

~The Dynamics of Ecology and Ethics~

Towards an Integrated Ethical and Biological Analysis
of Ecosystem Services



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Abstract

Scientific experts urge us to treat ecosystems and their services with due respect and prudence if we care about human survival. However the way in which to argue for the protection of ecosystem services differs greatly depending on the perspective one takes. Arguing for awarding a certain value to aspects of these services is even less straightforward.

The science of ecology can inform us what function which aspect of an ecosystem has and consequently provides us with information on what we should value. Yet a lot is still unknown to us and this means that it becomes difficult to properly evaluate ecosystem services, especially in the economic terms that are so determining for our policies and society. A moral evaluation of ecosystem services together with ecological knowledge on ecosystem services may be able to fill this valuation gap. The relationship between science and ethics has long since been controversial though.

I argue that a combination of environmental virtue-ethics and evolutionary biology will give the most encompassing and encouraging view of how humanity should relate to nature and to ecosystem services specifically. These theories merge quite naturally because they both acknowledge that morality (as a product of evolution) encompasses social, rational and emotional human nature that should be weighed in each context to come up with a suitable (moral) adaptation of one's attitude towards the environment. This can be compared to the way in which other organisms and whole ecosystems adapt through trial and error as a product of evolution. I think the regard for evolutionarily developed, natural traits and functions is necessary if we want humanity to jointly and effectively address the degradation of ecosystem services.

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Introduction

Humanity has conquered all corners of the earth, billions of us are spread across the globe and our numbers are still growing. The fact that all human beings need food, water and shelter for survival has left the earth's resources strained, deregulated and exhausted. Ecosystems and their services provide humanity with the necessary means to live and survive. However our resource depleting and ecosystem deregulating actions, like driving petrol guzzling cars and wasting litres of water in households, seem to illustrate that we do not value ecosystem services. Scientific experts urge us to treat ecosystems with due respect and prudence if we care about human survival. However the way in which to plead for the protection of ecosystem services differs greatly depending on the perspective one takes. Arguing to award a certain value to (aspects of) these services is even less straightforward.

The science of ecology can inform us which function (aspects of) ecosystems have and consequently provides us with information on what we should value. Yet a lot is still unknown to us and this means that it becomes difficult to properly evaluate ecosystem services, especially in the economic terms that are so determining for our policies and society. A moral evaluation of ecosystem services together with ecological knowledge on ecosystem services may be able to bridge this valuation gap. The relationship between science and ethics has always been controversial though. Therefore this study will address the question:

~ How should ecological data on ecosystem services relate to moral deliberation?

In order to answer this question I will address three sub-questions. The first chapter will demarcate the problem this study deals with by answering the question: why would we want to conduct research on ecosystems and their services? In this chapter I will elaborate on the empirical and socio-economic¹ side of evaluating ecosystem services and the shortcomings. I will prove that ecological sciences make clear that ecosystems services are essential for human life, but that their workings are very complex and often poorly understood. This gap in our knowledge is problematic for a socio-economic evaluation of ecosystem services, because we would only be able to award a value to what we know is beneficial for our lives, leaving out potentially valuable aspects of ecosystems we do not yet understand or know about. To conduct further research would be in the interest of humanity because it can either enable us

¹ I chose to focus on the 'socio-economic' rather than the 'economic' side, because I want to focus on the intertwinement of economics with social processes I believe to be important for the environmental debate, rather than the narrower field of economics that focuses on monetary evaluations only.

to protect ecosystem services properly or enable us to fully understand their workings and in time substitute them. Which of these two options is best to support is rather a question for normative ethics the one philosophical discipline concerned with judging the morality of our actions and attitudes.² A discipline inevitably linked with, but in this study distinguished from the empirical and socio-economic views for argumentation purposes.

The second chapter therefore addresses the question: in what way are ecosystem services of moral relevance? Here I will elaborate on different ethical positions which are mainly supported in the environmental debate. I will address their strong and weak points. I will argue that environmental virtue-ethics is more helpful in environmental debates because it presents multiple criteria by which to judge morality. It values nature for the sake of human well-being, not going to extreme lengths to advocate a value of nature that is separate from human evaluation. It is an agent-centred theory that has regard for our human nature with all its peculiarities and stresses that we are not perfect, but we can perfect our ways to improve our morality. This will hopefully both enable and encourage more people to want to be part of the sustainability endeavour. These points can be an advantage over utilitarianism and deontology that in my opinion suffer some problems regarding the environmental debate, being act-centred with the aim of providing a single criterion that should be universalisable. The problems this yields is that it is difficult to judge which action is morally right because (future) environmental circumstances are uncertain, the respective criterion often is not action-guiding or even guide towards committing an immoral act.

The relation between ecology and ethics, and particularly virtue-ethics, should be addressed in order to answer the main question of this study. The last sub-question therefore reads: what should the dynamics between ecology and ethics be? First I will address the main philosophical issues that come into play when trying to merge science and ethics, namely: the is-ought problem, the naturalistic fallacy and the fact-value distinction. Afterwards I will present views that either circumvent or reject these issues. Philosopher Marcus Düwell presents a helpful method of applied ethics, of which environmental ethics is a part according to Düwell³, that will circumvent the is-ought problem by incorporating proper reflection in moral deliberation. Ecologist-philosopher Ricardo Rozzi presents an analysis that I endorse which denies the fact-value distinction in the case of ecology and ethics. Lastly, to address the naturalistic fallacy, I argue that the idea of intrinsic value that is underlying this fallacy is not constitutive of a philosophically defensible, environmental ethics, because it is not action-

² Jan M.G. Vorstenbosch, "Ethiek – Ethics," In *Analytische filosofie - Een inleiding*, edited by Chris Buskes and Herman Simissen, (Nijmegen: Van Tilt, 2014), 217.

³ M. Düwell, *Bioethics: Methods, Theories, Domain* (London: Routledge, 2012), 3 & 36.

guiding in that it is too abstract from a human perspective and it will logically exclude non-sentient parts of nature from being morally considerable. I argue further that a combination of environmental virtue-ethics and evolutionary biology will give the most encompassing and encouraging view of how humanity should relate to nature and to ecosystem services specifically. These theories merge quite naturally because they both acknowledge that morality (as a product of evolution) encompasses social, rational and emotional human nature that should be weighed in each context to come up with a suitable (moral) adaptation of one's attitude towards the environment. This is similar to other organisms and whole ecosystems that adapt through trial and error as a product of evolution. I think the regard for evolutionarily developed, natural traits and functions is necessary if we want humanity to jointly and effectively address the degradation of ecosystem services.

I. Empirical and Socio-Economic Approach to Ecosystem Services

What now remains of the formerly rich land is like the skeleton of a sick man with all the fat and soft earth having wasted away and only the bare framework remaining. Formerly, many of the mountains were arable. The plains that were full of rich soil are now marshes. Hills that were once covered with forests and produced abundant pasture now produce only food for bees. Once the land was enriched by yearly rains, which were not lost, as they are now, by flowing from the bare land into the sea. The soil was deep, it absorbed and kept the water . . . , and the water that soaked into the hills fed springs and running streams everywhere. Now the abandoned shrines at spots where formerly there were springs attest that our description of the land is true.

~Plato~⁴

THE VALUE OF ecosystem services may seem obvious to the connoisseur and even to other intellectuals like Plato to whom, centuries before the beginning of our time, this was clear. So to discuss why we would want to know about the workings of ecosystems and their respective services may come across as superfluous. However it turns out to be very difficult to pinpoint how these ecosystems exactly work and thus to determine their worth and the way we should treat them. Hence this chapter aims to answer the question: Why would we want to conduct research on ecosystems and their services?⁵ First I will briefly describe what ecosystems and ecosystem services are from an empirical approach, after which I can demonstrate the importance of doing research on their workings by referring to a case-study of bees as pollination providers for agriculture.

Before the analysis of the possible link between ecological knowledge of ecosystem services and ethics can commence, we first have to clarify why we would want to gain knowledge of ecosystems and their services in the first place. This will enable us to fully understand the debate on the relevance of ecosystem services in empirical and socio-economic terms before diving into the question of their moral relevance. In order to do this I will present what data can be gained in ecological research that may be relevant for our moral decisions. First it is important to define what an ecosystem is (and hence what ecosystem

⁴ D. Hillel, *Out of the Earth: Civilization and the Life of the Soil* (New York: The Free Press, 1991), 104.

⁵ The 'would' in this question seems to make it an evaluative, which would suggest that I am going to present all possible values we can award to research on ecosystem services. However for the purpose of my line of argument I will only discuss the empirical and socio-economic side of reasons for doing ecological research here. The main reason for this is that I want to leave the discussion on the relation between facts and values for the third chapter, because it will otherwise interfere with a clear demarcation of the empirical and socio-economic standpoints that are prevalent in the environmental debate that give rise to moral questions.

services are), in order to have a clear view of the phenomena discussed in this study.

Ecosystems can be described as:

(...) any unit (a biosystem) that includes all the organisms (the biotic community) in a given area interacting with the physical environment so that a flow of energy leads to clearly defined biotic structures and cycling of materials between living and non-living parts. An ecosystem is more than a geographical unit (or ecoregion); it is a functional system unit with inputs and outputs, and with boundaries that can be either natural or arbitrary.⁶

Ecosystem services then, are the benefits humans can reap from the workings of ecosystems, including everything from nutrient flows that provide fertile soil and clean drinking water to the provision of aesthetic sights to see in nature.⁷

Since humans are organisms, it is needless to say that humans interact within ecosystems and have an impact on the functioning of these ecosystems. With this impact humans can use ecosystems to their advantage, but they can also deregulate them. The question then pops up which anthropogenic alterations should be tolerated and which ones should be avoided. Here I will only discuss the empirical and socio-economic approach to the matter, namely what scientific knowledge is needed on ecosystem goods and services to guarantee socio-economic stability. Chapter two will elaborate on the moral approach to the matter that these other approaches give rise to and are intertwined with.

I.1 What We Do and Do Not Know

According to experts ecosystem services are essential to human existence, yet they are seriously under threat by human actions.⁸ Furthermore these experts state that these services cannot be substituted by human systems.⁹ They argue that humans both lack the ability and knowledge to do so. Environmental scientist Gretchen Daily and philosopher Shamik Dasgupta hope to make this clear by referring to the failed experiments of the ‘Biosphere 2’

⁶ Eugene P. Odum, “Ecosystem, Concept of,” *Encyclopedia of Biodiversity 2* (2001): 305, accessed May 19, 2015, [doi:10.1016/B978-0-12-384719-5.00040-X](https://doi.org/10.1016/B978-0-12-384719-5.00040-X).

⁷ Gretchen Daily and Shamik Dasgupta, “Ecosystem Services, Concept of,” *Encyclopedia of Biodiversity 2* (2001): 353, accessed April 23, 2015, [doi:10.1016/B0-12-226865-2/00091-2](https://doi.org/10.1016/B0-12-226865-2/00091-2).

⁸ Ibid.

⁹ Ibid.

mission.¹⁰ This case-study illustrates how researchers currently lack the required knowledge and means to successfully substitute or mimic the functions of ecosystems and their services.

NATURAL CYCLES FUELED by solar energy are the driving force behind ecosystem services.¹¹ These cycles are very complex and operate in different timeframes and on different scales, but they are all the product of billions of years of evolution. They provide stability to humanity and enable survival, but most of this goes unnoticed in our daily lives. Moreover, most of these services are not included in our trading systems and have no price-tag attached to them. This means that, even though this is an economic focus, the fluctuation or deterioration of services do not flag up as concerning facts, at least not as often as fluctuations of the stock market.¹² Daily and Dasgupta therefore urge that local and global monitoring systems of ecosystem services need to be installed and that their value should be implemented correctly in policy-making.¹³

They further present four scientific facts about ecosystem services:¹⁴

1. They are critical for civilisation,
2. They are operational in very intricate ways, on such a large and unexplored scale that technology is not able to substitute them,
3. They are already being impaired by human actions,
4. If these alterations continue, humanity will have altered the whole of the Earth's surface gravely.

For Daily and Dasgupta these four facts represent the bare minimum of what we can be certain of.

At the beginning of the 1980's research was initiated to determine the importance of biodiversity for the functioning of ecosystems and to determine whether technology would be in a position to substitute this.¹⁵ Biodiversity is the concept describing everything from the ecosystem processes regulating energy and nutrient flow to sustain life to the diversity of ecosystems and the variety of species that inhabit them.¹⁶ Because it is such a complex

¹⁰ In this mission the aim was to create a fully self-sustained and closed ecosystem where eight people would live for two years, supported merely by the created ecosystem. However very early in the process unforeseen problems arose such as a drop in the oxygen level to a mere 14%, the extinction of 19 of the 25 species of vertebrates and an explosive growth of pest populations. Gretchen Daily and Shamik Dasgupta, "Ecosystem Services, Concept of," *Encyclopedia of Biodiversity 2* (2001): 354-353, accessed April 23, 2015, [doi:10.1016/B0-12-226865-2/00091-2](https://doi.org/10.1016/B0-12-226865-2/00091-2).

