we cannot say for sure that the larger the biodiversity, the better for a steady delivery of ecosystem services, and we can probably not say that we need all species for this purpose. We can say with great confidence about some particular species that they are very important in this respect, while the confidence is much lower regarding other species, and there is a great uncertainty concerning many species. There is also a great uncertainty concerning how many species it takes to make a certain system work.

Norton believes that the contribution of each species is in most cases very small. There are many species and the systems contain much redundancy. Therefore, the probability for each particular species to be the one that causes the system to break is extremely small.¹⁹⁰ On top of that, many threatened species are naturally rare, which means that their contribution

¹⁸⁴ Aniansson 1990 pp.37f,64, Sober 1986 p.176. See also Aoki et al 2001 p.70 who lists some examples. The authors are however critical to their conclusions that are based on what they label “mathematical toy models”.

¹⁸⁵ Tilman 1996 p.350

¹⁸⁶ Millennium Ecosystem Assessment 2005 p.5f

¹⁸⁷ Millennium Ecosystem Assessment 2005 p.22

¹⁸⁸ Norton 1986:1 p.112

¹⁸⁹ McGarvin 2001 p.25, Millennium Ecosystem Assessment 2005 pp.2,22,28,30

¹⁹⁰ Norton 1986:1 p.122

ought to be even lower.¹⁹¹ Norton does not believe that these problems are devastating however. He presents three reasons for that:

1. Even though there is much redundancy in most ecosystems, this is not a reason to be less cautious. In fact, it is the redundancy that drives the competition, which in turn drives evolution. Redundancy is therefore very important, and even if a species is rare, it may still be an important participant in the evolutionary process. Naturally rare species are often naturally rare because of their far-reaching specialisation. If a species is extremely specialised, the niche it inhabits is bound to be very small. A far-reaching specialisation can however be a strong evolutionary force in relation to other species that partly compete within the same niche, even though they are not limited to that niche. Even the extinction of rare species is therefore significant in terms of decreasing competition in relation to the characteristics for which it is specialised.

2. Our knowledge of the evolutionary process is in general not good enough to specify the importance of every species, and therefore we cannot say that a certain species is redundant.

3. As we saw above, even if the disappearance of a particular species does not lead to the extinction of other species, it may well lead to a weakening of some populations. This in turn may contribute to a process that eventually pushes these species over the edge.¹⁹² In other words: When we are dealing with extinctions, it is probably a good idea to consider that even extinctions that have very small, or even no discernible effects, may have the effect of taking us closer to the point where the ecosystem breaks down, and when we reach that point (the “threshold”) an extinction that otherwise would go virtually unnoticed, can have a tremendous effect on the ecosystem and thereby on us.

I believe that Norton’s answers are correct and to the point, and that they show that even though the probability that the disappearance of a particular species will be devastating is quite low, this cannot be used as an argument to disregard the species.

There is one salient problem with the argument from ecosystem services however, viz. that many species are in fact already gone and we seem to live on and prosper. Is this not an argument that we did not need all these species after all, and that it might not be such a big catastrophe if we lose some more?¹⁹³

To this one can answer

¹⁹¹ Norton 1987 p.61, Sober 1986 p.176

¹⁹² Norton 1986:1 p.121, Norton 1987 p.62

¹⁹³ This problem is pointed out by e.g. Ricklefs 1997 p.597

(1) that we do not know what we could have gained from the species if they had not disappeared. We are obviously alive without them, but we may have had better lives with them, and some humans that have succumbed might have survived if some of the species that have disappeared still existed.

One might also answer

(2) that there may be a time lag so that the effects do not show until later.

Finally

(3), we may find an answer in the threshold that Norton mentions. We may be fine so far, but we do not know for how long we can go on like this. There might be a threshold somewhere, and the warning signals may come too late.¹⁹⁴ In the worst case, we might not even know where the threshold is, which looks like an argument to be extra careful. I will however come back to this problem in chapter 3 where I take a closer look at this and other uncertainties we have encountered.

Both answers (2) and (3) means that even if we have not been seriously affected by the loss of a species, future generations might be affected by the loss that we have caused. I will discuss the moral implications of this in chapter 4.

The conclusions of this section is that ecosystem services are important from an anthropocentric instrumental perspective – at least as important as any of the other goods that different species contribute with. Some of the services are necessary for our future existence. Many of the services also seem to be irreplaceable. In order for these services to work, we need a certain – probably quite high – degree of biodiversity. We cannot say however how many and which species that are necessary for a steady supply of ecosystem services.

¹⁹⁴ The concept of and problems related to threshold effects and other non-linear changes will be discussed more thoroughly in the next chapter.

3. Uncertainty

3.1. Biodiversity and uncertainty

Our knowledge and understanding of most species, interactions between species, ecosystems functioning and what roles different species play, is still highly incomplete and full of uncertainties.¹⁹⁵ There is also much uncertainty about the anthropocentric value of different products and services from nature.¹⁹⁶ What complicates it even further is that many species are not even discovered yet. How can we value the services or goods they may supply?¹⁹⁷ In previous chapters we have encountered situations where our attempts to assess the value of other species have been hampered by uncertainty. We will hopefully be able remove some of the uncertainty by more thorough investigations, but we can probably not remove it completely without substantial costs,¹⁹⁸ or maybe even at all. To get a perfect prediction of what will happen in an ecosystem in the long term when we make as fundamental changes as removing a species might not even be possible.¹⁹⁹ The old view of nature as a machine – a clockwork with mechanic precision where a particular intervention necessarily leads to a particular, foreseeable effect – is replaced by a more modern conception of nature as something dynamic and complex, or even uncertain and chaotic.²⁰⁰ We have in other words started to realise that the way nature reacts to our treatment is not completely predictable.

Donna Maher talks about a change of science from a situation where

... prediction of system behaviour was a matter of having enough data, to a 'science of surprise', where chaos and unpredictability are endemic, with stability and predictability the exception.²⁰¹

Sverker Sörlin makes a similar point by referring to chaos theory and catastrophe theory when he tells us that the old fashioned linear models will not help us find out at which

¹⁹⁵ Aniansson 1990 p.38,42, Farber 2000 p.s492, Ihse 2005 p.71, Söderqvist 2005 p.78

¹⁹⁶ Farber 2000 p.s495

¹⁹⁷ Randall 1986 p.85

¹⁹⁸ Farber 2000 p.s496, McGarvin 2001 p.25

¹⁹⁹ McGarvin 2001 p.25

²⁰⁰ Beltrán 2001 p.4, Herremoës et al 2001 p.193, Sörlin 1991 p.18

²⁰¹ Maher 1999-2000

point the decreasing ozone layer, or the greenhouse effect etc. will take an uncontrollable catastrophic turn.²⁰² He does not mention loss of biodiversity, but the same reasoning can probably be used here.

One of these nonlinear phenomena that we have to consider when we are dealing with complex things like living beings or ecosystems is (as we have noted earlier), the existence of threshold values.²⁰³ Normally we assume that cause and effect are proportional, and can be described by some linear equation, i.e. that a certain change in the cause leads to a corresponding proportional change in the effect. However, in some situations all or most of the effect takes place when the causation power has reached a certain value – the threshold value. In this type of situation, most changes in the causation power do not have any visible effect at all, but still have the important indirect effect of taking us closer to the threshold value. This climbing closer to the threshold value is in many cases something that takes place invisibly.²⁰⁴ When the threshold is reached, the next change in the causing power – however small – will mean all the difference in the world. Then the up to now only latent effect will suddenly occur all at once.

In our case, it would mean that the disappearance of a single species, or two or three, from an ecosystem might not result in any discernible effects on e.g. the ecosystem services. This might go on for a while but when a threshold is reached, the results could be dramatic.

Anne and Paul Ehrlich use an analogy about a person who pops rivets from the wings of airplanes. He sells the rivets for 50 cents each and he defends himself by pointing out that:

I've already taken 200 rivets out of this wing, and nothing has happened yet. Lots of planes fly with missing rivets. They build a lot of redundancy into jet aircraft, partly because they don't completely understand the materials and stresses involved, so nobody can prove that taking another rivet out will weaken the wing too much.²⁰⁵

As we saw in the previous chapter, decreasing redundancy might have unwanted consequences. One consequence that we touched upon was that we might be approaching a threshold. Both the story about the water filler and the story about the rivet popper are illustrations of this.

²⁰² Sörlin 1991 p.255

²⁰³ Daily 2000 p.335, Clarke 1995 p.41, Herremoës et al 2001 p.193, McGarvin 2001 p.25, Norton 1986:1 p.123 (Clarke talks about them as “jump effects”).

²⁰⁴ This is not always the case though. Sometimes it is indicated by something else than the effect we are worried about (and do not see any trace of yet).

As Bryan Norton points out, the assumption of the ‘rivet popper’ that the absence of any accident so far is an indicator that the risk of an accident in the future is very low, would be true if we were talking about a series of independent events. The problem is that we are not. For every rivet he pops, there are fewer rivets left, which means that the constitution of the plane is constantly getting weaker. The same goes for species: For every species that goes extinct above the speciation rate, there are fewer species left, and the ecosystem – even the global system – is weakened.²⁰⁶

This is typical for threshold effects. Every change in the input takes the system closer to the threshold even though the effect is not noticeable until we reach the threshold.

Margareta Ihse extends the collection of “threshold-analogies” with an analogy about a hammock where the species are the threads of the fabric that will hold us up for a while, but bursts when the fabric gets too thin.²⁰⁷

This is a very good analogy of ecosystems as well as of the circulation of nutrients etc. in nature. They can be described as a web with many intertwined threads. This gives the system a certain amount of stability but we do not know when the web gets too thin to uphold its function. It also illustrates that the resisting power of nature that is due to the redundancy in the systems is never a guarantee against severe changes. It holds back – and hides – the changes for a while and lulls into a false sense of security, but it does not stop the change forever and when it occurs all the change occurs at once.

The Ehrlich analogy points at an important difference between the natural disappearance of species and the high extinction rate we are facing at the moment due to anthropogenic interventions: Normally the species that go extinct are replaced by other species just like lost rivets in an airplane are replaced by new rivets.²⁰⁸ At the pace by which species are disappearing today, the species cannot be replaced fast enough however and we face a net loss.

There is one important difference between the analogy with the rivets and the loss of species however, and unfortunately, this difference makes the species loss much more problematic than the loss of rivets. New rivets can be taken from the storeroom and the old ones can be replaced by human maintenance personnel. Species on the other hand are replaced by evolution. Instead of being taken from a storeroom, they evolve from the genetic

²⁰⁵ Ehrlich et al 1990 p.95

²⁰⁶ Norton 1986:1 p.122, Norton 1987 p.68

²⁰⁷ Ihse 2005 pp.70f

²⁰⁸ Ehrlich et al 1990 p.96

basis that *already exists in the existing species*. This tells us that in order to replace lost species with new species that have a better chance of survival, we need above all a large selection of genes. I.e., we need a large biodiversity, and that is precisely what we are losing.

The non-linear aspect can be brought one step further and form another argument to consider: Sometimes a very small change in the input can have a very large effect on the output. If there are effects like this in ecosystems, it must be a very strong argument indeed for extra caution about all interventions in the ecological systems – including interventions that contribute to the extinction of species.

Furthermore, if we take a closer look on the evolutionary process, we will find that one of its inherent features is that it has no predetermined direction. It is not the case that the individuals of a species always get bigger or faster or more intelligent. The direction in which the evolution takes a certain species depends on its environment and on chance. The environment changes all the time, and what “remedy” that evolves in a certain species as an “answer” to a particular change in the environment depends on what its gene pool happens to have in store, and on which re-combinations and mutations that happen to take place. Which of these “remedies” in turn that eventually are favoured by natural selection, depends not just on one single aspect of the environment in which the species live, but on the total selective pressure that the environment puts on the species. If rabbits (*Oryctolagus cuniculus*) become faster, foxes (*Vulpes vulpes*) have to evolve too, but not just in relation to the rabbits. If they evolve a quality that makes them better rabbit hunters but also makes them less resistant to cold or easier prey for the lynx (*Felis lynx*), they will loose out in the evolutionary game anyway. All species are in fact at any given moment subjected to pressure of many different types from a large number of different directions, and the sources of the pressure are also in their turn subjected to pressure of many different types from a large number of different directions – including from the species they are exerting pressure on. If we were going to calculate the direction of evolution for the fox, we would have to consider the selection pressure that is placed on the fox by both the lynx and the rabbit, as well as all other species that interact with the fox as well as all the non-living forces of nature. The rabbit and the lynx and the other species evolve too however, and that has to be taken into account. The fox is putting both the rabbit and the lynx under selective pressure just as they do with the fox, but that is not all. The lynx not only eat foxes but also rabbits so we have to look at the pressure they exert on each other. The lynx also eat other prey though and the rabbit is not just hunted by the fox and the lynx. It therefore does not just evolve in a way that helps the

rabbits cope with the threat from these predators, but also as a result of how the golden eagle (*Aquila chrysaetos*) evolve since they eat rabbits too, etc. The pressure from the lynx and the golden eagle will inevitably also affect what options the genes of the rabbit has when it comes to “dealing” with the threat from the fox and so on. Then we have to put the result we get for the rabbit back into our equation for the fox together with the results from other prey species for the fox, and so on and so forth – and while we have done that the whole scenario has already changed. In short, we would have a problem that is infinitely more difficult to solve than the “three body-problem” in physics.

What this tells us is that we simply cannot know for sure what will happen in an ecosystem in the long run when we make such a radical alteration as changing the species composition.

Changing the species composition can be done in different ways. It can be done e.g. by causing a species to go extinct as we are discussing here, or by putting in a new species that was not there before (but that may well have the result in other species disappearing).

The best literary description of the latter is probably Michael Crichton’s book “Jurassic Park”.²⁰⁹ In this book, species of animals and plants that lived more than 65 million years ago are resurrected and placed in a present day environment. As we know, it did not work out very well in spite of the guarantees from John Hammond and his bio-engineers. This was of course just fiction. We do not know what will happen in a situation like this, but the point of the story was just that: We *do not* know, because we *cannot* know. It is impossible to predict the results from such a project, and therefore we should be more cautious. To recreate pre-historic organisms is quite extreme, but many of the interventions we make are almost as extreme, and as we saw above, our possibilities of foreseeing the results are limited. The best and most frightening illustration in the book is probably the absolute confidence by which Mr Hammond and his staff guarantee the safety of the arrangement. (What is particularly frightening is how easy it is to recognise this unshakable confidence in many people in the real world.)

There are many real-life examples of how we have intervened in nature and ended up very surprised over the results. The rabbit explosion in Australia and the drought catastrophe in Sahel in Africa are both described as examples of catastrophic situations caused by our ignorance about ecology.²¹⁰ A well-known example of how human beings have deliberately tried to engineer nature to suit our purpose by taking away a species from the system, is the

²⁰⁹ Crichton 1991 passim

wolves that were hunted virtually to oblivion in North America in order to protect both farm animals and game animals (or to be more precise, to protect human farmers and hunters from the competition). This resulted in an explosive increase in the number of deer, which in turn caused a lot of damage to the ecosystems. It also had a negative economic effect on the human population since it destroyed the grazing for domesticated animals such as sheep.²¹¹

All the examples above confirm the problem of predicting what will happen in an ecosystem as a result of human encroachment. The lesson that seems to emerge from this section is that we will probably never reach a situation where we have enough information to make a fully informed decision as to which course of action is the most rational from an anthropocentric instrumental point of view. We therefore need some kind of strategy for how to handle the uncertainties that we cannot get rid of. In the coming sections we will try to find such a strategy, and we will in particular take a closer look at one that has recently become very popular.

3.2. Dealing with uncertainty

There is as we noted in the previous section – and have seen many examples of in the previous chapter – much uncertainty surrounding the things we have to consider in order to answer our main question. It might not even be possible to totally get rid of all the uncertainty, or even to reduce it to a reasonable level. We therefore need a strategy of how to behave in situations of uncertainty. Åsa Mattsson identifies four different strategies:²¹²

I. One strategy is not to change anything until we have a better understanding. At first sight, this looks like the only rational strategy: If we lack sufficient knowledge to make a good decision, it must be better not to make any decision at all – at least until we have sufficient knowledge.

It has also been suggested that lack of knowledge as such cannot be an argument in favour of acting in a certain way.²¹³ If that is correct, it is a strong argument for this

²¹⁰ Palmer 1995 p.26f

²¹¹ Ricklefs 1997 p. 598

²¹² Mattsson 2006 pp.10f

²¹³ Sober 1986 pp.175f

approach. It would also be very important for our investigation. Lack of knowledge regarding the future value of a species is sometimes used as an argument for preservation.²¹⁴ That argument would be refuted if we find that lack of knowledge cannot be an argument for any particular strategy.²¹⁵

There are problems with this idea however. The most important problem is probably that deciding to wait is also a decision, and in bi-polar decisions like preserving or not preserving, waiting must mean something. The question is: Does it mean that we preserve the species until we know more or that we exploit the species until we know more? The answer to the question “what do we do while we wait” is often very important. In situations where we deal with irreversible changes it is extremely important, and that the “wait and see” strategy do not have an answer to this question (it cannot have one – that is the very point of the strategy) is very problematic.

It is also possible that we will *never* reach an understanding that is much better than the one we have. In the previous section, we saw that this is a quite plausible option when we deal with some changes in nature.

Finally, we have to be aware that there is a risk in waiting. It is in general true that waiting for more information before we make a decision increases the probability that the decision will be better when it comes. On the other hand, there is a risk that it will then be too late. The time factor can in some situations make waiting a very dangerous strategy.

II. A slightly different strategy is to wait for a better understanding, *but* monitor what is happening while we wait and prepare for the possibility of problems materialising along the way. This strategy has the same advantages and drawbacks as the previous one, with the difference that we are better prepared to deal with problems as they appear. This does not seem like a good solution when dealing with nonlinear or irreversible changes though since we will not be able to act until the problem has already appeared.

III. Another strategy is to act immediately on the best available information, and hope it is correct. By doing that we will not lose any time, but we run the risk of the information not being correct. There is also the drawback that since we are treating our inadequate information as adequate, we leave no room for precautionary measures in case it turns out to be wrong.

²¹⁴ See previous chapter. See also Gärdenfors 2005 p.119

IV. Finally, we have the strategy of making a decision based on the information we have but adapting it to the uncertainties, and building in some precautionary measures in case events turn out differently than predicted. There are different versions of this strategy but the version that has received the most attention recently is the so-called precautionary principle. This strategy is recommended or even prescribed by many official sources, including international declarations and treaties such as the Rio declaration, Agenda 21 and the constitution of the European Union, but also by national as well as regional and local legislation in many countries.²¹⁶ If we can show that the precautionary principle is ethically and rationally in accordance with anthropocentric instrumentalism, or even required by anthropocentric instrumentalism, and if we can show that it is applicable to our situation, then we may have a method for dealing with some of our problems.

In the next section, I will try to produce an interpretation of the precautionary principle that is in accordance with basic moral intuitions. In the section after that, I will go on and take a look at some proposed problems with the principle. Finally, I will try to apply it on the species problem and see first of all whether it is possible, and in that case, what the result would be.

²¹⁵ Sober 1986 pp.175f

²¹⁶ Herremoës et al 2001 p.14 contains a list of international treaties that contain the precautionary principle. See also Beltrán 2001 p.3, Case, David 2005, Environmental commons, Gollier & Treich 2003 p.81, Grandjean 2004 p.206, Grandjean et al 2004 p.482, Lin 2001 p.129, Melin 2001 p.98, Rio Declaration §15, Sandin 2004:2 pp.2f, Sandin 2004:3 p.8, San Francisco Adopts the Precautionary Principle, SF Precautionary Principle Ordinance, Turner & Hartzell 2004 p.450, Walsh 2004 p.69. See also <http://www.institute.redlands.edu/p3/tthome.htm> for an extensive list of treaties containing references to the precautionary principle.

3.3. The Precautionary Principle

The precautionary principle has been formulated in several different ways. The most common formulation is from the Rio Declaration:²¹⁷

Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.²¹⁸

The Rio declaration in general leaves much room for interpretation, and the precautionary principle is no exception.²¹⁹ There is a large flora of interpretations, and there is still no real consensus.²²⁰ The Rio formulation has also been criticised for being too weak, and for not really telling us what to do, but only what *not* to do (i.e. *not* to use lack of scientific certainty as an excuse for not acting).²²¹ Nonetheless, it can be used as a good starting point for our investigation. It seems that the basic idea expressed by this formulation that “business as usual” is at least in some situations – viz. in situations where we risk serious or irreversible environmental degradation – not the best strategy as a response to uncertainty.

Another often referred to formulation of the precautionary principle is the so-called Wingspread formulation.²²² It was formulated six years after the Rio formulation at a conference with a number of scientists, activists, etc. from different countries (though mostly from North America).

It states the principle as follows:

²¹⁷ See e.g. Barrett 2005, Case 2005, Cussio 2005, Gee 2006, Gollier & Treich 2003 p.81 Grandjean 2004 p.206, Lin 2001 p.129, Melin 2001 p.101, Stijkel et al 1999 pp.304f, Sandin 1999 pp.895,903, Sandin et al 2002 p.289, Sandin 2004:1 p.4, Sandin 2004:2 p.5, Walsh 2004 p.69

²¹⁸ Rio Declaration §15

²¹⁹ For a discussion of the Rio formulation, see Sandin 1999 p.895, Sandin et al 2002 p.289, Sandin 2004:2 p.15, Sandin 2004:3 pp.10f

²²⁰ Sandin 1999 p.889, Sandin 2004:2 p.2

²²¹ Sandin 2004:1 p.4

²²² Grandjean 2004 p.206, Sandin 1999 p.891,905, Sandin 2004:1 p.4, Sandin 2004:3 p.8, Turner & Hartzell 2004 pp.449,251f, *passim*

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.²²³

Contrary to the Rio formulation, the Wingspread formulation is stated as a positive prescription. It is also somewhat more specific than the Rio formulation regarding what counts as scientific certainty. Finally, it widens the scope of the principle by being more general regarding the kinds of threat, and also by including human health among the relevant considerations for application. It seems clear, though, that the two formulations are built upon the same basic intuitions.

Other formulations point clearly in the same direction.²²⁴ Grandjean et al interpret the Precautionary principle as:

... a tool for avoiding possible future harm associated with suspected, but not conclusive, environmental risks.²²⁵

Per Sandin defines the basic idea of the precautionary principle as follows:

... on some occasions, measures against a possible hazard should be taken even if the available evidence does not suffice to treat the existence of that hazard as a scientifically established fact.²²⁶

The formulations differ, but the basic theme is the same: If we suspect that something is a threat to some important values – in particular to human health or the environment – we should do something about it even when we are not totally sure that it is a threat.

I believe it can be a good idea to get some understanding of the intuitions behind the principle in order to gain a better understanding of how to use it. It is also important for our investigation to find out whether the precautionary principle is justifiable from the position of anthropocentric instrumentalism. The formulations we have seen so far seem to be consonant with a number of basic moral intuitions that would justify the precautionary

²²³ Wingspread Conference 1998

²²⁴ See e.g. Gollier & Treich 2003 p.77

²²⁵ Grandjean et al 2004 p.282

²²⁶ Sandin 2004:2 p.3 This interpretation is stated more or less similarly at many places. E.g. in Sandin et al 2002 p.288, Sandin 2004:3 p.2

principle, and help us specify what it means and how it should be applied. I will take a closer look at some of these intuitions.

