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Sustainability Assessment: A clear image of a fuzzy concept?

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Submission date: June 2014
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Report Title:	Date:09.06.2014			
Sustainability assessment: a clear image of a fuzzy concept?	Number of pages (incl. appendices): 82			
	Master Thesis	X	Project Work	

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Abstract:

To achieve sustainable development globally, it is crucial to use sustainability assessment of policies, plans, programmes and projects. The purpose of this thesis is to find important aspects of what a sustainability assessment should include, point out the importance of using indicators on different perspective levels and research how the practice is in different States.

A literature review pointed out that practice and the perception of sustainability differs considerably. In this thesis sustainability assessment is defined as an ex ante tool that uses different methods to emphasize synergy, adverse, short- and long-term effect of different alternatives of proposals for policies, plans, programmes and projects. Making sure that the sustainability assessment is context-specific and using pre-determined trade-off rules are of great value.

Sustainability assessment with indicators on operational, tactical and strategic levels is adequate for assessing sustainability of policies, plans, programmes and projects because the levels affect each other. A policy must be optimized to achieve sustainability on all levels. The results of this thesis show that there are some shortcomings in current practice when it comes to using indicators on an operational level.

Switzerland managed to implement a sustainability assessment system for federal policies, while Belgium did not succeed. Norway governance is not adequate when it comes to assessing sustainability for large public projects.

Keywords:

1. Sustainability assessment
2. Operational, tactical, strategic perspectives
3. Indicators
4. Practice in States

Preface

This is a Master's Thesis for the program of study for Civil and Environmental Engineering at the Norwegian University of Science and Technology. For my specialization project I chose to write about the Organization for Economic Co-operation and Development (OECD) framework for Sustainability Impact Assessment and how indicators were used on different objective levels. Some information from my specialization project is included in this thesis. The topic is very fascinating and rewarding to work with, mainly because of its important purpose, and with a growing population and limited access to natural resources on earth, it can't be highlighted enough.

Together with my supervisors Ola Lædre and Tore Haavaldsen, I chose to continue with this topic for my Master's Thesis. I would like to thank my supervisors for giving good inputs and ideas for this thesis. Their commitment to bring forth the necessity of sustainability assessments has been important for my motivation. I would also like to thank Jardar Lohne for advises given in the start of this semester. I started with a wide purpose for my thesis, but when my understanding of the topic improved, I chose a more tangible research purpose.

Trondheim, June 2014

Øivind Østdal

Summary

Research questions

Sustainability assessment is a wide topic, and as a guide to write this thesis four research questions were formulated: What are the most important aspects of sustainability assessments? Why is it important to use indicators on different objective levels? What is the current practice concerning the use of indicators on different perspective levels in sustainability assessments? What kind of approaches do different States use to achieve sustainable policies, plans, programmes and projects?

Sustainable development and policies

The idea of sustainable development arose as a response to many unsustainable trends, which were closely linked to governance and policy-making. In many ways the term sustainability has been misused. In the early stages of policy assessment the main focus was reduction of regulatory costs, but when the principle of sustainability got better embedded, sustainability assessments of policies got more attention.

Sustainability assessment

Sustainability assessments is an ex ante tool that uses different methods to emphasize synergy, adverse, short- and long-term effects of different alternatives of the policy proposal. Indicators are used when measuring sustainability in the three dimensions; economic, social and environmental. There are different ways of handling trade-offs, and it is important to set trade-off rules before the process begins. Many important questions need to be addressed when performing a sustainability assessment. Sustainability assessments need to be context-specific because sustainability issues are related to the people and the area that are affected by the proposal, this is also the reason why stakeholder participation is important. These kinds of assessments can be vulnerable for manipulation, and to deal with this one must have an open process where stakeholders participate. The sustainability assessment process is a learning process that should have adequate resources for constantly seeking improvements.

Indicators on different objectives levels

It makes sense to separate objectives on different perspective levels to cope with the different stakeholder objectives. Operational level corresponds to project outputs, tactical level corresponds to the project goals (first order effects) and strategic level corresponds to the project purpose (second order effects). The purpose with arranging indicators to these levels is to predict sustainability impacts on each specific level. The choices one make on operational level have influence for the other levels.

Practice in different States

Many States have introduced some sort of policy assessment, and the practice and quality of these systems varies considerably. How decision-makers interpret and cope with scientific advices also varies.

Conclusion

Sustainability assessment with indicators on operational, tactical and strategic levels is adequate for assessing sustainability of policies, plans, programmes and projects because the levels affect each other. A policy must be optimized to achieve sustainability on all levels. The results of this thesis, which were obtained by analyzing case-specific sustainability assessments, show that there are some shortcomings when it comes to using indicators on an operational level.

Switzerland managed to implement a sustainability assessment system for federal policies, while Belgium did not succeed. Norway governance is not adequate when it comes to assessing sustainability for large public projects.

Sammendrag

Forskningsspørsmål

Sustainability assessment er et forholdsvis stort tema, og for å få en håndgripelig vinkling på masteroppgaven ble fire forskningsspørsmål formulert: Hva bør inngå i en sustainability assessment? Hvorfor er det viktig å bruke indikatorer på forskjellige målnivåer? Hvordan blir indikatorer brukt på forskjellige målnivåer i praksis? Hvordan blir politiske vedtak, planer, programmer og prosjekter i ulike land kvalitetssikret i forhold til bærekraftighet?

Bærekraftig utvikling og policyer

Ideen om bærekraftig utvikling kom som en reaksjon av flere ikke-bærekraftige trender, som er knyttet til hvordan land utarbeider og vurderer policyer før de gjennomføres. Begrepet bærekraft blir i mange sammenhenger misbrukt. Trenden med å vurdere politiske vedtak har skiftet fokus fra å få en mer effektiv og kostnadsbesparende vurderingsprosess til å vurdere hvor bærekraftige de politiske vedtakene er.

Sustainability assessment

Sustainability assessment som begrep brukes om flere metoder, men i denne sammenheng defineres det som ex-ante verktøy som kan bruke et vidt spekter av metoder for å vurdere uønskede, synergi, kort- og langtids effekter av ulike alternativer for politiske vedtak, planer, programmer og prosjekter slik at de kan bli optimalisert for å få et mest mulig bærekraftig utfall. Indikatorer blir brukt, ofte ved hjelp av multikriterieanalyse, til å predikere bærekraft av økonomiske, sosiale og miljøvennlige forhold. Hvordan avveininger blir håndtert mellom disse dimensjonene er essensielt, og det er viktig at reglene for hvordan avveiningene blir gjort avklares på forhånd. Vurderingen av bærekraft må være knyttet til konteksten for tiltaket. Dette er blant annet avhengig av sosiale og kulturelle aspekter, samt verdier som verdsettes av personer som blir påvirket av tiltaket. Involvering av interessenter er derfor meget viktig for å dekke ulike perspektiver knyttet til tiltaket som vurderes. Sustainability assessment kan bli utsatt for manipulering, det er derfor viktig at med en åpen vurderingsprosess som verdsetter de ulike interessentene sine synspunkter. Læringsaspektet er viktig gjennom hele vurderingsprosessen, og tilstrekkelig med ressurser bør settes av til oppfølging og forbedring av tiltaket, samt hvordan fremtidige vurderinger kan bli bedre og mer relevante.

Bruk av indikatorer på forskjellige målnivå

For å håndtere de ulike interessentenes mål for et prosjekt er det fornuftig å dele inn de ulike målene ut ifra forskjellige perspektiv. Det operasjonelle perspektivet angir hvilke resultatmål som skal oppnås i løpet av prosjektet, det taktiske perspektivet angir hvilke effektmål som skal oppnås (brukerperspektiv) og det strategiske perspektivet angir hvilke samfunnsmål som skal oppnås. Dette kan også benyttes for policyer, planer og programmer. Hensikten med denne inndelingen er å ta hensyn til bærekraftighet på alle nivåene, fordi de ofte korrelerer.

Praksis i ulike land

Flere land bruker policy vurderinger i en eller annen form. Hvordan dette utføres varier med tanke på kvalitet og hva de faktisk vurderer. Hvordan beslutningstakere (politikere på dette nivået) håndterer og benytter vitenskapelige råd er omstridt og har stor innflytelse for slike systemer.

Konklusjon

Bruk av sustainability assessment med indikatorer for operasjonelle, taktiske og strategiske mål er en fornuftig måte å vurdere bærekraftighet på alle nivåer, og er viktige aspekter for bærekraftigheten til det foreslåtte tiltaket. Tiltaket må optimaliseres for å sikre bærekraftighet på alle nivåer. Resultatene fra denne masteroppgaven viser at det er mangler ved dagens praksis når det gjelder å bruke indikatorer på et operasjonelt målnivå.

Sveits klarte å implementere et sustanability assessment system for statlige policy forslag, mens Belgia mislyktes. Norge sin håndtering av store offentlige prosjekter før iverksettelse er ikke godt nok med tanke på bærekraftighet. Norge har et stort forbedringspotensial.

Contents

1 Introduction

This chapter starts with the background for this thesis, followed by the research purpose and limitations. Lastly the explanations of the terms used in this thesis are described.

1.1 Background

Shifting focus of policy assessments

Policy assessments exist in many different formats, and the early forms arose from the need for more efficient policy processes (Renda, 2006) (Adelle and Weiland, 2012). Nowadays researchers and organizations like the Organization for Economic Co-operation and Development have put a lot of work to increase awareness of how policy assessments should be conducted regarding sustainability. In a policy process the information needed to assess a policy depends on which stakeholder the information is intended for (Braat, 1991). One way to seize sustainable development is to assess impacts of proposed policies. According to Ascher (1999) degradation of natural resources in developing countries is mainly caused by policy failures by the government.

Sustainability assessments

Sustainability and sustainable development has become a popular topic in the media, in the research community and by environmental activists (Bond et al., 2012) The meaning of sustainability will be discussed further in the theory chapter, because it is crucial that to achieve a sustainable outcome for policies and projects all involved parts need to share the same meaning of the term sustainability (Bond and Morrison-Saunders, 2013). According to Gibson (2013b) sustainability assessments done properly, is not about minimizing the damage already done, is about "reversing the unsustainable trends". One of the most serious trends highlighted by WWF (2010) was that in 2007 human depletion of natural resources had reached 150 % of what the planet can sustain. Sustainability assessment can improve the environmental governance (Craig and Jeffery, 2013), and encourage decision-makers to consider policy proposals that might stop or reverse some of the negative trends.

In sustainability assessments different indicators are utilized to give values to the three dimensions of sustainability; economic, social and environmental (Bond and Morrison-Saunders, 2013). To achieve a sustainable outcome of a policy, plan, program or project the use of indicators on different objective levels might be the key for success.

1.2 Research purpose and questions

1.2.1 Research purpose

The main objective for this thesis is to get a deeper knowledge of sustainability assessment as a tool to achieve better and more sustainable policies, plans and projects. To achieve this, the thesis will focus on:

- The concept of sustainability.
- Different frameworks for sustainability assessments and essential parts of what a sustainability assessment should contain.
- The correlation between indicators in sustainability assessments and the objectives of a proposed policy plan or project.
- Different practices in States concerning policy assessments focusing on sustainability.

1.2.2 Research questions

- What are the most important aspects of sustainability assessments?
- Why is it important to use indicators on different objective levels?
- What is the current practice concerning the use of indicators on different perspective levels in sustainability assessments?
- What kind of approaches do different States use to achieve sustainable policies, plans and projects?

1.3 Scope and limitations

1.3.1 Scope

This is a Master Thesis for the program of study for Civil and Environmental Engineering at the Norwegian University of Science and Technology. The Master Thesis was completed in 21 weeks, the last semester of a 5 year long degree program. The theory chapter is the most important part of this thesis, and most of the work was put into this chapter.

1.3.2 Limitations

Sustainability assessment is a wide topic, and the thesis will be limited to ex-ante sustainability assessments of policies, plans, programmes and projects. That's the reason this thesis mainly considers policy assessments that has sustainability as main focus. OECD Sustainability Impact Assessment framework was the topic for my specialization project last semester, so all the details concerning this framework is not part of this thesis. Considerations of sustainability in a context of measuring governmental progress to meet sustainable development goals are not included either.

The sustainability assessments that will be analyzed in the results are imitated to:

- Measuring sustainability in the three dimensions: economic, social and environmental.
- The proposed policy, plan or program is relatively easy to understand.
- The assessment methods and indicators are understood clearly and can be checked.

- Carried out by researchers with profound knowledge of sustainability assessments.

1.4 Explanation of terms

Social Impact Assessment and Sustainability Impact Assessment, share the same abbreviation, namely SIA. To deal with this possible confusion the term sustainability assessment will be used in thesis to describe integrated assessments that regard sustainability in the three dimensions economic, social and environmental. Impact assessment is used in the theory chapter, when the original authors use this term, but this is also considered as sustainability assessment. "Policies are inspiration and guidance for action, plans are sets of coordinated and timed objectives for implementing the policy and programmes are group of projects" (Craig and Jeffery, 2013) (derived from Therivel (2012). The rest of the explanation is given in Table 1.They are submitted to minimize the risk that misunderstandings will occur while reading this thesis.

Table 1. Explanation of terms used in this thesis.

Term	Explanation
Biosphere	"The regions of the surface and atmosphere of the earth or another planet occupied by living organisms" (Ordnett, 2014).
"Business as usual"	"Business as usual is the situation today and further development is expected on the current area in case the proposed action is not implemented, i.e. the situation today with possible upgrading's" (Samset, 2010).
EIA	Environmental Impact Assessment (described further in the theory chapter).
Ex-ante assessment	An early assessment of plans, programs, policies and projects. This is carried out before the decision-makers choose between alternatives, final concept is specified and funding is decided. Modified from Samset (2010).
Ex-post evaluation	An evaluation after the policy, plan, program or project is implemented and has been operating for some time, to evaluate long-term effects in correlation with the planned objectives. Modified from Samset (2010).
Governance	"The action or manner of governing a state" (Ordnett, 2014)
Index	"An index is a single measure that combines many individual pieces of information by means of a precise mathematical formula" (Farrell and Hart, 1998).
Indicator	"An indicator is something that provides useful information about a physical, social, or economic system, usually in numerical terms"

	(Farrell and Hart, 1998).
Land use change	"A process by which human activities transform the landscape" (University of Arizona, 2010)
Neo-liberal economy	A economy form that promotes: liberalization and deregulation of economic transactions within and across national borders, and privatization of state owned enterprises and services (Jessop, 2002).
Objective	The preferred word used in this thesis to describe what the proposals (policy, plan, program or project) is meant to achieve. Some might use words like goals and targets for this as well.
OECD	Strategic Impact Assessment (described further in the theory chapter).
Policy	"Principles that govern action directed to given ends" (Titmuss, 1974).
Process	A chain of activities that heads from one state to another (Samset, 2010).
Project	Planned activities with the purpose to achieve specific objectives concerning cost and timeframe (Samset, 2010).
SEA	Strategic Impact Assessment (described further in the theory chapter).
Stakeholders	"A stakeholder in an organization is all groups or individuals that can affect or is affected by the organization's achievement of objectives" (Freeman, 1984)
Spatial	Notation for relations of distance and space (Språkrådet, 2010).
Technocracy	A State system where technologists and economists dominates the political influence, also called a system where experts rule (Språkrådet, 2010).
The European Commission	"The European Commission represents the interests of the EU as a whole. It proposes new legislation to the European Parliament and the Council of the European Union, and it ensures that EU law is correctly applied by member countries" (European Commission, 2014)
Trend	"Observed change over time. If someone in present time thinks that it will continue, it is called prediction. If someone would like it to change, it is called prescription." (Samset, 2010)

1.5 Thesis structure

Chapter 1 – Introduction

This chapter will give an introduction that describes why this thesis is made, and what the purpose is. The most important limitations and definitions of expressions used in this thesis are also specified.

Chapter 2 – Methodology

To achieve trustworthy results the methodology is an essential part that has to explain how the research is performed. The methods for gathering information and analyzing the data used in this thesis are described in this chapter.