¹¹ Ibid. 353

¹² Ibid.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Ibid. 356.

¹⁶ G. Tyler Miller and Scott E. Spoolman, *Living in the Environment* (Canada: BROOKS/COLE CENGAGE Learning, 2010), 80.

concept experts now advise to take a ‘multi-attribute’ approach to estimate the value of biodiversity.¹⁷ Biodiversity consists of different operational levels from genes to species, all playing their part in ecosystems and thus in their services that impact societies. To focus on just one aspect of biodiversity when attributing values is problematic, because the levels of biodiversity interact in such unexplored and complex ways.¹⁸ It seems more appealing to focus on just one aspect, because of the recurring scientific principle of ‘simplicity’.¹⁹ However to literally have regard for the ‘diversity’ in biodiversity and focus on the general benefits biodiversity provides – namely ecosystem stability and insurance often unbeknown to the greater public - is important, because the state of biodiversity inevitably affects human well-being through its multiplicity of impacts on ecosystems and their services.²⁰ To show the intricacy of how ecosystems work and the role of biodiversity, I will give an example: the ecosystem where pollinators interact and the agricultural sector benefits.

POLLINATION IS THE transfer of pollen grain, the male parts of a flower, to the stigma, the female part of a flower where it eventually grows into a seed.²¹ The animal pollinators of plants in turn search for rewards like nectar and pollen or perfumes and oils.²² The diversity of relationships between plants and pollinators has sparked interest among researchers; especially pollination in agriculture has given research a boost.²³ Recently, researchers have discovered evidence in the form of fossils of flowering plants that date back to the late Jurassic period, which suggests that the co-evolution of plants and pollinators may be older than assumed before.²⁴ The immense diversity of types of flowering plants with their different colours, smells, shapes et cetera is the result of these evolutionary processes.

The largest group of pollinators are the *Hymenoptera* among which are bees on which I focus my investigation.²⁵ Interestingly enough almost all bee species and their larvae are dependent on flowers.²⁶ They collect pollen and nectar to feed themselves and their larvae, some species collect oil for nutrition and some resin for constructing their nest. The bee is the

¹⁷ Bartosz Bartkowski et al., “Capturing the complexity of biodiversity: A critical review of economic valuation studies of biological diversity,” *Ecological Economics* 113 (2015): 8.

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Ibid.

²¹ David W. Inouye, “Pollinators, Role of,” *Encyclopedia of Biodiversity* (2007): 1, accessed April 30, 2015, [doi:10.1016/B0-12-226865-2/00348-5](https://doi.org/10.1016/B0-12-226865-2/00348-5).

²² Ibid. 2.

²³ Ibid.

²⁴ Ibid.

²⁵ Ibid. 4.

²⁶ Ibid.

most adapted species of pollinator amongst all the pollinating animals.²⁷ Pollination by bees is very important for agriculture. One way of stressing the importance is by presenting economic yields.²⁸ A positive correlation exists between the density of pollinators in an area, the yield of the crops and consequently economic gain.²⁹ In a study running from 1991 to 2001 in the European Union (EU) it was shown that on average the European gain from pollinator services account for 12% of the total economic value of agricultural production.³⁰ Another model showed that approximately 1.6 to 5.7 billion US dollars would be lost annually if the service of pollination by the honeybee was reduced.³¹ The estimation of the worldwide value of pollination services came in at 117 billion US dollars per year. A lack of pollination by animals (including bees) would account for a worldwide loss of 153 billion euros or 9.5% of the crop production for human consumption annually.³² Both pollination stability and vulnerability is higher in countries that derive more of their Gross Domestic Product (GDP) from agriculture.³³ The dependency on pollination services can be gauged per country by an estimation from geographical, environmental and socio-economic perspectives.³⁴ Many of the ins and outs of pollination in agriculture are however still unknown to us and the gaining of knowledge goes at a slow pace.³⁵ Even the economic estimations of losses and gains due to pollination services vary widely as we have seen above. In general we know that a diversity of bees increases the stability of pollination services, because species have different spatial, temporal and conditional characteristics that complement each other and together can overcome environmental fluctuations.³⁶

The most well-known, domesticated species are so-called social bees.³⁷ The European honeybee is the species that is introduced to other countries for pollination of crops on the largest scale.³⁸ The main reason for this is that non-native plants are imported simultaneously

²⁷ David W. Inouye, "Pollinators, Role of," *Encyclopedia of Biodiversity* (2007): 4, accessed April 30, 2015, [doi:10.1016/B0-12-226865-2/00348-5](https://doi.org/10.1016/B0-12-226865-2/00348-5).

²⁸ Ibid.

²⁹ S.D. Leonhardt, et al., "Economic gain, stability of pollination and bee diversity decrease from Southern to Northern Europe" *Basic and Applied Ecology* 14 (2013): 462, accessed April 21, 2015, doi:10.1016/j.baae.2013.06.003.

³⁰ Ibid. 468.

³¹ David W. Inouye, "Pollinators, Role of," *Encyclopedia of Biodiversity* (2007): 7, accessed April 30, 2015, [doi:10.1016/B0-12-226865-2/00348-5](https://doi.org/10.1016/B0-12-226865-2/00348-5).

³² S.D. Leonhardt, et al., "Economic gain, stability of pollination and bee diversity decrease from Southern to Northern Europe" *Basic and Applied Ecology* 14 (2013): 462, accessed April 21, 2015, doi:10.1016/j.baae.2013.06.003.

³³ Ibid. 468.

³⁴ Ibid. 462.

³⁵ David W. Inouye, "Pollinators, Role of," *Encyclopedia of Biodiversity* (2007): 6, accessed April 30, 2015, [doi:10.1016/B0-12-226865-2/00348-5](https://doi.org/10.1016/B0-12-226865-2/00348-5).

³⁶ S.D. Leonhardt, et al., "Economic gain, stability of pollination and bee diversity decrease from Southern to Northern Europe" *Basic and Applied Ecology* 14 (2013): 468, accessed April 21, 2015, doi:10.1016/j.baae.2013.06.003.

³⁷ David W. Inouye, "Pollinators, Role of," *Encyclopedia of Biodiversity* (2007): 4, accessed April 30, 2015, [doi:10.1016/B0-12-226865-2/00348-5](https://doi.org/10.1016/B0-12-226865-2/00348-5).

³⁸ Ibid. 7.

that cannot or will not be pollinated by native species.³⁹ Recently the honeybee populations in the US have seen a decrease in numbers, jeopardizing the pollination service in agriculture.⁴⁰ This fall in numbers has increased the reliance of agriculture on the pollination by (wild) native species. Human induced threats to bee colonies include the use of pesticides and herbicides, habitat fragmentation, various effects of industrial agriculture and the introduction of new plant and pollinator species.⁴¹ Habitat fragmentation is a problem even for winged pollinators such as bees, because they can become hesitant to fly long distances in deforested or newly cultivated areas. Moreover if their habitat fragments are too small their reproduction might become problematic and cause negative genetic consequences. The ploughing of fields may be an obstacle for pollinators as well, as it disturbs potential habitat. Monocultures can be a limited resource of nutrients for pollinators too, not providing them with enough pollen and nectar to survive. The introduction of non-native plants that are close to native plants in terms of genetic make-up can have hybridisation of these plants as a result. These non-native plants and hybrids might compete with native crops for pollination as pollinators can be more attracted to the non-native plants and hybrids. However the effects of the introduction of non-native plants and pollinators are still largely unknown to us. Pesticide use in turn could be detrimental to pollinator colonies and herbicides could kill plants that provide a resource for pollinators. Unfortunately the effects of pesticide use are difficult to measure, as some effects do not show in controlled experiments.⁴² There are effects that result in acute and detectable deaths, but other effects can be harder to prove such as a dieback in a decade's time or the change in physiological make-up and/or behavioural patterns.

The most important thing to note is that both EU countries and the US possibly face monetary losses especially when they cultivate pollination dependent crops that cannot be substituted.⁴³ Farmers keep honeybees more frequently nowadays, to provide pollination to their crops, however this species is in decline for various reasons.⁴⁴ Plus it has been shown that economic yields are most probably down to a variety of bee species rather than a single species and thus the protection by law of the richness in pollinator species is preferable.⁴⁵ While a lot is still uncertain about the plant-pollinator relationship and the extent to which environmental conditions affect it, the need for more research is pressing. It is estimated that

³⁹ David W. Inouye, "Pollinators, Role of," *Encyclopedia of Biodiversity* (2007): 7, accessed April 30, 2015, [doi:10.1016/B012-226865-2/00348-5](https://doi.org/10.1016/B012-226865-2/00348-5).

⁴⁰ Ibid.

⁴¹ Ibid. 8.

⁴² J. Van der Sluijs et al. "Bijen en insecticiden: Late Lessen uit Vroege Waarschuwingen," *Tijdschrift Milieu* (2014): 37.

⁴³ S.D. Leonhardt, et al., "Economic gain, stability of pollination and bee diversity decrease from Southern to Northern Europe" *Basic and Applied Ecology* 14 (2013): 469, accessed April 21, 2015, doi:10.1016/j.baae.2013.06.003.

⁴⁴ Ibid. 470.

⁴⁵ Ibid.

habitat protection and defragmentation in order to safeguard pollinators' nutrition and nest-sites are the most effective policy measures that can be taken to protect pollination services.⁴⁶ Maintenance of wild bees and domestication may also help towards this goal. Plus the reintroduction of locally extinct pollinator species is advisable provided that the main cause of the extinction has been addressed effectively. When a species is globally extinct pollination by hand is the last resort.

IN SHORT THIS case-study shows that flowering plants are as dependent on pollinators as pollinators are dependent on flowering plants for survival. Society is in turn dependent on pollination for a large part of their agricultural activities accounting for billions of dollars and euro's. The more diverse a group of pollinator species is and the more stable their habitat is, the higher the yield of crops will be. However the keeping of bees for agriculture has been characterised by the keeping of a single species, the honeybee, causing all sorts of problems. Therefore we may conclude there is still a lot we have to learn about pollination services that have evolved for over billions of years, because it is affected by a lot of factors on different scales. These are environmental, geographical and socio-economical scales, but are also impacted by genetic and species diversity. This precludes humanity from substituting or mimicking pollination services effectively with the current level of knowledge and technology.

This level of intricacy and importance of diversity is characteristic for a lot of ecosystems and their services. Therefore as long as we don't understand the functioning of them through the empirical studies we have conducted, we cannot do without their naturally evolved functions. From both a social and economic perspective we are still dependent on them, which is a plea for their conservation or restoration. There are however limits to the empirical and socio-economic approach as I will show in the next paragraph.

I.2 The Limits To an Empirical and Socio-Economic Approach

As presented before, Daily and Dasgupta name four facts about ecosystem services of which we can be sure (see page 8). However these bare facts raise questions: what standard of living are ecosystem services essential for? If research provides the required knowledge to enable humanity to substitute ecosystem functions, implying that natural ecosystems will not be sustained, is it morally acceptable to do so? How grave is the impairment of ecosystem

⁴⁶ David W. Inouye, "Pollinators, Role of," *Encyclopedia of Biodiversity* (2007): 9, accessed April 30, 2015, [doi:10.1016/B012-226865-2/00348-5](https://doi.org/10.1016/B012-226865-2/00348-5).

services considered to be? And, what is the harm in humanity having altered the face of the Earth? All these questions still need to be answered to give body to these four basic facts. I will further explore some of the answers that relate to socio-economic or empirical issues here and will move other questions forward to be answered in the following chapters.

THE POLLINATOR CASE-STUDY shows that pollination services are important to our economic systems. The state of our economy is very important for the standard of our lives, however much you may disagree with this status quo. From this socio-economic perspective you could argue that pollination services need to be maintained. The most important and current issue to note is that people often do not observe, value or understand the benefits they reap from ecosystem services. As a result, they systematically do not realise how degrading some of their activities have been for these services until they have been irreversibly deregulated.⁴⁷ From an economic perspective this can be seen as a loss, because ecosystem services can be regarded as free providers of costly work when valued monetarily.⁴⁸ Empirical studies can fill the gaps in our knowledge, showing our dependence on ecosystems so they can be evaluated economically. However the economic perspective also has its limits, because the current economic system (for the most part) focusses on unlimited growth and assumes that natural resources are inexhaustible when in fact they are not. Natural resources cannot sustain unlimited growth.⁴⁹ This dominant view in economics, that has its grip on many societies, would have to be reformed in order to appreciate that there are limits to growth. Such a reformation would go hand in hand with much controversy and debates about the (unequal) standards of living.