3.3.1. Promoting the positive versus avoiding the negative

It might be argued as a basis for the precautionary principle, that it is more important to avoid things that are negative than to promote things that are positive.²²⁷ This intuition could explain expressions like “err on the side of caution”, and “better safe than sorry”. It seems that the precautionary principle could be interpreted along these lines,²²⁸ but is it a reasonable position to hold?

Kuntz-Duriseti reasons from an economic perspective and claims that the damage from a negative economic shock is larger than the value of a positive economic “shock” of the same size.²²⁹ Ingar Brinck on the other hand attempts to give an evolutionary account of the intuition. She believes that it has been more important for our survival to concentrate on negative events than on positive events.²³⁰

Kuntz-Duriseti does not provide any argument for his claim other than his intuitions, but let us take a closer look at Brinck’s idea: If we are in a situation where we can make a decision we are obviously alive and we have at least some degree of influence over our own lives. In such cases, it might be correct that we from a “survival perspective” are in a situation where we have more to lose than to gain. On the other hand, in order to improve our evolutionary fitness, there seems to be quite a lot more to desire. In order to propagate our genes – and thereby the inclination to be more negative towards harm than positive towards improvements – we need to mate, something we might have to be risk-taking in order to be successful at. In the evolutionary game, risk-taking individuals often lose, but when they win, the return is high. Therefore, it is not always an evolutionary advantage to be more negative towards harm than positive towards improvements – just as it is not always an advantage to be more negative towards harm than positive towards improvements.

²²⁷ Holtug 2002, Munthe 1997

²²⁸ see e.g. Munthe 1997

²²⁹ Kuntz-Duriseti 2004 pp.293,296

²³⁰ Brinck 2005 p.53

Therefore, from an evolutionary perspective there is probably room for both attitudes in a population (a mix of “strategies”).

Either way, an evolutionary investigation cannot on its own tell us whether the intuition is *morally justified*.

One problem we have to face is that it is not totally clear what it means to say that it is more important to avoid negative values than to promote positive values. In one interpretation, going from where we are to a *worse* position, is a less acceptable option than *not* going (the same distance) from where we are to a *better* position – other things being equal but independent of where we are on the positive-negative scale. If we e.g. talk in terms of happiness, this interpretation would mean that it is always worse to make someone less happy than to abstain from making someone more happy to the same degree no matter how happy they are to begin with. If we have to choose between an option (A) that will prevent a decrease in the level happiness for someone who is already in a bliss by 5 “units”, and an option (B) will that increase the level of happiness for someone in great misery also by 5 “units”, we are obliged to chose (A).

Another – and stronger – interpretation says that *all* changes for the worse are more important than *any* change for the better. If we use the happiness-example above and adapt it to this interpretation it would tell us that in a choice between an option (C) that will prevent a small decrease in happiness for someone who is really happy (with say 1 “unit”), and an option (D) that would largely increase the happiness of someone who is really miserable (with say 100 “units”), we are obliged to chose (C).

Neither is it clear how to distinguish harm from lack of improvement. When we talk about harm versus improvement we have to ask “in relation to what?”. Are we talking about a harm/improvement in relation to the situation in which the affected person is, or are we talking about harm/improvement in relation to some fixed baseline, and how, if that is the case, should the baseline be fixed?²³¹ There are also other complications: If we fail to prevent a pain, would that be an example of a harm or of a lack of improvement? The situation is getting worse than it is now and could therefore be seen as a harm. On the other hand, it is a matter of something that would have been in a better state if we had intervened, which sounds like something we have failed to improve.²³² We can even question whether an intervention that increases someone’s pleasure is just a matter of improvement or if it is also a matter of preventing a lack of enjoyment that she would otherwise suffer – i.e. of

²³¹ Holtug 2002 pp.268f

preventing a harm.²³³ Apparently, it makes a great difference if we look upon a state of the world or upon an ongoing process.

Another problem is that it is not quite clear what it means to say that avoiding negative values are more *important* than promoting positive values. Important in what sense? Are we talking of the same scale when we talk of the importance as when we talk about the positive and negative values in the phrase we are investigating? It might be that we have a meta-scale according to which moves on the lower scale get different values depending on which way they move or where on the scale they are. An alternative interpretation would be that the question about whether negative values are more important than positive values is a *moral* question, while the values we are comparing (the positive and the negative values) are about *personal experiences*. Such a move is not easy to justify. Why should negative experiences carry a larger weight than positive experiences of the same size from a moral perspective? We need independent justification in order to make such a controversial statement.

The intuition saying that it is more important to avoid negative values than to promote positive values may well be an important explanation for the popularity of the precautionary principle. However, because it is so controversial, and because it is in itself in need of justification, I will abstain from using it as a justification or interpretation of the precautionary principle.

3.3.2. Irreversibility

One common intuition that might help us justify and understand the precautionary principle, is that some outcomes are unacceptable and should therefore never be risked no matter what we could gain by risking them – or at least we need extraordinary security against them.²³⁴ In this section, I will discuss this intuition, and I will concentrate on one particular outcome that looks like a good candidate for being of this particular kind – irreversibility. Irreversibility is mentioned explicitly by some formulations of the

²³² Holtug 2002 pp.268f

²³³ Holtug 2002 p.370

²³⁴ Munthe 1997

precautionary principle,²³⁵ and is also, as we have seen, particularly relevant in relation to our investigation.

When Per Sandin discusses irreversibility as an aspect of precaution, he follows Fleming in viewing it as one of three aspects of ‘threat’ that are relevant for our understanding of the precautionary principle. The three aspects are: Severity, irreversibility and preventability.²³⁶ If the threat is not preventable, it is meaningless to take precautionary measures even if it is irreversible (it would not even be possible to identify any measures as precautionary).

That severity is relevant seems intuitively plausible as well. The more severe an outcome is, the more important it must be to take precautionary measures against it. It is also intuitively plausible that some degree of severity is a necessary prerequisite for invoking the precautionary principle. An event that is irreversible but not negative hardly calls for precaution, and an event that is only slightly negative but can quite easily be counterbalanced by the positive effects you get from the process in question (or from abolishing a process), should reasonably be treated as one value among others and be dealt with in a normal cost/benefit-analysis. Sandin illustrates the importance of severity by an example of a boulder that is crushed in order to get gravel.²³⁷ This is clearly an irreversible act, but it is not very severe (or in general bad).

In fact, irreversibility might even on some occasions be a good thing. If we manage to get permanently rid of some great evil, that is surely positive.

It thus seems that irreversibility cannot be a sufficient reason for invoking an extra precautionary decision procedure. It has to occur in combination with preventability and some degree of severity. Perhaps it is not that simple though. Cannot irreversibility be considered as something that is negative in its own right, and thereby automatically fulfil the severity criterion just by being irreversible? Obviously, irreversibility can have a negative intrinsic value for some people, but probably not a great enough negative intrinsic value to fulfil the severity criteria in its own right.

Another alternative is that something else has a very high intrinsic value, and that irreversible changes by necessity destroy this value. That way, irreversibility would not have a negative intrinsic value, but by being inherently destructive in relation to something that has a positive intrinsic value, the effect would be very similar in that irreversibility would be

²³⁵ Most notably the Rio formulation (see above). See also Herremoës et al 2001 p.13

²³⁶ Sandin 1999 p.892

²³⁷ Ibid

necessarily negative. I can imagine two widely held values in relation to which irreversibility is necessarily negative, namely choice value and democracy. The reason why irreversibility is necessarily negative in relation to these two values is the same in both cases: An inherent feature of irreversibility is that it limits our future range of choices. This means that irreversibility always has a negative choice value. This in turn means that we take decisions on behalf of all future generations – decisions that they will never be able to change. Therefore, it is a democratic problem as well. In relation to both these values – choice value and democracy – irreversibility seems to be necessarily negative. This means that if we value freedom of choice or democracy, the fact that a certain decision is irreversible, is by necessity an argument against it.

Is this a sufficient reason for removing irreversible decisions from the realm of acceptable choices or at least to grant it extra ordinary treatment? I do not believe it is. Choice value and democracy are two of many values that might be affected by, and therefore should be considered, in a decision. Even if they are important values, we may assume that they can be overridden by other values. It does not justify that we give irreversibility any extraordinary standing in the decision process. That something is a problem *by necessity* does not tell us anything about how *severe* the problem is. The problems we have discussed do not seem to be severe enough to grant irreversible changes the special status we are looking for.

I do not believe we need to claim that irreversibility is a sufficient prerequisite for invoking the precautionary principle however. When we are dealing with a problem that is severe in its own right or for some independent reason, *and* it turns out to be irreversible as well, the irreversibility can be a factor that enhances the problem to such a degree that it gives the problem a special status. Clearly, a decision that might lead to a severe problem, *and* that is also irreversible, must be treated with extra care. This could be handled by following the precautionary principle and demand that the burden of proof (in the form of showing that the suspicions are unfounded) should rest on those in favour of the irreversible alternative.

For instance, it seems reasonable that in a situation where we suspect that a certain resource might become very important in the future, we should be extra careful not to irreversibly destroy it even if we lack strong evidence about its future importance. It even looks reasonable to say that if we suspect that something will be more important in the future than the gain we will get from destroying or depleting it today, we need extra strong proof

against this suspicion if the destruction or depletion would be irreversible. This means that apart from being a problem due to its special relation to choice value and democracy, irreversibility is also a problem when combined with something that may turn out to be problematic for some other reason. This brings us back to the discussion about the boulder: If we suspect that the boulder might turn out to be more important in the future than the gravel is today and in the future, then we must not destroy it unless we have good arguments against this suspicion. Generally, if we suspect that something after being irreversibly changed may turn out to be more important than the goods or services we get now and in the future from changing it, then we should not change it in an irreversible way unless we have very good arguments against this suspicion.

Irreversibility can therefore in many cases of uncertainty – for instance about the future value of different resources – justify a change in where we place the burden of proof.

Irreversibility does not just have a tendency to complicate decisions about resources. It seems to have effects that go even deeper. Per Sandin compares the precautionary principle with a decision principle used by insurance companies: When making business decisions, the insurance companies try to “...maximize expected monetary value, but only if bankruptcy is not one of the possible outcomes.”²³⁸

This seems like a sensible decision principle: Use cost/benefit-analyses but make no decisions that if they fail will result in bankruptcy.

The question is: What makes bankruptcy so special? I believe that a substantial part of the explanation lies in its irreversibility: It is bad if we lose money on a deal, but we can come back and make money on another deal. It is also a pity if we stay out of a deal that would have rendered us a great profit, but we can in general make money on another deal (even though we have lost some opportunity value). If we go bankrupt on the other hand, it is over.²³⁹ Ordinary cost-benefit analysis may well be the most rational decision method when we talk about “ordinary” events such as recurring economic deals. In these cases, the expected value is probably a good account of the long-term gain or loss, and extremes that happen quite seldom are in general outweighed in the long term by the sum of the smaller but more common events. On the other hand, if we are talking about bankruptcy or about the irreversible loss of irreplaceable life-supporting systems (the “ultimate bankruptcy”), the

²³⁸ Sandin 2004:2 p.8

²³⁹ There is of course an important difference: A bankruptcy is obviously not irreversible in the same way as is loss of irreplaceable life support systems. A company can go bankrupt but the people involved can live on and eventually start a new business – which might explain why some aggressive actors on the market are after all prepared to risk bankruptcy to get a chance at the really big harvest. It illustrates the main idea nevertheless.

situation is extra tricky in that this particular type of effect cannot be allowed to happen *even once*. In situations like these, it seems rational to adopt an alternative strategy for decision-making. If we go for the reversible alternative instead of the irreversible, we have an option to choose the irreversible alternative later if further investigations show that it is safe.²⁴⁰

This brings us back to the discussion we had in section 2.5 when we noted that the irreversibility of extinction is probably an important reason why extinction is seen as morally problematic. As we saw in Sandin's example, it might also be a paradigm example of a widely held intuition that plays an important role, not just when we talk about extinction, but also in other decision situations where "game over" is among the possible outcomes.

The conclusion has to be that apart from being inherently bad in relation to choice value and democracy, irreversibility also has the property of making bad things worse in a way that is particularly significant for both the general understanding of the precautionary principle and for our investigation. This goes especially for – for lack of better terminology – "game over" situations, that is, for situations that are not even allowed to occur once.

Is irreversibility then a *necessary* prerequisite for applying the precautionary principle? Suppose we substitute the smashed boulder in Sandin's example with a species that is pushed to extinction, and add the assumption that we could recreate it exactly as it was (and at the same time assume that the environment in which it lived has not changed etc.). The intuitions go apart here. On the one hand, irreversibility does seem to be relevant. On the other hand, if a certain state of the world is bad, then it is bad even if it is just temporary. Let us assume that we are dealing with a species that is instrumentally important for us. Is not then the state of the world worse for us during the time the species is gone even if we know that we can get it back? We would in any case lose what the economists call opportunity value, that is to say, opportunities for utilisation of the species. Some people with a disease that could have been cured by a medical drug from the species would die. This is bad even though we will be able to cure future people once we have revived the species.

Imagine that we exterminate a species that could – but will not – be revived. It seems to me that this cannot be accepted at the same time as we maintain that the effects of an *irreversible* extermination are unacceptable. I therefore believe that it would be unreasonable to consider irreversibility as a necessary prerequisite.

Our conclusion is that irreversibility is not sufficient and not necessary for the precautionary principle to be justified. Its inherently negative impact on choice value and the

²⁴⁰ Gollier & Treich 2003 pp.83,88

democratic rights of future generations is an argument against making irreversible decisions. It is not strong enough though to give it the special status we need to support our intuition. However: When the irreversible change is problematic also in some other way, the irreversibility greatly enhances the severity, and it seems very reasonable to assume that it can push it over the threshold for what is unacceptable. This goes especially when a “game over” situation is among the suspected outcomes.

This will provide a strong justification for the precautionary principle: When we suspect that an act may lead to a severe effect that would also be irreversible, we need strong evidence against this suspicion before accepting the act as an acceptable choice.

Furthermore, some irreversible changes are such that they are not even allowed to happen once – so called “game over” situations. The burden of proof on someone who proposes what might have such an effect has to be extra strong.

Since both severity and suspicion come in degrees, the evidence we need against the suspicion should also come in degrees depending on how strong our suspicion is and on the severity of the problem.²⁴¹

3.3.3. The value of human health

It is sometimes claimed that human health and the environment tend to be downplayed in traditional decision procedures.²⁴² It is also explicitly stated in many formulations of, and discussions around, the precautionary principle that it should come into play in situations where there is a threat against human health or the environment.²⁴³

This indicates that one of the intuitions behind the principle is that human health and the environment need to be better protected than has been the case in traditional decision procedures.

If this is correct, it means that the precautionary principle indicates a change of value. Not, like in 3.3.1, a change in how we weigh positive and negative value, but a change in what we find most important.

²⁴¹ Gee 2006 and Grandjean 2004 p.208 reason along the same lines even though they do not discuss irreversibility in particular but severity in general.

²⁴² Turner & Hartzell 2004 p.453, Lin 2001 p.129, Wingspread Conference 1998

²⁴³ Gollier & Treich 2003 p.81, passim, Sandin 1999 p.889,892, Sandin 2004:1 p.1, Turner & Hartzell 2004 p.449, Wandall 2004 p.270

That human health should be highly valued from an anthropocentric vantage point seems obvious, but it is not obvious how it should be valued in relation to economic value. Especially since economic value can be transformed into human health (by using economic growth to improve health care), and the other way around. There are also attempts to conflate the two by measuring human health in monetary terms. Maybe the solution is to be found at least in part in the way the latter is done. It may be a general intuition that when economists and decision makers make comparisons between human health and other human values (whether these comparisons are expressed in monetary terms or not), health is assigned a value that is too low. It seems that the value people place on human life and human health is ascending. If this is correct, shifting the burden of proof could be one way of accounting for the change in the decision procedure.

The question that immediately arises is whether this change in value cannot be dealt with simply by assigning a higher value to human health in an ordinary cost/benefit-analysis. The answer is that the problem goes deeper than that. The entire decision procedure seems to be biased to the disadvantage of values like human health.

Traditionally, the burden of proof has been placed on those who want to decide against the use of a substance or a process that is – or has a good chance of being – economically profitable. It seems to be consciously or unconsciously assumed that economic gain is the default reason for acting or not acting in a certain way and that very good reasons are needed for those who want to change or abolish a money generating practice.²⁴⁴ A particular way of valuing outcomes is in other words built into the process. One important intuition behind the precautionary principle seems to be that this needs to be changed. It is very common to interpret the precautionary principle as consisting of, or at least implying, a change of the burden of proof.²⁴⁵ As we have seen, changing the burden of proof may be one way of dealing with the intuition that irreversibility has a tendency to worsen bad outcomes. Where we place the burden of proof also seems to be the result of how we prioritise between the alternatives we are deliberating about. The precautionary principle may thus be justified by the intuition that when human health is at stake, that should be the default value instead of economic profit. That also means that we can interpret the principle as telling us that someone who wants to make a decision that may be detrimental to human health should be

²⁴⁴ Herremoës et al 2001 p.180, McGarvin 2001 p.25

²⁴⁵ See e.g. Grandjean et al 2004 p.282, Kuntz-Duriseti 2004 p.291, Lin 2001 p.131, McGarvin 2001 p.23 note 3, Munthe 1997, Turner & Hartzell 2004 p.453, Wandall 2004 p.270, Wingspread Conference 1998. See also the section on irreversibility above.

assigned a burden of proof at least as heavy as those who want to ban or regulate an act that is potentially profitable.

3.3.4. The cost of being late

We have seen that traditionally it has been necessary to present strong evidence for a ban or even regulation of a useful or economically profitable substance or process. Gathering the necessary evidence may take some time and much can happen during this time.²⁴⁶ In recent history, both people and the environment have often suffered (and in many cases still suffers) unnecessary harm because the decision makers have waited for more conclusive evidence before dealing with the problem. The ozone depleting CFC is one example. If we had not waited so long for conclusive proof that CFC destroys the ozone layer, we could have banned it earlier and avoided some of its long-term effects.²⁴⁷ Benzene, asbestos, and lead additives in petrol are some other well-known examples,²⁴⁸ and there are probably many more.²⁴⁹

The time factor is especially important when dealing with complex things like ecosystems or the human body. The effects often do not show until the substance or process has been in use for a while (for instance because of the threshold effects we discussed earlier).²⁵⁰ This means we will in general not have conclusive evidence that a substance is dangerous until it is already in the system – maybe in large quantities – and we may have to live with the problem for a long time. When we deal with non-linear relations, it is also very difficult to establish a clear cause-effect relationship, and we may have to wait even longer than normal for conclusive evidence.

Therefore, taking action before we have conclusive evidence is in fact something that in certain cases is *required* by anthropocentric instrumentalism (as it would be by any moral theory).

²⁴⁶ Gee 2006, Herremoës et al 2001 passim, McGarvin 2001 p.20, Sandin 1999 p.906 note 10

²⁴⁷ Gee 2006

²⁴⁸ Beltrán 2001 p.3, Gee 2006, Gee & Greenberg 2001 p.59, Grandjean et al 2004 p.283, Infante 2001 pp.41f

²⁴⁹ For more examples, see Grandjean et al 2004 pp.282f, Herremoës et al 2001 p.173,176, Ibarreta & Swan 2001 p.86, Koppe & Keys 2001 pp.64f,71, Lambert 2001 pp.32,34

²⁵⁰ Farman 2001 pp.76f, Gee & Greenberg 2001 p.55, Gollier & Treich 2003 p.79, Ibarreta & Swan 2001 p.87, von Keauss & Herremoës p.117

The title as well as the content of the EEA report on the precautionary principle *Late lessons from early warnings*, states very clearly that the editors consider the cost of time loss as a very important motivation for the precautionary principle.²⁵¹ The idea that we under certain circumstances should not wait for conclusive evidence before taking action is as we saw in the beginning of this chapter, very central in all formulations of the precautionary principle.

I believe the problems connected with time loss is probably an important justification for the precautionary principle – maybe the most important of all. All “real world” decision-makers worthy of the epithet – from stock traders to military commanders – know that even though it is important to have accurate information, it is at least as important to act in time.

Maybe the tendency to give an unreasonably high priority to accurateness over acting in time, has been uncritically adopted from the realm of science and philosophy? In our “world”, the search for knowledge and understanding is the ultimate goal. In society in general, there are many other goals and the relative cost of losing time in relation to being wrong is sometimes much higher. Decision makers in society need information, and the best way of getting reliable information is to turn to those who have the formation of knowledge and understanding as their ultimate goal. However, since the goal of the decision makers is not precisely the same as the goal of those who provide them with information, we need a transformation rule. I believe it is very important that this is not done by changing *the rules or the aims of science*. Instead, we need an adaptor between the two realms – the realm of science and the realm of practical decision-making. It seems that the precautionary principle could be such an adaptor. The traditional formulations of the precautionary principle like the Rio formulation and the Wingspread formulation are not sufficiently clear. They talk about the importance of not waiting for conclusive evidence before taking measures, and they mention the importance of considering the value of what we might lose if we do not. That it is important to consider the values at stake can however just as well be an argument for taking the extra time needed to make sure that an intervention does not worsen the situation. In order to get to the conclusion they promote, we need an additional argument stressing the importance of timing when it comes to securing the values in question. As we have seen in this sub-section, timing is important and has shown to be important in many situations, which means that this premise is very well underpinned. Earlier in this section, we have seen

²⁵¹ Herremoës et al 2001 p.1

that the value aspect must be decisive when we make decisions under uncertainty, and that the decision procedures must be adapted to account for that.

I conclude that when timing is essential we have to move further towards the “being-in-time” end of the “being-in-time/being-right” scale. The stronger the suspicion that timing is essential and the more essential we suspect it to be, the closer ought we to be to the “being-in-time” end.

The opposite is also true. The stronger the suspicion that correct information is essential and the more essential we suspect it to be, the closer ought we to be the “being-right” end of the scale. Where the cut off point lies, i.e. when it is – to put it crudely – time to “stop thinking and start acting”, will then have to be decided in each particular case based on the relative importance of these two factors for the value at stake.

Since there have been quite a few cases where a lot of damage has been caused because regulators have waited too long before taking action, extra attention probably has to be given to the timing aspect for pure pedagogic reasons – in order to increase the awareness that timing does play an important role.