Chapter 3 – Theory

This is the main part of the thesis, and will be the basis for answering the research questions. The main focus in this chapter is covering the wide field of sustainability assessment theory, and to limited by what is important for this thesis.

Chapter 4 – Results

The data analyzed were sustainability assessments done by researchers or consultants. How these were found is described in chapter 3 and their limitation is described in chapter 1. The main focus in this chapter is to place objective levels to each indicator, and describe if there are any loopholes.

Chapter 5 – Discussion

Reflections from the theory and assessments of the results are discussed in this chapter. The research questions stated in chapter 1 form the basis for the discussion.

Chapter 6 – Conclusion

The purpose of this chapter is to answer the research questions.

Chapter 7 – Recommendations and further work

Sustainability assessment is a relatively new topic in Norway. This chapter includes recommendations which might be useful for researchers and some considerations on how Norway as a State can achieve more sustainable outcomes from political decisions from the governance of the State.

2 Methodology

"Hypotheses are nets: only he who casts will catch" (Novalis)

Firstly the general approach for the research method is described and secondly the more specific approach used in this thesis is presented.

2.1 Research methods in general

"Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically" (Kothari, 2004).

According to Creswell and Clark (2007) a research approach consist of plans and procedures for the research, and decisions about which philosophical worldview, research method and design that the researcher prefer.

2.1.1 Philosophical worldviews

The philosophical part of research can be seen as a worldview in the sense of basic guidelines for beliefs that shape the basis or paradigms (Guba, 1990) (Mertens, 2010). The reason why philosophical worldviews is included in this chapter is because these viewpoints may be used to describe some of the research approaches concerning sustainability assessments.

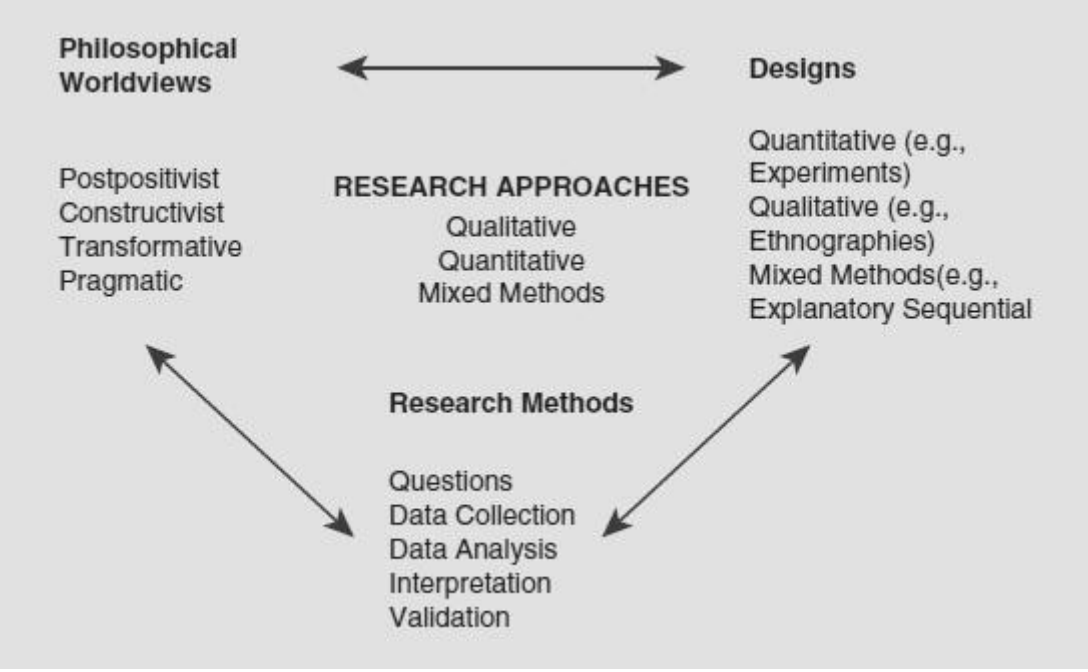

Figure 1. The correlation between research approaches, methods, philosophical worldviews and design (Creswell and Clark, 2007)

The philosophical worldview for the research approach is usually limited to one of these four (Creswell and Clark, 2007):

- **The postpositivist worldview** is the traditional research form that prefers quantitative research rather than qualitative research. It is based on a deterministic philosophy, which means that effects or outcomes are determined strictly by cause.

- **The constructivist worldview** is used in qualitative research approaches. Constructivists seek knowledge and meaning through humans subjective experiences. They will often try to interpret these meanings in a complex manner from the social and historical basis of the people involved.

- **The transformative worldview** originates from researchers that felt constructivist did not put enough effort into seeking out to help marginalized people (e.g. people with disabilities, indigenous people and homosexuals). Researchers advocating this philosophical view will try to address the problem with connections to politics, and to obtain a political change agenda (Mertens, 2010).

- **The pragmatic worldview** focuses more directly on the problems in order to obtain solutions for them. Pragmatists use whatever methods and approaches which may be helpful to address the problem.

2.1.2 Three approaches to research

The research approach can be divided into three main categories:

- **Qualitative research** is based on verbal and textual information, and it usually involves gathering a large amount of information regarding few objects of study. To check whether the results are verifiable can be difficult with this method (Olsson, 2011). This approach promotes inductive reasoning, which focuses on individual meanings and "the importance of rendering the complexity of a situation" (Creswell and Clark, 2007).

- **Quantitative research** is based on probing objective theories by using numbers and variables to analyze together with statistical procedures. This approach promotes deductive reasoning, which focuses on "protections against bias, controlling for alternative explanations, and being able to generalize and replicate the findings" (Creswell and Clark, 2007).

- **Mixed methods research** utilizes both qualitative and quantitative data to address the research problem. Proponents of this approach claims that the combination of quantitative and qualitative approaches gives a better understanding of the research problem (Creswell and Clark, 2007).

2.1.3 Reliability and validity

The term validity describes how well the information is related to the research. To achieve good validity there must be a correlation between reality and interpretation. Reliability is used to describe whether the information is reliable and can be verifiable. Figure 2 illustrates the correlation between reliability and validity.

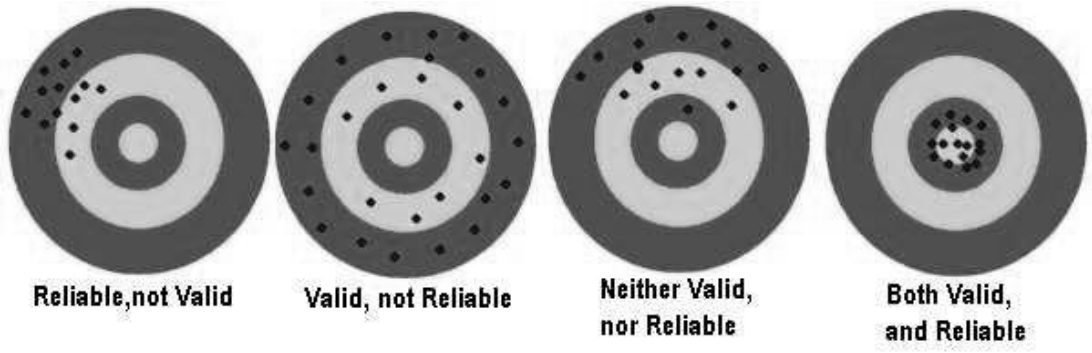

Figure 2. Reliability and validity (Klassen, 2014).

2.2 Literature review

The literature review is the most important part of this thesis. Sustainability assessment is a popular term which has been used to describe many different tools. One of the main objectives for this thesis is untangle some of the issues concerning sustainability assessments. To obtain a broad perspective of sustainability assessment, a wide search within the literature was performed. Most of the highlighted literature is written by well-known researchers of the field of environmental studies.

2.2.1 Databases and search engines

These are the preferred databases and search engines which have been used:

- **BIBSYS Ask** is a search engine for the BIBSYS database. This database is shared between most of the research libraries in Norway (UiB, 2012). BIBSYS is primarily limited to books and reports. Detached scientific journals are not available in BIBSYS.

  Scopus is the largest database for abstracts and citations, and all the literature found here is peer reviewed (Elsevier, 2014b). "Peer review is the process of engaging substantive experts to read and comment on new research in the fields which they study in order to validate and certify that research" (Elsevier, 2014a).

- **Compendex (Ei Village 2)** is a database for the engineering fields. Journals and books found here are peer-reviewed (Engineering Village, 2014).

- **Environmental Sciences and Pollution Management** is a search engine within the field of environmental science (ProQuest, 2014). Since sustainability assessment is within this category, this search engine has been important for this thesis.

- **Google Scholar** is a free search engine for academic literature. It searches complete journals for correlating terms, in contrast to other scientific search engines (Google, 2011). Google Scholar does not replace scientific reference databases and should be used as a supplementary search engine (University of Oslo, 2012) (NMBU, 2014).

- **Google** is an enormous search engine is not preferred for scientific literature, since the quality assurance is not satisfying for this purpose. Google was used in the search for how different states handle policies.

2.2.2 The search process

Together with my supervisors it was preferred to write in English, because then the results from this thesis might be used in a future research paper, only if the results are of interest of course. Most of the literature of this topic is written in English, so it naturally became the preferred language to use in the search.

Here is a selection of terms used in the preliminary search:

- Sustainability assessment
- Sustainability impact assessment
- Policy assessment
- Policy appraisal
- Practice
- Indicators
- Operational, tactical and strategic level
- Objectives, goals and targets

These search terms were often combined to limit the search. In the different search engines it was quite beneficial to use Boolean operators (e.g. and, or, not) to exclude less relevant literature for this thesis (e.g. Life Cycle Assessment).

2.2.3 Theoretical foundation

A lot of effort was put to achieve a profound understanding of the topic, and to get familiar with relevant scientific literature. Both these achievements are considered essential for anyone encountering sustainability assessments. Combining this with the complexity of the topic and the variety of approaches found in the literature, it becomes evident that in this thesis the theory chapter is of high importance. Generally, the topic is well covered in the literature, but when it comes to the objectives on different perspective levels, less literature was found. The literature that was found was assessed individually regarding relevancy, whether outdated or not, insufficiency, validity and reliability.

Scientific journals and books referred to in this thesis are quality assured. Literature from Google Scholar and Google has been thoroughly assessed, since literature found here is not necessarily peer reviewed. Some literature has been found on government official web pages from different States, and they have been assessed to reliable. The case-specific sustainability assessments which have been the main objectives for the analysis have been found by the search engines mentioned previously, or from web pages linked to actual research programs.

To get a trustworthy thesis it was important to find the primary source. In some cases the secondary source was used when the primary source was not found, or if it was not possible to

access, but then the primary source was referred to with the secondary source. If statements have not been found in the primary source, the statement has been rejected for this thesis.

2.3 Analysis

The results of this thesis are qualitative analyses from case-specific sustainability assessments. Limitations of the analyses were specified in the previous chapter. The sustainability assessments from the results were chosen from the limitations stated in the previous chapter. Those that fulfilled the limitation criteria were assessed more thoroughly. When they were difficult to understand (e.g. incomprehensible indicators), they were not further assessed. According to Samset (2010) it is important to assess causality when supporting rational choices. Possible sources for error will involve incorrect evaluations when assessing the indicators with respect to the operational, tactical and strategic objectives. If it's not good causality with this work the results will not be precise or valid.

3 Theory

"Theories are nets cast to catch what we call 'the world': to rationalize, to explain, and to master it. We endeavor to make the mesh ever finer and finer" (Popper, 1959).

In the following chapter theory that is relevant for describing sustainability assessments will be presented.

3.1 The principle of sustainable development

The idea of sustainable development originated from a meeting in "International Union for Conservation of Nature" in 1969. In a UN meeting in Stockholm in 1974 this was one of the main subjects as they discussed whether it was possible to achieve economic growth and industrialization without damaging the environment (Adams, 2006). According to Gibson (2006): "The idea of sustainability arose in response to the spreading gulf between rich and poor and the continued degradation of biospheric systems; and many particular concerns about the common and sometimes catastrophic failures of decision-making efforts that failed to take key linked factors into account".

Sustainable development was defined by The Brundtland Commision as: "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (WCED, 1987). Since then the word "sustainable" has been used in many different settings and with various meanings. As stated by Heinberg (2010) it is unfortunate that this word "has become widely used to refer merely to practices that are reputed to be more environmental sound than others". A clear and precise definition has not been reached, but people in general agree that sustainable development is about: "leaving something for your kids" (Bell and Morse, 2008).

3.2 Unsustainable trends

In a global context humankind is facing serious threats to our way of living. In 2007 human depletion of natural resources reached 150 % of what the planet can sustain (WWF, 2010). Throughout history numerous civilizations have collapsed due to overconsumption of resources (Diamond, 2005). According to Ascher (1999) degradation of natural resources in developing countries is mainly caused by policy failures of governments. Some unsustainable trends are listed in the following:

- The lack of phosphorus globally, which is vital to the food industry and modern farming and can't be replaced synthetically (Beardsley, 2011).
- Globalized exploitation of marine resources (Jackson et al., 2001).
- 2.7 billion people have less than 2 US dollars a day (World Bank, 2004).
- If CO_2 emissions continue to increase the radiative forcing will most likely increase the average temperature on earth (Moss et al., 2010).

Conventional decision-making institutions have previously assumed that (Gibson 2013b):

- Overall wellbeing is improved by exploiting energy and material resources as fuel for economic growth.
- Elimination of poverty is achieved through material wealth.
- Economic motives and technological innovation can save us from our degradation or depletion of resources.
- Impact mitigation can protect our valued ecological and socio-cultural resources.

When the carrying capacity of the planet is already overshot, "these convenient old assumptions are no longer valid" (Gibson 2013b).

3.3 Sustainability Assessments

Why should we use sustainability assessment? According to Gibson (2013b) the answer is: "with a few salutary exceptions, what we are doing on Earth is wrecking the place".

In its simplest definition sustainability assessments can be defined as the process that directs decision-making towards sustainability (Bond and Morrison-Saunders, 2011, Hacking and Guthrie, 2008). There is no consensus in the research community and international practice "as to what sustainability assessment is or how it should be applied" (Bond et al., 2012).

Several evaluation approaches for measuring sustainability exits, such as regulatory impact assessment (RIA), environmental impact assessment (EIA), strategic environmental assessment (SEA) and poverty impact assessment (PIA). These types of assessments have a tendency to focus on a specific pillar of sustainability (OECD, 2008). According to Morrison-Saunders et al. (2014) over 40 types of impact assessments are found in the literature. This thesis will mostly be orientated towards Sustainability Assessment (SA) of policies that assesses sustainability with consideration to the three dimensions: economic, social and environmental.

When policies are not properly evaluated before implemented, unintended consequences may occur. Such unintended consequences may cause new problems possibly even more difficult to deal with the original problem. These can be described as second-order problems. Sustainability is one of the main second-order problems in modern problem solving (Voß et al., 2006).

3.3.1 The concept of sustainability

There are different ways to describe sustainability. Most of them revolve around integration of environmental, social and economic dimensions (Bond and Morrison-Saunders, 2013). These three dimensions of sustainability can be expressed by a Venn diagram, pyramid, three pillars, three-legged stool, the triple bottom line or an egg as seen in figure 3. The triple bottom line (for elaborated information see Elkington (1997)) regard sustainability in a way

that gives equal attention to environmental, social and economic concerns in decision-making (Pope et al., 2004).

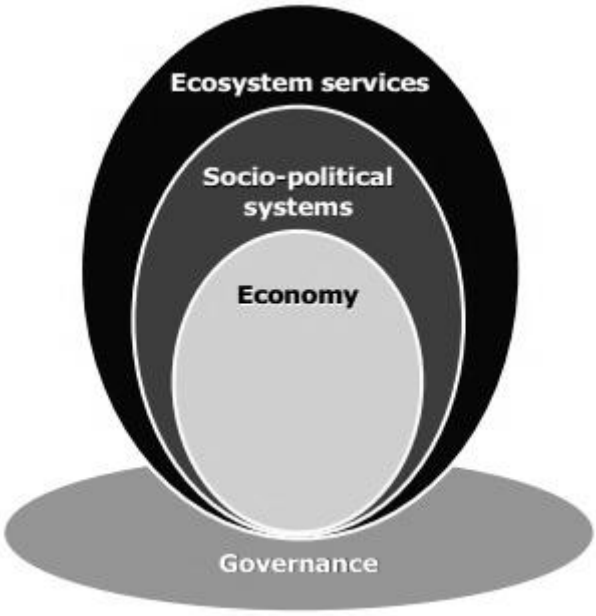

Figure 3. A systems approach to sustainability (DEAT, 2008).