Furthermore this sketch of potential gains and losses from pollination services has not been compared with the potential development societies can go through that may enable them to become independent of ecosystem services. When considering whether technology can substitute for biodiversity, it will not suffice to refute the possibility by saying that it cannot be done with current knowledge, because as we all know: knowledge evolves. Imagine we would have enough knowledge and sufficient means to substitute ecosystem services, the inevitable question arises and it is one we cannot postpone for future generations to answer: should we want this? Consider a scenario in which we would have the knowledge to no longer be in need of natural pollination services. We have conducted enough research by which we

⁴⁷ Gretchen Daily and Shamik Dasgupta, "Ecosystem Services, Concept of," *Encyclopedia of Biodiversity 2* (2001): 359, accessed April 23, 2015, [doi:10.1016/B0-12-226865-2/00091-2](https://doi.org/10.1016/B0-12-226865-2/00091-2).

⁴⁸ Ibid.

⁴⁹ Philip J. Cafaro and Richard B. Primack, "Ethical Issues in Biodiversity Protection" *Encyclopedia of Biodiversity 2* (2001): 597-598, accessed May 20, 2015, [doi:10.1016/B0-12-226865-2/00109-7](https://doi.org/10.1016/B0-12-226865-2/00109-7).

can mimic or enhance nature and have created enough means necessary for pollination by machine or hand or we are able to grow crops that do not need pollination. The decline of pollinator colonies would follow as their maintenance is no longer of importance to us and it is also very costly when you can convert their habitats to more profitable crop fields. We will have changed the earth drastically in a few decades time. Would we be missing out on something in this scenario, would something be lost with the disappearance of natural pollination services?

It can be concluded that the empirical and socio-economic approach to ecosystem services hinges on two contrary views. On the one side we have the school that argues we have to advance our understanding of ecosystem services for the sake of preserving or restoring them. For this the main argument is that with our current knowledge and societal requirements we cannot do without ecosystem services.⁵⁰ On the other side there is the school that argues for research into ecosystem services, because this school is hopeful that we may be able to substitute or mimic them in time.⁵¹ The recurring question whether we should want to substitute and/or mimic ecosystem services has three components that need to be addressed. The first I will further discuss in chapter two, the second and third I will consider in chapter three : 1) whether substitution neglects some other morally relevant value of nature (see page 28), 2) whether the fact we can or cannot substitute these services prescribes us to pursue substitution or not (see pages 34-35) and 3) whether research into the (im)possibility of substitution and/or mimicry presupposes that we value the natural systems in some way (see pages 39-40). Together these components can contribute to an answer to the main question, which I will come to in the overall conclusion (see page 46).

I.3 Conclusion

Ecosystems are biosystems that harbour all organisms in a certain area which interact with the physical environment, creating an energy flow that characteristically forms cycles of materials and interactive structures between living and non-living parts. These cycles and structures have in- and output that can be beneficial to humanity. For example the ecosystem in which bees pollinate flowering plants helps to maintain both the bee colonies and plants, but this pollination is also essential for our agriculture. These types of services provided by ecosystems, like the pollination service, are called ‘ecosystem services’.

⁵⁰ See for example David W. Inouye, “Pollinators, Role of,” *Encyclopedia of Biodiversity* & Gretchen Daily and Shamik Dasgupta, “Ecosystem Services, Concept of,” *Encyclopedia of Biodiversity*.

⁵¹ See for example Gretchen Daily and Shamik Dasgupta, “Ecosystem Services, Concept of,” *Encyclopedia of Biodiversity 2* (2001): 356. & G. Tyler Miller and Scott E. Spoolman, *Living in the Environment* (Canada: BROOKS/COLE CENGAGE Learning, 2010), 647.

These ecosystems and their services have evolved for over billions of years and function in very intricate and poorly understood ways. The main driving forces behind them are natural cycles and biodiversity. These in turn operate on different scales making the analyses of the functioning of ecosystems a very complex affair. Therefore ecologists recommend that we should have regard for this complexity and the principle of ‘diversity’, which is not always as popular in the scientific field where the principle of ‘simplicity’ rules.

Humanity benefits from ecosystem services in major economic and societal ways. The preservation of these services can thus be argued for from the socio-economic perspective. However, as some aspects of ecosystems are poorly understood, we cannot always evaluate them properly, especially in monetary terms that often dictate our societal standards. Scientific research may be able to fill in this gap and provide us with the information to distinguish valuable from less valuable ecosystem functions. However, this leaves us with the problem that we have no reason to attribute value to any part of nature, from an economic perspective at least, until we know what is important. Scientific uncertainty is therefore a great limitation to this empirical and socio-economic approach.

There are two views that can be deduced from the empirical and socio-economic approach of why we should research ecosystem services: 1) for the sake of preserving the poorly understood services society depends on so much, 2) in order to fully understand how they work and in due time enable us to substitute them. If in the future we are able to substitute natural ecosystem services with technology, there would be no reason from these perspectives to maintain natural ecosystem services. This begs the question whether, by holding these views, we would neglect other values of nature, to which I will come in chapter two. Plus it makes us wonder if the (in-)ability to substitute ecosystem services prescribes us to pursue this goal or not and whether research of ecosystems and their services presupposes that we value nature in another way. To these latter questions I will come in chapter three.

II. Ethical Approach to Ecosystem Services

If the land mechanism as a whole is good then every part is good,
 whether we understand it or not...
 To keep every cog and wheel is the first precaution of intelligent tinkering.⁵²

We need knowledge - public awareness – of the small cogs and wheels, but sometimes I think there is something we need even more... ‘a refined taste in natural objects.’
 Have we made any headway in developing ‘a refined taste in natural objects’?⁵³
 ~Aldo Leopold~

In the last chapter it was established that, as organisms living in the environment, humans are a part of ecosystems. The services and goods the ecosystems provide are often beneficial to humans as they serve certain human needs. These services and goods are essential to human well-being and therefore can be seen as a necessary condition for leading a good and healthy life. As proposed by Aldo Leopold, if these ecosystems as natural mechanisms are good for our well-being, should we not regard every part that makes up this whole as important? The importance of ecosystems to living moral lives might become apparent to us following Leopold’s argument combined with the fact that we know so little about land mechanisms, because: without some critical ecosystem goods and services how could we enjoy a (quite literally) flourishing life?

The difficulty lies in establishing which value can be awarded to which natural function, because, as I have shown in the first chapter, the economic valuing system is not always as effective. To overcome its issues we can look at the different approaches in environmental ethics to see whether these can reflect on scientific evidence and uncertainty of how our environment works and award it the correct value accordingly. The focus of this chapter will therefore be ethical and aims to answer the question: In what way are ecosystem services of moral relevance?

I will argue that, although it can be argued from multiple ethical theories, valuing ecosystem services from a virtue-ethical perspective is the most encompassing and action-guiding if we are to fully commit ourselves to tackling their degradation to safeguard our well-being. The line of argumentation is two-fold, it is in my eyes both the most effective theory in linking science with ethics. That is to say it is the most action-guiding in dilemmas

⁵² Aldo Leopold, *Round River* Oxford: Oxford University Press, 1993, 146-147.

⁵³ Aldo Leopold, *A Sand County Almanac, with Essays on Conservation from Round River* New York: Ballantine Books, 1970, 194.

of environmental ethics. It is also pragmatic in the sense that I believe it will be most widely supported from both a common-sense and psychological perspective. I want to make clear that moral deliberation still is a human affair. This, referring to the second reason, helps in getting all people involved in the sustainability endeavour, because virtue-ethics will give them both the incentive to want and encouragement to be a part of it, as it is so much in line with common sense and psychological inclinations. To back up my views I will evaluate three important ethical theories through comparison, namely: environmental deontology, utilitarianism and virtue-ethics. I will support a mildly anthropocentric holism that is in line with environmental virtue-ethics.

II.1 Three Important Ethical Theories

In the environmental debate it is not common to refer to the classic meta-ethical theories. Advocates of different lines of argument rather just state how they believe we should approach nature. The debate within environmental ethics mainly centres around two particular themes, namely the anthropocentrism – non-anthropocentrism and the holist-individualist opposition and crossovers between these two themes.^{54, 55}

This does however not mean that the types of arguments are completely new; they are often underpinned by meta-ethical presuppositions that go way back in history. It may not be necessary to make clear which ethical theory you endorse to get your point across, but I believe it is important to go all the way back to the roots of the views you hold if you want to firmly defend your beliefs against those of others. That is why I highlight three important ethical theories utilitarianism, deontology and virtue-ethics in this paragraph to evaluate their contribution to the environmental ethics debate and to show how I believe virtue-ethics is the most helpful in our approach to ecosystem services.

In order to defend this case I want to take up the bee case-study again. Otherwise this paragraph stays altogether quite abstract; it is in need of some concrete illustration. A case-study can help in showing why I give virtue-ethics precedence over deontology and utilitarianism in the environmental debate.

⁵⁴ Philip J. Cafaro, and Richard B. Primack, "Ethical Issues in Biodiversity Protection," *Encyclopedia of Biodiversity*, (2001): 594 & 600-601, accessed May 20, 2015, doi: 10.1016/B0-12-226865-2/00109-7.

⁵⁵ Bryan Norton, "Anthropocentrism," *The International Encyclopedia of Ethics*, (2013): 310-311, accessed May 22, 2015, doi: 10.1002/9781444367072.wbiee075.

II.1.1 Environmental Utilitarianism

Utilitarianism is a form of consequentialism; a theory that is act-centred and judges what act is morally correct on the basis of its consequences.⁵⁶ In utilitarianism to act morally correct is to generate the greatest happiness (defined as ‘utility’) for the greatest number and do as little harm as possible.⁵⁷ Holding happiness to be the greatest moral good is the core meta-ethical position of utilitarians.

Non-anthropocentric individualists hold that moral concern should be extended to non-human ,sentient beings. This essentially utilitarian argument was first made popular by philosopher Peter Singer, who held that there was no solid foundation for stating that human sentience is superior to that of other animals. To hold that there is a hierarchal difference would be plain *speciesism*.⁵⁸ When we acknowledge that some beings are sentient we have to conclude that they have interests, defined as the will to pursue pleasure (as a form of happiness) and avoid suffering.⁵⁹ Consequently to do what is right as a moral agent we have to give equal weight to equal interests of individuals in moral deliberation.

A more holistic view endorsed by other utilitarians would encourage choosing the option that will generate the most happiness for the greatest number of sentient beings. The idea is that the interest of an individual animal can be trumped by the interest of a greater number of individuals. In this respect utilitarianism can also result in a form of non-anthropocentric holism when the rights of species are predominant, subscribing to the idea that the natural world is valuable to all sentient organisms.

I have got three points that contest the utilitarian standpoint in its approach to nature and specifically ecosystems. The first objection would be that, as a consequentialist theory, utilitarianism may encounter some trouble in predicting the consequences of actions. As we have seen in the previous chapter we may know that ecosystems depend on different levels of diversity and operate in and are influenced by many spheres (see page 9). The intricacy of how they work that has evolved for over billions of years is yet largely unknown to us. So in order to predict what impact an act has, let alone to judge the morality of that act by its consequences is very difficult. This is one reason why I believe utilitarianism, focused on maximising happiness as a consequence of one’s action, is not helpful in the environmental debate. Moreover, from a Utilitarian perspective an act can only be judged for its morality

⁵⁶ M. Zwolinski, en D. Schmidtz, “Environmental Virtue-ethics, What it is and what it needs to be,” In *The Cambridge Companion to Virtue*, edited by D.C. Russell, Cambridge: Cambridge University Press, 2013, 221 & 228-229.

⁵⁷ John Stuart Mill, “Chapter II: What Utilitarianism is,” In *Utilitarianism*, London: Parker, Son, and Bourn, West Strand, 1863, 17.

⁵⁸ Peter Singer, *Practical Ethics* Cambridge: Cambridge University Press, 1979, 33-36.

⁵⁹ Ibid.

when sentient beings are involved. This means that when it is doubtful that any sentient being is affected in their pleasure experience by the deregulation of an ecosystem or ecosystem service there is no moral case to make. This neglects the idea that there might be other values in nature we can respect for other reasons than its pleasure generation. Plus, and this is a more general objection against utilitarianism, pleasure is not always the right measure to lead our moral decisions. Some beings take pleasure in the wrong things that will harm themselves or others.

To illustrate my (mostly practical) objections I now take up the bee case-study again. From a utilitarian perspective this case is interesting. In this type of ecosystem there are only a few beings of which we can state they can experience pleasure and pain and the bee is presumably not amongst those. So arguing that the decline of the bee population is immoral from the perspective of the bees is rather controversial.⁶⁰ The beings in the ecosystem that can experience pleasure and pain are humans and some other animals with a central nervous system. It is clear that the service of the bees yields mankind pleasure although mostly indirectly, by supplying them with food and profit to enjoy. For some, who enjoy watching or studying busy bees or the spreading of blooming flowers, this enjoyment might be more direct. Other animals might profit from eating the blooming flowers, resulting fruit or the bees themselves, so this might be a reason to protect the bees.