3.3.5. False positives versus false negatives

Scientists do not like to be wrong. In the scientific world, being wrong is in general worse than not being right. This does not only mean that scientists prefer to postpone their judgement until they have more evidence. It also means that they are biased to err in favour of false negatives over false positives. It is worse for a scientist’s career to be exposed as having claimed something that turns out not to be the case (a false positive), than to be exposed as having denied something that turns out to be the case (a false negative).²⁵²

Birgitte Wandall calls the bias towards false negatives the “conservative burden of proof”, since it confers the burden of proof on those who make a positive claim.²⁵³ She also points out that the reason for this tendency is probably that one of the main values guiding science is to keep the scientific corpus (the body of statements accepted by science) as free

²⁵² Gee 2006, Gee & Greenberg 2001 p.60, Grandjean 2004 p.217,384, Herremoës et al 2001 p.184, Mattsson 2005 p.9, Wandall 2004 p.267 note 6

²⁵³ Wandall 2004 pp.267,269, Wandall 2005

as possible from false statements.²⁵⁴ This is the scientific community's own version of "erring on the side of caution", and it is doubtlessly a good reason to trust science: If something is claimed by the scientific society to be true, it probably is true. This also means however that if the scientific community does not want to exclaim something as true, it does not necessarily mean that it is false. To believe that it is, seems to be an all too common mistake that in some situations can cause a good deal of harm.²⁵⁵ It is after all not obvious that the goal of avoiding false positives is always a superordinate goal in society at large. In many cases where other values are at stake (values – like human health – that may not be basic epistemic values but are important in anthropocentric instrumentalism as well as other moral theories), false negatives can have at least as severe effects as false positives. The effects of *not* regulating or banning something that is dangerous can be at least as bad from a moral point of view as the effects of regulating or banning something that is harmless. If we accept the intuition from section 3.3.3 that human health needs to be assigned a higher value than has traditionally been the case, it is probably in many cases more important to avoid false negatives than to avoid false positives.²⁵⁶ We therefore have a case that is parallel to the intuition discussed above regarding the value of acting in time. The conclusion must also be the same: We need a decision rule that can compensate for the difference in goals between science and practical decision making,²⁵⁷ and the precautionary principle seems to be precisely cut out for that job. The cost of false negatives for a host of human values, including human health, seems just like the cost of time loss to be a strong argument in favour of the precautionary principle: Just as it is sometimes more important to act in time than being exactly right, it is sometimes more important to avoid false negatives than to avoid false positives – depending on the values at stake.

It is therefore reasonable to handle this intuition in a similar way: When we make decisions in matters where some important value is at stake (e.g. human health), and when we suspect that a certain decision may result in serious damage to this value, *and* when we suspect that a false negative is a more substantial threat to the protection or promotion of this value than a false positive, then we should move our priorities from being biased towards avoiding false positives in the direction of avoiding false negatives.

²⁵⁴ Wandall 2004 pp.267,269

²⁵⁵ Gee 2006

²⁵⁶ Mattsson 2005 p.9, Wandall 2004 pp.269f, Wandall 2005

²⁵⁷ For a discussion on the goals of science, see Wandall 2004 p.267

It is important to see that it is not a matter of going from a system that is totally immune to false positives to one that is totally immune against false negatives. A system immune to false positives would not produce any statements about the world at all (only analytical statements would pass the test), while a system that is immune to false negatives would not be able to exclude anything other than pure contradictions. Everything would be considered as possible, and no possibility could ever be excluded from our considerations.

Changing priorities from being right in the direction of acting in time can be done simply by taking action sooner instead of waiting for more reliable information, but how do we in practice move our priorities from avoiding false positives to avoiding false negatives?

One way would be to transfer the burden of proof from those who claim that the practice or substance is dangerous to those who claim that it is safe in relation to the values in question. Instead of asking, “is this dangerous?”, we ask “is this safe?”. This is the solution Wandall suggests based on her categorisation of the scientific urge to avoid false positives as a “conservative burden of proof”.²⁵⁸

The idea of shifting the burden of proof can be interpreted as an “either/or-solution”. Either we place the burden of proof on one side, or we place it on the other. I think it would be more fruitful to go for a successive solution – as in the previous three subsections. Just as something can be more or less valuable, a threat can be more or less severe, and timing can be more or less important, avoiding false negatives can be more or less important. What we need is a method that allows us to change focus in proportion to the importance of avoiding false negatives relative to the importance of avoiding false positives. We need to be able to increase or decrease the burden of proof successively on the different sides. This could be dealt with for instance by moving the confidence level. The scientist can supply the decision makers with a set of answers based on different confidence levels. This would allow them to choose a confidence level that fits the distribution of the burden of proof that is appropriate given the importance of avoiding false negatives in relation to false positives. At the same time, the scientific community can choose to include only the answers based on the most conservative confidence level in the scientific corpus. It would also make the procedure more transparent and reduce the power scientists have over deciding the relative importance of avoiding false positives versus avoiding false negatives – on behalf of the entire society.

A weakness in this suggestion is that people lacking insight in how science works and what it is about, could point at the discrepancy in confidence level between the assertion

²⁵⁸ Wandall 2004 p.270

incorporated in the scientific corpus and the assertion on which policy/legislation is based, and claim that the latter is not based on sound science or at least does not fulfil the most rigorous scientific demands. It is my humble hope, however, that it is possible to explain the process to these people, and especially to point out both the distinction between the scientific method and the choice of confidence level, and the difference in goals between science and society, which is keeping the scientific corpus clean on the one hand and protecting/promoting a host of other important values on the other. It would thus hopefully be possible for the public to understand that making decisions based on a confidence level that is less biased in favour of avoiding false positives is not the same as making decisions based on a less scientific method. Instead, it is a matter of making the scientific results more useful in relation to the different but just as legitimate goals of society in general.

3.3.6. Conclusions

One important result from this section is that the precautionary principle seems to be acceptable, and probably required, from the point of view of moral anthropocentrism. Furthermore, the precautionary principle is based on a number of different intuitions. What we call the precautionary principle is therefore a conglomerate of several principles that has precaution as a common denominator.²⁵⁹

The precautionary principle should be used in order to deal with things that traditional decision procedures are unable to deal with, such as the scientific bias towards false negatives, loss of precious time, severe harms – especially irreversible ones – and certain important values like human health, that are systematically downplayed by the traditional decision methods.

Much more needs to be said in order to find out how exactly to apply the precautionary principle. For instance, we have to specify the degree of suspicion needed in order to ban a useful substance with reference to the principle. We also need to specify what kinds of harm that justifies such acts.

Based on what we have seen in this section we can make some conclusions however:

²⁵⁹ I will for simplicity go on using the term ‘the precautionary principle’.

* When we suspect that a process might result in unacceptable harm, we need extra strong evidence against this suspicion.

* The stronger the suspicion and the more unacceptable the harm, the stronger evidence we need in order to accept the process in question.

* When we suspect that a process may result in a severe and irreversible change, we need extra strong evidence against this suspicion in order to accept the process as a viable option.

* This goes especially when the change may result in a “game over” situation.

* Those who want to carry out a decision that is suspected to be detrimental to human health should be assigned a burden of proof that is at least as heavy as those who want to ban or regulate an act that is potentially profitable.

* When we suspect that timing is important in order to protect or promote an important value, we need to move towards the “being-in-time” end on the “being-in-time/being-right” scale.

* The more important we suspect the timing to be and the stronger our suspicion, the closer to the “being-in-time” end do we have to move.

* We also need to be able to successively change the burden of proof between positive and negative claims in proportion to the importance of avoiding false negatives relative to the importance of avoiding false positives (e.g. by adjusting the confidence level).

3.4. Problems with the precautionary principle

There are some frequently occurring objections to the precautionary principle.²⁶⁰ It has been described as being ill-defined, un-scientific or even anti-science, hindering progress, increasing the total risk instead of decreasing it, and trying to substitute science-based decision-making by value-based or ideology-based decision-making. In order to come to a reliable conclusion of whether the precautionary principle really is in accordance with the basic intuitions of anthropocentric instrumentalism, we have to take a closer look at these objections. I will start the question of whether the precautionary principle is too poorly defined to be of any use.

3.4.1. *Is the precautionary principle ill-defined?*

Many observers have pointed out that the meaning of the principle is unclear.²⁶¹ Some authors believe that this is an inherent trait in the principle,²⁶² while others are confident that it is possible to come to terms with the obscurities.²⁶³

In the previous section, we too noticed that much work needs to be done in order to clarify the precautionary principle. On the other hand, we did manage to identify some basic intuitions behind the principle. Based on these intuitions in turn we also managed to sketch out some ideas of how the precautionary principle should be interpreted and implemented.

The fact that there is more than one intuition behind the principle, and that the intuitions need to be accounted for in different ways, shows that what we call *the* precautionary principle is better thought of as several principles brought together under one heading. This may remove some of the confusion.

Are the remaining obscurities a terminal defect in the principle? I do not believe it is. First of all, it seems clear that much more can be done in terms of clarification than we have done here. What is even more important is that the obscurities of the precautionary principle are not more serious than in most ethical norms. Even if ethical norms present us with difficulties when it comes to interpretation and implementation, it would not be advisable to stop using them.

We also have to be aware that to compare the precautionary principle to the more simplified traditional decision methods *only* in terms of clarity would not be fair. The precautionary principle is invented in order to handle situations where the simpler solutions do not work. It is therefore only to be expected (though it is not a necessary truth) that it is more difficult to formulate in a clear and simple manner. To the extent that the traditional decision methods are clearer and simpler than the precautionary principle, it is so to a large degree *because* they ignore the intuitions that the precautionary principle accounts for.

In the good tradition of Ockham's razor, simplicity makes a solution better than the alternatives *only if* the solution in question is also as good as, and as comprehensive as, the alternatives. A cost/benefit-analysis is not satisfying in those situations the precautionary principle is cut out to deal with, which means that its simplicity will be of no help.

²⁶⁰ Sandin et al 2002 pp.287f, Sandin 2004:3 p.8

²⁶¹ Gollier & Treich 2003 p.99, Munthe 1997, Sandin 1999 p.894, Sandin et al 2002 p.289, Turner & Hartzell 2004 *passim*

²⁶² see e.g. Turner & Hartzell 2004 p.451

²⁶³ See e.g. Sandin et al 2002 p.289

Our conclusion is that the precautionary principle *is* ill-defined and needs much improvement, *but* the problem does not seem to be fatal, *and* can probably be improved quite a lot. The precautionary principle is also better than the simpler alternatives when it comes to accounting for many basic moral intuitions – in spite of its obscurities.

3.4.2. Is the precautionary principle anti-science?

The precautionary principle has been criticised for being unscientific and of marginalising the roll of science.²⁶⁴ It has even been accused of being “anti-science”.²⁶⁵

The Precautionary Principle tells us not to wait for incontestable scientific proof of the dangerousness of a process before we take action against it. This clearly looks like the principle urges us to pay less attention to science – at least when we are short of time. Is not this an unscientific – not to say anti-scientific – way of making decisions compared to the more traditional method of scientifically analysing the risks and putting the probabilities into a cost/benefit-analysis? Not necessarily. The latter method works best when we have virtually the knowledge we need.²⁶⁶ The question we have to answer is what to do when we do *not* have the information we need.

As we saw in section 3.2, there are different strategies for dealing with insufficient knowledge. Two of the strategies involve that we do not intervene until we know more. This may well be the most prudent choice in some situations of imperfect knowledge, for instance if we are in an acceptable situation and suspect that any change can cause serious damage if it is not properly thought through. However, not all situations are like that. As we saw before, it is not uncommon that quite severe problems have been allowed to go on and in some cases to become even worse because we have waited for better evidence. In situations like that, the strategy of waiting for better knowledge does not seem like a good idea.

An alternative strategy presented in section 3.2 was to act from the best available information and hope it is correct. We saw then however that there are serious drawbacks in the form of risks that we do not do anything to protect us from.

²⁶⁴ Sandin et al 2002 p.295

²⁶⁵ Grandjean 2004 pp.209,214

²⁶⁶ Grandjean 2004 p.203

The fourth alternative was to use the precautionary principle. The way we have interpreted the principle, it tells us to be aware that sometimes being too late is at least as problematic as being wrong, and therefore we need to adjust our decisions along the “being-right/being-in-time” scale. The adjusting should be made according to how important it is to be in time relative to how important it is to be right in relation to the values at stake, in the situation we are dealing with.

This is obviously not an easy judgement to make, but it is none the less routinely done by various decision makers. It is quite obvious that this kind of judgement cannot always be correct. However, if we abstain from making a decision and assume that being right is the only important thing, then we have deliberately excluded an indisputably important dimension of the decision, and it is hard to see how that could be an improvement.

What is important as well is that the precautionary principle does not belittle the importance of being right. It claims that it is sometimes even more important to be in time. It is so to speak better to be approximately right and in time than being absolutely right but too late.²⁶⁷

It is also important to note that the precautionary principle does not tell us to stop searching for a better understanding.²⁶⁸ An important implication of the concept of precaution is that decisions should be reviewed periodically in the light of new scientific findings.²⁶⁹ This may even lead to more – not less – research being done.²⁷⁰ It could therefore be argued that in this respect, the precautionary principle is promoting science rather than opposing it. Without the precautionary principle, we have the opposite situation: As long as we lack sufficient knowledge things go on as usual. This gives an advantage to those who do *not* produce sufficient data to make a risk analysis,²⁷¹ which in turn seems to be a tempting incentive to block scientific progress. More research might find out that what we are doing is dangerous. As long as we do not know, we can go on as usual. This is especially tempting in the frequently occurring cases where those who benefit from the practice are not the same as those who run the risks if the practice turns out to be dangerous.

The precautionary principle does not stand in the way of science but advises us on what to do about a problem *while we wait* for the new information and the better

²⁶⁷ Grandjean 2004 p.211

²⁶⁸ In fact in the EU interpretation it is explicitly stated that “scientific research shall be continued”. See Grandjean 2004 p.206

²⁶⁹ Grandjean 2004 pp.210,214, Lin 2001 p.131, Sandin 2004:1 p.10

²⁷⁰ Grandjean 2004 pp.210,214

²⁷¹ Grandjean 2004 p.208

understanding. There must reasonably be a policy for that – apart from the policy about improving knowledge. The time we have to wait for better knowledge is sometimes quite long, and what happens during that time may have rather far reaching consequences. I cannot see that it is more rational to have decision makers sitting down in inertia than to have them act in the most rational manner possible during the time it takes the scientists to form a better understanding of the situation. If we see someone drowning and wait until we are absolutely sure that she will in fact drown if we do not help her, then we will probably not get there in time to save her. If our criteria are really strict, we may not even be convinced until we have seen her drown – and then it is definitely too late. I believe that in good decision-making we always have to weigh the advantages of high certainty of the decision against the advantages of acting fast. True, acting on incomplete knowledge can worsen the situation, but so can inertia as we have seen. Therefore, we return to the question: Which aspect – the being-right aspect or the being-in-time aspect – is the most important one in the situation given the values at stake? The precautionary principle lets the being-in-time aspect enter the procedure without excluding the being-right aspect.

It could be argued that just by letting in the “being-in-time” aspect we do in fact marginalise science by allowing for the possibility of moving our priorities at least to some extent away from the “being-right” aspect. It is also quite reasonable to believe that the quality of the decision *will* decrease if we base it on less scientific evidence.²⁷² It can therefore not be denied that the precautionary principle to some extent diminishes the role of science *and* that this is bad. We have to remember however that *not* using the precautionary principle diminishes the time aspect *and* that this is bad. We are therefore back to the conclusion in 3.3.4: Both being-right, and being-in-time is instrumentally valuable.

Sandin et al also point out that the term ‘unscientific’ can be interpreted in a weak way and in a strong way. A decision is according to this distinction unscientific in the weak way if it does not build on scientific evidence, while it is unscientific in the strong sense if it disregards scientific evidence. Since the precautionary principle tells us what to do in situations where there is insufficient scientific evidence to build on or disregard, it is unscientific in the weak sense of the word, but not in the strong sense.²⁷³

We should also point out that not using the precautionary principle and doing nothing until we are totally sure, would in fact also be unscientific in the weak sense. It tells us to

²⁷² Sandin et al 2002 p.295

²⁷³ Sandin et al 2002 pp.295f

make a certain decision (in this case to wait) that is not based on science (remember that the reason for the suggested inertia is that we lack scientific evidence).

3.4.3. Values instead of science

The precautionary principle is sometimes seen as an attempt to substitute science with values, which is considered as a strong objection against the principle.²⁷⁴

I think it is quite clear that the precautionary principle contains value statements and that much of the motives behind the principle is a matter of values (see section 3.3). However, the precautionary principle is not supposed to be a description of the world, but a decision method. All decisions are valuations. If we have no values, we cannot make any decision. To say that we should do A rather than not-A is to say that A is *better* than not-A. I.e. we have made a value judgement. Any alternative decision procedure must also be based on values, and as a matter of fact, the existing alternative decision procedures – like risk analysis – are based on values as well.²⁷⁵

One important motivation behind the precautionary principle is to promote certain values like human health, but – again – decision procedures that do not tell us to be particularly careful when human health or other important values are at stake are equally evaluative. In section 3.3.3 we saw that the traditional decision methods are biased in favour of economic profit. We may also remember that the criteria for what statements to incorporate in the scientific corpus are in fact based on values (so called epistemic values).²⁷⁶ In section 3.3.5 we saw an example, in the form of the evaluation that false positives are worse than false negatives. The scientific community even evaluates how much worse a false positive is when they chose a certain confidence level. I believe that one of the major virtues of the precautionary principle is that it brings out the evaluative aspect into the open and makes it a subject of discussion and deliberation.

To base decisions on sound science is excellent and should always be strived for, and there is nothing in the precautionary principle that tells not to use the best available scientific evidence, or to look for better scientific evidence. To hide evaluative considerations behind a

²⁷⁴ Sandin et al 2002 pp.287f,294

²⁷⁵ Grandjean 2004 p.209, Sandin et al 2002 p.294

²⁷⁶ Wandall 2004 p.267

veil of quasi objectivity on the other hand is not an acceptable way of making decisions, *and* it does not make the decision more scientific. It only makes it look that way and is thus just less honest. It has been, and still is, very easy to brand decision criteria and decision methods that favour the environment or human health as being evaluative while promoting economic profit is seen as the default value or even as no value at all. This is a way of making decisions that is worrying, and if the precautionary principle can contribute to bringing the hidden values out in the open, it must reasonable be an argument in favour of the principle – not against it.

The precautionary principle is thus not a matter of substituting science with values but of substituting values with values – and of making the values more clearly visible.

There is still one aspect of the precautionary principle that may be interpreted as substituting science with values. We have seen that when important values are at stake and the uncertainty is large, we should be extra careful not to jeopardise the values. This can be interpreted as saying that if the uncertainty regarding the probability part of a risk assessment is large, then we should give less weight to the probability part of the equation, and more to the value of the possible outcome.

Strictly speaking, this is not a matter of substituting science with values since the precautionary principle does not tell us to stop looking for better predictions – or to disregard the evidence we do have. What it tells us to do is to distrust uncertain results (which seems like a sound scientific approach), and to adjust our decision method in light of the uncertainties in the predictions. Uncertainties concerning a scientific result must be a part of the scientific result and therefore accounted for by the researcher *and* used in the decision procedure. If the uncertainty is such that an error in one direction would be worse than an error in the other direction in relation to the values we want to promote or protect, it would no doubt be irrational not to account for that in the decision.

3.4.4. *Favouring the status quo*

It is often claimed that the precautionary principle demands an unreasonably high degree of certainty from new methods and technologies, and therefore is biased in favour of the status quo and against progress and innovation.²⁷⁷ It is even claimed that if the precautionary principle were consistently applied, it would in effect lead to a halt for all innovation.²⁷⁸

One part of the explanation as to why many people have made this interpretation might be that they associate ‘precaution’ with ‘caution’ and ‘caution’ with ‘inertia’.²⁷⁹ The precautionary principle has probably also been used in that way by political decision makers. I do not believe that this is the proper way of using the principle however. In fact, none of the classical formulations even indicate such an interpretation. For instance, the Rio formulation explicitly urges us to “take measures”. That is difficult to interpret as favouring inertia.

What might make the precautionary principle biased towards the status quo would be if it told us to take precautionary measures only when it comes to new ideas, or demanded a higher degree of security for new ideas.²⁸⁰ Nothing in the classical formulations – or in my conclusions – points in that direction however.²⁸¹

Consider the intuitions we discussed in the previous section. Only the first of the investigated intuitions seems to indicate a bias towards status quo. If the main motivation behind the principle were the intuition that avoiding the negative is more important than promoting the positive, it would probably – depending on how we interpret the idea (see section 3.3.1) – make sense to be more cautious against new ideas than against old ones.²⁸² However, as Munthe points out, it would not *always* make sense, since we may, by a new invention or idea, in some cases stop a change for the worse that is on its way. This means that even the intuition that the negative carries larger weight than the positive can in some cases favour innovation (depending on how the intuition should be interpreted). However, in

²⁷⁷ Cuccio 2005, Miller et al 2001

²⁷⁸ Gollier & Treich 2003 p.98, Grandjean 2004 p.208

²⁷⁹ Donna Maher (Maher 1999-2000) clearly points out the difference between ‘caution’ and ‘inertia’. It is probably also important to distinguish between ‘caution’ and ‘precaution’ since a shift between these two terms seems to be quite common in the debate concerning the precautionary principle.

²⁸⁰ Lin 2001 p.129

²⁸¹ Even if the precautionary principle has often been applied in a way that favours the status quo, we can at least see a tendency in the other direction in the new EU-regulation of chemical substances (REACH). One of the most important principles in REACH is that not only new chemicals but also chemicals already in use are to be tested.

most cases a precautionary principle based on the intuition that it is more important to avoid the negative than to promote the positive, would be biased towards the status quo.²⁸³

The intuition that it is more important to avoid the negative than to promote the positive is very controversial however, and it suffers from problems concerning both how it should be understood, and how it should be justified. I therefore choose not to use that intuition in my conclusions of how the principle should be interpreted and applied. I can imagine though that those who embrace that intuition might end up in an interpretation of the principle that favours the status quo.

This emphasises the conclusion that the general – undifferentiated –precautionary principle we meet in the classical formulations and in the general debate, seems to be motivated by various intuitions yielding different conclusions. It also shows again why an investigation of the intuitions behind the principle is important and why it is important to distinguish between the different “sub-principles” that follow from the different intuitions.

Another reason why the precautionary principle has been seen as a threat to progress and innovation might be found in the way we define ‘progress’ or ‘innovation’. There is a considerable difference between stopping progress or innovation, and redirecting it.²⁸⁴ The precautionary principle will probably stop some innovations that are deemed less safe. On the other hand, it ought also to give a competitive advantage to those who develop safer alternatives, and thereby in fact encourage some types of innovation.²⁸⁵

People who profit from a particular development probably tend to see it as a progress even if other people suffer from it or would gain much more if the development took another direction.

This reminds us of the problem that decisions are often based on an egocentric definition of ‘profit’ and ‘loss’. The definitions of ‘progress’ and ‘innovation’ may suffer from the same problem.²⁸⁶ If so, it may be that at least some of the worries regarding the precautionary principle are due to some people’s worries that technology will develop in a direction that is less profitable from their own perspective and not from the general anthropocentric perspective that we are investigating here.