The research community which contributes to methods and practice of sustainability assessment regard sustainable development as a good thing, but there are those who disagree. For example followers of the "Deep Ecology" movement (founded by Arne Naess), which argues that sustainable development is driven by the improper principle that humans have the right to dominate nature (Jacob, 1994) (Bond and Morrison-Saunders, 2013) (Naess, 1973).

While Lele (1991) argue for the different meaning of sustainability and sustainable development, this thesis will refer to those two as the same.

3.3.2 Different SA methodologies

This thesis will not go thoroughly through all existing sustainability assessment methods, but it's important to notice that many approaches are used to assess sustainability in different forms. The monetary aggregation method is used by mainstream economists, while the use of physical indicators is mostly used by scientists and researchers in other disciplines (Singh et al., 2009). The literature concerning sustainability assessments tend to focus on tools and techniques rather than examples of practice and case studies (Bond et al., 2012).

Ness et al. (2007) developed a framework for categorization of sustainability assessment tools which is presented in figure 4. This holistic framework consists of three umbrellas, which are arranged by the temporal focus (retrospective, prospective or both).

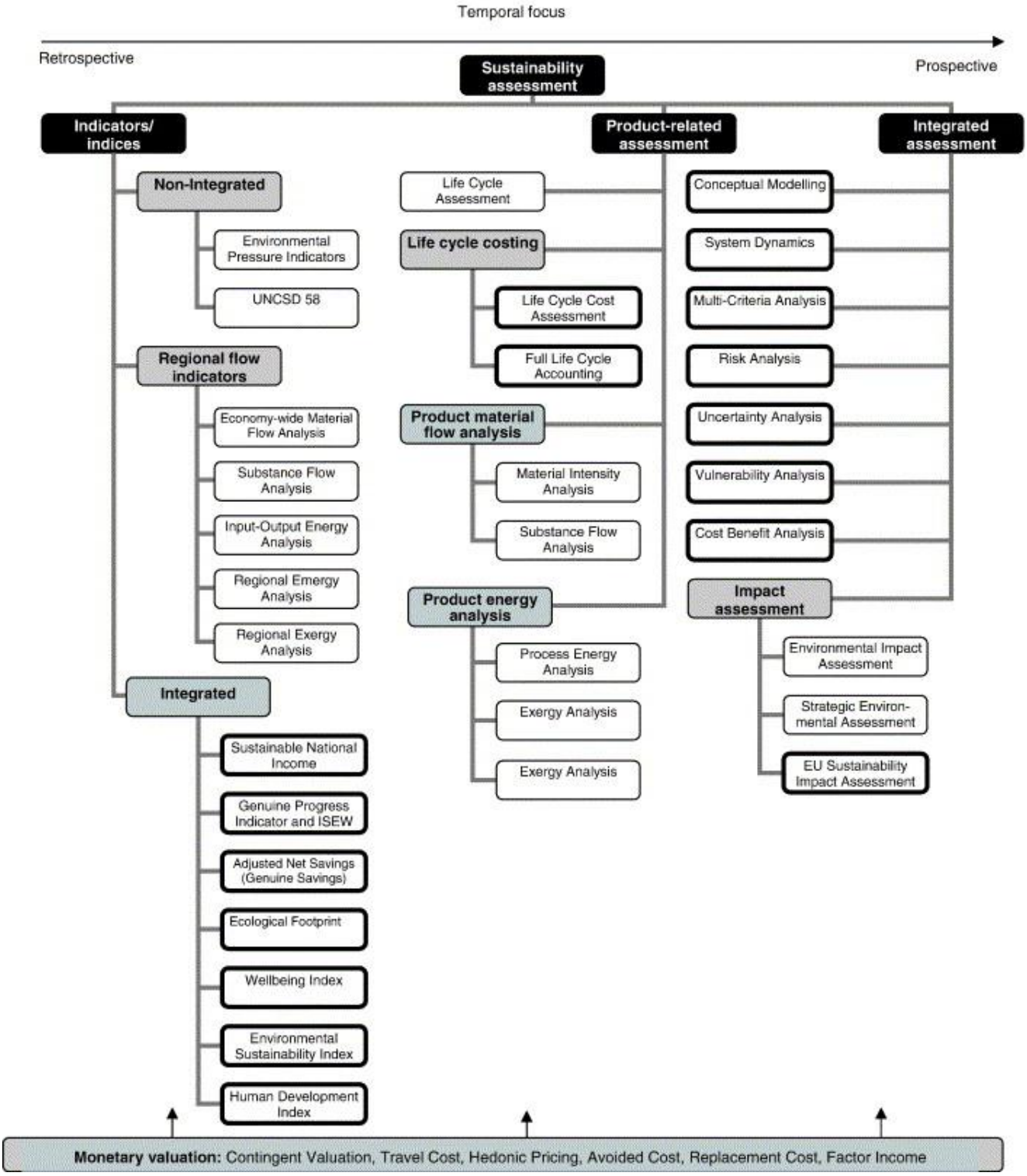

Figure 4. Framework for sustainability assessments tools (Ness et al., 2007).

3.3.3 Environmental Impact Assessment and Strategic Environmental Assessment

Environmental Impact Assessment (EIA) is a process that analyzes the possible environmental consequences of a proposed action in the planning, design, decision-making and implementation stages of that action (Morrison-Saunders and Arts, 2004).

Environmental assessments can be conducted on different planning levels. EIA is used on a project level, while Strategic Environmental Assessment (SEA) is applied to policies, plans and programs (Morrison-Saunders and Arts, 2004). The use of SEA is on a national/state level (Munier, 2004). Sheate et al. (2001) state that a SEA should contain the following:

- Scoping, including identification of alternative options.
- Production of environmental statement/report which includes the following – identification, analysis, and assessment of likely significant effects on the environment.
- Participation and consultation throughout the process to include relevant authorities, public and non-governmental organizations and concerned member States. A minimum requirement is that documents are open for public examination.
- The content of the environmental statement/report and the results from consultation during the process should be taken into consideration prior the adaptation of the plan/programme.
- A non-technical summary of the statement/report including results from consultation.
- Monitoring of the plan/programme.

3.3.4 OECD's Sustainability Impact Assessment Methodology

OECD (2010) developed guidance for Sustainability Impact Assessment, inspired by Swiss and Belgian sustainability assessment approaches. These steps are presented in table 2. Sustainability Impact Assessment is a method that uses both qualitative and quantitative analysis to consider all economic, social and environmental impacts of a policy proposal.

Table 2. The 8 steps of the Sustainability Impact Assessment process according to OECD (2010).

1.	Screening the proposal: deciding whether an Sustainability Impact Assessment is needed.
2.	Scoping the assessment: deciding the extent of the assessment to be conducted.
3.	Selecting tools or methodologies to match the scoping.
4.	Ensuring stakeholder participation: deciding on the role of stakeholders.
5.	Analyzing the economic, environmental and social impacts.
6.	Identifying synergies, conflicts and trade-offs across these impacts.
7.	Proposing mitigating measures to optimize positive outcomes.
8.	Presenting the results and options to policy makers.

The scoping step set the boundaries for the rest of the sustainability assessment. This can be done in many different ways including checklists, matrices and literature surveys. One way to execute this is presented in table 3.

Table 3. Scoping elements in Belgian Sustainability Impact Assessments (OECD, 2010) (Bauler and Wäktare, 2006).

Scoping area	Examples of scoping questions
1. Procedural	Who will conduct and oversee the assessment?
	What financial resources are available?
	Which decision-makers need to be engaged?
	Which specialists and expertise could be involved?
	Which stakeholders should participate at what stages?
	What is the timing of the assessment?
2.Substantive	What is the purpose of the assessment?
	What are the goals and the target groups of the policy?
	Which potential impacts should be the focus of the assessment?
	Which criteria will be used to assess the significance of the impacts?
	How extensive should the assessment be?
	Are there potential unintended side effects which warrant attention?
	What is the time horizon for the assessment?
3.Methodological	What data sources and information are available?
	Which methods will serve the purpose of the assessment?
	What set of tools should be considered?
	How will the assessment process be monitored and evaluated?

3.3.5 The DPSIR Framework

Many research programs have been initiated, with funding from the European Commission, to make progress towards more sustainable policies. Drivers, Pressure, States, Impacts and Response (DPSIR) was developed by the European Environment Agency (EEA) as an extension of the earlier Pressure, State and Response (PSR) framework developed by OECD (Singh et al., 2009) (Helming et al., 2011). A description of the terms in the DPSIR framework is given in Table 4. The DPSIR framework has been criticized for having a bias towards the environmental part of sustainability. In addition, it has provided shortcomings both concerning communication between researchers, in one end, and stakeholders and policy makers in the other end (Svarstad et al., 2008).

Table 4. The basis of DPSIR(Helming et al., 2011).

Relations between human activities and the environment	Description
Drivers	External drivers: socioeconomic and technological trends, and policy drivers
Pressure	The affected pressure by these two drivers.
State	The state's role is expressed as social, economic and environmental quantified indicators that are affected by the *Pressure*.
Impacts	Aggregating the previous indicators so they are translated into services to society.
Responses	The policy decisions that response to the simulated impacts.

The SENSOR research program tuned DPSIR framework into an ex ante impact assessment tool to measure sustainability regarding land use change policies (Helming et al., 2008). This tool can be applied to these land use sectors: agriculture, forestry, nature conservation, transport infrastructure, energy and tourism. Policy scenarios are predicted from data and modeling as shown in figure 5.

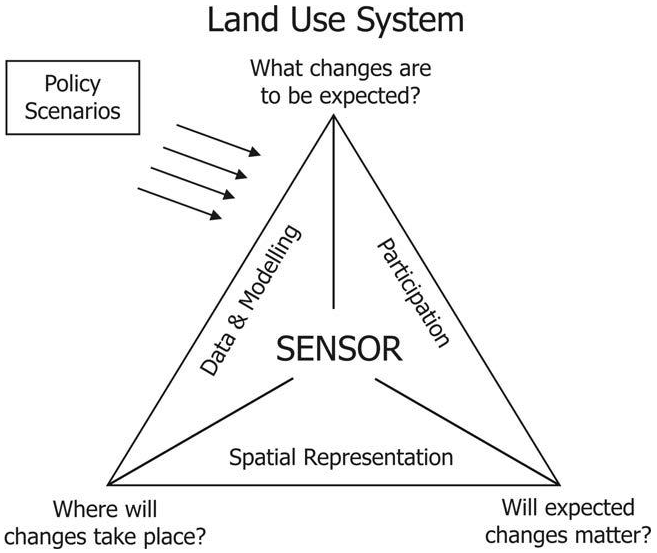

Figure 5. General questions that will be answered in impact assessment of land use policies (Helming et al., 2008).

The SENSOR approach to DPSIR uses top-down modeling together with bottom-up involvement of stakeholders as shown in the simplified analytical scheme in figure 6. In this model the *Response* is not included because that is covered in the policy decisions (Helming et al., 2011). While developing and applying the Tool for Sustainability Impact Assessment (SIAT) Schößer et al. (2010) claims that "the challenge remains to integrate complex systems knowledge into clear, easy to comprehend information on the one hand, whereas maintaining necessary detail about sensitive systems relations on the other. To be useful in the decision-making process, assessment approaches should be designed in close cooperation with the potential user, and applied and tested in actual policy and decision-making processes". The SIAT framework uses the three-pillar definition of sustainability and use indicators for each pillar (Helming et al., 2011).

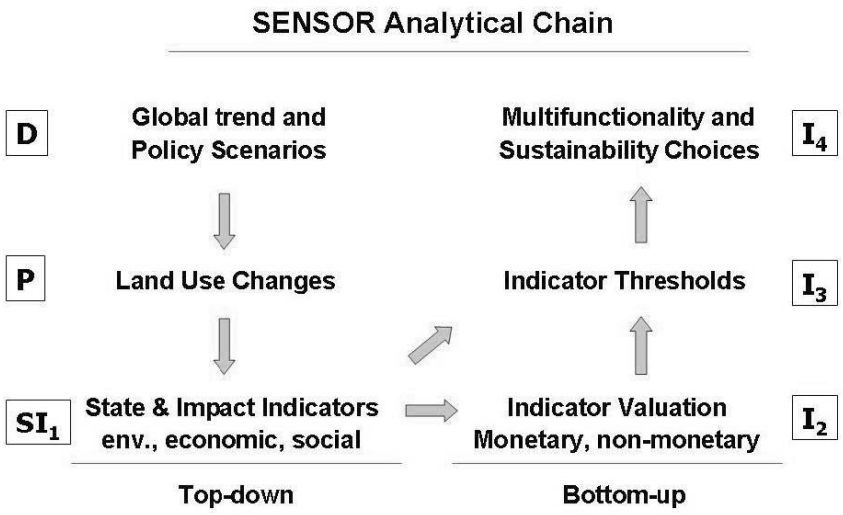

Figure 6. The adaptation of the DPSIR framework by SENSOR (Helming et al., 2008).

3.3.6 Framework for Participatory Impact Assessment

The Framework for Participatory Impact Assessment (FoPIA) was developed as a response to lack of approaches to involve stakeholders in impact assessments. This framework has evolved from the DPSIR framework described in chapter 3.3.5. The FoPIA can be seen as a complementary framework to the SIAT. While SIAT is often used as a "quick-scan" of an area, FoPIA is more suitable for an in-depth analysis (Morris et al., 2011).

As shown in figure 7, phase 1 starts by semi-structured interviews with national and regional-level policy-makers and experts. The interviews include issues concerning sustainability at a national and regional level, policy design and implementation, and issues about land use change. The results of an analysis from phase 1 form the basis for sketching the policy scenarios that will be debated in the SIA workshop in phase 2. Phase 2 involves all the stakeholders from phase 1. They analyze the sustainability criteria considering the alterations of impacts according to the environmental, economic and social indicators predicted from the proposed policy scenarios. Subsequently, the stakeholders set the limits for sustainability and compare them to the new indicator values. In the final part, the criteria are revaluated to reassure stakeholder preferences to each scenario (Morris et al., 2011).

To get valid and reliable results when considering land use change, impacts should derive from a combination of (König et al., 2012):

- Ex post analysis of monitoring data
- Ex ante simulation experiments
- Participatory expert-based tools

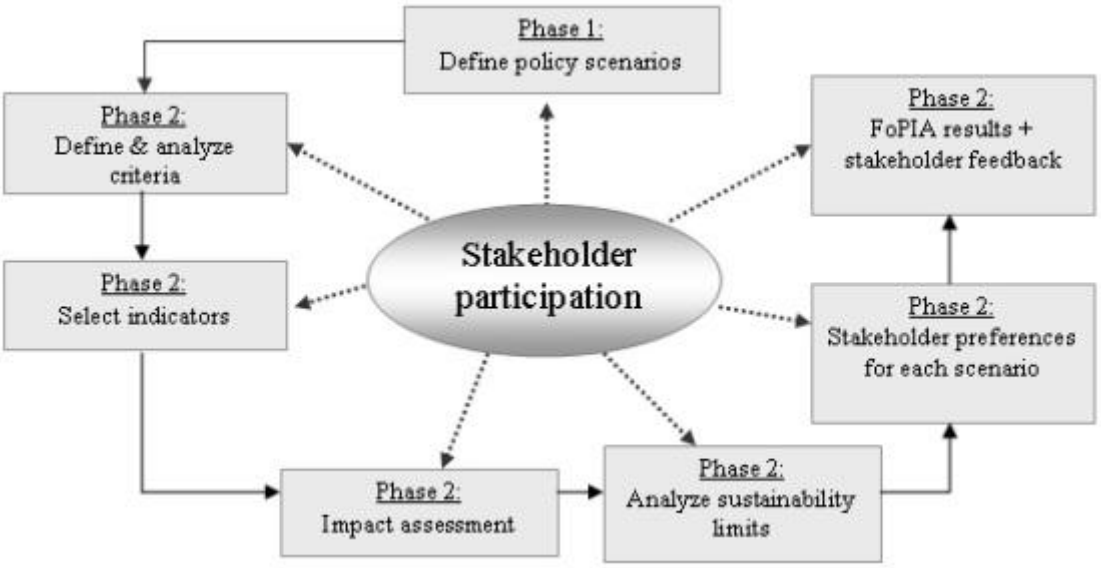

Figure 7. Framework for Participatory Impact Assessment (FoPIA) (Morris et al., 2011).