Imagine the majority of people did not know that the bees were so important for agriculture and the bees are not essential to the diet of other animals. Our agriculture seems to keep doing fine even though bees are on the brink of extinction. The bee-lovers' concern and plea for conservation does not overrule the economic concern of conservation-opponents. However in a few decades time, the whole system collapses and there is no bee left to save the day. Where did we go wrong? I believe this thought experiment illustrates that the utilitarian focus on maximising happiness for the greater number is what went wrong here. I will give that Utilitarians weigh their optional actions carefully against each other to decide which action is the most optimal and moral in their eyes. However, if we do not know that conservation will yield the most pleasure in the long run and a bigger short term gain for a great number of people presents itself, utilitarians will opt for the latter. This is the tragedy of taking pleasure in the wrong things, which can make a decision immoral.

⁶⁰ I will not go further into whether bees do or do not experience pleasure and pain, the scientific evidence is inconclusive.

II.1.2 Environmental Deontology

Deontology focusses on the formulation of universal moral obligations and duties that should determine our actions. It is, like utilitarianism, act-centred, but does not focus on consequences.^{61, 62} The philosopher who made this theory one of great importance is Immanuel Kant. He argued that the morally right thing to do is to always act in such a way that you could want others to act universally.⁶³ This principle is what he called the *categorical imperative* (CI) and this ‘moral law’ if you will, should govern your actions. It is only by a free and rational decision that you can act morally correct; by following the duty to govern yourself through the application of the CI. This self-governance is what is called *autonomy* and should be respected by all moral agents universally, this is the core meta-ethical position of deontologists. Therefore the second formulation of the CI protects this autonomy and reads: one should always act in a way that treats others as ends in themselves and never solely as a means to an end.⁶⁴ To respect a person as an end in him- or herself, is to respect a person’s personhood characterised by autonomy. For Kant morality was mostly limited to the human domain and we should only consider the way we treat animals insofar as our way of acting towards them has a negative effect on human relations.⁶⁵ This view can be summarised as an anthropocentric individualism, reserving moral concern only for humanity, a view that is not widely supported in environmental ethics nowadays.

It is only until recently that philosophers have begun to argue from a Kantian perspective that we need to have regard for other life forms in our moral deliberations, endorsing a non-anthropocentric individualism. Philosopher Tom Regan has made this view popular and argued that animals have an interest in their own life which gives them an inherent value, a value that is not the sum of other valued factors (e.g. pleasure), but a value simply by virtue of being a living, conscious being and having some form of personhood.⁶⁶ The fact that they are a so called *subject-of-a-life*, a being that experiences having a life in which it has prospects, desires and a sense of the future⁶⁷, gives us enough reason to award them moral rights. However this focus on the individual interest and rights can possibly clash

⁶¹ M. Zwolinski, en D. Schmitz, “Environmental Virtue-ethics, What it is and what it needs to be,” In *The Cambridge Companion to Virtue*, edited by D.C. Russell, Cambridge: Cambridge University Press, 2013, 228-229.

⁶² J.E. Macdonald, and C.L. Beck-Dudley, “Are Deontology and Teleology Mutually Exclusive?,” *Journal of Business Ethics*, 13, no. 8 (1994): 615, accessed June 18, 2015, doi: 10.1007/BF00871809.

⁶³ M. Zwolinski, en D. Schmitz, “Environmental Virtue-ethics, What it is and what it needs to be,” In *The Cambridge Companion to Virtue*, edited by D.C. Russell, Cambridge: Cambridge University Press, 2013, 221.

⁶⁴ S. Darwall, *Philosophical Ethics* 1st ed. Edited by N. Daniels, and K. Lehrer, Colorado: Westview Press, 1998, 158.

⁶⁵ Immanuel Kant, *Lectures on Ethics* translated and edited by P. Heath, and J.B. Schneewind, Cambridge: Cambridge University Press, 1997, 459.

⁶⁶ Tom Regan, *The case for animal rights* Springer Netherlands, 1987, accessed June 1, 2015, doi: 10.1007/978-94-009-3331-6_15, 20-21.

⁶⁷ *Ibid.* 22.

with the interest of the greater number of individuals. To give priority to saving the life of one sickly individual may jeopardise the well-being of the group as it might drag down the others by his less-than-optimal condition.

That is why some philosophers have argued, in line with Kantian philosophy and as a form of non-anthropocentric holism, that we should focus our moral consideration on keeping the integrity of ecosystems intact. Integrity is the concept that follows directly from the second formulation of the CI and protects the autonomy of phenomena so that they will always be treated with due respect and their freedom will not needlessly get infringed.⁶⁸ Ecosystems integrity can be described as being complete, unified and whole, but this is a problematic notion, because ecosystems are ever changing.⁶⁹ Therefore a new definition has been established that pinpoints ecosystem integrity more accurately: the ability of ecosystems to organise themselves, cope with stress and work optimally.⁷⁰

There are three problems I encounter with deontology and its approach to nature and ecosystem services. For starters it is unclear whether ecosystems can ever stop regulating themselves, making this latter definition of integrity slightly problematic. However much disruption they might be subjected to, they will always recover some (other) form of stability sooner or later through ecological succession.⁷¹ For me this makes it troublesome to accept the deontological reason for setting integrity as the central value that should be respected. This goes back to the issue I have with awarding nature an intrinsic value. To respect conscious beings as an end in themselves and thereby respecting their integrity might be acceptable, because they have an interest in their life and can award a value to it themselves that others should respect. However to say the same about non-sentient phenomena is problematic, because they cannot care about the disruption that is brought upon them or might in the long run even correct this disruption.

I will attempt to show why I have this objection against intrinsic value: something having a value presupposes that some conscious and/or sentient being has awarded this value to it, because having value means that there is an interest invested in it. Intrinsic value, as a value that is present in something irrespective of external factors (among which I argue an external, evaluative being) then necessarily implies that this value must be awarded to the

⁶⁸ Bovenkerk, B., van den Bergh, B.J. and Brom, F.W.A. "Brave new birds. The use of 'animal integrity' in animal ethics." *Hastings Center Report*. 32, no. 1 (2002): 19. Accessed June 8, 2015. doi: 10.2307/3528292.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Richard B. Primack, *Essentials of Conservation Biology* 5th ed. Sunderland, Massachusetts: Sinauer, 2010, 39.

phenomenon itself, by itself.⁷² So everything that is non-sentient will logically be excluded from living up to the deontological ideal of having a value in itself that has to be respected, a problematic prospect for ecosystems.

If you are not convinced consider the following thought-experiment, which might possibly convince you: there is a planet on which only one tree is left; there are no other organisms left on that planet.⁷³ Would it be wrong if this tree died? Imagine you said ‘yes’, I would want to ask you ‘why?’. Multiple reasons can come to mind like it would be a shame to lose the last living organism or that the tree has a right to exist. Contemplate this however: the tree or, more generally, nature is unable to care about this death and, because they are not sentient, they cannot provide us with an interest of their own that we need to give moral consideration to, leaving us with our human interests in them only.⁷⁴ It is only to our evaluative minds that the loss of this tree seems wrong, because we award the tree some (be it instrumental, e.g. aesthetic, religious) value. Deontology is therefore in my eyes too non-anthropocentric in its approach to nature, whereas if it accepted that we should respect the integrity of ecosystems as a means of guaranteeing our well-being, it might become more broadly accepted as an incentive to act upon. Some defenders of a ‘weak’ intrinsic value however still hold that, although attributing value comes down to a semi-conscious (human) faculty, other objects can still be attributed a value that is not related to human interest and thus intrinsic.⁷⁵ I want to ask a slightly rhetoric question: does ‘intrinsic’ not imply ‘irrespective of external factors’, making intrinsic value logically incompatible with external (human) attribution of it? In my eyes the concept ‘intrinsic’ cannot be given to something else, it may only be acknowledged by an evaluative being that has awarded itself a value.

Another, more general objection I want to make against deontology is that for a lot of people it is difficult to get the CI fully automated in moral deliberation. I say this, because not only must one consider and try to imagine whether the intended act could, without contradiction, be enacted by *all* people, one must also think if this would be *preferable*. And then we have not even started to consider whether or not this action respects the autonomy of beings. To consider whether your intended act is universalisable and respects autonomy may

⁷² Or an option I shall not further explore, because I want to discuss philosophical and not theological arguments: by the acknowledgement of its divinity as part of God’s creation.

⁷³ This is a variation on the “last man” thought experiment by R. Routley see: R. Routley and V. Routley, “Human Chauvinism and Environmental Ethics,” in *Environmental Philosophy*, Edited by D. Mannison, M.A. McRobbie, and R. Routley 96-189, Canberra: Australian National University, Research School of Social Sciences, 1980.

⁷⁴ J. Feinberg, “The Rights of Animals and Unborn Generations” in *Ethical Theory, An Anthology*, 2nd ed. Edited by Russ Shafer-Landau 375, Chichester: Wiley-Blackwell, 2013.

⁷⁵ Ibid.

be difficult to imagine. Moreover the uncertainty of what some acts may bring about if everyone were to do it, especially when dealing with uncertain scenarios in environmental ethics, is another problem deontology encounters as universalisability is key in determining the morality of a decision.⁷⁶ Deontology may give us the imperative to always act in such a way that would respect the integrity of both sentient beings and non-sentient (parts of) ecosystems, but how helpful and action-guiding is that if we do not even know what acts respect that integrity?

From a deontological perspective the bee case-study poses other challenges. A bee (presumably) cannot be said to have an interest in its own life, it does not have an awareness of its desires or the future. That is to say: a bee is not a subject-of-a-life. Their ecosystems are not a subject-of-a-life either. So again to argue that the colony decline is immoral from the perspective of the bees is controversial.

Ecosystem integrity however is another concept to consider here and mainly its second definition. However as we have seen ecosystems will always recover some stability in the future through ecological succession (see page 21). The problem is that this recovery might come too late for mankind. This seems like the perfect reason for a deontologist to act to ensure that the autonomy of mankind is not infringed, but if we cannot see this consequence coming or we are to occupied holding on to the ideal of ecosystem integrity we might still act to slowly. We could for example try to imagine if it would be morally right if everyone acted in such a way that would respect the integrity of pollinator ecosystems. At first sight it would seem that this is morally right. However if the ecosystem evolves in such a way that would deprive humans of means of survival, for example by natural desertification in areas where formerly there was arable land, causing bee colonies to migrate, should we then still be concerned with respecting ecosystem integrity? To prioritise a non-anthropocentric value of nature over an anthropocentric value humanity can award to it, might have misanthropic and consequently immoral results. From the argument of integrity, respecting the self-regulation (a form of autonomy) of the ecosystem, it does not become clear what should motivate people to act differently. To act for the sake of some vague and abstract concept as ‘ecosystem integrity’ is not very motivating or action guiding.

The problem with deontology and its approach to nature is mainly that its ideals are too abstract and literally too far away from what humans care about and can comprehend. It is

⁷⁶ Kant did hold that humans have a ‘good will’, the rational function of human psychology that is good in itself and is the driving force behind action, now often called ‘volition’. This is a metaphysical assumption I will not further go into explaining, because I have not got room to expand on this matter and I do not share the conviction that the driving force behind action is intrinsically good. See: Immanuel Kant, “Groundwork of the Metaphysics of Morals,” in *Ethical Theory: An Anthology* translated by Mary J. Gregor, 2nd ed. Edited by Russ Shafer-Landau 485, Chichester: Wiley-Blackwell, 2013.

non-anthropocentric: this has as a result that it is unclear what should motivate us to act. If it is not for the sake of the self-regulation of ecosystems nor for the well-being of mankind, what are we doing it for?

II.1.3 Environmental Virtue-Ethics

Virtue-ethics regained territory on the playing field of ethics in the second half of the 20th century. It is an ethical theory that defines what is morally right by reviewing what characteristics a person must obtain in order to become moral, not by sole reference to what yields the best results in terms of pleasure or by stating what imperative you could want everyone to act on.⁷⁷ For environmental virtue-ethics the main question to answer is consequently agent-centred: which character traits should a person obtain to become ecologically virtuous?

According to philosophers Matt Zwolinski and David Schmidtz the main reason why virtue-ethics is more helpful than other ethical theories is because it does not try to come up with universal moral rules, but rather with principles in the form of virtues to abide by.⁷⁸ This has as an advantage that virtue-ethics is able to stay sensitive to contextual differences that might change what the morally right course of action is. Utilitarianism and deontology both attempt to answer the question ‘what makes an action correct and universalisable?’. They try to present one universal criterion for judging morality that people can follow, respectively maximalisation of pleasure and endorsing autonomy. The insensitivity to context and the lurking orthodoxy of people putting these single criteria into practice can have immoral implications as we have seen in the previous paragraphs (see pages 19 & 23-24).⁷⁹

Virtue-ethics finds its origin with the Greek philosopher Aristotle. It is a theory that describes mainly how to perfect one’s attitude when willing to. Virtues are character traits that every person should try to obtain to become moral. One can only obtain them through repetition; making them habitual.⁸⁰ It takes both willpower and perseverance to do this. There is one essential virtue, namely *phronesis*, translated with ‘prudence’ or ‘practical wisdom’, which is essential in determining which act is the most virtuous and therefore required for all other virtues.⁸¹ Aristotle presses that prudence can only be obtained by acquiring contextual

⁷⁷ M. Zwolinski, en D. Schmidtz, “Environmental Virtue-ethics, What it is and what it needs to be,” In *The Cambridge Companion to Virtue*, edited by D.C. Russell, Cambridge: Cambridge University Press, 2013, 223-224.