²⁸² Munthe 1997

²⁸³ Munthe 1997

²⁸⁴ Herremoës et al 2001 p.182

²⁸⁵ Herremoës et al 2001 p.182

²⁸⁶ I.e. ‘problem’ from a general anthropocentric basis as we use in this investigation. From an egocentric view point, it would not be a problem.

3.4.5. Ignoring other risks

One argument that has been launched against the precautionary principle is that it neglects the fact that by focusing too much on one risk we may increase another risk or even the total sum of risks.²⁸⁷ It may e.g. urge us to spend so much money on avoiding one risk that we do not have enough money left to deal with other – maybe even larger – risks.²⁸⁸ It might also be that putting too much effort into avoiding a certain risk means that we will have to abstain from doing other more valuable things. I.e. we risk losing opportunity value.²⁸⁹ It might even be that by banning one particular substance or process we will end up in a situation that is actually worse.²⁹⁰ If for precautionary reasons we stop using a certain pesticide, it may increase the risk for crop failure and as a result cause famine.²⁹¹ If we say no to a certain genetically modified crop, it might lead to a continued use of pesticides and fertilisers that we could have avoided by genetic modification,²⁹² and if we abstain from using a certain chemical because of its neurotoxicity the result may be that we instead use another chemical that is carcinogenic.²⁹³

Sandin's way of dealing with this problem is simply to be very clear that the precautionary principle is precautionary in relation to a particular risk.²⁹⁴ By being clear about this, we avoid a situation where people are misled to think that we have attacked all potential risks while we in fact have discussed one particular potential risk.

Sandin's suggestion would make the shortcomings of the principle clearer and therefore the principle more honest, but it does not – as Sandin admits²⁹⁵ – help us get rid of the shortcomings. If the precautionary principle persistently tends to increase the total risk, it does not help to point out that it is not meant to deal with the total risk. The principle will still be worthless and should not be used. What we would rather need is a formulation of the principle that acknowledges and handles the fact that some ways of dealing with some risks may increase other risks. That does not seem like an impossible task. What we have to do is to formulate the principle in such a way that it is applicable to the *whole* situation.

²⁸⁷ Grandjean et al 2004 p.383, Sandin 2004:1 pp.3f, Sandin 2004:3 pp.8f

²⁸⁸ Sandin 1999 p.894, Sandin et al 2002 p.293

²⁸⁹ Herremoës et al p.175, 194, Kuntz-Duriseti 2004 p.291, Munthe 1997, Sandin 1999 p.894, Turner & Hartzell 2004 p.454

²⁹⁰ Kuntz-Duriseti 2004 p.291

²⁹¹ Sandin et al 2002 p.293

²⁹² Munthe 1997

²⁹³ Sandin et al 2002 p.293

²⁹⁴ Sandin 2004:1 pp.7f, Sandin 2004:3 p.9

²⁹⁵ Sandin 2004:3 p.9

I therefore prefer Sandin's et al earlier analysis in which they point out that if we stress one risk too strongly and therefore neglect another risk, we have a too narrow horizon. They also point out that this is not just a problem for the precautionary principle. It is in fact something that has to be dealt with by all decision principles.²⁹⁶ We have the same problem if we base our decisions on the strategy "always try to maximise utility": If we concentrate too much on maximising utility in one situation, we may fail to maximise utility in total.²⁹⁷ This is not an argument against trying to maximize utility however. It is only an argument against being too narrow in our considerations. The solution in this case is to include as many factors as we can in the decision.

We can reason in the same way regarding the precautionary principle, with the exception that finding a useful solution is a little more complicated. The precautionary principle is intended to be used in situations where we have incomplete information about the risks involved. This in turn makes it difficult to include more factors in the decision. There are other factors that can be included however, and that would help to make a more rational decision regarding the total risk. If we look at the interpretations in 3.3, the precautionary principle tells us to consider things like the values at stake, the importance of being in time, the degree of suspicion, etc. All these considerations can be applied to the whole situation. We can compare the values at stake and we can compare the importance of being in time for different values, etc. It makes the decision more complicated, but not more unfeasible than a traditional utilitarian calculation.

Consider the example of genetic modification versus pesticides and fertilisers: If we say no to a certain genetically modified crop, it might lead to a continued use of pesticides and fertilisers that we could have avoided by genetic modification. If we apply the precautionary principle to the situation as a whole, we would have to compare the risks we run in the different situations. Say, that we know approximately what risks we run by continuing the use of pesticides and fertilisers, but that we only have some unconfirmed suspicions about the risks we would run as a result of genetic modification. If we do not apply the precautionary principle the solution is simple: We do not know for certain that there are any risks involved in genetic modification, so we have no reason to avoid it.

What, then, if we apply the precautionary principle? The principle does *not* tell us *always* to avoid the uncertain risk and run for the known risk. At least that does not follow from the conclusions in this work, and I have found nothing in the classical formulations

²⁹⁶ This is also pointed out by Östberg 1993 p.27

pointing in that direction. Neither should we just wait and see while continuing with “business as usual”, or be satisfied with just making our decisions based on the present state of knowledge regarding the probabilities. Instead, the principle exhorts us to make a decision involving all relevant factors that were identified in section 3.3. We have to look at the values involved, and at how the different values can be threatened by the use of pesticides and fertilisers, and by genetic modification respectively. We would also have to factor in the uncertainties regarding our suspicion against genetic modification. We would of course have to look at the expected benefits of the different approaches – and at the uncertainties regarding our expectations of the benefits. We would have to consider whether any of the potential harms would be irreversible, and we would have to consider whether time is particularly important somewhere in the process, etc. All these considerations would need a lot of research and deliberation, and it would certainly not be possible to be correct all the time. It still seems like a more rational alternative though compared to disregarding these aspects and *only* look at how well identified the risks for the respective alternatives are.

In the previous sub-section as well as in the sub-section on irreversibility, we pointed out that an important aspect of precaution is that we have to be prepared to re-evaluate our decision in the light of better knowledge. This is also relevant in relation to the present problem.²⁹⁸ If we chose an attitude of precaution, we should be able to re-evaluate and if necessary reverse the decision if better knowledge shows that it has increased the total risk. This is not always feasible, which only shows – again – that irreversibility is an important aspect to consider when we make decisions that are potentially harmful. We should make sure that it is possible to change a decision in the light of better knowledge by avoiding irreversible effects – at least when we suspect that the irreversible effects can be unacceptably harmful, and the more severe and the stronger the suspicion, the more careful we should be in avoiding irreversible effects.

Let us finally take a look at the claim that the principle pays too much attention to potential harm and forgets the potential benefits.²⁹⁹ The principle has doubtlessly been used in that way in some cases, but it does not follow from my interpretation that it should be used that way. If we accept the intuition that it is more important to avoid negative events, it would be perfectly rational. Since we have chosen not to accept that intuition, there seem to

²⁹⁷ Sandin et al 2002 p.293

²⁹⁸ Wandall 2004 p.271

²⁹⁹ Herremoës et al p.175

be no reason why the principle should pay more attention to potential harm than to potential benefits.

One alternative – or complementing – explanation as to why the precautionary principle has been perceived as giving more weight to potential harm than to potential benefits might be found in what is considered a ‘harm’ and what is considered a ‘benefit’. We saw above (sub-section 3.3.3) that the value of the environment and human health has often been downplayed in traditional decision methods. The precautionary principle is often evoked in situations where the potential benefit from a decision is economic while the potential harm concerns human health or the environment. It may therefore look like harm gets more attention than benefit by the precautionary principle. Though what actually happens is that the values that have been notoriously subjected to harm get upgraded and better protected – not as a result of changing the way we weigh positive and negative effects, but as a result of how we value human health and the environment.

Herremoës et al also point out that claims to the effect that a process has certain benefits actually do need more attention. Not in the way of being assigned more weight, but by being subject of more thorough investigation.³⁰⁰ They argue that there should be a burden of proof placed on those who point out potential benefits and not just on those who point out the potential harms.

Such a demand seems reasonable and does not presuppose a shift in how we weigh positive and negative effects. On the contrary, if we put equal weight to positive and negative effects, it is very reasonable that the burden of proof should not fall on one side. Instead, claims of potential harm and claims of potential benefit should be subject of equally hard scrutinising. Since the burden of proof up to now has been almost exclusively placed on those who express worries regarding human health and the environment and since much of the harm that has resulted from different projects has fallen upon human health and the environment. A more equal distribution of the burden of proof necessarily means a larger weight on those pointing out economic benefits. That does not mean that the distribution was fair before and is now askew however. On the contrary, the precautionary principle used correctly corrects the prevalent distortions.

³⁰⁰ Herremoës et al p.175

3.4.6. Does the precautionary principle lure us into a paradox?

It has been argued that the precautionary principle demands that we forbid *everything*,³⁰¹ and that it leads to a paradox by demanding that we ban every action as well as every non-action.³⁰²

One of the basic features of the precautionary principle is that we take the burden of proof from those who want a ban and place it on those who do not want a ban. Instead of demanding proof that something is dangerous before forbidding it, we demand proof that it is safe before allowing it. However, abstaining from an act – any act – will also be risky, which means that we end up with a ban on both the performance the non-performance of all acts.³⁰³

Sandin considers this an argument against formulating the precautionary principle in global terms, and in favour of formulating it in terms of precaution against some particular potential harm.³⁰⁴ This will not help us though. Even if we concentrate on one particular harm, the decision we are considering will still carry some very small probability of bringing about this harm. Every act – and non-act – can by some weird chain of coincidences result in just about anything. For instance, we may follow Sandin's advice and use the precautionary principle only for some particular risk, say the possible extinction of mankind. Me putting on the right shoe first instead of the left may under some extreme circumstances by some weird coincidence lead to the actualisation of this risk. We would therefore have to prohibit me from putting on the right shoe first. In fact, we would also have to prohibit me from putting on the left shoe first – and from not putting on any shoe at all. Since all these alternatives have some minute probability of causing the extinction of mankind. We would thus be left in the dilemma we started with.

Maybe we can adapt Sandin's proposal to limiting the scope of the precautionary principle, not to one particular *outcome*, but to one particular *decision*. The decision can be in the form of performing a particular act or of not performing that act, but it cannot be applicable to both alternatives. We might then say that “prohibiting me from putting on the right shoe first or not putting on the shoes at all can have negative effects, but this does not

³⁰¹ Munthe 1997, Sandin et al 2002 pp.290f, Sandin 2004:1 pp.3f

³⁰² Munthe 1997, Sandin 2004:1 pp.1,3f

³⁰³ Sandin et al 2002 p.291, Sandin 2004:3 p.10. Turner & Hartzell 2004 pp.450f has compared this paradox to Pascal's wager.

³⁰⁴ Sandin 2004:3 p.10

have to concern us since we are only discussing precaution in relation to putting on the left shoe first”. This would, however, make the principle rather uninteresting.

Sandin et al do point towards an important fact: None of the authoritative formulations of the precautionary principle in fact require absolute proof of safety.³⁰⁵ This is important, since the opponents of the principle have to assume that it does. In order to end up in the situations described above, we must have an extreme epistemic threshold, at least when it comes to convincing us that something is safe. To assume that the degree of certainty we demand will lead to a ban of everything and ultimately end up in a paradox, therefore looks like a “straw man-argument”. The classical formulations of the principle do not assume such a high epistemic threshold, and neither do my interpretation from section 3.3. We must also remember that the precautionary principle is intended to come into play in situations where we have *some* indication that the act in question is a threat to some important value. Just as there must be a correlation between the importance of a value and the proof we demand that a process is not a threat to this value, we also need some correlation between these things and the strength of the indication that the process in question might be harmful.³⁰⁶

Sandin et al suggest that we apply a de minimis principle, i.e. a limit on how small probabilities that should count.³⁰⁷ The question is what would be a reasonable limit. My suggestion is that we use a flexible system in which the level is decided by the value at stake, the severity of the potential harm, and the degree of suspicion against the process we discuss.

3.4.7. How do we prove a negative?

Shifting the burden of proof is one of the main features of the precautionary principle. There is one seemingly important problem however. The problem is that we have an asymmetry in the very nature of “showing something to be the case”. It only takes one incident to show that a certain process can harm a particular value, while we can never be absolutely sure that a process is safe in relation to that particular value.

³⁰⁵ Sandin et al 2002 p.291

³⁰⁶ Herremoës et al (ed.) 2001 p.170, Sandin et al 2002 pp.290,291, and Turner & Hartzell 2004 p.456 bring up the question of correlation between degree of suspicion and demand of proof.

³⁰⁷ Sandin et al 2002 pp.291f

The question is therefore: How do you prove that something is safe? In other words, how many negative results does it take to prove that there are no negative effects?³⁰⁸

My answer is once again that this is a problem only if we have an extremely high epistemic threshold, e.g. if we demand absolute certainty. We have seen that none of the classic formulations of the principle urge us to adopt such an extreme threshold, and the same goes for my interpretation of the principle. In my interpretation it is a matter of a gradual change of the burden of proof in relation to the values, threats etc. that are at stake. The more valuable, the larger our suspicion, and the larger the suspected threat, the higher ought the threshold to be. Absolute certainty is not possible and cannot be demanded.

3.5. What can the precautionary principle do for us?

Is the precautionary principle applicable to the subject of extinction? It has been applied to this question by some official statements. The UN FAO Code of Conduct for Responsible Fisheries urges a precautionary approach in relation to fish stocks.³⁰⁹ In order to motivate the precautionary principle, the Wingspread document explicitly mentions extinction as one of the areas where traditional decision methods have failed.³¹⁰ The Rio declaration does not explicitly talk about extinction, but claims that the precautionary principle should be used in situations of a) serious damage, b) irreversible damage, and c) lack of full scientific certainty. These are all salient aspects of species extinction: The extinction of species is typically irreversible. There are many uncertainties concerning the species issue. There are suspicions that extinction will harm some very important values. There are non-linear effects that both increase the uncertainties and make the question of timing extra important. If the species loss results in a loss of an ecosystem service, that too is typically irreversible and the nonlinear reaction of ecosystems to encroachments makes the uncertainties great.³¹¹ In the worst case, loss of important ecosystem services can lead to what I called “game over-situations”. All of the things mentioned here turned out in section 3.3 to be precisely the kind of things that the precautionary principle is meant to deal with.

³⁰⁸ Gee 2006

³⁰⁹ McGarvin 2001 p.23

³¹⁰ Wingspread Conference 1998

³¹¹ Daily 2000 p.336

Bryan G. Norton compares the rivet popping analogy by Ehrlich and Ehrlich (see section 2.7 above), to a phenomenon called “zero-infinity dilemmas”.³¹² A zero-infinity dilemma is a situation in which the probability for something to go wrong is very small, while the effects if it does is catastrophic.³¹³ If too many species disappear from an ecosystem, the ecosystem may break down. The same would be the case with the entire biosphere. For each single species, the probability that its extinction would cause the breakdown is “quite low”, but if it does, the consequences would be very serious indeed.³¹⁴

This too looks like a good reason for applying the precautionary principle to the question of extinction. The question is what probability is low enough and what gain is high enough to take the risk. The important thing to note is that the principle tells us not to be satisfied with an ordinary risk analysis. It urges us to take into account the uncertainty concerning the probability (there is no way we can know in advance whether the species in question will be the one that causes the break down). It also urges us to consider both the value of the ecosystem at risk, the harm that may be caused to this value, the uncertainties concerning these aspects, and the aspect of irreversibility. It finally tells us that as a result of these considerations we must adjust and quite possibly increase the burden of proof for those who want to take the risk.

Norton is not alone in concentrating on the possible breakdown of ecosystems and the loss of ecosystem services. The UN Millennium Ecosystem Assessment group belongs to this category. They reason in three steps:

1. They first argue that working ecosystems provide us with many important ecosystem services.
2. Then they stress the importance of biodiversity for properly working ecosystems.
3. Finally, they suggest that since so much is at stake, and since we have good reasons to believe that biodiversity is important for the ecosystems to work, but do not know exactly how, we ought to apply the precautionary principle.

In our case, since the ecosystem services are very valuable and since there is a strong suspicion that loss of biodiversity may eventually be detrimental to this value, we should demand very strong evidence that the species under consideration will not be the one that breaks the neck of an ecosystem service. However, since we cannot ever know that in

³¹² Norton 1986:1 p.121, Norton 1987 pp.67ff

³¹³ This is the standard definition. Norton adds a list of other criteria that are characteristic of the extinction in particular. I believe however that the simpler standard definition is sufficient for the point I am going to make.

³¹⁴ Norton 1986:1 p.121, Norton 1987 pp.67ff

advance, we ought instead to demand good evidence that a certain practice will not cause extinction.

Protection of ecosystems and ecosystem services is not the only reason to apply the precautionary principle to the species issue however. Other species also supply us with a host of different instrumental values. In some cases the exploitation of these values risk causing extinction of the species. As we have seen, exploiting a species to the degree that it goes extinct may in fact be economically rational from an anthropocentric viewpoint. This is however something we do not always know for sure. In 3.3.2 I noted that when an act might result in an irreversible change, we need extra strong evidence against any suspicion that the change will result in serious problems – e.g. by destroying or depleting a resource that would afterwards turn out to be more valuable in its original state. This is clearly applicable to the situation we discuss here. Extinction is as we have seen irreversible, and we cannot know now what the value of the species will be for future generations of human beings. What we can know on the other hand is that historically species have time and again turned out to be valuable in ways we had not expected.³¹⁵ It therefore seems quite clear that the precautionary principle tells us not to drive species to extinction, and that if we still contemplate on doing it, a heavy burden of proof should be placed on the shoulders of those in favour of the exploitation.

³¹⁵ Gärdenfors 2005 p.119

4. Future Generations

Ghilleen Prance believes that we would manage the rainforests very differently (presumably better) if we thought more about our “great-great-great-great-great-grandchildren”.³¹⁶ That might be true, but do we have a moral duty to change our management of the rainforests out of concern for our great-great-great-great-great-grandchildren? Do we – to put the question in terms more suitable for our investigation – have a moral duty to preserve species for the benefit of future generations of human beings? Political and legislative documents sometimes express such a duty. Both the Brundtland report and the Rio declaration for instance explicitly tell us that we do have such a duty.³¹⁷ In his survey of official governmental and inter governmental policy texts, Mikael Stenmark has identified a general idea of what he calls ‘intergenerational justice’, meaning that we have a moral obligation to consider the needs of future generations of human beings.³¹⁸

It is not totally clear what this means. The official policy documents seldom state very precisely how they conceive of our duties to future generations.³¹⁹ I think it is quite clear though that most people do recognise some kind of moral duties towards future generations. It also seems quite clear that for many people this is a strong argument for nature conservation. It is not uncommon to hear people argue that we need to preserve nature, ecosystems or species for the sake of future generations.

According to Stenmark, the idea that we have duties not just to our children and grandchildren, but also further into the future, is a genuinely new idea in international policy. He believes that the change is induced by necessity through the new insights of our dependence on nature, of the possibility that some natural resources will eventually run out, and of the fact that there are limits to what nature can absorb in terms of human interference.³²⁰ He also puts his finger on the question of how far into the future our concerns should reach, and the question of whether our concern for future generations should decrease with time.³²¹

Our concern is whether a duty towards future human generations can explain at least a part of why extinction is conceived of as a moral problem. In order to answer that question

³¹⁶ Prance 1990 p.64

³¹⁷ Melin 2001 *passim*, Stenmark 2000 pp.29f,34,49ff

³¹⁸ Stenmark 2000 p.37

³¹⁹ Melin 2001 p.104, Stenmark 2000 pp.8,52f,56f,62ff

³²⁰ Stenmark 2000 pp.8,49ff

³²¹ Stenmark 2000 pp.67f

we have to investigate whether we have such a duty at all, and also its possible scope and demands.

4.1. Do we have any duties to future generations?

The first thing we have to investigate is whether we at all have any moral duties to consider the interests of future generations. This question has been the subject of an intensive debate and I will here discuss what I believe are the most serious objections.

4.1.1. The asymmetry problem

One salient feature in most of our relations with future generations is that they work only one way: Much of what we do will affect them, but almost nothing they do can affect us.³²²

Parfit illustrates our relations to future generations with ‘the auditorium dilemma’.³²³ In some auditoriums, the first row can gain a better view by standing. Standing up is less comfortable than sitting down, but in some situations it might be worth the discomfort to get a better view. This presents a problem for the second row. They originally had a view that was good enough and they had no reason to endure the discomfort of standing. It was therefore in their interest to remain seated. If the first row stands up, however, the second row will not see anything. Therefore, they also have to stand up in order to regain their view. This will make their situation worse compared to how it was from the beginning. By standing up, they will have the same view as before but they will be less comfortable. The same goes for the row behind it and so on for the rest of the rows. When all rows are standing up, all but the first row will have the same view as before but be less comfortable. The first row will be less comfortable but have a better view. The result is that the first row will be better off while all other rows will be worse off.

We can see this as an analogy to intergenerational relations, where the first row is the present generation and the second row the generation after that etc. What the first row does

³²² Barry 1996 p.209, Narveson 1996 pp.39f

will have effects on the next generation and so on but what a later generation does will not affect the generation before it.

The ‘auditorium dilemma’ differs from e.g. the ‘prisoner’s dilemma’ in having one group that is untouchable by the others (being the “outsiders” as Parfit calls it).³²⁴ This means that there is no way we can make a deal that will be acceptable to everyone based on strict rational egoism.

Another salient feature is that the luxury of being untouchable is transferred from row to row together with the bad effects of the acts done by the first row. This means that there is always a very strong temptation for every row to deal with the problem created with the row in front of them in a way that makes the situation worse for the row behind them. Even though it is worse to stand and have a good view than to sit and have a good view, it is even worse to sit and have a bad view. Analogously, it is always a tempting alternative for every new generation to soften the impact from the things done by the previous generation by passing on as much as they can of the bad effects to the next generation.

The auditorium dilemma is a good analogy to the case of future generations and natural resources, ecosystem services, etc. We can improve our lives by over consuming resources in a way that will affect future generations. The only thing they can do to deal with the situation is to continue consuming resources as long as there are any left, and thereby pass the problem on to future generations. In fact, the intergenerational problem is worse than the auditorium dilemma, since by consuming resources in a pace that exceeds the regeneration rate or by consuming non-renewable resources, the problem will not just be passed on, but also be worsened. If we add a growing human population it will become even worse.

The asymmetry problem does not present an obstacle for including future generations in the realm of moral objects as long as our criteria for being a moral object do not presuppose a reciprocal relation between the object and the agent. For theories that do that – like contractualism and communitarianism – it is problematic however.

Both Derek Parfit,³²⁵ and Brian Barry,³²⁶ concludes that the asymmetry problem in fact shows that, contractualism does not admit of duties to future generations, since they are not able to enter into mutual contracts with us. (Parfit bases his conclusion on Barry).³²⁷

³²³ Parfit 1987 p.383 note 19b

³²⁴ Parfit 1987 p.383 note 19b

³²⁵ Parfit 1987 p.357

³²⁶ Barry 1996 passim

³²⁷ Parfit 1987 p.357 note 7.