3.3.7 Non pillar based sustainability assessment

Gibson (2006) argues that abandoning the pillar concept of sustainability, would encourage practitioners to "think and act outside these boxes" , leading to a better understanding of what the real problem is. This concern is outlined by the argument that most of the participants have expertise in specific areas which may lead to a fragmentation of the sustainability issue. According to Gibson and Hassan (2005) the pillar-based thinking "encourage a focus on conflicts, especially between the economic and ecological pillars".

Gibson and Hassan (2005) have made a set of core generic criteria for sustainability assessments which doesn't follow the usual pillar-based method. According to Gibson (2006) these general requirements for sustainability assessment can be adjusted and reconstructed such that "the specifics of each item and the package as a whole must be defined in context, by the relevant communities of interest and concern". These core generic criteria are presented in table 5.

For practical use this framework can be applied both on a strategic level as in the ex ante assessment of a proposed Ontario Electrical Systems Plan (Winfield et al., 2010) , on a project level as in the ex ante assessment for improvements of a small scale biodiesel project in Barbados (Gaudreau and Gibson, 2010), and to highlight the importance that the strategic and project level correspond to maximize the sustainability outcome it has been used in the ex post evaluation of a sugarcane ethanol production mill in São Paulo in Brazil (Duarte et al., 2013) .

Table 5. General requirements for sustainability assessments (Gibson and Hassan, 2005) (Gibson 2006).

Core generic criteria for SA	Requirement description
Socio-ecological system integrity	Build human-ecological relations to establish and maintain the long-term integrity of socio-biophysical systems and protect the irreplaceable life support functions upon which human and ecological well-being depends.
Livelihood sufficiency and opportunity	Ensure that everyone and every community has enough for a decent life that everyone has opportunities to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity.
Intra-generational equity	Ensure that sufficiency and effective choices for all are pursued in ways that reduce dangerous gaps in sufficiency and opportunity (and health, security, social recognition, political influence, and so on) between the rich and the poor.
Intergenerational equity	Favor present options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably,
Resource maintenance and efficiency	Provide a larger base for ensuring sustainable livelihoods for all, while reducing threats to the long-term integrity of socio-ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit.
Socio-ecological civility and democratic governance	Build the capacity, motivation and habitual inclination of individuals, communities and other collective decision-making bodies to apply sustainability requirements through more open and better informed deliberations, greater attention to fostering reciprocal awareness and collective responsibility, and more integrated use of administrative, market, customary and personal decision-making practice.
Precaution and adaptation	Respect uncertainty, avoid even poorly understood risks of serious or irreversible damage to the foundations for sustainability, plan to learn, design for surprise, and manage for adaptation.
Immediate and long term integration	Apply all principles of sustainability at once, seeking mutually supportive benefits and multiple gains.

3.3.8 Trade-offs

A major part of a sustainability assessment is identifying synergies and conflicts. When conflicts between the economic, social and environmental dimension occur, trade-offs must be managed properly (OECD, 2010).

One way to deal with trade-offs is to regard sustainability as presented in figure 3 with the "egg of sustainability". Where the environment is the overall system boundary, society is a sub-system of the environment and economy is the last sub-system which is encircled by society. "If one sub-system overshoots the limits of the surrounding system(s) the overall system is destabilized and endangered. Sustainability can only be reached if the sub-systems fulfill sustainability criteria and stay within the limits of the superior system" (Stoeglehner and Neugebauer, 2013).

The "Indicator pyramid" shown in Figure 88 also addresses trade-offs. The model is read top down. To ensure an efficient screening phase this model uses general indicators like ecological footprint to assess different alternatives for the proposal. "Only alternatives that pass this pre-assessment are assessed in more detail using specific indicators, addressing specific environmental, social and economic issues" (Stoeglehner and Neugebauer, 2013). Ecological footprint is a measurement for the consumption of renewable natural resources by humans. This footprint is equivalent to the total area needed to (WWF, 2014):

- Produce our consumption of food and fiber.
- Absorb emissions from energy use.
- Provide space for infrastructure.

After the pre-assessment the proposal has to pass the environmental criteria before succeeding to the next.

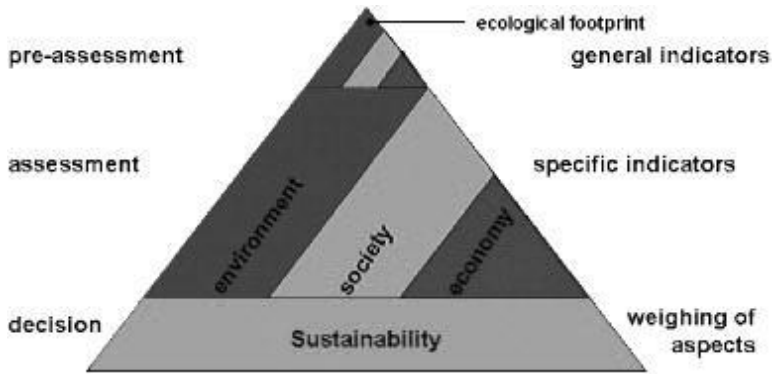

Figure 8. The "Indicator pyramid" (Stoeglehner and Narodoslawsky, 2008).

Gibson and Hassan (2005) have developed six basic rules for managing trade-offs in sustainability assessment, and these are presented in table 6. These broad rules are can be used in any sustainability assessment, but might need supplement of other context specific rules.

Table 6. Basic sustainability assessment trade-off rules (Gibson and Hassan, 2005) (Gibson 2006).

Trade-off rules	Description
Maximum net gains	Any acceptable trade-off or set of trade-offs must deliver net progress towards meeting the requirements for sustainability; it must seek mutually reinforcing, cumulative and lasting contributions and must favor achievement of the most positive feasible overall result, while avoiding significant adverse effects.
Burden of argument on trade-off proponent	Trade-off compromises that involve acceptance of adverse effects in sustainability-related areas are undesirable unless proven (or reasonably established) otherwise; the burden of justification falls on the proponent of the trade-off.
Avoidance of significant adverse effects	No trade-off that involves a significant adverse effect on any sustainability requirement area (for example, any effect that might undermine the integrity of a viable socio-ecological system) can be justified unless the alternative is acceptance of an even more significant adverse effect. • Generally, then, no compromise or trade-off is acceptable if it entails further decline or risk of decline in a major area of existing concern (for example, as set out in official international, national or other sustainability strategies or accords, or if it endangers prospects for resolving problems. • Similarly, no trade-off is acceptable if it deepens problems in any requirement area (integrity, equity, and so on) where further decline in the existing situation may imperil the long-term viability of the whole, even if compensations of other kinds, or in other places are offered (for example, if inequities are deep, there may be no ecological rehabilitation or efficiency compensation for introduction of significantly greater inequities). • No enhancement can be permitted as an acceptable trade-off against incomplete mitigation of significant adverse effects if stronger mitigation effects are feasible.
Protection of the future	No displacement of significant adverse effect from the present to the future can be justified unless the alternative is displacement of an even more significant negative effect from the present to the future.

Trade-off rules	Description
Explicit justification	All trade-offs must be accompanied by an explicit justification based on openly identified, context-specific priorities as well as the sustainability decision criteria and the general trade-off rules. • Justifications will be addicted by the presence of clarifying guides (sustainability policies, priority statements, plans based on analyses of existing stresses and desirable futures, guides to the evaluation of 'significance', and so on) that have been developed in processes as an open and participative as those expected for sustainability assessments.
Open process	Proposed compromises and trade-offs must be addressed and justified through processes that include open and effective involvement of all stakeholders. • Relevant stakeholders include those representing sustainability-relevant positions (for example, community elders speaking for future generations) as well as those directly affected. • While application of specialized expertise and technical tools can be very helpful, the decisions made are essentially and unavoidably value-laden and public role is crucial.

3.3.9 Multi-Criteria Analysis in sustainability assessments

The main objective for a Multi-Criteria Analysis (MCA) is to organize and summarize information in a way such that decision-makers feel comfortable when facing the final decision (Belton and Stewart, 2002). MCA is suitable for sustainability assessments due to its transparent structure which allows for managing considerations in a structured way and incorporates the different sets of values which come from the involved stakeholders. In an optimal MCA process all the alternatives should be equal in the way that none should be far worse than the others (Pope and Morrison-Saunders, 2013). It is stated by Jordanger et al. (2007) that one alternative should be "business as usual" because it represents the opportunity to reject the other alternatives.

There exist various MCA tools, which compensate for trade-offs in different ways (University of Amsterdam, 2006). In a fully compensatory method one criterion with weak performance can be fully compensated for by a positive result of another criterion. A partial compensatory method restrict the magnitude of compensation, while in a non-compensatory method compensation of trade-offs are not allowed (OECD, 2010). MCA has been criticized for being a method that is vulnerable for manipulation, because of its technocratic character that can give false accuracy. Proponents of MCA claim that the method results in a systematic and transparent process that secures objectivity in the decision-making (Janssen, 2001).

According to Pope and Morrison-Saunders (2013) the steps of an MCA process are as follows:

- Define the alternatives that are going to be compared.
- Define the sustainability criteria which form the basis of the decision (environmental, social and economic)
- Evaluate the alternatives against the criteria (also called scoring).
- Weight and prioritize the criteria.
- Rank the alternatives by combining their scores and weights.

3.3.10 Framing sustainability

According to Pope and Grace (2006) the opportunities to achieve optimal sustainable outcome can be constrained by a narrow frame of the sustainability assessment. Pope and Morrison-Saunders (2013) discusses this with an example concerning spatial planning and transport. If the SA is related to the main decision question: "What is the most sustainable (least unsustainable) route for the new road?", the assessment is already constrained to achieve a limited sustainable outcome. The sustainability assessment will then compare different route alternatives and the impacts of these will have a considerable amount of negative effects ("e.g. loss of biodiversity, noise impacts and air pollution"). Finding the "least worst" alternative of routes can cause conflicts and dissatisfaction regarding the fact that cars and ever expanding road network are not sustainable. These last considerations fall outside the scope of the assessment, and in this case the result will be that someone wins and others lose, or a mix of compromises and trade-offs.

Further Pope and Morrison-Saunders (2013) raises the reformulated question "What is the most sustainable way to ensure an accessible city?", which gives a different frame for the sustainability assessment. With this scope the sustainability assessment would consider improved public transport, bicycles and walking possibilities, together with new roads in a more high-density living area. This frame gives a greater possibility to achieve a sustainable outcome. There will be disagreements among the participants, and pluralism is still on the agenda, but the process has a greater chance of focusing on innovation and positive synergies rather than trade-offs between different "least worst" alternatives (Pope and Morrison-Saunders, 2013).

3.3.11 Weaknesses of sustainability assessment

Proponents of the *reflexive governance* mindsets like Voß et al. (2006) argues that ex ante predictions of socio-ecological transformation is not the solution for sustainable development, because the underlying values may change. The best solution for a problem must be seen as a hypothesis which will be probed in practical interaction with the world.

The meaning of sustainable development as described in chapter 3.1 is a disputed topic, and to achieve sustainable development it is important that all stakeholders participating in a sustainability assessment share the meaning of sustainability. The concept of sustainability is therefore an essential foundation for any sustainability assessment (Bond and Morrison-

Saunders, 2013). A critical part of sustainability assessments is the selection of indicators suitable to the objectives of the assessments. As stated by Bond and Morrison-Saunders (2009): "there is a concern that sustainability assessments has within it so much flexibility, covering an area which is so complex, that the results produced could be argued to be meaningless by those not sharing the same discourse".

Another example of the problem with differing perceptions is the weak and strong sustainability views, which differs in how the underlying values of natural and human-made capital are considered (Bond and Morrison-Saunders, 2013). This can be explained with the proposed project to build 75 windmills along the coast of Slenset in the county Nordland in Norway (Nord-Norsk Vindkraft, 2007). Eagle owls live in this area, and they are an endangered species in Norway. Windmills can threaten the already endangered species. The windmill park will generate income for the municipalities in the area, and create some jobs. From a weak sustainability perspective this proposal can be sustainable, because economic and social impacts are in favor of environmental impacts. From a strong sustainability perspective this is unsustainable. If this windmill park was proposed to be built further north where the indigenous Sami people live, the context of the sustainability assessments would be different, and their preferences should be considered. This is an example of why the meaning of sustainability must be context-specific in a sustainability assessment process (Bond and Morrison-Saunders, 2013). According to Bina (2008) there are four different dimensions of context: values, political, social and cultural.

The timescales used in sustainability assessments seldom exceed 10 to 20 years in practice (Bond et al., 2012). Difficulties predicting impacts over longer timescales may be the reason behind this (Bond and Morrison-Saunders, 2013). It is essential that the timescales used to assess impacts for major public projects is as realistic as possible (Lædre et al., 2012).

According to OECD (2010) sustainability assessments can be used in an incorrect manner as an ex post justification of decisions. Another and more global problem for sustainability assessments is economic recession, which may lead to undermining social and environmental objectives (Bond et al., 2012).

3.3.12 The use of indicators in sustainability assessments

According to Gallopín (1996) the main functions of sustainability indicators are:

- To assess conditions and trends.
- To compare across places and situations.
- To assess conditions and trends in relation to goals and targets.
- To provide early warning information.
- To anticipate future conditions and trends.

There exits two distinctive approaches for developing a framework with appropriate sustainable development indicators (SDIs) (Lundin, 2003, Singh et al., 2009):

- The “top-down” approach, which means that experts and researchers define the framework and the set of the SDIs.
- The “bottom-up” approach that features participation of different stakeholders in the design of the framework and the SDI selection process.

The weakness of “ top-down” approaches is the risk of developing indicators that are scientifically well founded, but are not relevant for the decision-makers or the stakeholders (Rosenström and Kyllönen, 2007). It is also a risk that policy-makers can use sustainable development indicators to promote their own opinions, as a form of legitimation of their views (Rosenström, 2009).

The presentation is as important as the selection of suitable sustainability indicators, and information should be meaningful to the particular target group (Lundin, 2003). This is why scientists prefer raw data which can be analyzed statistically; policy-makers want information that is linked to policy objectives and reference values, while the general public is most interested in simple index of information as shown in figure 9 (Braat, 1991).

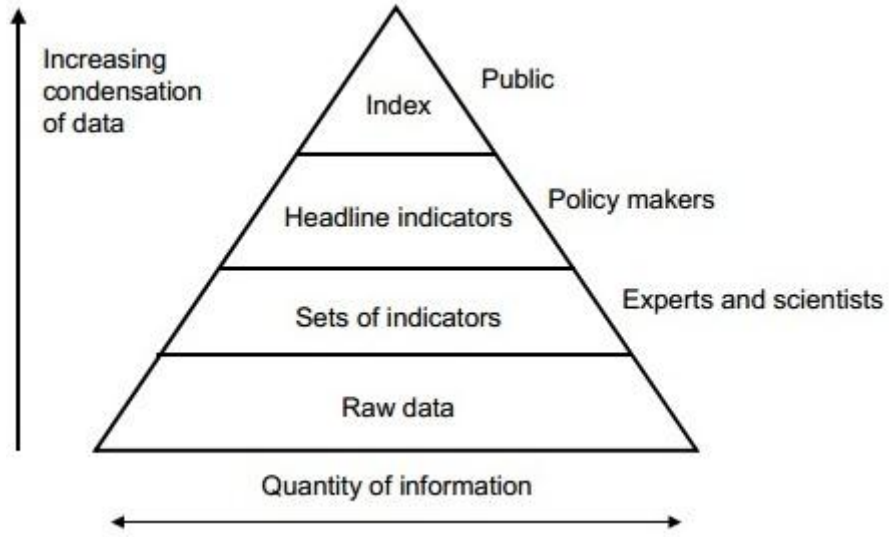

Figure 9. The information pyramid (Braat, 1991).