⁷⁸ Ibid.

⁷⁹ Ibid. 224-225.

⁸⁰ Aristotle, “Ethica Nicomachea (Nicomachean Ethics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 331-581, Chicago: The University of Chicago Press, 1973, 1095b3-6, 1103a25-b25 & 1180a15-19.

⁸¹ Ibid. 1107a1-2 & 1144b35-1145a5.

knowledge relevant to a great variety of situations, which can only be gained through experience. This contextual knowledge consists of both theoretical and practical data. In essence, as philosopher Rosalind Hursthouse describes, it is *worldly knowledge*. Knowing how the world works, the method to cultivate virtues and being able to reflect on and potentially change the course of your life.⁸² This virtue can be recognised by people in others; these persons can be labelled as *phronimoi*, wise people that lead by example.^{83, 84}

To Aristotle the ultimate reason for trying to obtain an all-round virtuous character is to reach the goal of *eudaimonia*. This ancient Greek concept is often translated with ‘happiness’, but it would be more accurate to translate it with ‘succeeding’.⁸⁵ It is important to note that Aristotle’s virtue-ethics is a teleological theory, which means that everything in nature can be explained by reference to the goal or purpose (*telos* in ancient Greek) a process, cycle or organism has.^{86, 87} What it means for humans, but also beings in general, to reach this ‘goal’ is to become a fully-fledged and flourishing member of its species. The faculty that is characteristically (some argue uniquely) human and discerns what is morally correct is rationality, so making rational choices is paramount to becoming a successful human being.⁸⁸ However Aristotle also acknowledges that emotions are essential to a moral human life. They make us aware of what we approve of and what we are repulsed by. They subsequently make us strive for what we feel is morally right and avert what is morally wrong. Acknowledging that we are both rational and emotional animals can be described as a form of necessary self-understanding. We need to balance these two sides in order to flourish and make virtuous choices. Yet these emotions can be off the mark in that they give an inaccurate representation of what value something holds regarding the goal we strive for. It is therefore important that a person who wants to be prudent and virtuous always weighs both his rational considerations and emotions and corrects the latter where needed.⁸⁹ This equation of what is good (flourishing) with what is natural (rationality and emotion) seems to have fallen prey to the

⁸² Rosalind Hursthouse, *On Virtue-ethics* Oxford: Oxford University Press, 1999. 307-308.

⁸³ Aristotle, “Ethica Nicomachea (Nicomachean Ethics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 331-581, Chicago: The University of Chicago Press, 1973, 1140a25-28.

⁸⁴ In the past century these *phronimoi* would have been, among others, Nelson Mandela, Mahatma Ghandi and the Dalai Lama but also people closer to home perhaps a teacher or church leader, such as the current pope.

⁸⁵ *Ibid.* 1097a15-1098a20.

⁸⁶ C. Witt, “Teleology in Aristotelian Metaphysics,” In *Method in Ancient Philosophy*, 1st ed. Edited by J. Gentzler, Oxford: Oxford University Press, 1998, 253.

⁸⁷ This view is much contested in contemporary philosophy, because most philosophers deny that nature has a goal. However to hold that almost all things in nature have a function is less controversial and is the definition of ‘purpose’ I want to focus on.

⁸⁸ Aristotle, “Ethica Nicomachea (Nicomachean Ethics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 331-581, Chicago: The University of Chicago Press, 1973, 1094a1-1097a14, 1098a21-1098b8 & 1177a12-1178b32.

⁸⁹ *Ibid.* 1139a21-31.

naturalistic fallacy and is-ought problem. However in the next chapter I will show that this is not necessarily the case or a problem if moral agents reflect properly.

Contemporary virtue-ethicists have adapted virtue-ethics to become suitable for the environmental ethics debate, starting the movement ‘environmental virtue-ethics’ or EVE.⁹⁰ There are a few trends discoverable in the EVE theories. For example the eco-virtue ‘humility’⁹¹ is often presented as important and non-materialistic and non-anthropocentric views are often endorsed by some EVE philosophers.⁹² Especially interesting is the non-anthropocentric tone in a lot of EVE discourses, a tone that to my ears departs from Aristotle’s views, because for him morality and what we value is deeply entangled with our human nature. And, as we have read, I hold that awarding intrinsic value to organisms other than sentient organisms is unfounded (see pages 21-22). That is why I will not subscribe to a non-anthropocentric virtue-ethics as I will have explained by the end of this paragraph.

A general objection made against virtue-ethics is that it is rather subjective. This objection seems valid if you look at the way morality is determined. Although it is based on common human nature, the guarantee that the virtue-ethical deliberation process will always end with a moral choice seems rather doubtful, making universalisable rules from utilitarianism and deontology more appealing because of their rigidity. However Aristotle pressed the importance of the public sphere, as in public education and good upbringing, for morality too.⁹³ He described human beings as social animals (*zōon politikon*), an animal that needs the community in order to live a flourishing life.⁹⁴ The idea of commonly held virtues that are backed up by good law enforcement from politics and education in both the public and private sphere was essential to keeping up his whole ethical system.⁹⁵ Justice is illustrative of the link Aristotle acknowledges between ethics and politics and was defined as the virtue that helps work towards the common benefit of people or ‘common advantage’.⁹⁶ So, morality may not be as objectified as is tried in utilitarianism and deontology, but it is based on commonly held principles of and that benefit a community. It therefore is an

⁹⁰ For an overview see: R. Hull “All About EVE: A Report on Environmental Virtue-ethics Today,” *Ethics & the Environment*. 10, no. 1 (2005): 89-110.

⁹¹ C. Frakes, and M. Pianalto, “Part III, Environmental Virtue,” In *Virtues in Action*, 1st ed. Edited by Michael W. Austin, 118-149, New York: Palgrave Macmillan, 2013.

⁹² R. Hull “All About EVE: A Report on Environmental Virtue-ethics Today,” *Ethics & the Environment*. 10, no. 1 (2005): 93-96.

⁹³ Aristotle, “Ethica Nicomachea (Nicomachean Ethics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 331-581, Chicago: The University of Chicago Press, 1973, 1094b4-7.

⁹⁴ Aristotle, “Politica (Politics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 584-659, Chicago: The University of Chicago Press, 1973, 1252b29–30 and 1253a31–37

⁹⁵ Aristotle, “Ethica Nicomachea (Nicomachean Ethics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 331-581, Chicago: The University of Chicago Press, 1973, 1094a1-b12 & 1179a33-1181b25.

⁹⁶ Aristotle, “Politica (Politics),” In *Introduction to Aristotle*, 2nd ed. Edited by Richard McKeon, 584-659, Chicago: The University of Chicago Press, 1973, 1160a10-14.

approximation of universalisation. Also, to my mind it is worth more that people have to be reflective in their decision-making and train their reflexivity on the different values they hold, rather than follow a moral law or single criterion which I will demonstrate later in this paragraph.

To come back to the objection against a non-anthropocentric EVE one could argue that what non-sentient or -conscious nature in itself holds, has nothing to do with ‘having a value’. The ‘value’ nature has, may have more to do with the ‘function’ particular elements in it have, which make natural systems work. This view can be recognised as a distillation of virtue-ethics, from which respect for the telos - the purpose of a phenomenon - of natural systems can be emphasised.⁹⁷ The problem with this view however is that not everything in nature that has come about through evolution has an actual purpose, or at least not one we can understand yet. This problem can be avoided by acknowledging that overall the purpose of nature is to adapt and evolve in order to stay as stable as possible. There is a reason why things evolved the way they have as that state of being might be the most optimal. I think it is the strong point of EVE that the natural states of phenomena are respected out of prudence for what might happen to both humans and nature in general if we deregulate the natural order. Just like you should not bring the (arguably) similarly evolved social, but also rational and emotional nature of humans in disbalance, nor should we unnecessarily deregulate the nature of phenomena around us. I will come back to this evolutionary ethics in chapter three.

EVE is more encompassing in the bee case-study, but also makes it more complex in a way. Both because it provides us with multiple principles (namely virtues) to test our morality and because it presents us with many important values which altogether make our disposition towards the environment insightful. Where rational assessments with the single criteria of ‘integrity’ and ‘pleasure’ may fail, EVE can include both criteria, but will hand us even more to assess the situation and enable us to choose the right action based on our rational knowledge and emotional intuitions. Our (public) upbringing and education should ensure that we are well equipped to make virtuous choices, even on the spot. In case of the bees and their ecosystem it will not be helpful to just be a ‘respectful’ person towards their integrity or to be ‘generous’ in your aim to maximise the pleasure for the majority of sentient beings, but we also have to be ‘appreciative’ of the beauty, convenience and evolutionary history of the bees and their ecosystem and be ‘prudent’ in how we treat them as it might end badly for humanity if we are not. This also presents my answer to the question raised in chapter one

⁹⁷ R. Hull “All About EVE: A Report on Environmental Virtue-ethics Today,” *Ethics & the Environment*. 10, no. 1 (2005): 91.

whether substitution of ecosystem services neglects some other relevant moral values, rendering it immoral (see page 14). I believe humanity may at some point be able to substitute for the technical functions of ecosystem services, but can never hope to achieve the level of aesthetic value or substitute for the potentially valuable knowledge nature holds for us that will be essential for flourishing as human beings in a natural environment; this is the most important goal for EVE. From this point of view I think it would be immoral to try to substitute ecosystem services, apart from those cases that have to out of necessity (e.g. some essential ecosystem service cannot be saved except by substitution or if only substitution can guarantee that people reach the minimum threshold of leading a good life). The question should not be ‘is it immoral to disrupt pollinator ecosystems?’, but rather ‘what kind of person would do that?’. I would say a rather ignorant or arrogant person, or both.

IN SHORT I believe virtue-ethics is a better suited theory for tackling environmental issues than utilitarianism and deontology. Both utilitarianism and deontology have a rational method to decide what the morally right thing to do is. When in the deliberation process it is unclear how you work towards these goals you get stuck and cannot act on the single principle of either of these theories; you lack the necessary information to foresee what the right course of action is, so the principle stops to be action-guiding. This is particularly troublesome in environmental ethics where scenarios are uncertain. Virtue-ethics has a solution for this, namely to act in such a way that, reflecting on the facts that lead to the circumstances, your emotional intuitions and the inclinations of wise, more experienced people, you decide what is most virtuous. Of course you can fail in making the virtuous choice, but this is the beauty of being human: you (and the situations you judge) are not perfect. After all, it takes practice to become perfect.

II.2 Conclusion

In this chapter I argued that virtue-ethics is more helpful in the environmental ethics debate than utilitarianism and deontology. The first reason for this is that I believe virtue-ethics gives the most encompassing definition of what multiplicity of characteristics, that are ethically relevant in our approach to and understanding of (our) nature, we share as humans. It also accepts both scientific knowledge and scientific uncertainty as a factor in moral deliberation. It presents multiple criteria to judge morality, which makes it a bit more challenging to decide what is right, but it keeps you on your toes more than following a single criterion would.

Maximising utility, a criterion in utilitarianism, is a problematic criterion. For one: we might not know which action will live up to this ideal, especially considering the uncertain environmental prospects. Plus pleasure, as a form of utility, might not be the best measure for morality because, as we all experience, we sometimes tend to take pleasure in the wrong, detrimental things. Yet another problem may be that natural phenomena, which are morally relevant, can be exempt from experiencing pleasure and pain and could therefore be excluded from our moral considerations.

Considering whether your maxim can be universalised, the criterion of deontology, may be just as problematic. This comes back to the same point of uncertainty: we might not know which concrete act we should want to universalize, because we cannot imagine what scenarios this would render. Or if we could think of such an act it will be very unspecific and not action guiding in the case of environmental ethics. Respect for the integrity of other beings or ecosystems, another formulation of the criterion in environmental deontology, poses problems too. Regarding sentient and/or semi-conscious beings it may be good to have respect for their integrity and autonomy, but this leaves other phenomena out of the picture again. Arguing for respecting the integrity of ecosystems is controversial, because it is unclear what this integrity would entail. Ecosystem integrity can be classified as 'self-regulatory', but experts state that ecosystems will never stop regulating themselves. The way in which they do however, may be detrimental to humanity. Environmental deontology thus appears to me to be too non-anthropocentric in its approach to nature, rendering altogether too abstract, non-motivating and non-guiding duties.

Furthermore I have argued intrinsic value, a highly esteemed value in environmental ethics, is exclusive to sentient and semi-conscious beings. In environmental debates, often discussing the way we should treat non-conscious and non-sentient phenomena, intrinsic value will not be very helpful. These non-conscious and non-sentient natural phenomena cannot care about the way they are treated, it is just evaluative, semi-conscious beings that can.