Christian Munthe and Anders Melin are of the same mind when it comes to contractualism in general.³²⁸ Both claim however that John Rawls' version in fact allows for moral duties to future persons. The reason for that is that it is possible to deny the people behind the veil of ignorance³²⁹ the knowledge of what generation they will belong to. They will therefore prefer an equitable distribution of resources between generations as well as within generations.³³⁰

This seems plausible given the idea of a veil of ignorance. There is one problem that is not mentioned however but which I believe is of crucial importance if we are to establish a just distribution of resources. The people in the original position do not know what generation they will belong to, but do they know how many generations the resources are supposed to be distributed among and how large each generation will be? Rawls does not mention anything about this and to assume such knowledge would be utterly unrealistic. If the people in the original position do not know these things however, how can they decide what will be a just distribution? Luper-Foy believe that the people behind the veil will adopt a policy regarding e.g. consumption and pollution that can be indefinitely sustainable.³³¹ Such a policy would take care of this problem even though it would be sub-optimal for the rational egoists that the people in the original position are according to Rawls' model. It is not optimal since it puts harder restrictions on people than would be necessary if they know how many generations there would be, but given that they do not know and given that no one would like to be born in generation X+1 after having agreed to base the calculations on X generations, this principle still seems rational given the original position.³³²

Luper-Foy's suggestion would not take care of the problem regarding the number of people per generation however. We could of course quite simply transform the idea of infinite sustainability into a policy that assumes an infinite number of people. The problem is that such a policy would not allow for any consumption at all. I believe however that the problem could be solved by approaching the question of population size from a prescriptive rather than a predictive angle. I.e. by adopting a policy for how large a generation is allowed to be.

³²⁸ Melin 2001 p.124, Munthe 1997

³²⁹ The "veil of ignorance"-model is described in Rawls 1973 pp.136ff.

³³⁰ Rawls 1973 pp.137, 287f. Commented by e.g. Luper-Foy 1995 pp.95f,100, Melin 2001 p.124, Munthe 1997

³³¹ Luper-Foy 1995 pp.95f,100

³³² It still assumes a rather high aversion towards risk, just like many other decisions Rawls assumes that the people in the original position would take. In Rawls description of the veil of ignorance he specifies that the people behind do not know their aversion to risk (Rawls 1973 p.137), but they obviously have one and it has to be quite strong – much stronger in fact than would be granted by the precautionary principle.

A simple solution to both problems would be to assume that everyone that will ever live takes part in the decision behind the veil. This is forbidden by Rawls in his restrictions for the veil of ignorance however. He presents different reasons, but the strongest reason seems to be that it is important for his theory that any randomly selected person should be able to go behind the veil and reach the same conclusion.³³³

A possible solution to the problem concerning the number of generations would be to let all generations be represented behind the veil. This alternative is also ruled out by Rawls – apparently for the same reasons.³³⁴ Instead he assumes that everyone behind the veil belong to the same generation. This assumption does not just exclude a simple solution to the problem presented above. In fact, it also threatens to bring down the whole motivation for considering the interests of future generations at all. It is true that they still do not know when in history they will live so they would initially be in favour of a fair distribution but only up to the point when they enter the picture whenever that will be. They cannot affect the policy of previous generations (who do not take part in the decision process), and since they do not have to care about future generations (they all know that they will belong to the same generation). The veil of ignorance can therefore not given the original set-up produce any agreement to consider future generations.³³⁵

Rawls himself is aware of this, and he infers a special amendment to deal with the problem. Two of the most basic rules of the original position are that none are allowed to have any moral inclinations and that none are allowed to know their preferences. Rawls makes an exception to the second of these basic rules however by allowing the people behind the veil to care for their future relatives.³³⁶

This is a very strong concession by Rawls and it means in effect that care for future generations does not follow from his theory but is added to the theory from the outside in order to save the theory. In his later writings, he therefore chose another solution. Instead of allowing the people behind the veil of ignorance to have emotions towards their offspring, he infers a rule that their agreements must be such that they would want everyone to follow it independently of what generation they belong to.³³⁷ This means that instead of making an exception to the restriction against knowing their interests, Rawls chose to make an exception to the restriction against having any moral inclinations. I do not know if this is a

³³³ Rawls 1973 p.139

³³⁴ Rawls 1973 pp.140,291f

³³⁵ Rawls 1973 pp.140,291f, Rawls 1993 pp.273f

³³⁶ Melin 2001 p.125, Rawls 1973 pp.140,292

³³⁷ Melin 2001 p.125, Rawls 1993 p.274

smaller concession for Rawls. The new solution means that he introduces a certain moral intuition explicitly in order for his theory to include a duty to care for future generations instead of letting such a duty emerge from behind the veil of ignorance. He uses the moral relevance of future generations as a basic moral principle needed to make his theory justifiable, which in turn means that we cannot use his model to justify concern for future generations.

There is also a general problem with the idea of the veil of ignorance that affects the question of future generations. It does not give us any hint on how to implement the idea in a world where we do not make decisions behind a veil of ignorance. I.e. even though intergenerational equity would be a rational conclusion from an egocentric perspective *given* the veil of ignorance, this does not tell us anything of what is rational from an egocentric perspective in the real world. The only way of making use of the idea of a veil of ignorance in a world that is as a matter of fact not constructed like that would be to adopt the veil of ignorance as a basic moral principle overruling any selfish inclinations. That would in practice be equivalent with adopting a moral principle that tells us to be totally impartial. If we do that however we have left both reciprocity and rational selfishness.

Is there any way a true reciprocal theory can deal with the asymmetry problem?

Barry Gower thinks that it is possible to have a reciprocal arrangement between overlapping generations, but not between non-overlapping ones. He therefore concludes that there cannot, according to formal theories of justice, be such a thing as justice or injustice in our relations with generations further into the future.³³⁸

Jan Narveson has a different opinion. According to him, the overlapping can be used to solve the problem also in the general case. There is always overlapping between generations (since one generation is born by the previous one), and just as one generation takes care of the next one during the latter's childhood, the latter takes care of the former during their old age. Therefore, he claims, it is not really true that the intergenerational relations only work one way.³³⁹

This would not be a general solution however, since it cannot deal with situations where the time lap between the act and the effect is so long that there will be no overlapping between the generation that causes the problem and the generation that experience it. Situations like that are probably not that uncommon when dealing with environmental changes.

³³⁸ Gower 1995 pp.51f

There are also other problems that seems to show that Narveson's solution might not even work in the particular case where generations overlap. The relation between generations that Narveson points out does in fact not make the relation totally symmetrical. The parent's care of the child takes place before the child's care of the parent. There is thus still a time asymmetry. Time asymmetries always present a problem for theories based on reciprocity since it puts a heavy pressure on the trust of the first agent in the second (potential) agent, and also puts a heavy burden on the sense of duty of the latter to fulfil her part of the deal even though she has already got what she wanted. Basing the argument on this sense of duty would however make contractualism superfluous.

There is also another problem. If children are not well taken care of the effect is shown immediately or within the lifetime of the parent. This is not always the case when we deal with environmental problems. When it is the case, it tends to make the intergenerational aspect less interesting. If the consequences are immediate, they will also affect us and other contemporary people, and we do not need to involve duties to future generations in order to establish that there is a moral problem.

There might be a certain degree of interesting overlapping though, since it is possible that the bad consequences begin to show in the later years of the inflicting generation without outweighing the earlier benefits they have already got, while the younger generation will have to live with the negative consequences for a long time. In these cases, contractualism would give us a reason to constrain ourselves in our dealings with nature, since the members of the future generation still have time to retaliate if we break the hypothetical contract.

Often the negative effects do not turn up until after the inflictors are dead however, and if they turn up earlier, they generally do not yet overshadow the positive effects. This is probably the most common setup in cases of human inflicted extinction. It normally takes a while for a species to disappear completely after a fatal blow, and the disappearance of one species will not always have any perceptible effect (consider the threshold effects discussed earlier).³⁴⁰ In these situations, we lack the overlapping that Narveson's argument hinges on.

Brenda Almond suggests – inspired by Dworkins and Rawls – that justice demands us to repay future generations for what we got from past generations.³⁴¹

³³⁹ Narveson 1996 p.56

³⁴⁰ See also Ihse 2005 p.70

³⁴¹ Almond 1995 p.18

I am not convinced that this can help us solve the problem. We live in a world with an increasing greenhouse effect as a result of what our parents and grandparents did. Would that make it all right for us increase the greenhouse effect further – or are we even obliged to do it and punish future generations for the acts of previous generations in order for justice to have its course? Previous generations have driven a large number of species to extinction. This could if we follow Almond's idea be a reason for us to do the same.

One could say that we should do to future generations what we *wish* that previous generations had done for us but this cannot be defended from the point of view of rational selfishness. We are back where we started: We need an account of moral standing for future generations that does not depend on what we can actually get from them in terms of benefits or retaliation.

There is also another problem with Almond's asymmetrical idea of justice: How can justice demand that we pay back not to the one we received the benefit from, but to *someone else*?

The question of future generations is apparently a devastating problem from a contractarian point of view. Other contractarians have offered different solutions but none of them have been able to deal with the asymmetry problem.³⁴²

I believe we have to conclude that contractualism does not supply us with any rational reason to preserve species for the benefit of future generations.

Anver de-Shalit tries to solve the asymmetry problem from a communitarian vantage point, which he thinks gives the best account of our duties to future generations.³⁴³ He claims that even though we live at different times we are part of the same community. For example, parts of us survive in the form of our achievements and in the form of other people's memories of us.³⁴⁴ This is a kind of cultural interaction between the generations: We interact with them by creating and inventing ideas and things that will live on during their lifetimes. They interact with us by upholding the memory of us and by using and refining the things and ideas we have passed on to them.³⁴⁵ This also goes for ethical norms. We pass on ethical norms to them. They share, apply, and reflect on the norms.³⁴⁶ This means that we are part of the same community.

³⁴² See e.g. David Gauthier (Gauthier 1986 passim). His suggestion is a very clear example of this shortcoming, as is shown in de-Shalit 1990 p.226 and Melin 2001 pp.122ff.

³⁴³ de-Shalit 1995 p.13ff

³⁴⁴ de-Shalit 1995 p.38f

³⁴⁵ de-Shalit 1995 p.43

³⁴⁶ de-Shalit 1995 p.45ff. See also Melin 2001 pp.125f

Eventually this will fade off however. Their reflecting on the common values together with external influences means that after a number of generations we will no longer be members of the same moral community.³⁴⁷ From this de-Shalit concludes that we do have duties to consider the interests of future generations, but that these duties gradually fade away as we gradually become members of different communities.³⁴⁸

This will give us three degrees of duties:

To contemporary people we have far-reaching positive duties.

To those who will live in the near future we have almost as strong positive duties.

To those living further off into the future we have much weaker and only negative duties. Moreover, if it is not a matter of very strong remote future interests competing with very weak present-day interests, the remote future interests will not outweigh the interests of contemporary people.³⁴⁹

I find de-Shalit's solution problematic. We are not part of the same community on the same premises. We can pass on norms to them, but they cannot pass on norms to us. No matter how much and how well they reflect on our norms they can still not impose them on us. The asymmetry problem therefore does not disappear.

In addition, it is not obvious to me that sharing the same ethical norms could tell us anything about what the norms should imply. It does not seem to exclude for instance that we share the norm that there are no duties to future generations. It is odd to claim that moral standing is decided not by the content of our ethics, but with whom we share it. Furthermore, de-Shalit's communitarianism is hit by the argument from marginal cases. Some contemporary human beings are not able to reflect on moral values or fulfil any of the other criteria de-Shalit has placed for being part of the same community. They will therefore fall outside the community and have no standing.

De-Shalit also argues that we want future generations to conclude that our values are good.³⁵⁰ Why? It is probably not because we fear their reactions. The explanation cannot be that we care for them, since that would beg the question. If we do not care about future generations to begin with, we are not likely to care about what they think about our values.

He refers to the existence of guilt feelings and to our interests in the welfare of future generations as arguments for his idea of a trans-generational community.³⁵¹ However, these

³⁴⁷ de-Shalit 1995 p.47

³⁴⁸ de-Shalit 1995 p.53f

³⁴⁹ de-Shalit 1995 p.54f. See also Melin 2001 pp.125f

³⁵⁰ de-Shalit 1995 p.48

³⁵¹ de-Shalit 1995 p.18f

feelings do not show that we regard future generations as moral objects. It may be that we have these feeling towards them because they are *valuable* to us. We can have an interest in just about anyone and anything from stalagmites to extraterrestrials. If we weaken the criteria for what it takes to be a part of a common community that much, the term would lose all meaning.

It is also a problematic fact that all duties in the trans-generational community are aimed in one direction. De-Shalit uses our upholding of traditions as an argument for the fact that we identify ourselves as being part of a trans-generational community together with past generations of practitioners of the same traditions.³⁵² If anything, however, this illustrates how interactions between generations move only in one direction. By upholding the traditions of our forefathers, we clearly see that we are influenced by those before us in a way that they can never be influenced by us. De-Shalit talks about a cultural interaction in the form of discussions aiming at finding “a common set of ideas which determine a common good”.³⁵³ It is difficult to see how such a discussion can take place between individuals living in different generations however. Melin also points out that since de-Shalit demand shared values in order to be part of the same community, it must be difficult to perform the kind of critical debate he talks about as something that binds us together.³⁵⁴

I have found nothing in de-Shalit’s arguments that helps us in our dealings with the asymmetry problem. The general result in this sub-section is that neither communitarianism, nor contractualism can demand from us that we care for future generations. The failure of contractualism also underlines our previous conclusion that rational egoism does not seem to give us much reason for avoiding extinction.

Since the asymmetry problem only is a problem for theories that demand some kind of symmetric relation between the moral agent and the moral object however, it is not a devastating drawback to the idea of moral duties to future generations.

³⁵² de-Shalit 1995 p.20

³⁵³ de-Shalit 1995 p.25

³⁵⁴ Melin 2001 pp.127f

4.1.2. The non-identity problem

One problem that has been widely discussed in relation to future generations, is the so-called *non-identity problem* pointed out by Thomas Schwartz and Derek Parfit among others.

Thomas Schwartz argues that because of this problem, we can not have moral obligations to posterity other than to our “near posterity”.³⁵⁵ He uses the question of population size to illustrate the problem, but claims that his point can be generalised to cover all kinds of duties to future generations. His reasoning goes as follows: Assume that we do not limit the size of the population and as an effect of that, the lives of future generations of human beings will be less enjoyable. If we take any future person X, it would be very probable that X would not have existed had we adopted a more restrictive population policy not only because there would be fewer people, but also because the events leading up to the birth of X would be significantly different. This in turn means that X would probably not be identical to anyone of those who would be born if we were to live according to the stricter policy.³⁵⁶ The people that would have benefited from the stricter policy will not be the same as those who actually get to live. Therefore, we have not failed to do our duty to those people by not adapting the stricter policy.³⁵⁷

He believes that in the first generations after our own, there will still be people who would be identical independently of our choice. We should therefore assume some duties to our immediate posterity. However, these duties will fade very fast since the differences between the populations will increase exponentially.³⁵⁸

This reasoning is then generalised, and Schwartz claims to have shown that it covers all alleged duties to future generations – not just duties concerning population size.³⁵⁹

Schwartz is not satisfied with having shown that we do not have any *duties* to make sacrifices on behalf of future generations other than possibly the immediately following generations. He also claims that to put restrictions on now living human beings in order to benefit future humans cannot even be *morally permissible*, since it would mean that we put restrictions on now living individuals, although there is no one to whom we owe these restrictions.³⁶⁰

³⁵⁵ Schwartz 1996 (first published 1978) p.3

³⁵⁶ Schwartz 1996 pp.4ff

³⁵⁷ Schwartz 1996 pp.7ff

³⁵⁸ Schwartz 1996 p.6

³⁵⁹ Schwartz 1996 pp.10f

³⁶⁰ Schwartz 1996 pp.11f

It could be argued against Schwartz that even though no individual member will be the same under the different policies, the society will be the same. One could therefore object that even if no particular member of the society is better off than she would be had we adopted a more restrictive policy, the *society* would be better off.

This idea differs from the communitarianism discussed in the previous section, since here we are not talking about duties to particular individuals based on their belonging to the same community but about duties to the communities as such.

One thing that speaks in favour of this approach is that when we talk about future generations, we spontaneously tend to talk about them not as individuals but as a group. Stenmark explains this habit by pointing out that future humans do not yet have an identity, which makes it easier to conceive of them as a group than as individuals.³⁶¹

Schwartz does not believe it can solve the non-identity problem however. His argument is that it does not matter morally if the society is better off when no individual is.³⁶² This objection seems reasonable although not everyone would agree. We do not have to go into that question here however. In this book, we investigate whether anthropocentrism can answer the question of why it is morally problematic to cause extinction. Anthropocentrism does not admit moral standing for anyone or anything but human beings. That excludes the possibility of accepting moral duties to societies. This means that we cannot find any help in the idea of moral duties to societies in order to support anthropocentrism even if it would turn out to be valid.

Schwartz concludes that we do not have any moral duties to future humans. Instead, he suggests that we presently living humans have a moral duty to *each other* to adopt policies that contribute to a better life for future generations. Most now living human beings wish that future generations should prosper far into the future. In order to secure this wish, we need to make sacrifices. In order to secure a fair distribution of these sacrifices, we all have a moral obligation – not to future generations but to each other – to contribute.³⁶³

We would in other words have no duties *towards* future generations of human beings, but only duties *regarding* them, just as we according to anthropocentrism have no duties *towards* other species but might have duties *regarding* them. The difference is that our valuing of a good life for future generations of human beings is probably intrinsic rather than

³⁶¹ Stenmark 2000 pp.60f,64,67

³⁶² Schwartz 1996 p.6f

³⁶³ Schwartz 1996 pp.12f

instrumental (although Schwartz does not discuss this question). It is not very probable that people, who are unable to affect us, would have instrumental value for us.³⁶⁴

For our investigation, this means that we have a duty to other now living human beings to share the burden of considering the wellbeing of future human beings to which we have no moral duties, but who have intrinsic value for us. This might among other things imply a duty to preserve species that have instrumental value for future generations of human beings.

Derek Parfit's conclusion is radically different. The basic story is the same: If someone had not been conceived at the time she was actually conceived, she would not exist at all. If the conception had taken place earlier or later, it would have involved two other gametes, and therefore the resulting foetus would have a perhaps slightly but still different genetic makeup.³⁶⁵ Parfit sets the time limit at a month (obviously to be on the safe side, but he also hints that the real time interval after or before which we would not have existed had we not been conceived within it, may actually be much shorter).³⁶⁶

If we try to benefit a future individual by doing what will change the time of his conception, we have not benefited him at all – we have benefited someone else who is born instead. This in turn means that if we neglect to take this step, no one is made worse off, since he would not have been born at all if we had acted in the less depleting way.³⁶⁷

We can complicate the situation further by adding that if we choose different lifestyles, it will also effect who we meet and have children with. This means that different lifestyles will lead to different identities of future individuals. If we then choose to consider the interests of future generations by living a less destructive life, the future people who will benefit from this will not be the same as if we instead had chosen a more wasteful lifestyle. If we choose the wasteful lifestyle, this will not be worse for future humans as long as their lives will be worth living.³⁶⁸ If we assume that it is possible to benefit someone by bringing her into existence, we could even claim that we have benefited her by living a wasteful life.³⁶⁹

³⁶⁴ Anthropocentric instrumentalism the way I have defined it in this investigation does not exclude the possibility that future generations of human beings may have intrinsic value for us. It only excludes that other species can have intrinsic value for us. Schwartz's solution therefore seems to be allowed by anthropocentric instrumentalism. It does not take us all the way however since future generations still do not have any moral standing of their own.

³⁶⁵ Parfit 1987 pp.351ff

³⁶⁶ Parfit 1987 p.352

³⁶⁷ Parfit 1987 p.358ff

³⁶⁸ Parfit 1987 p.361ff

³⁶⁹ Parfit 1987 p.363

Should we therefore follow Schwartz and conclude that we have no moral duty – other than a duty to other contemporary humans, and possibly to the immediately following generations – to make any sacrifices for the sake of coming generations? Not according to Parfit. He regards the intuition that we have a moral duty to consider future generations as too basic. He illustrates this by the following imagined situation:

There are two different conditions – K and J – that give the same handicap to the child of a woman who is the bearer of either K or J. The difference between them is that J is curable, while K is not curable but disappears by itself within two months. A programme (let us call it *J*) is set up to cure women with condition J. Another programme (let us call it *K*) is set up to test women for condition K, and if they have it, advice them to wait for two months before getting pregnant. Both programmes will if performed have the result that 1000 more healthy children and 1000 fewer severely handicapped children will be born. Unfortunately, there is not enough funding to go through with both programmes, so one of them has to be cancelled. If we chose to carry out programme *J*, the same children will be born, only they will not suffer from the handicap. If we chose to carry out programme *K*, different children will be born and thereby benefit from the programme. We could therefore say that we have a duty to these individuals to perform programme *J* but we have no duty to anyone to perform programme *K*.

The question is: What does our intuitions tell us? Is there any moral reason to prefer one programme rather than the other?³⁷⁰ Parfit's intuition is that there is not. If we disregard the obvious fact that there are more risks involved for the prospective mother in having an operation, compared to just waiting two months before becoming pregnant, I share this intuition. I suppose most people would agree, in spite of the fact that alternative *K* is vulnerable to the non-identity-problem, while alternative *J* is not. The fact that our intuitions do not distinguish between the two programmes indicates just as Parfit points out, that what matters intuitively in this example is that independently of which programme we chose, 1000 more healthy children and 1000 fewer handicapped children will be born. The identity of the children does not seem to be relevant.³⁷¹

Parfit's conclusion is that we must reject the idea that "*what is bad must be bad for someone*".³⁷²

³⁷⁰ Parfit 1987 p.367f

³⁷¹ Parfit 1987 p.368f

³⁷² Parfit 1987 p. 363

I am not sure that making this sacrifice is an improvement however – or even that it is necessary. What Parfit needs is to reject the idea that identity is morally relevant, not the idea that what is bad must be bad for someone.

That what is bad must be bad for someone is also a very basic moral intuition, and maybe even more so than the intuition that we should show concern for future generations. If we reject the idea that what is bad must be bad for someone, the answer to the question “what is bad?” would be up for grabs – and I cannot figure out a plausible answer to this question that does *not* assume that what is bad is bad *for* someone.

It seems that Parfit has missed an important distinction. We can – and should – distinguish between the questions of what is *bad* and what is *wrong*. The question of what is bad and the principles for answering this question are indeed very important for the question of what is wrong, but they are not the same thing. The question of what is bad concerns necessarily what is bad *for* someone in order to be meaningful, and analogously, in order to be meaningful, the question of what is good has to be about what is good *for* someone. There must be a subjective perspective from which something is good or bad in order for it to be so. The question of right and wrong in turn has to relate to good and bad – and thereby to what is good and bad *for* someone. Of course, we can say that a certain act should not be performed because it is taboo even though it does not relate to the question of what is good or bad for any moral object. This is not what is normally meant when we condemn something for *moral* reasons however, and it is not the way I am using the terms ‘moral’ and ‘ethical’ here.