Which indicators and how many indicators should a sustainability assessment have? Bell and Morse (2008) differentiates between reductionism and holism regarding sustainability indicators. In its simplest form reductionism can be described as taking a complex process and breaking it down to a simpler and more tangible part. A reductionist approach to a sustainability assessment consists of few indicators to predict the sustainability of a complex system. In a holistic approach to sustainability assessment the analysis consists of a greater amount of indicators to get a broader understanding of the sustainability of a complex system (Bond and Morrison-Saunders, 2013).

There are some important aspects which must be considered when choosing indicators. The indicators should be (Wiek and Binder, 2005):

- Based on the specific system that is supposed to be analyzed, like geographic, biophysical and socioeconomic characteristics (Musters et al., 1998).
- Related to the specific problems regarding sustainable development issues (Malkina-Pykh, 2000).
- Measurable and comprehensible (Linser, 2002).

Wiek and Binder (2005) advocates the use of minimum and maximum threshold values for the indicators. The reason for this is to enhance flexibility in the decision-making by limiting the range within what is reasonable for achieving sustainability. Therefore by defining ranges for the indicators, supposed to one specific threshold, one can cope with scientific uncertainties, imponderable socioeconomic issues and political constrains.

3.3.13 Objectives and perspective

"Managing the future is a 'wicked' problem, meaning that it has no definitive formulation and no conclusively 'best' solutions and, furthermore, that the problem is constantly shifting. Obviously, however, one cannot even begin to purposefully shape the future without social goals" (Hjorth and Bagheri, 2006).

The United Nations (UN), the Organization for Economic Co-operation and Development (OECD) and the European Commission the following success factors to assess projects in broader perspective (Samset, 2010): efficiency, effectiveness, relevance, impact and sustainability.

According to Haavaldsen et al. (2013) it is essential to assess sustainability in all perspective levels for investment projects. What is sustainable in one perspective is not necessarily sustainable in another perspective. These perspectives are (Samset, 2010) (Haavaldsen et al., 2013):

- Operational level: Project outputs (e.g. quality according to time and cost)
- Tactical level: Project goal, first order effects (e.g. benefits and impacts for the users).
- Strategic level: Project purpose, the long-term contribution to society, second order effects.

This characterization, with effects on all levels, addresses the fuzziness concerning different objectives for different stakeholders. These levels correlate to different stakeholders that might have conflicting interests. In an infrastructure project consultants (operational level) might not share the view of the local government politicians and the local stakeholders (tactical level), or the decision-makers and financing government view (strategic level). Good cooperation will secure that stakeholders on one level can contribute with input leading to a more sustainable project on other levels, which may lead to a generally more sustainable project on all perspective levels (Haavaldsen et al., 2013).

As stated by Klakegg (2010) the project goals have to be in accordance with stakeholders priorities. If there are any severe discrepancies between these two the outcome of a project is unlikely to be sustainable.

Decision levels from the Total Quality Management (TQM) methodology is another approach that deals with different objectives from differing perspectives. According to Macario (2000), in an article regarding planning and control of urban mobility systems, it is important for the organizations overall performance to address the decision-making process at strategic, tactical and operational level consistently. In practice this is seldom the case, because of the fuzzy boundaries between the levels, and that the strategic and tactical level often overlaps. This may be a hinder for the successfulness of the project, caused "by the lack of a clear and well-structured regulatory and organizational framework" (Macario, 2000). In this setting the different levels are defined as follows (ISOTOPE, 1997):

- Strategic level: strategic management is involved in the formulation of general aims and in the determination in broad terms of the means that can be used to attain these.
  In short: what do we want to achieve?
- Tactical level: makes decisions on acquiring means that can help reaching the aims, and on how to use these means most efficiently.
  In short: what product can help achieving the aims?
- Operational level: makes sure the orders are carried out, and that this happens in an efficient way.
  In short: how do we produce that product?

3.4 Policy assessments in general

"The more accepted the concept of sustainability becomes, the more obvious are the shortcomings of current forms of policy making and knowledge production" (Whitelegg, 2006)

The concept of the word "policy" implies a change in: situations, systems, practice and behavior. That is why this concept only will be meaningful to society, a group or an organization if all the people involved believe that an action can affect some kind of change (Titmuss, 1974).

3.4.1 The concept of policy assessment

Policy assessment as concept is based on the principle that the use of analytical tools will cause more "rational" policy-making. The main ideas are to give scientific predictions to decision-makers, support a pluralistic policy-making process, integrate cross-cutting issues, and to support cooperation between different departments which are involved (Adelle and Weiland, 2012).

In the early development of policy assessment, which originated in the USA, the reduction of regulatory costs was the main driving force (Renda, 2006, Adelle and Weiland, 2012). Policy assessment or policy appraisal (term used in England by Thérivel (2013)) arose from different political motives. Some of them are listed below:

- The intellectual and political difficulties that occurred when assessing projects and programs of projects (Boothroyd, 1995).
- The need for "better regulation" got political focus (Wiener, 2006, Baldwin, 2005).
- Environmental protection (Hertin et al., 2008).
- Promoting a neo-liberal economic agenda (Adelle and Weiland, 2012).

"Sustainability assessment is one approach that can be used for improved environmental governance" (Craig and Jeffery, 2013). According to Bond et al. (2012) international practice of sustainability assessments differ greatly and it depends on which legal and governance structure is practiced and what form of decision-making is used, as well as the actual perception of sustainability varies.

3.4.2 Improvement of the link between policy assessment and decision-making

Adelle and Weiland (2012) mentions some weaknesses which must be tuned such that policy assessment is more embedded in the decision-making process:

- Countries and unions where policy assessments are well institutionalized tend to struggle to follow up in the last part of the decision-making process, which involves politicians, because policy assessments usually are used in the formulation phases by bureaucrats (European Court of Auditors, 2010).
- Improvement of the link between ex ante policy assessments and ex post policy evaluation (Jacob et al., 2008, HM Government, 2011).
- More involvement from stakeholders.
- "Within the EU there is a need to vertically link assessment systems between different levels of governance".
- Improvement of the link between research for policy-making concerning the methods and tools and research on policy-making concerning the learning and the politics, which could be mutually beneficial.

Better integration in policy assessment is one way to adress some of these problems. Turnpenny et al. (2008) proposed a list of the key dimensions of integration in policy assessment systems:

1. Paradigm: Which paradigms and policy objectives restricts the policy assessment? A policy assessment with high level of integration would include co-operation between several government sectors.
2. Scope: Which impacts are assessed in a policy assessment? To achieve high levels of integration in the scoping part means that a wide set of impacts are assessed.
3. Goals: How is policy objectives described in the first part of the policy assessment? To have clear objectives in the start of the decision making process is considered as adequate integration of this dimension.
4. Process: Which processes are included in the policy assessment? A high level of integration implies that many assessment methods are included.
5. Stakeholders: How, when and what stakeholders are included in the policy assessment? To achieve a high level of integration in this dimension multiple stakeholders with a broad set of perspectives should be involved such that as many as possible conflicts and inconsistencies are debated.
6. Trade-offs: How is trade-offs dealt with? To have a systematic approach when identifying trade-offs between the three dimensions of sustainability leads to a high level of integration.
7. Learning: Is learning a part of the policy assessment (what sort of learning, who learns and what is learned?). Short and long-term learning indicates a high level of integration.

8. Evidence: How, why and what kind of evidence is utilized? High level of integration is the utilization of a broad range of tools, from simple reasoning to scenario analysis, in the very same policy assessment.

3.4.3 Policy-making as a learning process

Regarding policy-making there are three main types of knowledge use (Hertin et al., 2009, Romsdahl, 2005, Weiss, 1999):

- Conceptual learning: when policy makers get new information, ideas and perspectives due to gradually increasing knowledge on the particular topic, which challenge their initial beliefs that will lead to new opportunities for policy change.
- Instrumental learning: when the use of knowledge leads directly to decisions because knowledge gives specific directions on the design of policies.
- Political use: when knowledge is used to achieve political objectives.

Some studies show that the use of knowledge is more complex, due to the fact that different stakeholders have different objectives in the policy-making process (Owens et al., 2004, Hertin et al., 2009). Adelle et al. (2012) claims that from a postpositivist worldview "it is unrealistic to assume that decision-making is rational and to assume that knowledge will necessarily transfer in a linear way directly and smoothly into policy-making. The role of policy assessment, therefore, is not to identify the overall 'best' policy option, but to inform debate and critical reflection in the messy reality of policy-making".

A government participant in an Australian sustainability assessment summarized the learning process in the SA like this:

"This process has started me thinking more deeply about some of those bigger issues… it's just made me think differently about it and more deeply. If it can achieve that for me, just working on one little project in our little corner of the world, if we can encourage more of it on other big initiatives and strategic projects and get more and more people involved in looking at things that way, it's going to have an impact" (Pope, 2007).

3.4.4 Weaknesses of policy assessments and policy processes

The European Commission´s use of Integrated Impact Assessment (IIA) were analyzed by Lee and Kirkpatrick (2006a) and they concluded that the overall quality of the assessments were disappointing. These impact assessments where described as first generation extended impact assessments (ExIAs). Some of the weaknesses in the ExIA reports and the processes are listed below (Lee and Kirkpatrick, 2006b):

- “Problem identification: fundamental nature of the problem and its root causes are not satisfactorily identified”.
- “Difficulties observed in articulating high and low level objectives and achieving consistency between these”.
- “Unbalanced coverage of different types of impacts (economic, environmental and social; positive and negative; distributive effects, short and long-term effects)”.
- “Deficiencies in the clarity and objectivity of the presentation findings”.
- “Deficiencies in options analysis and justification of choice of the preferred option”.
- “Absence of non-technical summary for executive and none-specialist use”.
- “Lack of transparency in the process – including the timely availability of ExIA documentation for the external consultation process”.

Research from Sweden and the UK discovered that there are serious weaknesses within specific assessments in the conceptualization of what the main issues are. In Sweden policy assessments are done by committees that acquire instructions from the relevant ministry. The ministry’s agenda often constrains the assessments (Turnpenny et al., 2008).

How the government is divided in sectors and organized have influence for the policy-making. According to Bauler and Kegeleirs (2009) most modern states policy-making structures, at a federal level, are separated in policy domains and sectors that “function largely independent from each other”.

Some might disagree that the results from a policy assessment is used in an objectively manner by the decision-makers. The outcome from an analysis might be used in devious ways such that decision-makers can fulfill their interests (Scrase and Sheate, 2002) (Flyvbjerg, 1998). Another aspect is that scientific recommendations concerning the “best” alternative for a policy proposal can be disregarded by decision-makers. This is highlighted by Daw and Gray (2005) when they criticize the European Union’s Common Fisheries Policy, because scientific advices are poorly implemented into the policy. The Common Fisheries Policy ended up as a policy failure, caused by inadequate management of marine resources, and the impacts were that many of the fish species suffered with serious decline in numbers.

In the EU and UK policy officials reported that the amount of time deposited to analyze, reflect and to think strategically was not sufficient, because of the time pressure of handing over the policy proposals to the decision-makers (Turnpenny et al., 2008).

3.5 Policy assessments in different States

The following chapter describes how different States assess policies, plans and projects specifically towards sustainability.

In many countries the use of Regulatory Impact assessment is common. Countries like Poland, Australia and Korea use this system. Australia's RIA system has its focus towards effective and efficient regulation and it does not consider sustainability directly (OECD, 2012).

3.5.1 New practice in Ireland

A method called Sustainability Evaluation Metric for Policy Recommendation (SEMPRe) has been developed by researchers in collaboration with policy advisors from the Irish Environmental Protection Agency (EPA) and the Irish National Spatial Strategy (NSS). The target for the SEMPRe method was to predict and optimize policies to enhance sustainability in urban areas. 40 policies were analyzed in 18 urban areas. This method uses both Ecological footprint and 40 indicators for the sections: environment, quality of life, socio-economic and transport. The policies were chosen by these criteria: possible for repetitive evaluation, relevancy to urban sustainability, feasible to the data that was available and whether they were easy to understand and explain. (Fitzgerald et al., 2012). The SEMPRE method is shown in figure 10.

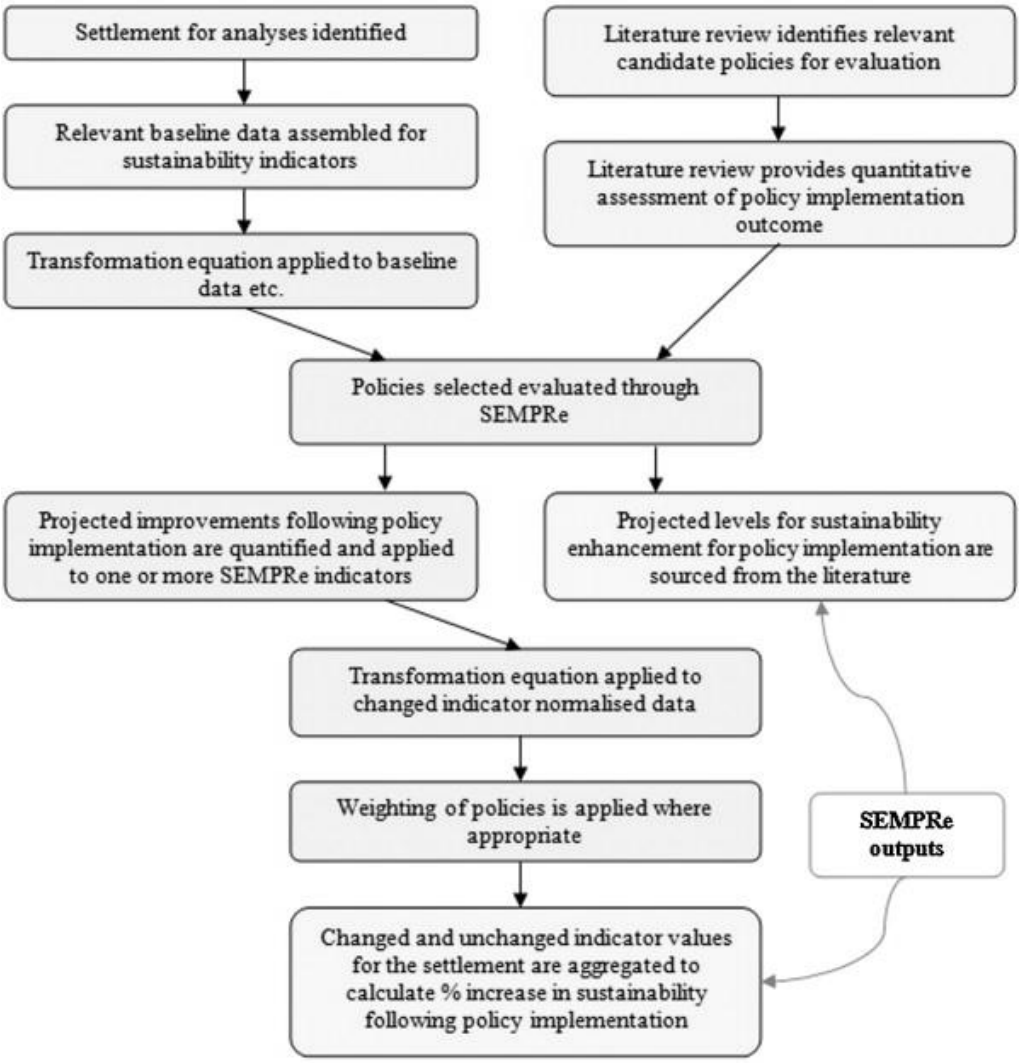

Figure 10. Steps in the SEMPRe method (Fitzgerald et al., 2012).

3.5.2 Sustainability assessments in Canada

In Canada the responsibility for issues concerning sustainability are divided into federal, provincial, territorial, Aboriginal and municipal authorities. Sustainability assessments do not have a solid entrenchment in the Canadian assessment law and practice, but some sustainability assessment have pushed the boundaries and been innovative to achieve better sustainability assessments. Environmental impact assessments are often used in Canada, and they use it on a strategic level and on a project level (Gibson 2013a).