An anthropocentric EVE circumvents this by stating that humans are a part of and dependent on nature for both their well-being and flourishing and should therefore value it, including the non-conscious phenomena. To deny this illustrates sheer lack of understanding the position of humans in the natural environment. Even if we cannot foresee what value nature has in store for us, we still seem emotionally predisposed to praise nature for e.g. its aesthetics, potential source of scientific knowledge, recreational values and more. Even if the EVE theory I present is (ever so slightly) anthropocentric and instrumental, it is more

encompassing as an environmental ethic. What we judge to be morally right still is a human affair and EVE acknowledges that by linking morality with reflection on our own social, rational and emotional nature. This provides us with the necessary means for reaching moral excellence; if we understand ourselves and our position in nature, we can ultimately do what is right even if it is through trial and error. What our environment and our own nature have in common is that they are the product of evolution, a process of trial and error. So arguably there is a state of being that is most advantageous and stable in both the natural world and within ourselves. I will go further into the theory behind this idea in chapter three. That the ideals of EVE are reachable, even if you have to work hard to habituate them, I hope will provide everyone with an incentive to strive towards becoming ecologically virtuous.

III. Dynamics of Ecology and Ethics

A moral being is one who is capable of reflecting on his past actions and their motives - of approving of some and disapproving of others.⁹⁸

~Charles R. Darwin~

In the previous chapters we read that scientific research tells us that ecosystem services are very important to humanity and that, if we want to live a worthwhile and moral life, we have to conserve these services. Science can inform us with factual information which context we find ourselves in and ecology specifically teaches us the context of ecosystems and their services. Ethics can instruct how we can become moral agents and environmental ethics does this regarding our attitude towards nature specifically. Within environmental ethics I argued that EVE is the most encompassing theory, because it is context specific and can thus integrate specific, ecological insights well. Scientific uncertainty is ever present in the environmental sciences though. Plus the question can be asked whether the way science describes the world to be is how we morally want it to be. So to reason from the scientific, factual information to the moral obligation to have a specific attitude in our treatment of nature might not be so straightforward. There are three philosophical issues that complicate this inference, namely: the is-ought problem, the naturalistic fallacy and the fact-value distinction. In this chapter I will address these three issues that arise when trying to integrate scientific input with moral considerations and present my answer to the question: What should the dynamics between ecology and ethics be? Thorough reflection, as Darwin suggests, may very well be the solution to our moral problems.

I will first describe the three philosophical issues named above and follow philosopher Marcus Düwell's writings closely to see how his bioethics, according to whom environmental ethics is a part⁹⁹, circumvents these issues. Bioethics necessarily integrates scientific facts and moral considerations, because how are we to know what we should do if we do not know the context we are working within? The reason I specifically treat Düwell's views is that he presents a form of bioethics that does not fall prey to the is-ought problem. With this he provides an approach to tackle environmental dilemmas in a philosophically defensible manner. I will take a step further than his line of argument in one respect, namely in taking the stance that research in environmental science should be value-laden. I will argue that environmental ethics requires that the relevant scientific research is value-laden, because, like

⁹⁸ Charles R. Darwin, *The Descent of Man, and Selection in Relation to Sex* (Ebook: Digireads.com Publishing, 2009), 95.

⁹⁹ M. Düwell, *Bioethics: Methods, Theories, Domain* (London: Routledge, 2012), 3 & 36.

Cafaro states, we might not have the luxury to do research in environmental sciences just for the sake of value-free knowledge.¹⁰⁰

After that I will analyse the findings of ecologist and philosopher Ricardo Rozzi, evolutionary-anthropologist Oliver Scott Curry and primatologist Frans de Waal who all state that moral values are inevitably intertwined with ecology and thus present a template for how I think ecological knowledge on ecosystem services and our moral deliberations should be integrated. The view I endorse can be said to align with evolutionary ethics; the view that what we morally ought to do should be the most effective and adapted solution to environmental problems. We can gain relevant knowledge from evolutionary biology, a discipline that both informs us which adapted, ecological state is the most sustainable and suggests that morality itself is a biological adaptation for cooperation and survival.

III.1 Three Philosophical Issues and Düwell's Bioethics

The is-ought problem, naturalistic fallacy and fact-value distinction are three philosophical issues that come into play when factual statements and evaluative statements are being discussed simultaneously. The fact that these issues have this in common often results in them being aggregated as the same issue. However I think they are distinct from each other and I will present their different focuses and how they are involved in environmental ethics below. They are relevant in different respects: the is-ought fallacy is relevant to address when using results from ecological research to infer how we should act. Regarding the pollinator-case this would mean that this particular issue is relevant when e.g. inferring that we should preserve pollinator ecosystems, because scientific results show that we cannot do without their services. The naturalistic fallacy comes in when presuppositions are being discussed of what we consider to be 'good', e.g. ecosystem sustainability in the pollinator case can be considered 'good', but some also argue that the goodness of nature, including the pollinator ecosystem, is intuitively apparent to us. Lastly the fact-value distinction needs to be addressed when we elaborate on the status of both ecological science and moral statements. When applied to the pollinator case this distinction would be relevant if we for instance analyse the statement of a scientific expert 'that bees are essential to the well-being of humans', after this questions arise about the basic assumptions (criteria or values) the expert made underlying this statement and whether this statement can in fact be considered valuable in scientific and/or moral terms.

¹⁰⁰ Philip J. Cafaro and Richard B. Primack, "Ethical Issues in Biodiversity Protection," in *Encyclopedia of Biodiversity*, 2 (2001): 606, accessed May 20, 2015, [doi:10.1016/B0-12-226865-2/00109-7](https://doi.org/10.1016/B0-12-226865-2/00109-7).

Düwell states bioethics, as opposed to pure science, is not so much concerned with answering the prognostic question ‘what *will be* the case?’ or the descriptive question ‘what *is* the case?’, but rather with answering the prescriptive question ‘how are we *to act*?’.^{101, 102} Its ‘mixed judgements’ are comprised of judgements gained from ethics and relevant other disciplines, e.g. biology, medicine, psychology et cetera.¹⁰³ This is exactly what makes bioethics prone to the is-ought and other related problems. Düwell has a solution for this, one that is related to the very nature of ethics. Ethics, he says, is essentially the discipline that analyses moral statements thoroughly and systematically and uncovers presuppositions to make theories transparent and enhance their philosophical defence.¹⁰⁴ To his and my mind this is exactly the lead (environmental) bioethics should follow; it should reflect systematically and repeatedly on the science-ethics relationship and the statements made in either of these areas and the (moral) prescriptions inferred from these views to make them well-founded.¹⁰⁵ Bioethics for Düwell can be defined as an interdisciplinary sub-domain of ethics that covers the areas of medical, animal and environmental ethics.¹⁰⁶ The fact that he is one of the philosophers who incorporates environmental ethics in the definition of bioethics is, among other reasons, why I treat his views in this study. I also believe his views to be very helpful in teaching people how to integrate ecological insights with moral deliberation.

SCIENCE HAS DEVELOPED rapidly and its impact on society has grown with it, changing them immensely (most notably through technology). As a reaction to this the fields of normative and applied ethics have emerged as a means of systematic reflection on and analysis of these practices.¹⁰⁷ Analysis is something that is common to all ethics, but what is surprising is that contemporary analytical ethics has developed its own methodology and context by aligning with contemporary science.¹⁰⁸ This means that analytical ethicists strive to come up with an ethics that mirrors the scientific ideals (e.g. clarity, precise formulation, thoroughly discussed et cetera) which enables them to approximate scientific certainty.¹⁰⁹

¹⁰¹ M. Düwell, *Bioethics: Methods, Theories, Domain* (London: Routledge, 2012), 15-16.

¹⁰² Ibid. 5. The framing of this prescriptive question seems to show that Düwell believes moral prescriptions gained from bioethics should be act-centred, disregarding agent-centered theories like virtue-ethics. Düwell describes himself as a Kantian, but leaves this out of his description of bioethics as he wants to describe what he thinks is the essence of bioethics irrespective of which philosophical theory you endorse. Therefore I believe Düwell’s description of bioethics to still be compatible with environmental virtue-ethics and thus with my line of argument in this study.

¹⁰³ Ibid. 12.

¹⁰⁴ Ibid. 43 & 51.

¹⁰⁵ Ibid. 85.

¹⁰⁶ Ibid. 3 & 36.

¹⁰⁷ Jan M.G. Vorstenbosch, “Ethiek – Ethics,” In *Analytische filosofie - Een inleiding*, edited by Chris Buskes and Herman Simissen, (Nijmegen: Van Tilt, 2014), 213.

¹⁰⁸ Ibid. 201.

¹⁰⁹ Ibid. 202.

What is especially typical for the changing science-ethics relationship is the change of attitude regarding the is-ought problem; currently what (science informs us) ‘is’, does not have to be distinct from what we ‘ought’ to do.¹¹⁰ For example contemporary meta-ethics defends that facts and norms are linked by the phenomenon of ‘reason-giving’, normative-ethics currently tries to balance facts and norms in normative judgements and contemporary applied ethics (among which bioethics) uses this input and makes it readily available for policy-making.¹¹¹

The is-ought problem dates back to the work of philosopher David Hume: *A Treatise of Human Nature*. In this book he criticises the trend in moral philosophy to make the human faculty ‘reason’ superior to ‘passions’.¹¹² Hume opposes this trend by stating that passions provide us with sufficient input to decide what is moral and immoral, because they make us approve of what is good and disapprove of what is immoral.¹¹³ So morality, what ‘ought’ to be, boils down to our emotional impressions we have of a situation or an act and reason can only have a say in this insofar as it describes what causes us to react in such a way by uncovering the cause of the emotional effect.¹¹⁴ However he pressed that to hold that morality is only dependent on our internal state of mind, which can result in absurdities, because people could be found immoral merely because of the emotion they experience irrespective of their actions or the context.¹¹⁵ Therefore Hume concludes that morality lies in the correct reflection on the relation of our passions and the external, real things (the context) we are affected by.¹¹⁶

This means that the transition from ‘is’ to ‘ought’ is possible, but one that is complicated to make. Passions can be irrational if they are accompanied by a wrong rational judgement.¹¹⁷ For example ‘eating lots of sweets makes me happy, therefore this ought to be done’ is based on the wrong judgement that whatever gives you pleasure should be pursued. Hume further claims that reason is able to distinguish right from wrong by discovering the virtues. These virtues are based on the ‘general principles’, which are the sentiments that, according to Hume, arise in all people and form the basis of all moral notions.^{118,119} So, one

¹¹⁰ Jan Vorstenbosch. “Ethiek – Ethics”. In *Analytische filosofie - Een inleiding.*, edited by Chris Buskes and Herman Simissen, 201-230. Nijmegen: Van Tilt, 2014, 202.

¹¹¹ Ibid. 228.

¹¹² David Hume, *A Treatise of Human Nature* (3rd ed. Mineola, New York: Dover Publications, 2003), 294.

¹¹³ Ibid.

¹¹⁴ Ibid. 294-295.

¹¹⁵ Ibid. 331.

¹¹⁶ Ibid.

¹¹⁷ Ibid. 295-296.

¹¹⁸ Ibid. 333 & 337.

¹¹⁹ To my mind Hume’s general principles resonate the views of Aristotle I presented in the previous chapter. Not only does Hume specifically use the term ‘virtue’ (which could be down to other historical factors), but he also endorses the view that our social, emotional and rational nature must be weighed in our decision-making processes just like Aristotle proposes with

has to be very careful to infer an ‘ought’ from an ‘is’ statement, but through proper reflection and enough proof that it is a shared value one can make the inference.

In this respect I believe that Düwell’s bioethics passes the is-ought challenge, because he acknowledges the importance of ongoing and thorough reflection on the is-ought relationship. Arguably bioethics has to incorporate both descriptive and evaluative information, because moral judgements can never be applied in the real world if they do not have regard for relevant contextual facts. According to Düwell the ‘mixed judgements’ of bioethics are the prime example of correct integration of science and ethics.¹²⁰

This approach to redress the is-ought problem also gives rise to my answer to the question I presented in chapter 1: Does the fact that we can or cannot substitute ecological services prescribes us to pursue it or not? I hold that the fact that we can or cannot achieve something does not tell us whether we should or should not try to achieve it. It is to the experts to estimate whether we can achieve ecology substitution in the long run and down to society¹²¹ to decide whether we want this or not, it is therefore a matter of reflection. The question in the process of substitution is whether or not we would lose other aspects we value e.g. potential knowledge and aesthetics of wild nature that is independent from humanity.

THE NATURALISTIC FALLACY finds its origin in the *Principia Ethica* of G.E. Moore. He addresses a commonly made ‘mistake’ to define ‘goodness’, whereas according to Moore, goodness is a simple, yet undefinable concept.¹²² He illustrates what he means by drawing a parallel between acknowledging something as being good and seeing the colour yellow. Objects that are yellow might also give off a vibration in the light that we perceive as yellow, but Moore states that it is not the vibrations that can define the yellow, but the all-encompassing impression we have of something being yellow.¹²³ Colours are, according to Moore, just like ‘goodness’ simple and undefinable concepts. It would therefore in the same way be erroneous to equate goodness with another property, such as pleasure. Moore endorses the idea that goodness is an intrinsic value that is immediately apparent to us through our intuitions when we observe everything around us.¹²⁴

his virtue *phronēsis*. The accent however differs in that Aristotle might press the importance of rationality and Hume that of the passions more. In this study I will both treat them as forms of virtue-ethics and the change in focus on rationality and passions will prove to be convenient in environmental ethics as I will show in the third paragraph of this chapter.