Gustaf Arrhenius investigates the possibility of solving some other dilemmas involving different populations by discussing them on the normative (right/wrong) level instead of on the axiological (good/bad) level.³⁷³ He is not satisfied with the result however and therefore abandons the idea. He does not discuss the implications for the non-identity problem though but I believe that much could be gained by doing so. I also believe that by doing so we would avoid some confusion. When Arrhenius discusses what he calls “*The Person Affecting Restriction*” (sometimes also called “the slogan”) – i.e. the intuition that for something to be good it must be good for someone – he states it as follows:

- (a) If outcome A is better (worse, equally as good) than (as) B, then A is better (worse, equally as good) than (as) B for at least one individual.

³⁷³ Arrhenius 2000 pp.196ff

(b) If outcome A is better (worse) than B for someone but worse (better) for no one, and B is better (worse) than A for no one, then A is better (worse) than B.³⁷⁴

Formulated in this way, the person affecting restriction seems unproblematic but at the same time uninteresting from an ethical perspective since it is totally axiological and contains no normative statement. I.e. if we assume that the terms ‘better’, ‘worse’ etc. keep their meaning through the entire statement. It would be possible to interpret the formulation in prescriptive terms but then we have to use the terms ‘better’, ‘worse’ etc. in two different ways: Normatively in the first part of (a) and the last part of (b) and axiological in the other parts. To shift the meaning of a term in the middle of a definition is rather confusing however. I would instead suggest that we reserve the words ‘good’ and ‘bad’, ‘better’ and ‘worse’, and the like for axiological discussions and instead use terms like ‘right’, ‘wrong’ etc. for normative discussions. By doing so we will avoid much confusion, and we can avoid the ‘good without being good for someone’, and ‘bad without being bad for someone’ to sneak their way back into the discussion. If we follow my reasoning, we would be able to reformulate (a) by replacing the axiological formulation (including the use of the words ‘better’, ‘worse’, and ‘equally as good as’) in the part before the comma with a normative formulation (and thus use terms like ‘right’, ‘wrong’ or ‘morally neutral’).

In statement (b), the axiological formulation (with the words ‘better’ and ‘worse’) in the last third of the sentence should be replaced by a normative formulation (and terms like ‘right’ or ‘wrong’ – or maybe ‘more right’ and ‘more wrong’ depending on the view one wants to express).

We would then have a normative statement looking like this:

- (a) If it is right (wrong, morally neutral) to chose A over B, then A is better (worse, equally as good) for someone than (as) B for is for someone.
- (b) If outcome A is better (worse) for someone than B is for someone but worse (better) for no one, and B is better (worse) than A for no one, then it is right (wrong) to chose A over B.

In this reformulation, we do not use words like ‘good’ and ‘bad’ in two different senses. It is therefore my belief that even though discussing the particular problems Arrhenius is concerned with in terms of right/wrong instead of good/bad, does not help him

³⁷⁴ See e.g. Arrhenius 2000 p.125

deal with the particular problems he is investigating, the shift is still an improvement. It is an improvement since it stresses the correct question. If we discuss how we ought morally to behave, it is a matter of right or wrong, not just about good and bad. When we discuss the non-identity problem, we are as a matter of fact discussing how we ought morally to behave, considering the fact that what we do will not be better for the particular members of a particular population, even though it will be good for some other individuals.

To shift our attention from good/bad to right/wrong, will also help us deal with the non-identity problem without having to jump from the frying pan into the fire so to speak. I.e. we can save the intuition that we have a moral duty to consider future generations without having to sacrifice the even more basic intuition that what is bad must be bad for someone. If we distinguish between good/bad and right/wrong, we will be able to keep the sentence Parfit rejected (i.e.: "*what is bad must be bad for someone*"), and instead reject the sentence: "*what is wrong must be wrong to someone*". It seems reasonable to say that what is wrong does not have to be expressed in terms of 'wrong to someone'. In fact, it seems intuitively more correct to say about an act that 'it is wrong' than to say 'it is wrong to someone' (or 'it is wronging someone'), even though it concerns what is good or bad for someone. That is, an act can be considered as right or wrong without being right or wrong to someone, but for it to be considered as right or wrong, it has to affect (the quality or quantity of) things that are good or bad for someone even though the identity of the 'someone' does not matter.

The problem in Parfit's example was that by choosing the less wasteful life we would not increase the amount of good for a particular person, but we would still increase the amount of experienced good in the world. By increasing the amount of good in the world, we would not make the situation better since it would be better for no one, but we would do the right thing. There is nothing deeply counter-intuitive in saying that we can do the right thing even if it does not increase the amount of good or decrease the amount of bad for a given individual. It also seems reasonable that we can do something wrong even if it does not increase the amount of bad or decrease the amount of good for a given individual – as long as there is in fact someone experiencing some amount of good or bad, and the amount of experienced good or bad will be larger or smaller depending on our behaviour. It just does not have to be an intrapersonal improvement or impairment. An interpersonal comparison seems to work just as well.

If we apply this to Parfit's example, we could say that choosing a depleting lifestyle would be wrong because it would mean that some people would experience less good than some people would if we choose a less depleting lifestyle, where 'some people' may or may not be the same individuals. The important thing is that we are still talking about things (food, energy, clean air, wellbeing, happiness, fulfilment of preferences, etc.) that are good because they are good for someone, and our behaviour is wrong because it means less of something that is good because it is good for someone (or more of something that is bad because it is bad for someone). We do not have to infer some kind of objective good that exists independently of a perspective that experiences it as good. We reserve the term 'good' for things that are good for someone, and talk about 'right' when we talk about how we should act.

The conclusion is that the situation which arises in the future if we chose a more depleting lifestyle today is not *bad* as long as the population will at least have a life worth living (since it in that case is not bad for anyone), but to make this choice would be *wrong* because it results in a situation that is less good for the people affected than the alternative would have been for the people that would have been affected had we chosen differently – independently of the identity of those affected.

Jan Narveson seems to have missed the distinction between good/bad and right/wrong just as Parfit has, but from another direction so to speak. He claims that: "Duties that are not owed to anybody stick in the conceptual throat".³⁷⁵ I believe the reason why they stick in Narveson's conceptual throat is that when he is uttering them, he is not distinguishing between 'right/wrong' on the one hand and 'good/bad' on the other. If doing one's duty is to do what is right, then it has to be about what is good or bad *for* someone, but it does not have to be expressed as a duty *to* someone. To talk about things as being good or bad without them being good or bad for someone would stick in my conceptual throat too. However, this is not the same as talking about duties that are not owed to anybody.

Note that the only thing we have to accept in order to avoid the non-identity problem is that it is possible and meaningful to make interpersonal comparisons. We do not have to assume the full load of utilitarianism. We do not for instance have to assume any particular way of comparing good or bad. We do not have to accept that we can or should add the good or bad of different people. We do not even have to accept that we are always obliged to make interpersonal comparisons, or that we have to aim for the maximum quote of good

³⁷⁵ Narveson 1996 p.43

over bad in order to accept this solution. The solution ought therefore to be acceptable even for those who have a more deontological view of right and wrong – as long as they accept that interpersonal comparisons are possible, meaningful and at least in situations involving different possible future populations also morally relevant.

Therefore, as long as we do not have a very strong aversion towards interpersonal comparisons, the non-identity problem does not relieve us from having duties to consider the good of future generations – whoever they will be.

4.1.3. The problem of overwhelming sacrifice

For those who have a utilitarian approach to ethics there is another possible problem to consider. If our aim is to maximise happiness (or well-being or preference satisfaction etc.), we get into a problem if we count all happiness/suffering or preference satisfaction/preference frustration independently of when it occurs. If we show equal consideration to future generations and avoid messing things up terribly by for example destroying essential ecosystem services in the near future or start an atomic war, there will be a multitude of generations ahead of us. This means that almost any sacrifice we can make that will benefit future generations is morally required no matter how small the benefit, since there will be many more to enjoy the benefits than who makes the sacrifice.³⁷⁶ Therefore, it seems that we have a duty to live very modestly indeed, and save almost everything to future generations – and so should the next generation, and the one after that and so on. This in turn means that as long as people can expect several generations ahead of them, every future generation would have to abstain from harvesting what was saved by the previous generation, and just hand it over to the next generation.³⁷⁷

This seems like an unreasonably large sacrifice, and it has therefore been suggested that we discount the interests of future generations,³⁷⁸ or even disregard them totally.

Derek Parfit does not agree with this solution, and claims instead that our problem calls for a general limit on how great sacrifices someone can be asked to make for someone else – independently of whether we talk about inter- or intragenerational issues. He also

³⁷⁶ Almond 1995 p.6, Melin 2001 pp.128f, Narveson 1996 p.38,40, Parfit 1987 p.484, Rawls 1973 pp.286f

³⁷⁷ Narveson 1996 p.59

³⁷⁸ Melin 2001 p.129, Parfit 1987 p.484

thinks that if we believe that trying to maximise the total sum of good leads to inequality between generations and if we find this problematic, we should not solve the problem by discounting but by adopting a principle of fair distribution.³⁷⁹ If we discount, we may occasionally end up in situations where we could avoid a larger catastrophe in the future by a relatively modest sacrifice today but find that it is not worth it since the bad effects in the future carry less weight.³⁸⁰

I believe that Parfit is right when he points out that the problem of overwhelming sacrifices is a general problem of distribution and that is not particularly related to intergenerational matters. We have a similar problem in intragenerational ethics: There is an almost endless amount of poverty in the world, and almost any krona I make would generate a larger benefit if I give it to charity than if I spend it myself. Do I have to give up everything? This is a difficult question for utilitarianism, but no utilitarian would seriously propose that we solve it by not counting or by discounting the interests of our contemporaries. If it is not justifiable to use such a method in intragenerational dealings, it cannot reasonably be justifiable when we are dealing with the same problem only on an intergenerational level. Luper-Foy in fact goes as far as stating that we have to deal with the issue of distributing resources justly between different generations *before* we can take on the task of distributing the resources among contemporaries in a just way.³⁸¹

The point is that if we accept the overwhelming sacrifices in intragenerational relations then we have no excuse for not accepting them in intergenerational relations. If we do not accept such large sacrifices then that is a problem for both inter- and intragenerational ethics and it has to be dealt with in a way that would work both within and between generations. Discounting does not seem to be considered acceptable within generations and should therefore not be used between generations.

If we want to take on Parfit's challenge of finding a solution in the form of a system for fair distribution, we would have to step away from basic utilitarianism. If we accept that then what kind of solution should we choose? I will look at two different suggestions, and as we will see, the large number of future people is not just a problem for utilitarians.

Anver de-Shalit especially looks at the problem that we already today have people who have less than a fair share of resources, and it would not be reasonable to demand from them that they further decrease their use of resources for the benefit of future generations. Anver

³⁷⁹ Parfit 1987 p.184f. According to Melin 2001 p.129, others too have reasoned in the same way.

³⁸⁰ Parfit 1987 p.184f

³⁸¹ Luper-Foy 1995 p.100

de-Shalit has aimed for a compromise. He suggests that when duties to future generations conflict with “a genuine need to improve the welfare of contemporaries”, we should look for what he calls “a middle way”.³⁸²

When our

obligations to very remote future generations do not contradict obligations to contemporaries, we have no excuse not to fulfil them. If these obligations to very remote future generations clash with certain obligations to contemporaries, and especially to the worst off among our contemporaries, it is reasonable to argue that in some cases our obligations to contemporaries have some priority (although this difference by no means cancels out our obligations to very remote future generations).³⁸³

It is not easy to draw any conclusions from this and it is even harder to find any useful advice on how we should actually behave.

Gregory Kavka suggests that we use Locke’s principles of just acquisition, and adapt them to an intergenerational setting. This means that it would be acceptable for us to use resources as long as we do not waste them and as long as there is “enough and as good” left for others.³⁸⁴ This in turn implies that we should leave the next generation at least as well off regarding resources as we were.³⁸⁵

What does it mean to leave enough and as good of a non-renewable resource? One way of doing so could be to limit the number of people – i.e. to limit the number of competitors for resources – in the future, and thereby decreasing the pressure on the resources.³⁸⁶ That is probably not what Locke had in mind. In addition, for non-renewable resources this would not be enough if we want to uphold Locke’s proviso. Even if we use the resources very sparingly, there will be less and less, and sooner or later, it will be totally depleted. Before that happens, there will be less left than each of us has used and therefore Locke’s proviso will no longer hold.

One way of dealing with this would be to decrease the number of people in each generation and eventually let the species disappear when the resources are exhausted.

³⁸² de-Shalit 1995 p.11

³⁸³ de-Shalit 1995 p.11

³⁸⁴ Kavka 1996 p.200

³⁸⁵ Kavka 1996 p.200 Robert Nozick and Robert Elliot are reasoning along the same lines (Melin 2001 p.130).

³⁸⁶ Stenmark 2000 pp.53ff

Kavka is opposed to exterminating humanity,³⁸⁷ but what other alternatives are there? Kavka talks about recycling and using technology to increase the output of resources,³⁸⁸ but that is probably not enough. Even if we get better at extracting a non-renewable resource, it will disappear eventually and we cannot recycle everything. Some resources are destroyed when we use them. In fact, even for the resources we can recycle, the second law of thermodynamics will eventually claim its due.

An alternative would be to widen the interpretation of Locke's proviso and allow for substitutes.³⁸⁹ This approach is often advocated by economists (see chapter 2 above), and would be in accordance with e.g. the Brundtland report, which tells us that we may use or even deplete a resource as long as we compensate for the loss.³⁹⁰

Take for example fuel. One way of leaving enough fuel to future generations is to see to it that all future generations will have as much fossil fuel at their disposal as we have had at our disposal. However, since we cannot produce fossil fuel, and since it takes nature millions of years to do so, it means that given a stable population, we will not be allowed to use any fossil fuel at all. However, if we allow for substitutes, we can use all the fossil fuel there is, given that we find an alternative that will do the same job to the same extent and just as good. This modification of Locke's proviso seems more reasonable, and would just take a small amendment. We only need to shift focus from the resource to what we can get from it.

What would this shift mean for our investigation? The answer is that it would reaffirm a suspicion that has been brought up before: That it might be acceptable from an anthropocentric instrumental perspective to drive a species to extinction as long as the service or goods we get from it can be substituted by another species or by a non-living source. This means that if we allow for substitution and concentrate our concern on the goods or service rather than on the resource as such even in an intergenerational setting, our theory will be a weaker defence against extinction, and may not be able to entirely account for the intuition we aim to explain.

³⁸⁷ Kavka 1996 pp.192ff

³⁸⁸ Kavka 1996 pp.200f

³⁸⁹ This alternative is apparently suggested by Elliot and Nozick. See Melin 2001 p.130

³⁹⁰ Stenmark 2000 p.56,62f

4.1.4. Mental impossibility

It is not easy to imagine or to reason about things that will take place very far in to the future. It is probably even more difficult to mobilise really emotions towards events that are far into the future even if it is possible to reason around them in an abstract way. This problem has been pointed by Anver de-Shalit and Jan Narveson among others. According to both of them, it means that we cannot in practice demand from now living humans that they make sacrifices on behalf of future generations that are comparable to the sacrifices we can demand on behalf of their contemporaries.

Anver de-Shalit argues that we should discount the interests of future generations (by not adjudging them with positive duties more than a few generations into the future) because duties that reach too far into the future would demand what is for most people inconceivable.³⁹¹

Narveson tells us that a principle that gives future generations the right to an equal share of resources that are basic for life, would be “impossibly abstract or obscure or both”.³⁹² He also claims that this principle will be “self-extinguishing”. The reason for that is that we are deciding the size of the next generation. Narveson asks us to consider a scenario where we cut the next generation by one half. The question will then be: What does that mean for our resource use? Does it mean that the members of the next generation will be able to enjoy twice as many resources, or does it mean that we will be able to spend more of the resources?³⁹³

Parfit and Melin do not agree with this however. Parfit claims that the fact that future individuals cannot be identified is no more relevant than that we might have difficulties identifying individuals who are geographically far away.³⁹⁴

Melin points out that to take departure in the question of whether presently living people think we should care about future generations is to beg the question that it is the values of now living people that count while the future only counts if *we* think it should count.³⁹⁵

The question is undoubtedly interesting: Does our limited imaginative faculties justify a discounting or even non-counting of the interests of future generations?

³⁹¹ de-Shalit 1995 p.14

³⁹² Narveson 1996 p.60

³⁹³ Narveson 1996 p.60

³⁹⁴ Parfit 1987 p.357

³⁹⁵ Melin 2001 p.11

I do not believe it does. Both Melin's and Parfit's objections seem valid, and in addition, one can point out another thing that I believe is crucial. I believe that as long as it is mentally possible to rationally understand that even future people will have interests and that the future realisation or frustration of these interests can be affected by what we are doing now, we have a duty to consider this in our decisions even if it is a difficult intellectual process and even if it is not possible to fully take in emotionally.

4.1.5. Uncertainty

According to the Brundtland report, sustainable development is a development that “ensures that it meets the needs of the present without compromising the ability of future generations to meet their own needs.” To be able to live up to that, we need to know what the needs of future generations are. Even if we follow the terminology already in practice in this book and use the wider term ‘interests’, this is a task that seems very difficult. There is a large degree of uncertainty regarding the interests of future generations,³⁹⁶ and this problem is also accompanied with some other problems. Anver de-Shalit for instance points out that even if it were possible to foresee the interests of future generations – which he does not believe it is – it would be complicated to compare and weigh their interests against the interests of our contemporaries.³⁹⁷

Another problem is that we do not know for sure what life will be like in the future, how the technology will develop, or even for how long the human species will survive.

Our inability to make reliable forecasts not just about the preferences of future generations, but also about the future in large, makes I.G. Simmons question the entire idea of caring for future generations:

There is time for caution here: if we define justice to include future generations, but cannot forecast the nature of that future at all accurately, then how do we know what to avoid?³⁹⁸

³⁹⁶ Farber 2000 p.s495

³⁹⁷ de-Shalit 1995 p.5, Melin 2001 p.128

³⁹⁸ Simmons 1995 p.71

Simmons does not want to see this as an excuse for a laissez-fair attitude in relation to future generations, but how do we avoid such an attitude? When we look at the problems presented here, one might be tempted to limit our concerns to the present, and possibly to the immediately following generations while leaving the rest to their destiny. Another approach would be to discount our concern for the future at a rate representing the degree of uncertainty. This last approach is used by many economists and some philosophers.³⁹⁹ One fact in favour of discounting rather than a more abrupt cut off-point is that we are dealing with predictions that tend to get more uncertain the further into the future we stretch them. Discounting would make it possible to lessen our concern successively in proportion to the increasing uncertainty.

Another possibility is put forward by Jan Narveson who suggests that our almost total lack of knowledge of the future can be seen as an argument for confining our concern for the future to approximately the next 50 years.⁴⁰⁰ His argument is that since we are next to totally ignorant, “no rational consideration of the problem is possible ...”.⁴⁰¹

One might point out here that if “no rational consideration of the problem is possible” how can he then conclude that confining our concerns to a special length of time is a better solution than any other solution? I think Narveson is too pessimistic however. In the previous chapter we noted that inertia is not always the best way of handling uncertainty. We found that in situations where for instance important values are at stake, it is more rational to take precautionary measures such as demanding extra high degrees of certainty in order to go through with a project that might threaten the value in question. If we have a situation where our decision may threaten important future interests although we do not know if they will, the conclusion must be the opposite of what Narveson recommends. I.e. in order to be justified to ignore future generations, we should demand a high degree of *certainty* that future generations will not hold the interest in question. Lack of knowledge should count *against* ignoring them, not the other way around. The degree of certainty we demand should of course as we saw earlier stand in proportion to how important we suspect the interest to be. This is complicated since that is one of the things we do not know, but which also seems to talk in favour of being extra careful with what we subject them to.

³⁹⁹ See Gower 1995 p.57, Kavka 1996 p.190,202 note8 Kavka also mentions Martin Golding (“Obligations to Future Generations” *Monist* 56 1972 pp.97-98), Parfit 1987 p.481

⁴⁰⁰ Narveson 1996 p.40f

⁴⁰¹ Narveson 1996 p.41

Parfit is in general negative to discounting and he makes no exception when it comes to uncertainty. He follows the same strategy as before and points out that we have to distinguish between (1) the fact that our predictions get less certain over time, and (2) whether, given the assumption that a prediction is correct, we are entitled to discount the weight of the effect just because it takes place in the distant future. He admits that (1) is often the case, but does not believe that this can answer (2).⁴⁰²

According to Parfit, this is important for two reasons. Both because we should be careful not to “miss-state our moral view”, and because there are situations when predictions do *not* get less certain over time.⁴⁰³

I agree with the first reason: We should be more cautious about the terminology we use and not claim that we discount on the basis of time as such when we are actually discounting on the basis of diminishing certainty.

How about Parfit’s second reason? Even if he is correct and there actually are such cases, we still have to admit that most prognoses *do* get less certain over time. On the other hand, it might be that the things we can predict with a higher degree of certainty are important enough to make a difference even if the uncertainty is great in the general case. Several authors point out cases where our knowledge about future generations is not so bad,⁴⁰⁴ Kavka e.g. points out that we can know about future generations that they will need “enough food to eat, air to breathe, space to move in, and fuel to run machines”.⁴⁰⁵ This looks correct, but what does it tell us? Even if we agree that they will need fuel for their machines, we don’t know what kind of fuel. When I write this a large amount of alternatives are being developed, and I would not like to put much money on a bet about which of these will be the fuel of the future. Maybe a combination? Maybe something completely different that no one has yet thought of? Our need for things like food, air and water on the other hand is biologically determined and we can assume that these things will not change substantially in the future. All life forms on the planet need water and nutrients, and all “higher” life forms need oxygen. This may not seem like much information to base our concern on, but for this investigation, it is very central. This means that we have to apply our concern for future generations on our previous food discussion, and the same goes for ecosystem services. In order to have a working water cycle, sufficient levels of oxygen, suitable climate

⁴⁰² Parfit 1987 p.481f

⁴⁰³ Parfit 1987 p.482,486

⁴⁰⁴ See e.g. Kavka 1996 p.189, Melin 2001 p.129, Munthe 1997

⁴⁰⁵ Kavka 1996 p.189

etc. we need working ecosystems. This means that the few things we do know about the needs of future generations are still very important for our investigation. It is true that it only takes away some of the uncertainty and therefore only deals with the argument from uncertainty for some particular interests. On the other hand, these interests are very basic and they are directly related to some of the ways where other species are the most important for us.

The conclusion seems to be that we are not justified in using the lack of certainty concerning future generations as an excuse for discounting their interests. We only have some knowledge about a few things but these things are on the other hand very important – and directly relevant for our investigation since they imply that species that have a high instrumental value for us will also have a high instrumental value for future generations of human beings. When it comes to the things we do not know, it seems most reasonable to invoke the precautionary principle. That means that since we do not know whether a particular species will be important for future generations, but have a strong suspicion based on historical evidence that many species will turn out to be important for future generations probably in ways we can not yet imagine,⁴⁰⁶ we should be very restrictive when it comes to doing things that risk leading to extinction, and the burden of proof should lay on the shoulders of those in favour of exploitation.