3.5.2.1 Sustainability test by the Mackenzie Gas Project Joint review panel

The Mackenzie gas project is a proposed plan to build natural gas infrastructure in the Northwest Territories of Canada with project cost estimated to 16.2 billion Canadian Dollars. The proposed pipelines are supposed to be built alongside the Mackenzie River, and it crosses land which is inhabited by many Aboriginals. The ecological environment in the area is mostly unspoiled (Gibson, 2011). This sustainability test was on a strategic level (Gibson 2013a).

According to Gibson (2011) "the Mackenzie Panel's report represents the most detailed effort so far by an environmental assessment hearing body in Canada to adopt and apply a contribution to sustainability test". This sustainability assessment included 176 recommendations for the project that would offer positive overall contribution to sustainability. Environmental, social and economic impacts were assessed in this SA. The Panel's report was extensive and thoroughly conducted with public hearings held over 115 days in 26 communities. Following alternatives were analyzed (Mackenzie Gas Project Joint Review Panel, 2009):

- No project.
- The project as proposed.
- The project carried out according to the recommendations given by the panel.

An analytical framework was built around long term impacts, which included interactions between impacts and how trade-offs were addressed. The analyzed impacts were as follows (Mackenzie Gas Project Joint Review Panel, 2009):

- Cumulative impacts on the biophysical environment
- Cumulative impacts on the human environment
- Equity impacts (fair distribution of benefits and risks)
- Legacy and bridging impacts
- Cumulative impacts management and preparedness (capacities for managing the risks and opportunities).

By the time the Panel had finished their report "controversial but effective new technology for exploiting shale gas deposits much closer to main North American markets had led to sharply reduced natural gas prices, making the Mackenzie project economically unfeasible for the foreseeable future" (Gibson 2013a).

3.5.3 Sustainability assessments in England

Sustainability assessments of local land use plans have been carried out in England since 1991, but it is not clear how these contribute to sustainability in plan-making. Most of the sustainability assessments conducted In England follow a method derived from *Practical Guide to the SEA Directive,* which is summarized in table 7 (Thérivel, 2013) (ODPM, 2005).

Table 7. Incorporating sustainability appraisal within the plan-making process (ODPM, 2005) (Thérivel, 2013).

Plan-making stage	Sustainability appraisal stage and task	Resulting reports
Pre-production -Evidence gathering	**Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope** A1. Identifying other relevant policies, plans and programs, and the sustainability objectives A2. Collecting the baseline information A3. Identifying sustainability issues and problems A4. Developing the sustainability appraisal framework A5. Consulting on the scope of the appraisal	Scoping report – sent to statutory consultees for comments, and typically made available on the planning authority website
Production	**Stage B: Developing and refining options and assessing effects** This stage involves several rounds of appraisal of the emerging plan using the sustainability appraisal framework as an appraisal structure, and consideration of ways of mitigating adverse effects and maximizing beneficial effects. Typical appraisal stages are plan objectives, plan issues and options, the draft plan and the submission plan. **Stage C: Preparing the sustainability appraisal report** **Stage D: Consulting on the preferred plan option and sustainability appraisal report** D1. Public participation D2i. Appraising significant changes made to the plan in response to public participation	One or more appraisal reports, culminating in a formal sustainability appraisal report and non-technical summary which are made available for consultation to the statutory consultees and the public.
Examination	D2ii. Appraising significant changes resulting from representations	Possibly additional appraisal report(s)

Adaptation and monitoring	D3. Making decisions and providing information	"SEA statement"
	Stage E. Monitoring the significant effects of implementing the DPD	Monitoring reports
	E1. Finalizing aims and methods for monitoring	
	E2. Responding to adverse effects	

Fischer (2010) analyzed 117 Strategic Environmental Assessment (SEA) reports, and according to his work, the main shortcomings with the use of Strategic Environmental Assessment in England are as follows:

- Ineffective tiering: What is the interface between other assessments?
- Insufficient consideration of options: is the process leading to reasonable options and how is sustainability issues considered?
- Insufficient evaluation of impacts: Unsatisfying identification and evaluation of the magnitude and extent, probability, duration, frequency, and reversibility of positive and negative impacts, secondary, cumulative and synergies.
- Insufficient consideration of substantive aspects: Risk for human health.
- Unclear impact of public participation and the SEA on plan making: unsatisfying changes were made after public participation.
- Insufficient explanation of uncertainties.
- Insufficient consideration given to monitoring.

3.5.4 Policy assessments in Austria

Austria has implemented the EU SEA Directive, but they have no framework for SEA legislation. The requirement for carrying out SEA is integrated in sectorial areas, like transport and water (OECD, 2013). Some main points in the criticism on Austria's use of SEA has been (Konrad and Alge, 2007):

- SEA is implemented to late in the decision-making process
- Lack of influence from the public and environmental authorities
- Wide gap between SEA process and the actual decision.

Federal ministries are obliged to assess potential economic impacts of new legislations and regulations. Broader Regulatory Impact Assessments (RIAs) are supposed to include financial, economic, environmental and consumer protection related impacts, but this is seldom the case. There is no mechanism embedded in this system to include all aspects of sustainability beyond the economic part (OECD, 2013).

3.5.5 Sustainability assessments in Switzerland

According to the Swiss Federal Council (2012) sustainable development is rooted in the Federal Constitution as guidelines which all federal government sectorial policies must follow. These guidelines are as follows:

1. Taking responsibility for the future.
2. Balanced consideration of the three target dimensions of sustainable development.
3. Incorporating sustainable development into all areas of policy.
4. Improving coherence and coordination between policy areas.
5. Forging sustainable development partnerships.

"Sustainability assessment must be conducted in particular in the case of new and important projects of a legislative, planning/conceptual or building nature" (Swiss Federal Council, 2008). The procedures in the Swiss sustainability assessment system is described in table 8.

Table 8. The steps and sub-steps in the Swiss SA methodology (Federal Office for Spatial Development, 2008)

A - Preliminary work	**A1 Describe initiative**	• Describe the initiative • Describe goals and planned action • Describe anticipated implementation/execution
	A2 Conduct relevance analysis	• Conduct initial assessment of potential impacts (relevance analysis) using both Federal Council criteria and additional criteria
	A3 Determine study design	• Define the purpose and positioning of the assessment • Determine the methodological design • Determine the organizational design/ clarify procedural issues
B - impact analysis	**B1 Explain impact model**	• Explain the different impacts and their target groups (output-outcome-impact, primary and secondary impacts) • Refine the criteria system, determine criteria indicators
	B2 Determine impacts	• Estimate or calculate impacts
	B3Overall impact summary	• Aggregate findings into key statements about impacts • Show the impacts in chart form

C - Conclusions	**C1 Identify optimization potential**	• Address the need to make improvements to the initiative • Determine subsequent sustainability assessments for implementation projects
	C2 Identify need for further work	• Identify the need for more in-depth studies (loop back to A3 if needed)
	C3 Address implementation issues	• Document findings • Communicate/publish findings • Initiate optimization measures

To evaluate the necessity of a sustainability assessment for policies or other major public initiatives a relevance analysis is needed. In this analysis 15 pre-established criteria and eight additional criteria are used as further explained in figure 11 and table 9 respectively.

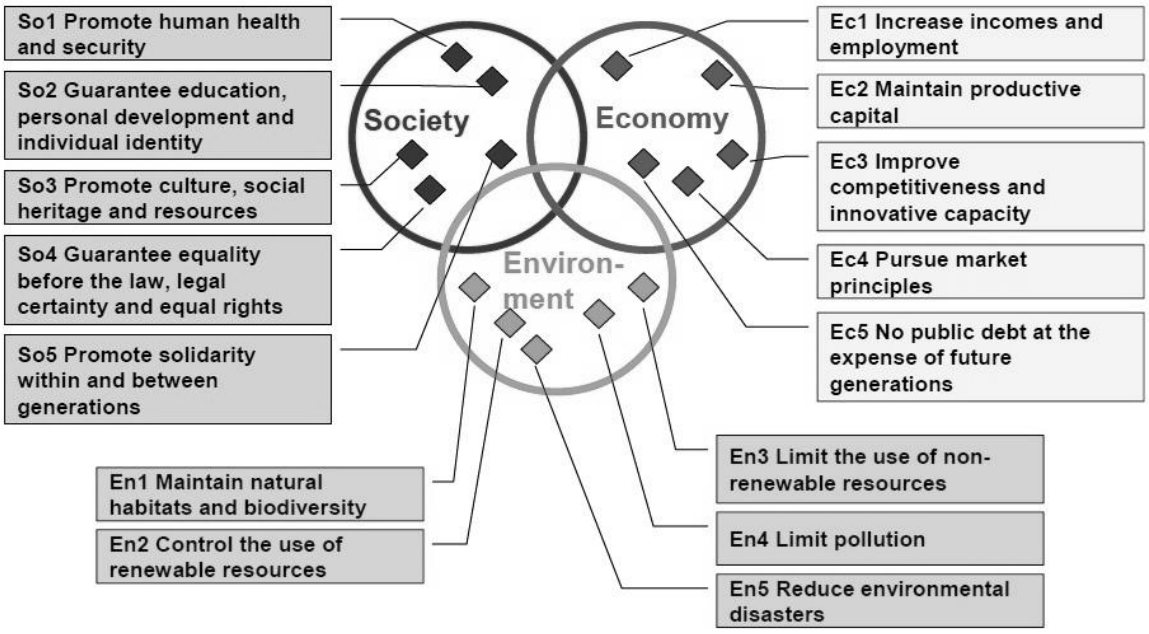

Figure 11. Federal Council criteria (Federal Office for Spatial Development, 2008).

A few practical examples where this methodology is used is found on the Swizz government official web page (ARE, 2014).

Table 9. The eight additional criteria in the Swiss relevance analysis(Federal Office for Spatial Development, 2008).

1 Problem status	Will the initiative further exacerbate an already critical situation?
2 Trend	Will the initiative further strengthen an existing negative trend?
3 Irreversibility	Will the initiative result in negative impacts that are difficult or even impossible to reverse?
4 Burden on future generations	Will the negative impacts be felt only at a later point in time? Will this place a particular heavy burden on future generations?
5 Risks/uncertainties	Is the initiative associated with major risks (very high potential damage/loss, even if the probability is low) and major uncertainties (insufficient knowledge of the dangers linked to impacts, or about future trends)?
6 Minimum requirements	Does the initiative result in a violation of minimum social, economic or environmental standards (e.g. thresholds and limits)?
7 Spatial impact perimeter	Will the negative impacts be felt across a wide area (spatial parameter)?
8 Conflicts of interest	Do conflicts of interest exist between the various dimensions of sustainability, and with regard to the primary objectives of the initiative?

3.5.6 Sustainability assessments of infrastructure projects in The Netherlands

The Ministry of Infrastructure and the Environment in the Netherlands, has developed a quality assurance program called Multi-year Plan for Infrastructure, Spatial Planning and Transport (MIRT). All new project proposals by this ministry must meet the requirements of the MIRT framework in order to get funding. The main idea is to achieve a faster and better decision-making process (I & M).

The basis for this framework is involvement of stakeholders, as co-initiators, such they can contribute and supplement in the problem identification and solution development. One of the major benefits with the MIRT process is that different stakeholders are involved in all the dimensions of sustainability (in this case ecological, economic and socio-culture) and the decision-making. Requirements in the MIRT are set to ensure the integration between the different levels of state vertically (national government, provinces and municipalities) and between the different sectors horizontally (Shiferaw, 2013).

3.5.7 Sustainability assessments in Belgium

Belgium implemented Sustainability Impact Assessment of all major policy decisions in 2007. Each Minister's administration is responsible for the application of SIA. They distinguish between the following three forms (Bauler and Kegeleirs, 2009):

- Exemption form: for policy proposals that have been excluded from the system.
- Quick scan form: for policy proposals that have been through a screening and the results from this is not sufficient enough evidence for potential adverse impacts.
- Synthesis form: for policies that have been through a complete Sustainability Impact Assessment process and the results are presented in a report.

Numerous problems occurred during implementation of this system. No data is available for the public, but in 2008 the agency which is responsible for sustainable development estimated that 70 % of the policy proposals were excluded from the new system. The rest of the policy proposals were submitted to the screening process. In 2009 not a single fully fledged Sustainability Impact Assessment had yet been conducted. There were three reasons behind these problems (Bauler and Kegeleirs, 2009):

1. The new system was implemented in the start of the financial crisis in 2007.
2. Three fully fledged prototype Sustainability Impact Assessment reports, that were supposed to be showcases for the practitioners, were never conducted due to timing and organization amongst other reasons.
3. None of the federal administrations had included the implementation cost in their budgets.

3.5.8 Quality assurance of large public sector projects in Norway

The Ministry of Finance has the main responsibility for sustainable development (Regjeringen, 2014). Norway has a quality assurance (QA) system for public sector projects that have a total budget over 750 million NOK. This quality assurance system is divided into two stages. QA1 is presented in figure 12 and covers the society objectives of the project, relevancy, cost-benefit analyses, uncertainty analyses, recommendations and guidelines for the engineering phase (DNV, 2007). QA2 has it main focus on raising the quality of cost estimation and uncertainties of the project alternatives before the Parliament makes the final decision (Concept). QA1 should include a "business as usual" alternative which includes costs of maintenance and upgrading so that this alternative is reliable (Finansdepartementet, 2010).

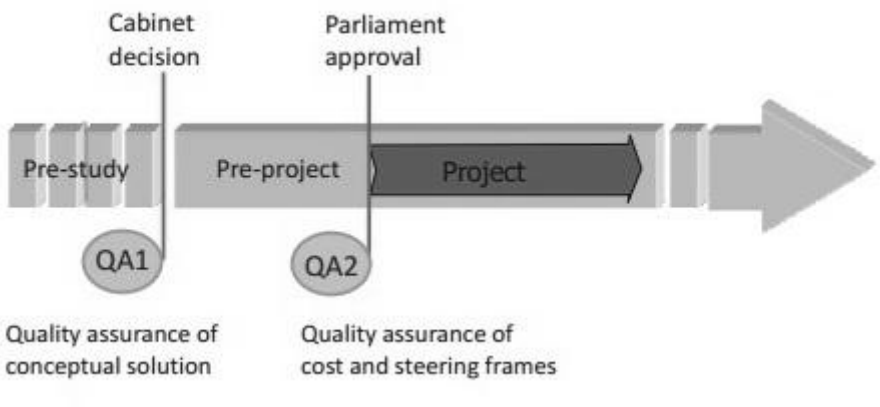

Figure 12. The Norwegian QA system (Samset and Volden, 2013).

According to Shiferaw (2013) the Norwegian QA system does not assess sustainability specifically. This QA system lacks specific requirements concerning environmental and social issues. The co-operation between different governance levels concerning policies and the ministries different strategies are not included in this QA system. The involvement of stakeholders is not a requirement, but the practice indicates that stakeholders are involved in the project study phase (Shiferaw, 2013).

4 Results

"Negative results are just what I want. They're just as valuable to me as positive results. I can never find the thing that does the job until I find the ones that don't" (Thomas Alva Edison).

The results consist of analysis of sustainability assessments done by researchers. Firstly the operational, tactical and strategic perspectives of the objectives had to be determined for each case study. The case studies have been analyzed with regard to which perspectives were included by the selected indicators. Generally the selected sustainability assessments follow a three dimensional approach to sustainability. There are some exceptions, however, due to challenges in finding relevant sustainability assessments to analyze.

4.1 Assessing regional sustainability in south west Victoria, Australia.

In south west Victoria researchers made a tool for regional decision-makers such that progress towards regional sustainability could be made (Richards et al., 2007, Graymore et al., 2009). Agriculture is the most important sector for this region which explains why the majority of the selected indicators are associated to land quality (Wallis et al., 2011).The assumed perspectives for this assessment are as follows:

- *Strategic perspective*: Overall gain in regional sustainability.
- *Tactical perspective*: To improve living conditions (e.g. lower unemployment, healthcare, lower crime rate etc.)
- *Operational perspective*: Implement a policy assessment for ex ante and ex post evaluation according to the cost, quality and timeframe set by the regional department and decision-makers.