¹²⁰ M. Düwell, *Bioethics: Methods, Theories, Domain* (London: Routledge, 2012), 12.

¹²¹ To me this includes everything from politics, to businesses, to (individual) citizens

¹²² G.E. Moore, *Principia Ethica* (2nd ed. Mineola, New York: Dover Publications, 2004), 9-10.

¹²³ *Ibid.* 10.

¹²⁴ *Ibid.* 173.

This intrinsic value exists independently from external factors. To Moore it is clear that a lot of philosophers have failed to acknowledge that some things just ‘ought to be’.¹²⁵ So the relation between what ‘ought to be’ and what ‘is’ lies in the real property goodness belonging to certain phenomena in the real world and not, as Hume holds, in the reflexivity on the relationship between our sentiments and external reality. However I foresee some problems in holding that what is ‘good’ comes down to intrinsic value. For one I believe it will be limited to sentient and/or (semi-)conscious beings that can perceive this value which is problematic for environmental ethics as I demonstrated in chapter two (see pages 21-22). Moreover I find the term ‘intrinsic’ or ‘inherent’ logically incompatible with external organisms, valuing a non-conscious object in nature, because it would lose its independence on external factors. Therefore I would conclude that goodness and morality only exist in the reflexivity of (semi-)conscious minds reflecting on our internal state in relation to external reality and not, as Moore held, in reality itself.

The naturalistic fallacy as the mistake of trying to define ‘goodness’ is not directly tackled by Düwell, but is left to the reflective bioethicists. They could avoid this fallacy either by not equating what they find to be true in the world with it being ‘good’ or by, as I suggested in the second chapter, addressing but denying the possibility of indefinable, intrinsic value in external reality and thereby acknowledging that value is inevitably related to (semi-)conscious evaluation and values in morality to (changing) human reflection.

THE FACT-VALUE DISTINCTION focuses on meta-ethical presuppositions. There are three levels on which the fact-value debate can be held: on a purely semantic, a mixed semantic-epistemological and a purely epistemological level. On a semantic level the debate characterises itself by proponents of the fact-value distinction, holding that a statement cannot be descriptive and evaluative simultaneously.¹²⁶ To these proponents a statement that hints at both a descriptive and evaluative side to it can in principle always be dissected in these two sides. Opponents of this distinction believe that some descriptive concepts have an underlying, evaluative judgement.¹²⁷

On the second semantic-epistemological level proponents of the distinction claim that evaluative, thus prescriptive, statements have a different status than descriptive statements.¹²⁸ Descriptive statements supposedly have certain characteristics that evaluative statements lack,

¹²⁵ G.E. Moore, *Principia Ethica* (2nd ed. Mineola, New York: Dover Publications, 2004),173.

¹²⁶ Rob De Vries and Bert Gordijn, "Empirical ethics and its alleged meta-ethical fallacies." *Bioethics* 23, no. 4 (2009): 198 & 200, accessed May 12, 2015, doi:10.1111/j.1467-8519.2009.01710.x.

¹²⁷ Ibid.

¹²⁸ Ibid. 198-199.

namely that they correspond with reality, as is attempted in science. Opponents of the distinction do admit that there is a difference in content and meaning of the two types of statements, however they do not acknowledge that there is a hierarchical difference between them.¹²⁹

The last level centres around the discussion whether science is value-laden.¹³⁰ Proponents of the distinction do believe that science has values of its own, like transparency and simplicity. However, they do want to stress that other evaluative convictions should never dictate the outcome of research. Opponents of the distinction hold that science is permeated with other values which are not scientific values.

Düwell also avoids the debate of the fact-value distinction, because he requires bioethicists to reflect on this distinction. This means that whoever passes a judgement on what the relationship between (scientific) facts and (moral) values in a mixed judgement ought to be like, inevitably steps into the fact-value discussion. To Düwell the most important point is that philosophically speaking none of the bioethical judgements are assumption free.¹³¹ It should therefore be the task of bioethics to give everyone insight in these assumptions and be open to reflect on them to improve their philosophical defence.¹³² In the next paragraph I will come back to this point and the judgement I pass specifically for environmental ethics in terms of the fact-value distinction (see pages 39-40).

IN SUM, THESE three philosophical issues, although related, have a distinct focus. They touch upon the analysis of the relation between evaluative and factual statements. In the is-ought problem this focus is on the possible, but difficult inference from factual findings to moral evaluations and prescriptions. For the naturalistic fallacy the focus lies in the impossibility of defining 'goodness' as this is a simple, indefinable concept which is present in external reality and makes itself apparent to us through intuitions. Lastly the fact-value distinction focusses on the semantic and/or epistemological differences between evaluative and factual statements.

What I take from Düwell's account of bioethics is that systematic and recurrent reflection on the science-ethics relationship is a prerequisite for passing philosophically defensible judgements. For Düwell bioethics is an interdisciplinary sub-domain of ethics including everything from medical to environmental ethics. Its interdisciplinary character

¹²⁹ Rob De Vries and Bert Gordijn, "Empirical ethics and its alleged meta-ethical fallacies." *Bioethics* 23, no. 4 (2009): 198-199, accessed May 12, 2015, doi:10.1111/j.1467-8519.2009.01710.x.

¹³⁰ Ibid. 199.

¹³¹ M. Düwell, *Bioethics: Methods, Theories, Domain* (London: Routledge, 2012), 19, 31-32, 34.

¹³² Ibid.

explains the fact that bioethics yields mixed (moral) judgements, comprised of relevant insights from various disciplines. This includes both descriptive scientific insights and prescriptive ethical statements. This means that, in order to circumvent the is-ought and related problems, bioethicists should repeatedly and systematically reflect on the science-ethics relationship in the judgements they pass to come up with a well-founded and philosophically defensible point of view. I believe this to be a valuable insight for environmental ethics, as it is often forgotten that a judgement passed at one point in history may well be moral according to the insights available then, but may be considered immoral or not optimally moral owing to newly obtained insights. This calls for recurrent reflection.

III.2 Evolutionary EVE

Up until now we have not yet found a comprehensive way in which ecological facts and ethical values can be merged to come up with a philosophically defensible view of how humanity should relate to ecosystem services. The account of Düwell shows the importance of reflection on the science-ethics relationship even if it does not present an available method for integrating ecology and ethics. Bearing that in mind I will now present further views on how to integrate science and ethics in environmental ethics, based upon views taken from evolutionary philosophy.

In these views the way we describe the world to be and the way in which we believe we ought to behave are more intertwined than some might think. What humans feel is the morally right thing to do can be explained as an evolutionarily instilled inclination to promote whatever is the most optimal solution to problems humanity encounters in terms of survival, even if we do not realise or comprehend it rationally. Therefore in evolutionary biology there is both a place for an emotional and a cognitive defence of the moral values we hold. The ethical theory of Hume is often endorsed and praised in evolutionary biology for its complementing nature. To sketch the background of evolutionary biology I will analyse the theories of ecologist and philosopher Ricardo Rozzi, evolutionary-anthropologist Oliver Scott Curry and primatologist Frans de Waal.

Furthermore I will add Aristotle's virtue-ethics to this biology-ethics combination and elaborate on how I think both Humean and Aristotelean ethics are in line with evolutionary biology and helpful to our approach to ecosystem services and nature in general. What I believe Humean theories lack that Aristotelean theories can make up for is a specified method of how to become a moral person.

FOR ECOLOGIST-PHILOSOPHER Rozzi ecology can be framed as the study that describes what nature *is*, and environmental ethics as the study of what *ought to be* with regards to nature.¹³³ Rozzi holds, as do Aristotle, Hume and Düwell, that these different types of information are compatible. He even goes so far as to state that ecology and ethics inspire and influence each other:

“(…) that the ways in which humans dwell in the natural world inspire the ways in which we understand, explain, and look at the natural world. Conversely, the ways in which we represent nature (e.g., through scientific theories) constitute a kind of text or scenario that inspires our attitudes, behaviors, and ways of inhabiting nature. Therefore, changes in the scientific sphere suggest changes in the ethical sphere, and vice versa. If the way of dwelling in the natural world is viewed as an environmental ethos, we can in a broad sense refer to this ethos as an environmental ethic. If the way of understanding the natural world is called a science, we can broadly refer to this understanding as evolutionary–ecological sciences.”¹³⁴

By inferring this it is clear that Rozzi does not mean for ecological sciences to determine what we should think of as moral or that ethics should dictate what we value and believe about our environment, but that the relationship between ethics and ecology is a dynamic and reciprocal one. What ‘is’ does not only influence our ‘ought’, but what we feel we morally ought to do inspires our description of the world around us.

The view Rozzi holds does not make a definitive distinction between scientific, descriptive and moral, evaluative statements, but claims that ecological science is naturally value-laden as environmental ethics is fact-laden. I largely agree with him and the main reason for that is, that within the environmental sciences a lot of aspects are still obscure to us and yet humans take permanent interest in this unknown terrain. I believe this is a good thing for if we did not value the natural cycles and systems that we do not understand yet, we might not pursue further research, or worse: disregard them too easily in our moral deliberation implicitly endangering our own well-being. This also presents my answer to the other question ‘whether research into the possibility of technological substitution presupposes that we value the natural systems in some way’ I posed in chapter one (see page 14). This type of research is characterised by the fact that we have to have full knowledge of the ecological

¹³³ Ricardo Rozzi, “The Reciprocal Links between Evolutionary–Ecological Sciences and Environmental Ethics,” *BioScience* 49, no. 11 (1999): 911.

¹³⁴ *Ibid.*

function if we want to substitute it, implicitly valuing that function in its natural form, because otherwise we would not want to replace or mimic it. This natural function thus inspires us to develop our own processes and researching it (e.g. as in innovative sciences or biomimicry¹³⁵) necessarily implies that we attach a value to what we research. A hint of the putative fact-value intertwinement.

Rozzi further states that the domains of nature and culture influence each other reciprocally. To illustrate this he refers to Charles Darwin's work in which explanations of both social and selfish behaviour in human beings are given. On the one hand Darwin describes how people understand that organisms are closely related to one another and consequently feel an affiliation towards other living species.¹³⁶ This to Rozzi explains our social predisposition towards our environment, our sense of community and the cradle for morality. On the other hand Darwin describes organisms' individualistic and selfish behaviour, as the drive to survive at the expense of others.¹³⁷ This can explain our selfish predispositions towards our environment, our sense of the self and self-preservation.

DE WAAL EXPLAINS how the individualistic and social side to natural organisms interact. Recent studies have indicated that primates such as the *homo sapiens* (and possibly other animals), are naturally inclined to act socially and sometimes even altruistically. The latter is defined as acting to the benefit of another at the expense of oneself.¹³⁸ Furthermore in groups of non-human primates it is shown that they actively try to re-establish harmony after discordance by e.g. reconciliation or protesting about inequality.¹³⁹ This 'normativity' in non-human primate behaviour may well be proof that our normative systems, rooting for amongst other things justice and condemning violence, have an evolutionary origin.¹⁴⁰

Empathy is defined by De Waal as the ability to assess the reason for the emotional state of another, adopting their perspective (cognitive empathy) and being affected by and sharing the state of the other (emotional contagion). Empathy is often the driving force behind this social behaviour.¹⁴¹ In the light of evolution the function of social and empathetic

¹³⁵ The science of imitating biological functions for sustainably, solving human problems, for more see: <http://biomimicry.org/> accessed 17-06-2015.

¹³⁶ Ricardo Rozzi, "The Reciprocal Links between Evolutionary–Ecological Sciences and Environmental Ethics," *BioScience* 49, no. 11 (1999): 911 & 915-917.

¹³⁷ *Ibid.* 915-916.

¹³⁸ Frans B.M. de Waal, "Putting the Altruism Back into Altruism: The Evolution of Empathy," *The Annual Review of Psychology*, 59 (2008): 289, accessed June 3, 2015, doi: 10.1146/annurev.psych.59.103006.093625.

¹³⁹ Frans B.M. de Waal, "Natural Normativity: The 'is' and 'ought' of Animal Behavior," *Behaviour* 151 (2014): 185, accessed May 28, 2015, doi: 10.1163/1568539X-00003146.