4.1.6. Democracy

A possible argument for discounting is that most people living today seem to be less concerned with the further future compared to the immediate future. We could claim that we for democratic reasons have to respect this and discount the future.⁴⁰⁷

However, Parfit points out that this argument only exhorts us to follow the majority view concerning whether we should discount the future. It does not tell us what this view morally ought to be – and this is the question we are concerned with.⁴⁰⁸ I agree with Parfit that there is a distinction and that it is relevant. Since we are performing a moral investigation, the relevant question is whether it is right to count the interests of future

⁴⁰⁶ Gärdenfors 2005 p.119

⁴⁰⁷ Parfit 1987 p.480

⁴⁰⁸ Parfit 1987 p.480

generations for less than the interests of contemporary people. This question cannot be answered by an election.

There is also another problem with the argument from democracy. It begs the question of whose interests should be considered. A basic assumption of the argument is that most *now living people* are less concerned with the further future. If we base our decision solely on the interests of the concerns of now living people, we have excluded the interests of future generations already in the decision process.

It is in fact a serious problem for present versions of democracy that they seem incapable of dealing with this kind of questions: They are not democratic over time. We do many things today that have been decided by “democratic” methods by now living human beings, but where most of the people who will be affected by the decisions are not represented in the decision process simply because they are not yet born. Since the normal democratic process is inherently biased in favour of the present population, we cannot rely on the normal democratic process in intergenerational issues. If we want a reason to exclude the interests of future generations, it has to be an independent argument why their interests should not count. It cannot be based on a process where the interests of future generations are excluded already in the process.

4.1.7. Opportunity loss

A common reason for discounting the future is based on the issue of opportunity loss. A thing that (like money) represents an instrumental value has value because of what you can get out of it (in the form of intrinsic value or of another instrumental value – like more money). The earlier you get something, the more utility you can extract from it. If you get it later, you will not be able to use it while you wait, and you will therefore lose opportunities.⁴⁰⁹ This is an important reason for economic discounting, but is it applicable to the question of whether and to what extent we should consider the interests of future generations?

Alan Randall does not think so. He points out that market economy has a tendency to handle questions of resource use over time as investment problems, but he is not convinced

⁴⁰⁹ Parfit 1987 p.482f

that this is a possible approach in situations like extinction that has effects for a very long time and are irreversible.⁴¹⁰

Parfit points out in the same way as we have seen above that it is important to keep in mind the reason for discounting. If we think it reasonable to discount for opportunity losses, we should be clear that it really is a matter of opportunity discounting, not temporal discounting as such. Parfit stresses the importance of being clear about this both in order for us not to be led astray in our moral reasoning and because he does not believe that opportunities always decrease over time. For instance, some investments do not bring any return, and things we consume do not decrease in opportunity value if we receive them later (we still only consume them once). Furthermore, when we deal with trade-off-situations, we will continue to get value out of what we started with until we trade it in. This will compensate for the value we should have extracted from the thing we are going to trade it for. Assume that we are going to exploit a beautiful landscape in order to build an airport, but the exploitation is delayed. We will then lose opportunity value because we cannot use the airport but we will also gain opportunity value because the landscape will be intact and can be used for other things like recreation.⁴¹¹

Parfit's reasoning seems reasonable up to a certain degree, and I think his last point is well worth pointing out since it is often forgotten. We also have to admit however that if we find the trade-off worth doing in the first place, i.e. if we value the airport higher than the unspoiled landscape, we have presumably decided that there is more value in the airport than in the unspoiled landscape. We will therefore lose net-opportunity-value by delaying the exploitation even if we can get some value from the unspoiled landscape while we wait.

What does it mean for our investigation? Let us assume that building the airport in the example above will lead to the extinction of a species that has its last refuge in the area. Let us also assume that the species supplies some kind of good but that the airport will be more valuable for us than the species. Let us finally assume that by the time the last contemporary human has died, the airport has become obsolete but that the species would have continued to produce the good had it been allowed to survive. That would mean that even though its value for us is smaller than the value for the airport, its value for future generations will be larger than that of the airport. These are the assumptions. The reason for the last assumption is to create an intergenerational conflict. The question would then be: Does opportunity value in cases like this tell us to build the airport?

⁴¹⁰ Randall 1986 p.83,96

An aspect that seems to be important when we apply the question of opportunity value on intergenerational relations is that the receivers of the value will change during the process. If we build the airport, we will receive a higher opportunity value. Future generations will not get anything and since they will not have the species either, they will lose out on the deal. It therefore looks like discounting on the basis of opportunity value assumes that future generations do not have any moral standing or at least a lower moral standing.⁴¹² There might be another explanation however. It may be that we do count future generations but realise that we will get more out of the airport if we build it than they would get from the species. I.e. we will win more than they will lose. In that case, we do not have to assume that future generations are without moral status in order to get the result that it is better all things considered to build the airport. In fact, we have not even reached the conclusion that the interests of future generations do not count. We have considered their interests but concluded that it will be more in our interest to drive the species extinct than it is in their interest that we preserve it. That way, opportunity value is not really a basis for discounting the interests of future generations, but in practice it will at least in some cases still make references to the interests of future generations less useful for those who claim that we should protect species for anthropocentric instrumental reasons.

The reasoning above presupposes a strictly utilitarian outlook. It might be that we hold a moral conviction about what is to count as a just distribution of harms and benefits between moral object, or any type of principle with the effect that there are limits to what we can subject a moral objects to in order to benefit someone else. Then we cannot dismiss the fact that we will get the benefits of the higher opportunity value while future generations will not get anything, as easily as we did above. I.e. we cannot get rid of the problem that we get all the benefits from the airport and they get none of the benefits (since they have no use for the airport and the species is gone), by referring to the fact (when it is a fact) that the total sum of good will be larger that way.

In cases like this, it therefore seems that a deontological approach would mean larger consideration of future generations, and also a stronger reason to avoid extinction.

Even from a utilitarian perspective however we have to remember that it is not necessarily always the case that the total value will be higher from decisions like the one above. Not even the opportunity value would always be higher that way, and even when it is higher, it can in many cases be outweighed by a higher total value over time if we utilise the

⁴¹¹ Parfit 1987 p.483f

species in a sustainable way. The important point here is however that there will probably be some cases where a utilitarian anthropocentric instrumental approach – even if we accept moral standing for future generations – will accept that we drive a species to extinction even when the moral intuition we are investigating in this book tell us that it would be wrong. I do not know how often this will happen in reality, but it still weakens the position for anthropocentric instrumentalism in our investigation.

4.1.8. Distance

Parfit is very careful to point out that we should not claim to be discounting because of time when our reason for discounting is in fact something else. In this sub-section, we shall ask whether it is reasonable to discount because of the distance as such between the decision-maker and the affected person. We can imagine different kinds of distance. One type is temporal distance. Another is genetic distance (distance of kinship).

Parfit claims that discounting because of kinship is not strictly the same as discounting because of temporal distance though in practice they always coincide, since degree of kinship does decrease from generation to generation.⁴¹³

However, temporal discounting may well play a role of its own independently of kinship or other distance discounting. If one believes that the distance between the agent and the object is important for moral considerations, why should genetic distance be more important than temporal distance? I guess we should rather say that temporal discounting is a sub-category of distance discounting just like genetic discounting (or kinship discounting) is. Even if these two sub-categories in general co-inside, they do not always co-inside and have to be handled separately.

The most interesting question is whether discounting for distance is morally acceptable (or even obliged) – and whether it is a matter of temporal distance or of genetic distance.

Parfit compares time discounting and spatial discounting. He claims that no one accepts spatial discounting, and believes that temporal discounting is equally unacceptable.⁴¹⁴ Mary Warren, Kristin Shrader-Frechette, L.W. Sumner, Gregory Kavka and

⁴¹² This seems to be Munthes conclusion (Munthe 1997).

⁴¹³ Parfit 1987 p.485

⁴¹⁴ Parfit 1987 p.486, 357

Jan Narveson reason along the same lines. Warren makes an analogy with different kinds of non-acceptable discrimination forms of now living people. She claims that “the historical period in which they exist” is no more relevant as a basis for moral standing than is other “accidental properties” such as age, race or sex.⁴¹⁵ Shrader-Frechette makes the same analogy with irrelevant properties but from a contractual perspective.⁴¹⁶ Sumner points out that to favour someone just because of her location in time is to count someone for more than one, which cannot be acceptable according to utilitarianism.⁴¹⁷ Kavka notes that spatial location is not morally relevant, so why should location in time be? He also considers it part of rational prudence to put equal weight on one’s own present and future, and thinks that analogously rational morality should put equal weight on present and future generations.⁴¹⁸ Narveson argues that the fact that people differ by their location on the planet does not grant that we should treat them differently and the same should apply to future people who differ from us when it comes to their location in time. The same rules that guide our dealings with contemporary people should thus apply to our dealings with future generations just as the same principles apply to all presently living people even though some live quite far from us in geographical terms.⁴¹⁹

Kavka’s comparison with rational prudence does not seem relevant here since in his example we are talking about one and the same person, not about our duties to consider other people’s interests.

How about the general comparison with spatial distance made by all of the abovementioned authors? It seems reasonable that if we are not allowed to discriminate because of spatial distance as such, we should not be allowed to discriminate because of temporal distance as such, and I cannot think of any relevant difference between the two cases that would make it acceptable to treat the cases differently.

How about kinship distance then? Can we apply the same reasoning there? Intuitively, it does not seem unreasonable to treat one’s own family different than others, at least in some respects. I believe very few people would find it immoral if someone feeds her own children rather than sending food to distant children if we have to choose between the two options. In fact, many people are inclined to find it morally questionable *not* to take special care of their own family. This does not seem to be a matter of strict proportional discounting

⁴¹⁵ Warren 1996 p.29

⁴¹⁶ Shrader-Frechette 2000 p.772

⁴¹⁷ Sumner 1996 p.103

⁴¹⁸ Kavka 1996 p.188

⁴¹⁹ Narveson 1996 p.39

however, and it apparently does not apply to all situations. Even if it is morally required to give certain benefits to your closest kin or to give priority to your closest kin in some situations, you may not do so generally and you are not allowed to harm others in order to benefit your closest kin, at least not if the harm done exceeds a certain magnitude. Parfit suggests that the kinship discounting in analogy with spatial discounting (which he now surprisingly seems to accept) should not apply to inflicting of great harm. I.e., even if it is acceptable to give larger benefits to your closer kin, this way of reasoning is not acceptable when we talk about large degrees of harm. To cause great harm to anyone is never acceptable according to Parfit independently of how distantly related the victim is.⁴²⁰ This should obviously be more specified since we need to establish where to draw the borderline. It might also have to be widened since it is not always acceptable to give larger benefits to your closer kin either. Parfit's solution does seem to be generally acceptable however.

Another thing we have to add which is also pointed out by Parfit is that the discounting should probably only apply up to a certain distance.⁴²¹ Even if it is reasonable to treat your own child differently than a much more distantly related child, it is not acceptable to treat that child differently than an even further related child. Discounting is therefore reasonable only up to a point. The alternative would be a discounting that decrease exponentially with decreasing degree of kinship. This alternative could be made to coincide closely with the exponentially decreasing degree of genetic kinship.

Our conclusion is that discounting based on distance is reasonable when it comes to kinship distance but only up to a certain point, and only in some situations, and never when we are talking about great harm. No discounting is acceptable on the basis of temporal distance as such.

4.1.9. Will they need our sacrifices?

Another thing to consider is that although many natural resources decrease and are eventually depleted, other types of good actually increase. Knowledge is e.g. typically increasing. By the help of knowledge, we can find substitutes for some of the depleted resources. We also invent new technologies that utilise other – and possibly less – resources

⁴²⁰ Parfit 1987 p.486

than the old technologies. This means that we could make up for at least some of the demise we have caused by accumulating knowledge and improving science and technology that benefits the lives of future generations.⁴²² Since new knowledge is constantly created and since knowledge can be transferred from the present to the future but not the other way around, it is highly probable that future people will have more knowledge than we do. That way, they may figure out remedies to the problems we have already caused.⁴²³ Some economists even claim that the increase of human knowledge might be more important than natural resources for the economy.⁴²⁴

This is sometimes seen as an argument not to restrict our selves for the sake of future generations,⁴²⁵ or at least to discount the negative effects of our actions. Parfit identifies two principles that support this reasoning:

1. Diminishing marginal utility. They will be better off than we are. Because of that, a certain resource or other benefit would be relatively less important for them than for us. It is therefore reasonable that we use the resource instead of saving it for future generations.

2. Distributive justice. If they will be better off than we are, we cannot be morally required to redistribute our more limited resources to benefit them.⁴²⁶

By now, we know Parfit's position. First, to discount because of (1) and (2) is not the same as discounting for temporal reasons and we should be careful to state the correct reason for our discounting. Second, the overlapping is probably not perfect. Some future humans are likely to be less well equipped than some present day humans.⁴²⁷

An interesting problem with (1) as an argument against making sacrifices is pointed out by Anver de-Shalit. Thanks to technological progress, the resources we leave to future generations may well be worth more to them than to us.⁴²⁸ This means that from a utilitarian perspective, the accumulation of knowledge and improvement of technology can be an argument *in favour of* preservation.

Another author who is not satisfied with the appeal to knowledge accumulation is Shrader-Frechette. She is not explicitly talking about species extinction, but attacks the assumption that future generations might be better equipped to deal with nuclear waste than

⁴²¹ Parfit 1987 p.485f

⁴²² Narveson 1996 pp.39f, Rawls p.288, de-Shalit 1995 p.2

⁴²³ Narveson 1996 p.40,57,59

⁴²⁴ Radetzki 1990 p.48,51, Radetzki 2001s.72

⁴²⁵ Narveson 1996 p.60, Rawls 1973 p.287

⁴²⁶ Parfit 1987 p.484

⁴²⁷ Parfit 1987 p.484

⁴²⁸ de-Shalit 1995 p.4f

we are.⁴²⁹ Her arguments could be useful also in a discussion about species extinctions however.

She launches four arguments:

The first one resembles Parfit's second objection above: We cannot know that future generations will be better equipped than we are to deal with a certain problem. She mentions that things like overpopulation and depletion of resources as well as the possibility that the problem as such get worse over time, may actually make it *harder* for them to deal with the problem.

Secondly, she invokes an argument from justice: Even though another person is better equipped to deal with a problem than I am, I have no right to expose this person to the problem.

Her third argument is that the appeal to increasing knowledge is self-serving by being clearly in the interest of those who make the decision.

The fourth argument says that we are dealing with a case of misplaced priorities. She argues that it is more important to protect someone from harm than to promote welfare and if a person is harmed, she cannot be compensated by enhancing the welfare of *someone else*.⁴³⁰

Let us take a look at these arguments: In her first argument, Shrader-Frechette questions the assumption. I find it very difficult to assess the probability of the assumption in the long term but so far the accumulated knowledge of humanity has increased tremendously and seems to increase exponentially. As a result, our technological capacity has skyrocketed (not just literally). If this continues, there seems to be almost no limit to what future humans may be capable of. Not everyone is convinced that this will be enough however. Luper-Foy for instance is rather pessimistic about the possibility of solving the problems we have caused by improved technology. He claims e.g. that there is not much room for improvement of the food production.⁴³¹ We also have to remember that the assumption that the capacity of future generations to solve all problems we may throw at them is based on simple extrapolation and we ought to be careful about what we impose on posterity with reference to such an unsophisticated forecasting method. There have been periods of stagnation in the history of human thought. During the middle ages, the Catholic Church put a very strong lid on human thinking, which in effect meant that intellectual progress in many areas was made virtually impossible. We cannot be totally sure that this

⁴²⁹ Shrader-Frechette 2000 p.773

⁴³⁰ Ibid

⁴³¹ Luper-Foy 1995 p.99

will not happen again, even though it seems unlikely. Had for instance Nazi-Germany been victorious in World War II we might well have ended up in a situation where new thinking would have been impossible in many areas and old knowledge would have ended up in the flames. We can also imagine that catastrophes like atomic war or extensive climate change may be at least as effective lids on human progress in the future. The very behaviour we are trying to defend by the argument from increasing knowledge may eventually undermine the argument by prohibiting the progress. It might be a good idea to apply the precautionary principle again. Since we do not know what capacities future generations will hold, and since large values are at stake, we should not use this uncertainty as an excuse for not taking the necessary measures to avoid imposing the problems on them.

Let us now have a look at Shrader-Frechette's second objection: It does indeed seem unacceptable in intragenerational relations to go around and cause problems for other people and excuse oneself by pointing out that they have the ability to handle it. It is one thing that someone is capable of dealing with a problem. It is another to say that it is acceptable to expose him to the problem (whether I too have this capacity or not) – at least as long as it actually *is* a problem. If future generations would have such powers that problems that seem overwhelming to us are not even problems to them, then maybe it would be justified to say that we have done nothing wrong by exposing them to these “problems” simply because they would not be problems. What then if they are still problems but so insignificant that future generations will be able to deal with them in a few seconds by a simple and cheap operation, or that their society or technology will be so different from ours that what would be very large problems for us are only very small problems for them, and that they would be able to live with them with only a small inconvenience? Then I suppose we would be justified in saying that what we did was a little selfish, but not that bad. What if the problem would take a little more effort to solve or make their lives somewhat more inconvenient? Then one should probably say that what we did was not very nice, but no serious crime. So we could go on. My point here is that we are dealing with a matter of degree. The question is: Where should we draw the line?

A utilitarian will clearly draw the line where the total expense for future generations will be larger than the gain for us.

From a deontological perspective, this is not acceptable. According to Shrader-Frechette, it is intuitively obvious that we have to consider basic rights before we try to

maximise the total welfare.⁴³² This is her fourth objection. I will not enter the debate of deontological versus consequentialist ethics here. I just note that if we assume a deontological position, our answer would not so much depend on how much we can gain from imposing this problem on future generations. Instead, we would have to accept that imposing problems on future generations for our own gain is not a just behaviour even if the problems we cause are relatively small. Exactly where the limit should be placed is however a question that remains to be answered.

Let us turn to the third objection: The fact that a decision favours the decision-maker is not in it self an argument against it. Considering what our experience tells us about human beings, however, we must be aware of the risk of bias. This is a reason for some degree of healthy suspicion. When dealing with future generations we also have to take into account the fact that we for obvious reasons cannot mitigate the risk by letting them take part in the decision.

The fourth objection is in fact two: That it goes against the principle that harm is more important than benefit, and that it goes against the principle that it is wrong to let one person pay for someone else's benefit even if the benefit is larger than the harm.

I have already discussed both these intuitions. The second one is discussed above and the first one is discussed in section 3.3.1, where we concluded that it was in need of better justification before we dare to accept it and that we therefore do not want to rely on it in this investigation.

The conclusion from this sub-section must be that the accumulation of knowledge is very large and it is reasonable to assume that it will increase the capacities of future generations to deal with problems that seem overwhelming to us, but that we cannot straight off take this as a valid excuse for downplaying our responsibilities. There are still moral problems with imposing the costs of our progress on future generations even if they can handle it. We have also seen that there are uncertainties that have to be dealt with, and that the accumulation of knowledge may even in some cases be an argument in favour of preservation.

⁴³² Shrader-Frechette 2000 p.773

4.2. Conclusions

For anthropocentric instrumentalism, it is important to show that we have moral duties to consider the interests of future generations. In this chapter, we have seen that there are many difficulties but that it is quite reasonable to assume that we have such duties as long as we do not adhere to a contractarian or communitarian approach to ethics, and as long as we accept interpersonal comparisons. We have found some reasons to restrict our duties to future generations in certain situations e.g. by discounting, which weakens the power of anthropocentric instrumentalism somewhat.

We have to add however, that if duties to future generations of human beings is a good reason to consider extinction a moral problem, a non-anthropocentric view that accepts duties also to future generations of *non-human* life, would give us an even stronger reason for preservation.

5. Something is Lacking

Alan Randall tells us that: “The earth’s biota may be viewed as a resource or a complex group of resources.”⁴³³ The question is, may it *exclusively* be viewed as a resource or a complex group of resources, or are there other types of value that have to be considered in order to answer the question of what is wrong with extinction? Maybe it is problematic in itself to regard other species just as resources? We have up to now assumed an anthropocentric instrumental vantage point in order to test what obligations anthropocentric instrumentalism place upon us regarding other species. As philosophers, we cannot stop there. We must also ask whether something in our moral intuitions cannot be captured by the view of the earth’s biota as a resource or as a complex group of resources even if this view supplies us with strong reasons for preservation of the biota. Let us illustrate this with an analogy:

Imagine a meeting in the southern part of USA some time during the first half of the nineteenth century. A group of slave owners has gathered to discuss some disturbing rumours about the slave trade. These rumours say that the slave ships are coming in less and less frequently. Presumably because the slave traders have to travel further and further inland on the African continent to find new slaves. There are even worries that if they continue to harvest slaves at the same pace, Africa will soon run out of humans suitable for slavery. At the same time, the cotton harvests have been larger than ever, so the economy is going great. As a result, the slaves who have done the harvesting are completely worn out. Many have become sick or permanently crippled. Some have even died, and “to be honest” – one of the slave owners admit – “we have mistreated our slaves”. “In fact” – he continues – “some of us do have a tendency to use the whip a little too much. Not that the slaves didn’t deserve it, but we have noticed that the slaves that have been too severely punished have had trouble working after a while. So maybe we should try to treat our slaves a little wiser? After all, the slave system has worked well for us and we want it to work well even for our children and grandchildren, and we should definitely develop this system so that more white people can have their own plantations and prosper economically. In short, we need a more sustainable development of the slave trade!”

⁴³³ Randall 1986 p.79

For a present day observer, it is immediately obvious what is wrong with this picture. The slave owners regard the slaves as merely resources for them to use, and instead of abolishing a genuinely immoral system, they are looking for methods to prolong it.

There are obviously many differences between the picture above and the problems we are dealing with in this investigation, but I trust the reader does not let the main point of the analogy get lost among the differences: The slave owners in the story did not really care for the slaves. They just cared for the work they could do, and the reason for lessening the pressure on the slaves was exclusively about productivity. In the same way, according to anthropocentric instrumentalism, other species should be preserved not out of concern for the species or their individual members, but only out of concern for ourselves and future human generations. The species should be preserved in order to be better utilised, not in order to assure a morally acceptable solution.

What this story shows is that a full account of why it is morally problematic to contribute to the extinction of other species possibly involves more than instrumental values for human beings. Even if that value is enough to establish that something is wrong, it may not give the whole moral picture.

Even so, could we not just play along and appeal to the instrumental value of the species for tactical reasons? When we started our investigation of anthropocentric instrumentalism as an answer to our main question, we noted that this answer has a dominating position in national and international policy documents. Could we not use that in order to get the protection we want even if it is not (totally) for the right reasons? It is not uncommon to hear phrases with that purport from active environmentalists, but there are risks connected with this strategy. One risk is that by using this tactic we will get *what we ask for*, but not *what we want*. It happens now and then that environmentalists and environmental groups seemingly successfully use anthropocentric instrumentalist arguments to back up their claims but when they finally get what they asked for they are still not happy. The government, city council or company they have been negotiating with cannot understand why the environmentalists are still complaining since they got what they asked for. Sometimes even the environmentalists themselves have difficulties explaining what is wrong. They may disagree among themselves about why, but they at least agree that something is wrong. The problem might be that the environmentalists want to preserve an area or a species because they see some kind of value in it that exceeds the human resource

value, while what they got (and what they probably argued for) is a law (/policy/agreement etc.) that preserves the species in order to use it more efficiently by the human society.