Table 10. Indicators used in a SA for the south west region of Victoria in Australia (Wallis et al., 2011).

Indicators	Measuring unit	Perspective
Economic		
Employment diversity	-	Tactical
Unemployment rate	-	Tactical
Weekly income	-	Tactical
Social		
Age structure diversity	-	Tactical
Students completing year 12	-	Tactical
Population growth rate	-	Tactical
Environment		
Risk of dry land salinity	-	Strategic
Remnant vegetation	-	Strategic
Dry land pasture	-	Strategic
Susceptibility to wind erosion	-	Strategic
Susceptibility to water erosion	-	Strategic
Soil structure decline	-	Strategic
Pine plantations	-	Strategic

4.2 Sustainability impact assessment of land use policy in Indonesia

Yogyakarta in Indonesia has a high population growth which leads to rapid conversion of paddy fields and forests into urban areas. The alternatives for policy implementation were: protection of forest land (S1), conservation of paddy fields (also called rice fields according to Barnes (1990)) (S2) and a "business as usual" scenario (BAU) (König et al., 2010). The assumed perspectives for this assessment are as follows:

- *Strategic perspective*: Protecting forest lands ecosystem to reduce risk of landslide and maintaining regional food security by conserving paddy fields.
- *Tactical perspective*: Promote new and existing employment opportunities and achieve better living conditions.
- *Operational perspective*: Implementing the protecting system to the agreed upon cost and timeframe.

Table 11. Land use functions indicators for the sustainability impact assessment i Yogyakarta (König et al., 2010).

Indicators	Measuring unit	Perspective
Economic		
Land area used by built-up areas	GDP output/region	Tactical/Strategic
Land use for crop- and economic production	km^2/region	Strategic
Road density	km length/region	Tactical/Strategic
Social		
Regional employment rate	%	Tactical
Life expectancy	Age	Tactical
Food availability	kg per capita/year	Strategic
Environmental		
Water availability	m^3	Tactical/Strategic
Natural land under protection	Area size/region	Tactical/Strategic
clean water	m^3	Tactical

4.3 Sustainability impact assessment of agricultural policies in China

The Taihu Basin is a water reservoir, which crosses three provinces, and has a great value for the agricultural production and economy in China. Agricultural production in the region contributes to water pollution in Taihu Lake (Guo, 2007) (Qin et al., 2007). The different policy scenarios assessed were: (1) Improve information and education in agriculture, specifically concerning fertilizing. (2) The use of economic instruments (fertilizer subsidies to farmers). (3) A combination of (1) and (2). (4) Conversion of arable fields to riparian buffer zones which can reduce leaching of nitrogen and phosphor. These scenarios were used to assess possible impacts on different farm types of different sizes (Reidsma et al., 2012). The assumed perspectives for this assessment are as follows:

- *Strategic perspective*: Reduce pollution, while maintaining economic growth in the Taihu Basin.
- *Tactical perspective*: Secure employment in the agricultural sector and to improve quality of life.
- *Operational perspective*: Implementing the policy proposal and plan related to cost, timeframe and quality.

Table 12. Indicators used in an integrated sustainability assessment of agricultural land use policies in Taihu Basin, China (Reidsma et al., 2012).

Indicators	Measuring unit	Perspective
Economic		
Crop income	kg/year	Strategic/Tactical
Net income	yuan/year	Strategic/Tactical
Input cost	yuan/year	Operational/Strategic
Social		
Labor use efficiency	yuan/day	Tactical/Strategic
Biocide index (human health)	-	Tactical
Rice production	kg/year	Tactical/Strategic
Environmental		
Fertilizer K/N ratio	kg K/kg N	Strategic/Tactical
Nitrogen input	kg N/hectare/year	Strategic/Tactical
Phosphorus input	kg P/hectare/year	Strategic/Tactical
Nitrogen leaching	kg N/hectare/year	Strategic/Tactical
Phosphorus run off	kg P/hectare/year	Strategic/Tactical

4.4 Sustainability assessment of a regional light railway in Belgium

This SA uses four categories to assess the sustainability impacts of a light rail transit network in the region of Klein Brabant in the central Flemish Rhombus. This area in Flanders is a highly populated having stakeholders with conflicting objectives. In this SA the stakeholders were involved in a participatory multi-actor multi-criterion analysis (MAMCA) to assess the impacts of different alternatives for the placement of the light rail transit network (Vermote et al., 2013). The assumed perspectives for this assessment are as follows:

- *Strategic perspective*: To reduce pollution and minimize accidents concerning travelling in the region.
- *Tactical perspective*: To minimize travel time and promote train as a better and more efficient alternative then using a car.
- *Operational perspective*: Build the light train transit network according to time, cost and quality frames.

Table 13. Indicators used to assess impacts of a light rail transit network in a region in Belgium (Vermote et al., 2013).

Indicators	Measuring unit	Perspective
Land-use integration		
Integrative land-use development	km² compact urban development	Operational
Available user amenities	% activities per distance/time, No. of seating and shelter	Tactical
Current/future connections	% dwellers in proximity to station	Tactical/Strategic
Multimodal public transport nodes	No. of multimodal stations	Tactical/Strategic
Park and ride parking	No. of parking spaces	Tactical/Strategic
Proximity to arterial roads	No. of km to arterial road	Tactical/Strategic
Economic		
Transit in-vehicle time	No. of minutes	Tactical/Strategic
Proximity to urban area	No. of potential travelers in vicinity/ km²	Tactical/Strategic
Rail network trailing	No. of Euro/km	Operational
Social		
Accident numbers	No. of fatal and injury accidents	Strategic/Tactical
Environmental		
Pollutant gas and noise emissions	NO_x, CO, PM_{10}, $PM_{2,5}$, SO_2; >55dB(A)	Strategic/Tactical
Barrier effects	No. of km segregated land	Operational
Construction related greenhouse gas emissions	No. of CO_2 equivalent	Operational/Strategic

4.5 Sustainability impact assessment of energy production in Finland

The objective of this SA was to predict which impacts affects changes in fuel consumption patterns in North Karelia, Finland. Fossil and woody biomass-based energy production chains have been analyzed with the three pillar approach to sustainability. 34 % of the total energy consumption in this region comes from woody biomass, which is a renewable resource. The consumption of woody biomass is expected to increase according to the Finnish government (Den Herder et al., 2012). The assumed perspectives for this assessment are as follows:

- *Strategic perspective*: Reduce oil consumption in the region by replacing oil with renewable resources.
- *Tactical perspective*: To maintain employment and the supply of energy in the region.
- *Operational perspective*: Implementing policies and plans according to time-, cost and quality frames (e.g. subsidies).

Table 14. Indicators in a sustainability impact assessment of energy production in Finland (den Herder et al., 2012).

Indicators	Measuring unit	Perspective
Economic		
Labor costs	Euro	Strategic/Tactical
Energy costs	Euro	Strategic/Tactical
Other productive costs (e.g. maintenance, administrative etc.)	Euro	Strategic/Tactical
Non-productive costs (e.g. taxes etc.)	Euro	Strategic/Tactical
Local Value Added	Euro	Strategic/Tactical
Social		
Employment	Person-years	Tactical
Environmental		
Greenhouse gas emissions from machinery	Kg of CO_2 equivalent	Strategic
Greenhouse gas emissions from fuel combustion	Kg of CO_2 equivalent	Strategic

4.6 Sustainability assessment of China's sloping land conversion programme

China has made a plan called sloping land conversion programme (SLCP) to prevent soil erosion and reduce poverty. The ex-ante impact assessment takes part in Guyan, a poor and rural region of China. This region is threatened by soil erosion and land degradation caused by droughts, fragile soil and rising consumption of natural resources by a rapidly increasing population. The plan is to convert areas with steep slopes, previously used as cropland, into forestland. This was a joint consideration of two sustainability assessments. The FoPIA (see chapter 3.3.6) was the preferred approach to assess the SLCP impacts at a regional level and to propose the best alternative for forest management. Trade-offs between the three dimensions of sustainability was also assessed. The time frame was set to the year 2020 (König et al., 2012). The assumed perspectives for the first assessment considering the SLCP program are as follows:

- *Strategic perspective*: Reduce poverty and soil erosion.
- *Tactical perspective*: Increase the employment in the converting areas.
- *Operational perspective*: Convert the exposed land areas according to quality, time and cost using sustainable solutions.

Table 15. Indicators used in a sustainability assessment considering land use change in China (König et al., 2012).

Indicators	Measuring unit	Perspective
Economic		
Economic income from land	yield	Tactical
Build-up area	m^3	Operational
Road density and quality	network size and status	Operational/Tactical/Strategic
Social		
Regional employment	%	Tactical/Strategic
Net income per household	RMB (Chinese currency)	Tactical
Regional food availability	kg/capita	Tactical/Strategic
Environmental		
Soil health/quality	Status	Operational/Strategic
Habitat and biodiversity	Status	Strategic
Vegetation cover	Status	Strategic

The second impact assessment was to find the best alternative for forest management in the area. The assumed perspectives for this assessment are:

- *Strategic perspective*: To achieve more sustainability for the forest sector and reduce poverty.
- *Tactical perspective*: To increase employment and quality of life.
- *Operational perspective*: Implement the new forest management policy according to time, quality and cost.

Table 16. Indicators used in a sustainability assessment considering forest management in China (König et al., 2012).

Indicators	Measuring unit	Perspective
Economic		
Income from wood harvest	RMB	Tactical/Strategic
Income from fruit yields	RMB	Tactical/Strategic
Income from forest industry and services	RMB	Tactical/Strategic
Social		
Sectorial employment	%	Tactical
Clean air	Status	Tactical
Right to access and utilize forest		Tactical
Environmental		
Soil health/quality	Status	Operational/Tactical/Strategic
Habitat and biodiversity	Status	Strategic
Water availability	m^3	Tactical/Strategic

4.7 Summary of the results

In table 17 the number of indicators on each perspective level is summarized. It is observed from the seven sustainability assessments that 12.5 % of the indicators assess sustainability from an operational perspective, and some of the cases did not include indicators on an operational perspective at all. Most of the indicators are applied on strategic and tactical level.

Table 17. The distribution of indicators on different perspectives.

Perspectives	**Total**
Operational	4
Tactical	17
Strategic	14
Tactical/Strategic	32
Operational/Tactical/Strategic	2
Operational/Strategic	3

5 Discussion

"[Doubt] is not a new idea; this is the idea of the age of reason. This is the philosophy that guided the men who made the democracy that we live under. The idea that no one really knew how to run a government led to the idea that we really should arrange a system by which new ideas could be developed, tried out, tossed out, more new ideas brought in: a trial and error system. This method was a result of the fact that science was already showing itself to be successful venture at the end of the 18th century. Even then it was clear to socially minded people that openness of the possibilities was an opportunity, and that doubt and discussion were essential to the progress into the unknown. If we want to solve a problem that we have never solved before, we must leave the door to the unknown ajar." (Feynman, 1988)

This chapter will focus on the aspects from the theory together with the discovered results. The purpose of this chapter is to discuss these aspects with considerations to the research questions.

5.1 The essential parts of an sustainability assessment

Sustainability assessment should be a foundation for decision-makers, which considers economic, social and environmental impacts concerning a policy proposal. Stakeholders, experts and decision-makers take part in a learning process that seeks to broaden their perception of sustainability through debate and critical thinking.

The large number of approaches and tools to measure sustainability makes it somewhat confusing to comprehend what they actually measure. Especially since there is no consensus to what sustainability assessment is and how it should be used, as stated by Bond et al. (2012). Ness et al. (2007) and Singh et al. (2009) put a big effort in untangling the mess surrounding sustainability assessments. Their systematic reviews of the different sustainability assessment methodologies are of great value to new researchers in the field. Sharing the same meaning of sustainability is essential for accepting or not accepting the outcome of a sustainability assessment. When the consensus is that sustainable development is a good thing, the answer lays in finding the most sustainable outcome for a proposed policy, plan, program or project. The integrated form of considering sustainability in environmental, social and economic dimensions is the most common approach (Bond and Morrison-Saunders, 2013), and it is also the preferred way to apprehend sustainability in this thesis.

The frameworks that have been highlighted in the theory chapter have different approaches to measure sustainability. The OECD framework can be seen as a general approach to sustainability assessments. The DPSIR and FoPIA frameworks are closely linked and can be used complementary to each other, as mentioned by Morris et al. (2011). These frameworks have been explained, with the purpose of showing the frameworks that are used in some of the sustainability assessments that have been analyzed in the results. Sustainability assessments are quite suitable for policies concerning land use change, because policies concerning land use change are likely to have great impacts for the people living there, the nature, companies

and workers in the area. The DPSIR and FoPIA frameworks have also been tested in many practical case studies, and the framework and indicators that are used are comprehensible.

While the DPSIR and FoPIA use the three pillar approach to sustainability, others like Gibson and Hassan (2005) argue for an abandonment of this approach, because it encourages trade-offs between economic and environmental pillars. While this is a fight the environmental pillar often loose, it is not likely that if we stop using the three pillar approach we will have less conflict in the sustainability assessment process. The three pillar method with indicators is a systematic and comprehensible way of carrying out sustainability assessments. Gibson and Hassan (2005) core generic criteria for sustainability assessments can act as supplementary guidelines for three pillar frameworks, because the generality of the core generic criteria and the fact that they include many important aspects of what a sustainability assessment should contain.

Dealing with trade-offs in sustainability assessments can be a difficult and conflicted procedure. The basic rules should be specified before the actual trade-off process starts. A preliminary assessment with ecological indicators, as presented by Stoeglehner and Narodoslawsky (2008) in the "indicator pyramid", is an efficient approach for the pre-assessment. By this procedure general indicators like ecological footprint may conclude that an alternative is not sustainable, and this alternative can be excluded at an early stage. The process of conducting a sustainability assessment is time and resource demanding, so every progress leading to more efficiency without compromising in a negative manner is highly welcomed.

The trade-off method visualized by the "egg of sustainability" has environmental dimension as a superior system, and it sets the rules for the two other dimensions (Stoeglehner and Neugebauer, 2013). This method is similar to the "indicator pyramid" in the way that they both represent clear sequences to avoid trade-offs. In some cases trade-offs are necessary to bring progress to the process, and to avoid standstill. In such a case the basic trade-off rules by Gibson and Hassan (2005) can be applied. The main points from these rules are the justification of all trade-offs, to reject trade-offs that have severe negative effects and to only accept trade-offs with feasible results that deliver positive net gain towards sustainability. These general rules should be used supplementary to the more context specific rules that should be formulated with the help of stakeholders in collaboration with experts on the specific fields.

It is not only trade-off rules that have to be context specific, because to reveal all impacts and use the best possible indicators the sustainability assessment itself have to be context specific from the very start (Bina, 2008) (Bond and Morrison-Saunders, 2013). To assess impacts one must consider context specific issues like: the social and cultural aspects for the stakeholders and for the area, what kind of political system the assessment takes part in, who has political influence amongst stakeholders and what kind of underlying values of sustainability does the stakeholders have? There are probably many more issues, but the point is that if these crucial

considerations are not discussed the sustainability assessment might get biased and loose its credibility.

Proponents of the reflexive governance movement, like Voß et al. (2006), claim that scientific analysis and policy approaches are so uncertain in the way they handle cause and effect, that they should not be implemented. The uncertainties in sustainability assessments are high, but one argument against the reflexive governance mindsets is as follows: if the assessment process manages to get decision-makers to consider as many pros and cons for a proposed policy, these issues are at least taken into account. Predicting the long-term effects include a high amount of uncertainty, that is why they seldom exceed 10-20 years in sustainability assessments (Bond and Morrison-Saunders, 2013), but they should be as realistic, relevant and be in accordance too the timespan of the proposed policy, plan, program or project as noted by Lædre et al. (2012) and Bond et al. (2012).