¹⁴⁰ *Ibid.*

¹⁴¹ Frans B.M. de Waal, "Putting the Altruism Back into Altruism: The Evolution of Empathy," *The Annual Review of Psychology*, 59 (2008): 281-283, accessed June 3, 2015, doi: 10.1146/annurev.psych.59.103006.093625.

behaviour is now said to be to enhance chances of survival through cooperation and behavioural copying.¹⁴² By copying another's behaviour the behaviour of a group can be adapted, which might entail that the group as a whole is suited to the environment better and therefore able to survive.¹⁴³ Moreover multiple studies do not only show the importance of our inherent, genetic tendencies, but also of the impact of mostly contingent, environmental aspects on the behaviour of humans.¹⁴⁴ With 'environment' experts do not only mean our social, but also our physical surroundings. Studies suggest that during the upbringing of both non-human and human primates we need to gain experience-based knowledge of our physical surroundings in order to develop a cognitive ability to assess these surroundings and gather knowledge on how to interact with them effectively (by which is meant to better the chances of survival), this is called 'ecological imprint'.¹⁴⁵ It still seems rather deterministic that our biological make-up together with our direct environment provide ingredients for our (moral) behaviour. However humans have an enormous choice of environments in which they can move around freely (and increasingly so due to globalisation), which all adds to their experience and consequently to the diversity of cognitive abilities and character traits.¹⁴⁶ It can be argued that our moral systems have arisen from this background of empathetic sentiments, the evolutionary need for cooperation and from our environment.^{147, 148}

TO EVOLUTIONARY-ANTHROPOLOGIST CURRY it is clear that Humean philosophy and especially Humean ethics merges quite naturally with the views of evolutionary ecology.¹⁴⁹ As we could read in the previous paragraph and as Curry stresses: Hume believed that human nature provides us with certain passions that are shared by most of humanity and hence give rise to common, moral values or, as Hume called them, virtues (see pages 34-35).¹⁵⁰ By analysing Darwin's observations we could see that Hume 'was right': it turns out that human psychology is comprised partly of 'adaptations for cooperation', meaning that

¹⁴² Frans B.M. de Waal, "Putting the Altruism Back into Altruism: The Evolution of Empathy," *The Annual Review of Psychology*, 59 (2008): 288, accessed June 3, 2015, doi: 10.1146/annurev.psych.59.103006.093625..

¹⁴³ Ibid.

¹⁴⁴ Robert L. Trivers, "The Evolution of Reciprocal Altruism," *The Quarterly Review of Biology* 46, no. 1 (1971): 53.

¹⁴⁵ Christophe Boesch, "What Makes Us Human (Homo Sapiens), The Challenge of Cognitive Cross-Species Comparison," *Journal of Comparative Psychology* 121, no. 3 (2007): 227 & 235-236, accessed June 11, 201, doi: 10.1037/0735-7036.121.3.227.

¹⁴⁶ Ibid. 236.

¹⁴⁷ Jessica C. Flack and Frans B.M. de Waal, "'Any Animal Whatever' Darwinian Building Blocks of Morality in Monkeys and Apes," *Journal of Consciousness Studies* 7, no. 1-2 (2000): 1.

¹⁴⁸ Frans B.M. de Waal, *Good Natured: The Origins of Right and Wrong in Primates and Other Animals* (Cambridge, MA: Harvard University Press, 1996). 31.

¹⁴⁹ Oliver Scott Curry, *Morality as Natural History, An Adaptationist Account of Ethics* (London: London School of Economics and Political Science, 2004), 2.

¹⁵⁰ Ibid. 171.

mankind is naturally inclined to behave socially as a means of living a peaceful life.¹⁵¹ That does not implicate that humans naturally behave morally, because, as we all know, we also have what we consider to be ‘immoral’ inclinations (e.g. aggressive, free-riding or even murderous inclinations). Therefore I believe it is up to the reflective mind of humans to decide right from wrong.

However, Humean ethics seems to resonate Aristotelean virtue-ethics, in the sense that they both use the concept ‘virtue’ to specify what is morally right and acknowledge that living up to the virtues includes the correct weighing of social, emotional and rational facets of human psychology. Where Humean ethics lacks a specific method-for-morality Aristotelean ethics presents the virtue *phronesis*. I believe this virtue is key to the method to become a moral person. It is the virtue of knowing what to do in which context and this ‘knowing what to do’ comprises of what was described as worldly knowledge: knowledge on how the world and human nature works and the ability to change the course of your life for the better. This change all depends on your knowledge of how to obtain virtues and for Aristotle repetition and habituation are key to obtaining any character trait. To distinguish good character traits from bad ones, one must know how external reality and how internal human psychology works. Knowledge of the external context can be gained by venturing out into the world. Gaining experience and knowledge of human nature lies in acknowledging both rational and emotional faculties of human beings and acknowledging we are a social species. Above all other things that cannot be figured out by yourself, you can learn from wise people surrounding you that act not only to enable their own, but also communal flourishing.

THE SIMILARITIES BETWEEN virtue-ethics and evolutionary biology I find remarkable. Both acknowledge that improving behaviour can be reached by experiencing the world and learning through trial and error, knowing what is right is subject to both cognition and emotional response and last, but not least: both see an important role reserved for the copying of other people’s behaviour that will ultimately benefit both the self and the community. The only difference between natural improvement and human moral improvement is that humans can reflect - as Düwell states is important to ethics - and direct their (prospective) actions and character traits by being more selective in what they pursue and what not.

The fact that ecology and this specific ethical theory are so much in line illustrates to me how helpful it can be in our approach to nature. It simultaneously presents us with its

¹⁵¹ Oliver Scott Curry, *Morality as Natural History, An Adaptationist Account of Ethics* (London: London School of Economics and Political Science, 2004), 192-193.

validation. I believe that by promoting an ethical theory that is not only rooted in human nature, but also in nature in the wider sense, ethicists can come up with a method that reaches out to a growing amount of people and encourage them to pursue what is considered moral. By acknowledging that evolution underpins almost all systems in the world, including our cultural ones, we may create respect or even empathy in humanity that will promote conservation of these systems as the morally right thing to do. Evolution tells us that everything has a history which has caused things to develop as intricately as they have. To disrupt this unexplored, historical intricacy and attempting to replace it by new, less adapted systems may be very unwise. Therefore I believe an environmental-virtue-ethic with regard for this evolutionary history to be the most helpful in environmental ethics. It will promote humanity to become ecologically virtuous for the sake of themselves and the communities they are part of. We can do this through acknowledging that everything is subjected to evolution and we should have regard for this if we want to become wise individuals that survive.

III.3 Conclusion

When trying to prescribe what humans ought to do on the basis of descriptive, scientific findings three philosophical issues inevitably come into play: the is-ought problem, naturalistic fallacy and fact-value distinction. Inferring what one should do from what is found to be the case has long been controversial in philosophy. However with the field of applied ethics (among which environmental ethics) on the rise, factual findings and moral deliberation are often attempted to be integrated, because: how are we to know what to do if we do not know the context we are working within?

Philosopher Marcus Düwell describes what he holds to be the essence of bioethics (which includes environmental ethics for him) in which he circumvents these philosophical issues. The is-ought problem focusses on the difficult transition from an 'is' to an 'ought', but does not render it impossible. Düwell holds, and I endorse, that through systematic and repeated moments of reflection on the science-ethics relationship one can come to a founded, philosophically defensible point of view.

The naturalistic fallacy, as the 'mistake' of defining 'goodness' when it is supposedly indefinable, and fact-value distinction, as the debate on whether science is value-laden or not, Düwell does not address as directly. He leaves these to be addressed by bioethicists. I do have something to say about these issues from the perspective of environmental ethics. Goodness as an indefinable and intrinsic value I cannot agree with, since I believe that what is

considered to be good is always decided by an evaluative mind, making intrinsic value for non-sentient phenomena a logical impossibility. So non-sentient parts of nature we can only value from an anthropocentric point of view.

The fact-value distinction in ecology is something philosopher-ecologist Ricardo Rozzi reckons with. He believes that the way in which we dwell in nature influences the way we describe her and vice versa. I agree with his view insomuch that I believe that our moral inclinations and values may well be underlined by naturally evolved predispositions we can get to know about through scientific research. In this way science and ethics are very much intertwined. However we can also change our disposition if it turns out that our natural inclination is not constitutive to or even detrimental to our own or nature's well-being. Science can help us find out what is constitutive to well-being.

To me it seems to make the most sense to adopt an ethical stance which will align with both what evolutionary ecology teaches us and what we know about our evolutionarily evolved human nature. That is: if we want people to commit themselves to sustainability. Environmental-virtue-ethics does this by acknowledging what we hold to be morally right is (as biologists hold) the product of both our rational cognition and our emotional predispositions. Doing the right thing is trying to improve your dispositions for your own well-being and that of the community.

IV. Conclusion

In this study I aimed to come up with a dissertation that would present an answer to the question how ecological knowledge on ecosystem services should relate to moral deliberation. In the first chapter we read that ecology teaches us that ecosystems provide services that are essential to human life. They work in very complex ways and are poorly understood which is also the main reason why humanity cannot substitute for their services. Experts urge that we should respect their complexity and diversity to safeguard human well-being. From a socio-economic perspective attempts have been made to evaluate ecosystem services monetarily. But because a lot about how these services work is still unknown, possibly relevant aspects of the services might not get a proper (monetary) value assigned to them. Further research can help fill this knowledge gap so that we can properly validate ecosystem services and decide whether we want to preserve (certain aspects of) them or to substitute them with the gained knowledge. Deciding between these two options raises further ethical questions however that need to be addressed first; questions about valuing ecosystem services correctly.

Therefore in chapter two we could read which philosophical views are underpinning points of view in the environmental ethics debate. These are environmental utilitarianism, deontology and virtue-ethics. Of the three I considered environmental virtue-ethics to be the most helpful in the environmental debate. Utilitarianism and deontology are namely both act-centred theories judging what the right course of action is by considering if the intended act is moral when it would be universalised, testing it against a single criterion. The problem within the environmental debate however, is that we often do not know which act is best to perform, because of scientific uncertainty. Plus the single criteria these theories offer to judge the morality of an act by often render too abstract, not action-guiding or even immoral maxims.

The environmental virtue-ethics I propose acknowledges that nature (comprised of both sentient and non-sentient parts) holds a value to humans and it represents an anthropocentric, holistic view. Moral deliberation is a human affair and we have to award the environment (or particularly ecosystems and their services) a value, since it is in our own interest to do so. The aim of environmental virtue-ethics is agent-centred, it is to develop and flourish as a truly excellent human being, true to its own nature. To become excellent, humans have to balance their social, rational and emotional nature and consider what the virtuous attitude to have is in the specific context that will result in the best act. People do not become perfectly excellent overnight, they have to work hard to habituate virtues and do so through their own path of trial and error. To me this theory has some major advantages over the other

two in the environmental debate, because it presents: 1) a direct incentive to preserve nature, namely for the sake of humans, 2) multiple principles that will help prevent the inability to act, 3) our emotional intuitions as important too, filling in the evaluation gap where it is left by rational analyses and 4) ideals that are within reach, albeit through a lot of hard work, but that will make you and your community thrive.

I concluded in chapter three that the combination of evolutionary ecology and environmental virtue-ethics will render the most encompassing and encouraging view of how we are to relate to nature in the broad sense and deal with ecosystem services specifically. I sided with Düwell and his proposition that repeated and systematic reflection on the inferences from scientific data to moral prescriptions is needed in environmental ethics. In this field it will be unavoidable to merge science with ethics without making some presuppositions, however to be open and transparent about the foundation of your assumptions makes your theory philosophically defensible. I believe that what is 'good' is ultimately to be decided by human reflection and perception. As Rozzi states: in environmental science the distinction between descriptive and prescriptive statements should be more vague, because what we hold to be valuable in our environment is inevitably linked with how we know nature to be at present. The lack of a clear distinction is helpful in the current climate, because we have a need of scientific knowledge on ecosystem services to instruct us what we should value in nature to help safeguard human well-being and enable us to survive.

The important message I hope to have conveyed is that we can learn a great deal on how humans should relate to nature from integrating evolutionary ecology and environmental virtue-ethics. Both evolutionary ecology and environmental virtue-ethics endorse that we should have regard for natural heritage and therefore should respect evolutionarily evolved phenomena. This tells us that we are naturally social beings that will (most often) act towards upholding harmony in their community, with both a cognitive capacity to make rational decisions and an ability to experience emotions and react intuitively. With regard to ecosystem services, and the cycles and systems they are a product of, this tells us that they have evolved for over billions of years to become as intricate and complex as they have. To take this complexity of human and non-human nature into account and protect it would be a prudent thing to do. To bring (relatively) stable, natural systems in disbalance could have a multitude of detrimental and adverse effects on human well-being and on that of other organisms.

For further research it would be interesting to see which ecological discoveries we make in nature on how to preserve ecosystems and their services. Perhaps jellyfish turn out to hold precious, potential knowledge on how to cure cancer and perhaps non-human primates can teach us a thing or two about how a social environment is a requirement for developing moral behaviour. Also I would be interested to see which other eco-virtues will be advocated in the future or which societal values we may discard. I would bet that 'moderation' or 'self-constraint' as the eco-virtue to live a life with a small ecological footprint will be on the rise and our old virtue of 'maximalisation' will in time be discarded as outdated and irresponsible.

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