Very often, it seems that a species is preserved only as a way of producing new individuals that can be utilised. For many, this is counter to their moral intuitions, and it seems that even if this way of handling nature is rather prudent, there is something wrong with it. Many would say – like in the example with the slave owner convention above – that it is something morally wrong.

J. Baird Callicott makes an analogy with space travellers who find life on another planet, and after having established that it is life, they eradicate it. Intuitively, there seems to be something wrong about this – something morally wrong. Callicott claims that this would be more wrong compared to if they had eradicated some interesting geological patterns.⁴³⁴ Apparently, this extraterrestrial life form does not have any greater resource value for us so why is it still wrong?

This question will be subject for a continued investigation and another book. This part of the investigation has reached the stage where it is time to wrap it up and see what we have found out.

⁴³⁴ Callicott 1986 p.142

6. Summary and Conclusions

This book contains the first part of an investigation aimed at finding out why it is morally wrong (at least *prima facie*) to cause species to go extinct. That it is morally wrong seems to be a very basic and widely held intuition. It seems reasonable that a moral theory worth taking seriously ought to be able to account for that intuition.

The most common attempt to answer our question is to refer to the instrumental value of the species for human beings – the anthropocentric instrumental approach as I have chosen to call it. This is the answer that is discussed in this book.

We have found many ways in which different species have instrumental value for human beings – both individually and as a part of ecosystems and of biodiversity in general. We could not guarantee however that this includes all species. In some cases, it also turned out that the instrumental value of the species in fact favours exploitation maybe even as far to the extinction of the species. We also noticed that there is no guarantee that the instrumental value of the species can always outweigh the competing values that we would gain by different encroachments that contribute to the extinction of the species.

We found however that there are some special circumstances that help push the scale in the direction of preservation. I am thinking of some particular types of value such as choice value and transformation value – values that in general seem to favour preservation of species. This principle shows us that it would be rational from an anthropocentric instrumental vantage point to rule in favour of preservation in many of the cases where we are uncertain about the value of the species, about the best way of utilising the value, or about the connection between the species and other species or biodiversity in general. I am finally thinking of the moral principle that we have duties to consider the future interests of generations to come. We found that with a few exceptions it is justified to adopt such a principle. This in combination with the principles of precaution ought in general to urge us not to cause the extinction of species unless we have very trustworthy evidence that they will not turn out to be more valuable alive to future generations in comparison to what we can get from driving them to extinction.

In relation to the discussion about the value of other species for human beings, it is worth noticing that all the arguments we have found in favour of preservation would be even stronger – and therefore account even better for the intuition that it is at least *prima facie*

wrong to cause extinction – if we also accepted that other entities than human beings can have moral standing.

Finally, we noticed that our moral intuitions strongly indicate that even in the cases where the instrumental value of other species for human beings talks in favour of preservation, there is still something lacking. Something we have to account for in order to totally account for our moral intuition against extinction.

The conclusion will have to be that anthropocentric instrumentalism is in favour of preservation in many cases – probably in more cases than is generally acknowledged – but that it is not enough to give a complete account of the intuition that it is *prima facie* morally wrong to contribute to the extinction of species. We therefore have to continue our search for such an account.

References

Almered Olsson, Gunilla: "Använd hela landskapet!" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.51-59

Almond, Brenda: "Rights and justice in the environment debate" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international and interspecies issues* Routledge 1995 pp.3-20

Andersson, Petra: "Bevara alla arter – regel med undantag" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.83-94

Aniansson, Britt (ed.): *Biologisk mångfald* SNF 1990

Aoki, Ichiro & Hamamatsu, Takahisa: "Biomass diversity and stability of food webs in aquatic ecosystems" in *Ecological Research* 16 2001 pp.65-71

Arrhenius, Gustaf: *Future Generations – A challenge for Moral Theory* Uppsala University 2000

Bandyopadhyay, J. & Shiva, Vandana: "Asia's forests, Asia's cultures" in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.66, 77

Barrett, Bruce: "Using precautionary rule for health makes sense"
<http://www.madison.com/tct/mad/opinion/index.php?ntid=46467> 2005-07-11

Barry, Brian: "Circumstances of Justice and Future Generations" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996 pp.204-248

Beltrán, Domingo Jiménez: Preface to Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001

Bennett, Jeffrey & Shostak, Seth & Jakosky, Bruce: *Life in the Universe* Addison Wesley 2003

BirdLife International <http://www.birdlife.org> 2006-08-10

BirdLife Malta <http://www.birdlifemalta.org> 2006-08-10

Bodegård, Johan: "Miljardsatsning på bevarande av biologisk mångfald" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.21-28

Brinck, Ingar: "Om riskkommunikation – Kartor, klyftor och mål" in Brinck, Ingar et al (ed.): *Risk och det levande mänskliga* Nya Doxa 2005 pp.45-78

Brinck, Ingar et al (ed.): *Risk och det levande mänskliga* Nya Doxa 2005

Callicott, J. Baird: "On the Intrinsic Value of Nonhuman Species" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.138-172

Cal/EPA: *Draft Recommendations of the California Environmental Protection Agency (Cal/EPA) Advisory Committee on Environmental Justice to the Cal/EPA Interagency Working Group on Environmental Justice* 2003

Case, David: "Liberte! Egalite! Environment?" at <http://www.precaution.org/lib/rpr-html.htm> 2005-09-07

Clarke, John I.: "The interrelationship of population and environment" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international an interspecies issues* Routledge 1995 pp.34-45

Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international an interspecies issues* Routledge 1995

Council of Europe: *Bern convention on the conservation of European wildlife and natural habitats* 1979

Crichton, Michael: *Jurassic Park* Ballantine Books 1991

Cuccio, Sara: "The problem with precaution" at <http://www.precaution.org/lib/rpr-html.htm> 2005-09-07

Daily, Gretchen C.: "Management objectives for the protection of ecosystem services" in *Environmental Science & Policy* 3 2000 pp.333-339

Danmarks Naturfeedningsforening <http://www.dn.dk/> 2006-08-10

Defenders of Wildlife <http://www.defenders.org> 2006-08-10

Delin, Anders: "Inledning" Introduction to From, Johanna & Delin, Anders (ed.): *Art- och biotopbevarande i skogen* Skogsvårdsstyrelsen I Gävleborgs län 1997 pp.9-20

Doole, Claire: "Going Beyond the Great Wall: Ecotourism in China" at http://www.panda.org/about_wwf/what_we_do/species/news/news.cfm?uNewsID=21813 2005-07-18

Ehrlich, Anne H. & Ehrlich, Paul R.: "Extinction – Life in Peril" in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.95-105

Eliasson, Per: "När bruk av skog blev skogsbruk – Etablering av högskogsbruk och trakthyggen i Sverige" in Eliasson, Per & Lisberg Jensen, Ebba (red.) *Naturens nytta – Från Linné till det moderna samhället* Historiska media 2000 pp.122-145

Eliasson, Per & Lisberg Jensen, Ebba (red.) *Naturens nytta – Från Linné till det moderna samhället* Historiska media 2000

Elmqvist, Thomas & Norberg, Jan: "Klimatförändringar ritat om utbredningskartan" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.29-36

Elmqvist, Thomas & Johannesson, Kerstin: "Biologisk mångfald – inte bara arter" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.41-50

Environmental commons: <http://www.environmentalcommons.org/precaution.html> 2005-10-15

Estonian Fund for Nature <http://www.elfond.ee/index.php?keel=inglise> 2006-08-10

Europarc Federation: *European Charter for Sustainable Tourism in Protected Areas* 2002

European Centre for Nature Conservation <http://www.ecnc.nl> 2006-08-10

Fall, Carl-Axel: "Är det trångt på fjället?" in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Farber, Stephen: Welfare-based ecosystem management: An investigation of trade-offs" in *Environmental Science and Policy* 3 2000 pp.s491-s498

Farman, Joe: "Halocarbons, the ozone layer and the precautionary principle" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.76-83

Fisher, John A.: "Taking Sympathy Seriously: A Defense of Our Moral Psychology Towards Animals" in *Environmental Ethics* 9 1987 p.197-215. Reprinted in Hargrove 1992 pp.227-248

Friends of the Earth International <http://www.foei.org> 2006-08-10

From, Johanna & Delin, Anders (ed.): *Art- och biotopbevarande i skogen* Skogsvårdsstyrelsen I Gävleborgs län 1997

Gauthier, David: *Morals by Agreement* Oxford University Press 1986

Gee, David: *Uncertainty and decision making – the contribution of the Precautionary Principle* Talk at Lund University Centre for Sustainability Studies, Lund 2006-03-02

Gee, David & Greenberg, Morris: "Asbestos – from magic to malevolent material" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.52-63

Gerstin, Julian: "No condition permanent" in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.78-91

Gollier, Christian & Treich, Nicolas: "Decision-Making Under Sceintific Uncertainty – The Economics of the Precautionary Principle" in *The Journal of Risk and Uncertainty* 27 2003 pp.77-103

Gower, Barry S.: "The environment and justice for future generations" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international and interspecies issues* Routledge 1995 pp.49-58

Grandjean, Philippe: Implications of the Precautionary Principle for Primary Prevention and Research” in *Annual Review of Public Health* 25 2004 pp.199-223

Grandjean, Philippe & Bailer, John C. & Gee, David & Needleman, Herbert N. & Ozonoff, David M. & Richter, Elihu & Morando, Sofritti & Soskolne, Colin L.: “Implications of the Precautionary Principle in Research and Policy-Making” in *American Journal of Industrial Medicine* 45 2004 pp.482-385

Greenpeace <http://www.greenpeace.org/international> 2006-08-10

Greenpeace Sweden <http://www.greenpeace.org/sweden> 2006-08-10

“Grenar och blad i livets träd” <http://www.biologiskmangfald.nu/main.asp>

Gärdenfors, Ulf: “Satsar svensk naturvård på fel arter?” in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005

Hanneberg, Peter: “Från storviltjakt till ekoturism” Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hargrove, Eugene C. (ed.): *The Animal Rights/Environmental Ethics Debate – The Environmental Perspective* State University of New York Press 1992

Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990

Heinzman, Robert: “Visions of the rainforest” in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.1-10

Hellmark, Mats: “Att maximera upplevelsen” in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hellmark, Mats: “Ett stycke bronsålder” in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hellmark, Mats: “Med renar genom världsarvet” in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hellmark, Mats: “Sova med björnar” in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hellmark, Mats: “Svensk märkning tidigt ute” in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Hermele, Kenneth: *Vad kostar framtiden* Ordfront 2002

Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001

Holtug, Nils: “The harm principle” in *Ethical Theory and Moral Practice* 5 2002 pp.357-389

Ibarreta, Dolores & Swan, Shanna H.: "The DES story – long-term consequences of prenatal exposure" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.84-92

Ihse, Margareta: "Bevara arter – försäkring för framtiden och inget natursvärmeri" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.61-72

Infante, Peter F.: "Benzene – an historical perspective on the American and European occupational setting" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.38-52

James, Jennie: "Missing Lynx" in *Time* October 28 2002 p.55

Johansson, Birgitta (ed.): *Biologisk mångfald* Vetenskapsrådet 2003

Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005

Johansson, Birgitta: Interview with Mikael Karlsson chairperson of the Swedish Nature protection Society, in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.105-112

Johansson, Maria: "Hur värderas biologisk mångfald?" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.95-103

Karlsson, Mikael: "Förord" (preface) to Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Kaufman, J.H. & Brodbeck, D. & Melroy, O.R.: "Critical Biodiversity" in *Conservation Biology* Vol.12 1998 p.521-532

Kavka, Gregory: "The Futurity Problem" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996 pp.186-203

Kellert, Stephen R.: "Social and Perceptual Factors in the Preservation of Animal Species" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.50-73

Koppe, Janna G. & Keys, Jane: "PCBs and the precautionary principle" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.64-75

Kuntz-Duriseti, Kristin: "Evaluating the economic value of the precautionary principle – using cost benefit analysis to place a value on precaution" in *Environmental Science & Policy* 7 2004 pp.291-301

Lambert, Barrie: "Radiation – early warning; late effects" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.31-37

Lin, James C.: "The Precautionary Principle – A Rose by Another Name" in *IEEE Antennas and Propagation Magazine* 43 2001 pp. 129-131

Lindén, Olle: "Livet hotat i tropisk akusthav" in Aniansson, Britt (ed.): *Biologisk mångfald* SNF 1990

Lovejoy, Thomas E.: "Species Leave the Ark One by One" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.13-27

Luper-Foy, Steven: "International justice and the environment" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international an interspecies issues* Routledge 1995 pp.91-107

Maher, Donna: "Revisioning Development in a Changing Environment" in Development Express 6 1999-2000 at http://www.acdi-cida.gc.ca/cida_ind.nsf/vPrintNewsReleaseEn/C1D2A4210EA4513185256A4C007B14B3

Mattsson, Åsa: "Framing the uncertain – The case of the IPCC" presented at the 7th *Nordic Environmental Social Science Research Conference* Göteborg June 15-17 2005

Mattsson, Åsa: *Politik och vetenskaplig osäkerhet – Att hantera klimatfrågans osäkerhet i beslutsfattande* Unpublished 2006

McGarvin, Malcolm: "Fisheries – taking stock" in Herremoës, Poul et al (ed.): *Late lessons from early warnings – the precautionary principle 1896-2000* European Environment Agency 2001 pp.17-30

Melin, Anders: *Judgements in Equilibrium? – An Ethical Analysis of Environmental Impact Assessment* Linköping University 2001

Miljöförbundet Jordens Vänner <http://www.mjv.se> 2006-08-10

Millennium Ecosystem Assessment: *Ecosystems and Human Well-being – Biodiversity Synthesis* world Resources Intsitute 2005

Millennium Ecosystem assessment – official web site:
<http://www.millenniumassessment.org/en/Article.aspx?id=61>

Miller, Henry I. & Conko, Gregory: Precaution (of a sort) without principle
http://www.acsh.org/printVersion/print_news.asp?newsID=589 2001-07-01

Munthe, Christian: *Etiska aspekter på jordbruk* Jordbruksverket 1997 and at
<http://www.phil.gu.se/munthe/JordbrukWWW.html>

Myers, Norman: "Tropical forests and life on earth" in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.13-24

Narveson, Jan: "Future People and Us" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996 pp.38-60

Natur och Miljö – Riksorganisation för miljövard <http://www.naturochmiljo.fi> 2006-08-10

Niklasson, Mats & Nilsson, Sven G.: "Uthållighet I skogen ur biodiversitetsperspektiv" in *SUFORs Årsskrift* 2001 p.18-20

Nordlund, Christer: "Att lära känna sitt land och sig själv – Aspekter på konstitueringen av det svenska nationallandskapet" in Eliasson, Per & Lisberg Jensen, Ebba (red.) *Naturens nytta – Från Linné till det moderna samhället* Historiska media 2000 pp.20-60

Norges Naturvernforbund <http://www.naturvern.no> 2006-08-10

Norton, Bryan G.: "Environmental Ethics and Nonhuman Rights" in *Environmental Ethics* 4 1982 p.17-36

Norton, Bryan G.: "On the inherent Danger of Undervaluing Species" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.110-137

Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986

Norton, Bryan G.: *Why preserve natural variety?* Princeton University Press 1987

Olsson, Roger: "Vad är en eko-turist?" in Hellmark, Mats (ed.): *Rena semestern* SNF 2004

Palmer, Joy A.: "Just ecological principles?" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international and interspecies issues* Routledge 1995 pp.21-33

Parfit, Derek: *Reasons and Persons* Clarendon press 1987

Plantlife <http://www.plantlife.org.uk> 2006-08-10

Plato: "Republic" in Cooper, John M. (ed.): *Plato – Complete Works* Hackett Publishing Company 1997

Prance, Ghilleen T.: "Rainforested regions of Latin America" in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.53-65

Prosser, Robert: "Power, control and intrusion, with particular reference to Antarctica" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international and interspecies issues* Routledge 1995 pp.108-120

Radetzki, Marian: *Tillväxt och miljö* SNS Förlag 1990

Radetzki, Marian: *Den gröna myten – Ekonomisk tillväxt och miljöns kvalitet* SNS Förlag 2001

Rainforest Action Network <http://www.ran.org> 2006-08-10

Randall, Alan: "Human Preferences, Economics, and the Preservation of Species" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.79-109

Rawls, John: *A theory of justice* Oxford University Press 1973

Rawls, John: *Political Liberalism* Columbia University Press 1993

Regan, Donald H.: "Duties of Preservation" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.195-220

Ricklefs, Robert E.: *The economy of nature* Freeman 1997

Rio Declaration on environment and Development The Earth Summit Rio de Janeiro 1992

Rundlöf, Ulla: "Nytan med Linné och kunskapens villkor" Summary of presentations made at the Linné-symposium Lund 1999, and printed in Eliasson, Per & Lisberg Jensen, Ebba (red.) *Naturens nytta – Från Linné till det moderna samhället* Historiska media 2000 pp.12-19

Sandin, Per: "Dimensions of the Precautionary Principle" in *Human and Ecological Risk Assessment* 5 1999 pp.889-907, and in Sandin, Per: *Better Safe than Sorry* Theses in Philosophy from the Royal Institute of Technology 2004

Sandin, Per & Peterson, Martin & Hansson, Sven Ove & Rudén Christina & Juthe, André: "Five charges against the precautionary principle" in *Journal of Risk Research* 5 2002 pp.287-299, and in Sandin, Per: *Better Safe than Sorry* Theses in Philosophy from the Royal Institute of Technology 2004

Sandin, Per: "A Paradox out of Context: Harris and Holm on the Precautionary Principle" in Sandin, Per: *Better Safe than Sorry* Theses in Philosophy from the Royal Institute of Technology 2004

Sandin, Per: *Better Safe than Sorry* Theses in Philosophy from the Royal Institute of Technology 2004

Sandin, Per: "The Precautionary Principle and the Concept of Precaution" in Sandin, Per: *Better Safe than Sorry* Theses in Philosophy from the Royal Institute of Technology 2004

San Francisco Adopts the Precautionary Principle:
http://www.rachel.org/bulletin/index.cfm?issue_ID=2338

Schwartz, Thomas: "Obligations to Posterity" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996 pp.3-13

Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996

SF Precautionary Principle Ordinance:
<http://www.sfenvironment.com/aboutus/innovative/pp/sfpp.htm> 2005-10-15

de-Shalit, Anver: "Bargaining with the Not-yet-born? – Gauthier's Contractarian theory of Inter-generational Justice and its Limitations" in *International Journal of Moral and Social Studies* 5 1990

de-Shalit, Anver: *Why Posterity Matters* Routledge 1995

Shrader-Frechette, Kristin: "Duties to Future Generations, Proxy Consent, Intra- and Intergenerational Equity: The Case of Nuclear Waste" in *Risk Analysis* 20 2000 pp.771-778

Simmons, G.I.: "Nature, culture and history" in Cooper, David E. & Palmer, Joy A.: *Just Environments – Intergenerational, international and interspecies issues* Routledge 1995 p.59-71

Stijkel, Ann & Reijnders, Lucas: "Implementation of the precautionary principle in standards for the workplace" in *Occupational and Environmental Medicine* 52 1999 pp.304-312

SLU: "Bättre träd på kortare tid" <http://www.slu.se/?id=551&puff=11> 2006-07-24

SLU: "Vi kan ersätta olja med kål" <http://www.slu.se/?id=551&puff=3> 2006-07-24

SLU: "Vi kan ersätta olja med kål – men hur skall vi veta om det är rätt?" <http://www.slu.se/?ID=563> 2006-07-24

Sober, Elliott: "Philosophical Problems for Environmentalism" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.173-194

Sumner, L.W.: "Classical Utilitarianism and the Population Optimum" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996 pp.91-111

Svenska Naturskyddsföreningen <http://www.snf.se> 2006-08-10

Svenska Rovdjursföreningen <http://www.rovdjur.se> 2006-08-10

Sveriges Ornitologiska Förening <http://www.sofnet.org> 2006-08-10

Söderqvist, Tore: "Nötskrikan – värd sin vikt i guld" in Johansson, Birgitta (ed.): *Bevara arter – till vilket pris* Formas 2005 pp.73-81

Sörlin, Sverker: *Naturkontraktet* Carlssons 1991

Taiga Rescue Network <http://www.taigarecue.org> 2006-08-10

The World Conservation Union <http://www.iucn.org/> 2006-08-10

Tilman, David: "Biodiversity: Population Versus Ecosystem Stability" in *Ecology* vol.77 1996 p.350-363

Tucker, Richard P.: "Five hundred years of tropical forest exploitation" in Head, Suzanne & Heinzman, Robert: *Lessons of the Rainforest* Sierra club books 1990 pp.39-52

Turner, Derek & Hartzell, Lauren: "The Lack of Clarity in the Precautionary Principle" in *Environmental Values* 13 2004 pp.449-460

University of Redlands P3 project at <http://www.institute.redlands.edu/p3/tthome.htm>

Vermeij, Geerat J.: "The Biology of Human-Caused Extinction" in Norton, Bryan G. (Ed.): *The Preservation of Species* Princeton University Press 1986 pp.28-49

Wallström, Margot EU commissioner, interview with in *Sydsvenska Dagbladet* February 9th 2004: <http://w1.sydsvenskan.se/print/printarticle.jsp?article=10074604>

Walsh, Juan Rodrigo: "Major Infrastructure Projects, Biodiversity and the Precautionary Principle: The Case of the Yacyretá Dam and Iberá Marshes" in *Review of European Community and International Environmental Law* 13 2004 pp.61-71

Wandall, Birgitte: "Values in science and risk assessment" in *Toxicology Letters* 152 2004 pp.265-272

Wandall, Birgitte: "Värderingar inom naturvetenskap och riskbedömning" presented at Filosofidagarna Uppsala 2005

Warren, Mary: "Do Potential People Have Moral Rights?" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996

Wildlife Trust <http://www.wildlifetrust.org> 2006-08-10

Wingspread Conference on the Precautionary Principle 1998

Williams, Mary B.: "Discounting Versus maximum Sustainable Yield" in Sikora, R.I. & Barry, Brian (Eds): *Obligations to Future Generations* The White Horse Press 1996 pp.169-185

World Commission on Environment and Development: *Our Common Future* United nations 1987

World Conference on Sustainable Tourism: *Charter for Sustainable Tourism* 1995

World Ecotourism summit: *Québec declaration on ecotourism* 2002

World Wide Fund For Nature <http://www.panda.org/> 2006-08-10

Wramner, Per: "Förord" (preface) to Aniansson, Britt (ed.): *Biologisk mångfald* SNF 1990

Östberg, Gustaf: *Att veta vad man gör – studier i riskhantering* Carlssons förlag 1993