Multi-Criteria Analysis is an efficient tool for aiding decision-makers in a way that they feel more comfortable when taking the final decision, and due to its ability to weigh the different indicators against preferences of the stakeholders makes it a good tool for sustainability assessments (Pope and Morrison-Saunders, 2013) (Bell and Morse, 2008). It is essential to notice that the MCA is vulnerable for manipulation as Janssen (2001) emphasizes. Given that the professionals or the researchers that uses MCA are objective towards the main underlying problems that is considered in the sustainability assessment, it will most likely be a systematic and transparent process. The ones that carry out the MCA should also be objective towards the values of the stakeholders and the decision-makers. There are other tools that can be used in sustainability assessments, such as Computer General Equilibrium modeling but to go in detail of all the tools that could be used in sustainability assessments is outside the scope of this thesis.

Indicators are the backbone of an MCA. In some cases they try to measure the immeasurable. The complexity of finding relevant and specific indicators for a policy proposal can be difficult. Objectives of stakeholders and society must certainly be incorporated into what Musters et al. (1998) call socio-environmental system characterization. This characterization should serve as a basis for the discussion of the specific problems with the policy, specifically regarding sustainability issues (Malkina-Pykh, 2000). Linser (2002) point out that an indicator should be measurable and comprehensible. This is important because the output of sustainability assessments should give meaning to the particular target group (Lundin, 2003, Braat, 1991), and the most important target group is the policy makers and the decision-makers. The problem with indicators is to choose which and how many to use (Bell and Morse, 2008). To cope with the complexity concerning a policy proposal it is preferable to use a holistic approach. Wiek and Binder (2005) promotes to use minimum and maximum thresholds for each indicator, but to believe that setting these will handle scientific uncertainties, imponderable socioeconomic issues and political constrains might be a bit optimistic. The principle of setting threshold ranges is respectable, because it makes it easier

to reject alternatives that have indicator values outside the range of what is considered to be acceptable.

Given the negative aspects like legitimation of own opinions from policy-makers (Rosenström, 2009), and scientist using irrelevant indicators for the decision-makers (Rosenström and Kyllönen, 2007) makes it clear that collaboration is the path to take, favored by the "bottom-up" approach. Experts and stakeholders should both take part in this process. The DPSIR and FoPIA framework uses *State Sustainability Indicators* to predict long and short term impacts of a policy proposal. An example of such an indicator, describing the state of a variable, can be soil quality in the specific area, as described in the sustainability assessment from China's sloping land conversion program (König et al., 2012) (Bell and Morse, 2008). It can be difficult to give a quantitative value to some social and environmental indicators, as observed in some of the results, where the unit of measurement was only a status describing the predicted conditions.

The single most important part of a sustainability assessment is stakeholder involvement. This is highlighted by the use of FoPIA framework, and the multi-actor multi-criterion analysis from the sustainability assessments in practice and from the literature (Vermote et al., 2013) (König et al., 2012) (Helming et al., 2008). The Mackenzie Gas Project Joint review panel secured the stakeholders views with public hearings, which is rather time consuming, but the thoughts and considerations from the communities was heard and evaluated (Mackenzie Gas Project Joint Review Panel, 2009). A different approach is the FoPIA which uses interviews with community groups together with expert's opinions considering the specific issue for the policy. Adelle and Weiland (2012) claims that one of the improvements for a better link between policy assessment and the actual decision-making is in fact more involvement form stakeholders. The importance of this is also mentioned by Turnpenny et al. (2008) who claims that to achieve good integration there need to be multiple stakeholders involved to get a broad set of perspectives to reveal all relevant impacts.

What is state of the art of sustainability assessments? The researchers who have published papers within the field conclude that state of the art of policy assessments and sustainability assessments is merely in start phase of development (Adelle and Weiland, 2012) (Bond et al., 2012). A better description for sustainability assessments is the topic of Bond and Morrison-Saunders (2009) paper: *Sustainability appraisal: jack of all trades, master of none?* This shouldn't be interpreted literally, but it gives some insight in the complexity of what a sustainability assessment actually try to perform.

5.2 Linking objectives on different levels to sustainability assessments

The reason why the objectives were arranged on the different levels is to think and consider the sustainability issues of the proposal on these levels. Take for instance the land slope program in China, sustainability issues on the operational level would mean to analyze and find the most sustainable way of converting the land areas (König et al., 2012). What kind of soil is the most sustainable to use? Considerations of the distance and consumption of fossil

fuel to get the soil to the actual project, what kind of soil is best for that exact area? Are there any plants which should be reused or replanted due to their importance for the ecological system in the area? All these considerations are on an operational level. The choices one makes on operational level can have strong correlation to the outcome on the strategic and tactical level. If the quality of the work and materials do not last the proposed lifespan, the tactical and strategic objectives will most certainly not be met.

One of the problems with the early forms of integrated impacts assessments, as evaluated by Lee and Kirkpatrick (2006b), was to express consistency between high and low level objectives. Having clear objectives is obviously important, and if the sustainability assessment does not deal with the main issues, like Turnpenny et al. (2008) found in Sweden and the UK, the policy assessment is based on something different than what it was supposed to, which doesn't benefit anyone.

Both the relevance test from Switzerland and the scoping questions from Belgium have considerations about objectives and target groups for the policy as well as the purpose for the sustainability assessment (Bauler and Wäktare, 2006, Federal Office for Spatial Development, 2008, OECD, 2010). To discuss and reveal these aspects in the start of a sustainability assessment will improve the chances for a sustainable outcome of a policy proposal.

According to Macario (2000) there is need for objectives on operational, tactical and strategic level to achieve a successful outcome of the decision-making process. The perspective levels is slightly different from the ones expressed by Haavaldsen et al. (2013), but both address the same problem, and according to OECD one must achieve sustainability to be successful (Samset, 2010). It is noted by Klakegg (2010) and Haavaldsen et al. (2013) that if the stakeholders preferences are not satisfied the outcome of a project is unlikely to be sustainable. Linking sustainability to these perspective levels will most likely achieve a more sustainable outcome for a policy. To be more specific, predicting impacts in sustainability assessments should be done with indicators on all levels.

In this work sustainability assessments from primarily land use change policies have been considered, and the results are clear in the form that only 12.5% of the indicators that are used consider one of the dimensions of sustainability on an operational level. The shortcomings of not assessing sustainability on an operational level can cause adverse effects for the proposal. Sustainability assessments of trade policies were not included in the analysis, because they are mainly on a strategic and tactical level. It can be quite hard to differentiate between tactical and strategic objectives in some cases. When this became a problem, the perspective that was most suited was placed first in the tables. Most of the indicators are associated with the tactical and strategic level. The sustainability assessment from Belgium was the only one which sufficiently used indicators on an operational level.

In the cases where implementing a sustainability assessment system is the operational objective, there should be indicators that predict each alternative with respect to the sustainability of input resources. To assess sustainability of a project or a more concrete plan

rather than implementing a sustainability assessment system is more tangible from the operational perspective.

The literature has a strong tendency to focus on methods and not a lot on practice as mentioned by Bond et al. (2012). That's probably why sustainability assessments from practice are hard to find.

5.3 Different States approaches to sustainability assessment

The ways States govern and regulate have great impacts for the success and the sustainability of implemented policies. If decision-makers neglect scientific evidence presented to them, or if they misinterpret advices given to them by experts, unsustainable policies are most likely the outcome. Daw and Gray (2005) emphasized this problem when the European Union implemented a new policy for fishing regulations, which ended up as a policy failure with unsustainable outcomes.

The shifting trend of policy assessments have gone from reducing regulatory costs (Renda, 2006), to considering all three dimensions of sustainability. Which of course is much needed.

The problems and weaknesses of current policy assessment practice are quite discouraging (Konrad and Alge, 2007) (Fischer, 2010) (HM Government, 2011). It seems like ex post monitoring and evaluation is merely a bureaucratic procedure that just has to be executed. Ex post evaluation can have significant meaning for the learning process of sustainability assessments and decision-making process. The data can be used to improve simulation experiments, and be used to get more reliable and valid results (König et al., 2012). Switzerland is one of the few countries that have implemented sustainability assessment on a State level (Federal Office for Spatial Development, 2008). Their integrated form of using indicators on all the three dimensions of sustainability can be a model for other States.

Adelle et al. (2012) claims that from a postpositivist view, policy assessments main objective is not to find the best alternative for a policy, but to support "debate and critical reflection in the messy reality of policy-making". Postpositivistic thinking has a good point, but it might be too pessimistic, because the main objective for a policy assessment should rather be to find the "best" policy alternative, through debate and critical reflection. On the other hand this might be a too rational statement, because the different actors involved in policy-making have different agendas and objectives in the policy process (Hertin et al., 2009) (Owens et al., 2004), and because the results from a policy assessment can be interpreted and used in a devious way to fulfill special interests (Flyvbjerg, 1998) (Scrase and Sheate, 2002). Perhaps the best approach is to have a pragmatic worldview, which acknowledge all these aspects and try to seek solutions objectively. The ones that carry out the policy assessment should be obliged to present the findings objectively and comprehensibly to the decision-makers, or else the outcome would be as disappointing as the findings of Lee and Kirkpatrick (2006a).

It should be noted that the time pressure in the policy process is often a problem, as stated by Turnpenny et al. (2008). Available time and resources should be in accordance to the

magnitude of the policy. This aspect should be clarified in the scoping phase of a sustainability assessment. This could be more precise in the English approach, while the Swizz approach has included a procedural scoping. The OECD framework with examples of which questions that should be discussed is probably the most important part their framework. Without these considerations the magnitude and the outcome of the sustainability assessment is unlikely to have a great value for the decision-makers and the process is likely to be a bureaucratic mess. These questions also include the important considerations of objectives for the assessment and for the policy proposal (OECD, 2010).

The lack of initiative from the Ministers in Belgium together with a financial crisis led to a failure for the new Sustainability Impact Assessment system (Bauler and Kegeleirs, 2009). The problems in Belgium highlight many of the implementation problems a state can experience in the initial phase of handling policy proposals with a new and unknown approach for the involved actors. Titmuss (1974) description of the concept of "policy", gives a good indication of the fundamental problem in Belgium, because if the people involved in implementation of a new system, for handling policies, does not believe or understands the importance of such a system it would not be considered meaningful. The policymakers have to believe that implementing such a system can make a difference, or else progress to better sustainability assessment processes will not be possible.

Canada use Environmental Impact Assessment (EIA) on both a strategic and on a project level (Gibson 2013a). There has been a change in the way these assessments are utilized. From only being on a project level to the form Canada is using today, as stated by Morrison-Saunders and Arts (2004). The strategic assessments that are carried out in Canada which include environmental, social and economic considerations of a proposed plan is more like a Sustainability Impact Assessment in many ways. The mixing of terminology like exemplified here than contribute to confusions and misunderstandings on a global level.

Norway addresses only the economic dimension of sustainability in their quality assurance system for major public projects (Shiferaw, 2013). Improving such a system to include the environmental and social impacts of public sector projects would most likely give Norway more predictable projects, because the short- and long-term effects are dealt with in an integrated way. Stakeholder involvement should be a requirement for such a quality assurance system. The "business as usual" alternative is included in the first stage. This alternative includes cost of maintenance and upgrading, which makes the alternative reliable and genuine. Jordanger et al. (2007) points out the importance of including the "business as usual" alternative because it is not certain that the other alternatives will obtain a better achievement of objectives, which might lead to rejection of the other alternatives. The "business as usual" alternative should also be assessed with indicators on operational, tactical and strategic objectives levels.

The new initiative in Ireland only promotes policies that increase the sustainability in urban areas. When sustainable policies are implemented together, synergy effects increase the overall sustainability in the areas that are evaluated (Fitzgerald et al., 2012). Something to

consider with this proactive implementation of sustainable polices, is that the policies must be relevant for the urban area. If it is not needed by the society it would not be considered as sustainable.

So can sustainability assessments save us from the unsustainable trends? Probably not alone but it will help us in achieving better policies which at least considers alternatives that might reverse the trends through critical thinking. Sustainability is a relative term, because nothing lasts forever, including the Earth, but we should try to embrace sustainable development for as long as we can.

6 Conclusion

Sustainability assessments is an ex ante tool that uses different methods to emphasize synergy , adverse, short- and long-term effects of proposed policies, plans, programmes and projects. It is common and useful to assess economic, social and environmental impacts of different alternatives for the proposal, and to give the decision-makers proper information as a basis so that they feel comfortable in taking final decision. Setting trade-off rules and to make sure the sustainability assessment is context specific is of great value. It is important to ensure stakeholder participation from the people affected by the proposal to get a broad set of perspectives to reveal all relevant impacts. To use holistic sets of indicators with respect to operational, tactical and strategic perspectives will lead to more sustainability in policy assessments. The results from this thesis show that indicators on operational perspective level are lacking in many of the sustainability assessments from practice. The operational level is closely linked to both short- and long-term effects and considering it is crucial. Different stakeholders will have different comprehension of what is important considering the sustainability of the proposal. The process and the outcome of sustainability assessments can be used by decision-makers to fulfill own and subjective opinions, this can be handled with participatory approaches, which are influenced by experts and stakeholders in an open process.

The practice in different States differs considerably. Belgium was unsuccessful with the implementation of their sustainability assessment system, while Switzerland has succeeded with their system. The Netherlands has sufficient routines when it comes to stakeholder participation when assessing policy proposals for the transport and infrastructure sector. England and Austria uses Strategic Environmental Assessment for infrastructure policies, but their system have been criticized for having many weaknesses. Canada uses mainly Environmental Impact Assessment on some large projects and stakeholder engagement is often well rooted. Ireland is testing out a new policy system which predicts and optimizes policies to enhance sustainability in urban areas. While many States contribute with research and practice concerning sustainability, Norway is mainly assessing the economic dimension of sustainability for large public sector projects. Norway has a great potential in achieving more sustainable policies, plans, programs and projects.

7 Further work and recommendations

This chapter is limited to my recommendations for Norway.

Many governments have a strategic plan to ensure sustainable development, but when policies, plans, programmes and large public projects are not assessed according to sustainability, their efforts are somewhat hypocritical. Norway's way to ensure sustainable development is mostly done by climate change mitigation, which is off course a good thing, but it is not the only part that is important for sustainable development.

A problematic and controversial question is: Is the governance in Norway driven optimally to achieve a sustainable future for our future generations? As mentioned previously, it is the department of finance that has the responsibility for achieving sustainable development for Norway as a country. It is obvious that other countries are many steps ahead of Norway regarding use of sustainability assessment as a tool to accomplish more sustainable policies. Norway has a great opportunity to be a leading figure with the work on sustainable policies globally. I believe it's our duty as a nation with an economy driven by oil production, to start transition into more sustainable governance. To achieve this we have to implement some kind of sustainability assessment system, and contribute to research on the topic. Implementing such a system will be a slow learning process. Learning form mistakes is a crucial part of this transition. The system will not be flawless from start, but it takes time for the involved actors to learn and be comfortable with taking decisions based on sustainability assessments.

An extensive research of how this can be implemented in Norway, which can start with interviews of how the system was implemented in both Belgium and Switzerland, and their recommendations of how this could be done better, is a start. If a three dimension sustainability assessment system is implemented in Norway it is essential to learn from mistakes of others. All this is a part of the learning process concerning sustainability assessments.

Norway should have an organ that can perform ex-post evaluation of policies, to see if they have reached their initial objectives. These can also be used to check the ex-ante assessments and to improve how the predicted impacts were in correlation with the real impacts. This evaluation should be performed by an independent organ or private consultants with no political attachment.

I would recommend that Norway starts to use sustainability assessment on land use change, since the frameworks, practice and expertise of these methods are available, and without doubt it will encourage decision-makers to think and assess different policies in a more holistic manner which most likely will lead to more objective and less biased policies. Some might argue that picking an "off the shelf" framework will not work because of context specific issues like culture, social and other elements are different in Norway related to other States. The framework should off course be adjusted with participation from stakeholders, decision-makers and experts. This could be a showcase for other government sectors. The

strategic objective should be to implement a sustainability assessment system on a state level that assesses all major policy proposals. The expertise is, perhaps, already embedded in the Concept program, it just has to be reorganized to include the environmental and social dimension of sustainability in addition to the currently assessed economic dimension.

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