THE VALUE OF PERCEPTION

GRADUATION THESIS

AN ANALYSIS OF PORT OF ROTTERDAM'S SOCIAL VALUATION APPROACH FROM A STAKEHOLDER POINT OF VIEW

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Preface

This report is the final report of the graduation project. It contains the research results of the literature study and internal research within the Port of Rotterdam Authority. It concludes with recommendations for the incorporation of perceptional value and a tool for handling uncertainty about perceptional value. In the period towards the finalization of this document I had the opportunity to discuss this complex subject with the members of the committee. With the support of the committee members and the discussions we had, it was possible to set up this document. I would like to thank them for their support and input. Further, I would like to thank the interviewees for their time and input to finalize this document. On the next page, the persons who were interviewed for this research are named and deserve special acknowledgement.

In this report, the need for research and the theoretical background of perceptional value are described in relation to Port of Rotterdam Authority's business. It was really motivating to work on such a topic, in which the way people value gets a more central position in business policies and valuation strategies and tools. The translation of abstract and complex concepts like value and uncertainty to practical and tangible business tools was a scientific adventure.

The linkage and incorporation of economic and social aspects in the engineering practice is in my opinion one of the main challenges for the coming generation of engineers. Engineers' responsibility is not limited to the structural value of what they design, but a broader view on value is needed to develop appropriate designs. This report describes the search to this broader view on value and proposes an approach for the incorporation of value from a perceptional point of view. Hopefully will the increasing attention and research into the link between engineering, economics and social sciences result in mutually reinforcing technical, economic and social systems. It feels good that I got the opportunity to add a tiny piece to that linkage in this graduation project.

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Summary

The Port of Rotterdam Authority has to deal with an ever growing influence of stakeholders about conditions for the implementation and operation of their port activities. A special stakeholder in this context is a group of people in the role of the public. This stakeholder can appear with representative names like 'the man on the street', 'the normal man', 'residents/inhabitants', or 'the public domain'. However, despite all its representations, this stakeholder is responsible for one very influential factor, called 'the public opinion'. People's interests and level of satisfaction regarding these interests are collected in the term 'public opinion'. This 'public opinion' is very influential with respect to the Port of Rotterdam's 'license-to-operate' and 'license-to-grow'. Besides, the Port of Rotterdam Authority can reach consensus about port activities with representatives of 'the public domain', but it can only define intention agreements with these representatives. In addition, the 'public opinion' can change over time and this can also have consequences for the Port of Rotterdam's operating and grow opportunities. In the light of uncertainty about the development of the 'public opinion' and its influence, which is more powerful than contractually fixed intention agreements, it is time to obtain more knowledge about this stakeholder and its way of valuing.

The objective of this research is to obtain more insight in different perspectives on value and people's psychological drivers for valuation and compare this with the way the Port of Rotterdam Authority incorporates social value in its strategies and strategic tools to confirm or improve these strategies and strategic tools in their social valuation approach.

To reach this objective, the research is structured to four main research blocks. The first research block is related to trends and developments, which suggest a need for research into a broader view on value. The second research block is related to the theoretical principles of social valuation. Thereafter, the third research block goes into the way the Port of Rotterdam Authority incorporates social valuation in its strategies and strategic tools. Finally, the principles of social valuation in theory and the social valuation approach in the Port of Rotterdam Authority's strategies and strategic tools are compared with each other to confirm or improve these strategies and strategic tools in their social valuation approach.

Trends and developments in politics and in corporate business indicate a need for a broader view on value. Examples like the increasing discussion about the limitations of value indicators like the GDP rate and the rising amount of shareholder resolutions about responsibility boundaries of corporate social value creation show that current valuation methods are not sufficiently appropriate to express social value creation. It suggests the need for research into the principles of social value. Dictionaries do not give a definition for social value. The scope of social value is therefore derived from the combined definitions of 'social' and 'value' in Oxford dictionaries. It is combined to the following definition for social value:

> *'The regard that something is held to deserve; the importance, or usefulness of something that is related to society or its organization'*

The question is how this 'usefulness' or 'importance' to society can be determined, because these are subjective terms. In engineering and economics, subjectivism is classified as irrational and irrationality is contradictory with the calculation appropriateness of system modeling. However, subjectivism should not be denied or reformed to simplified rational systems, but described and explained in its rationality, irrationality and consequences for the way people value. It will create more insight in different perspectives on value and people's psychological drivers for valuation.

People's psychological drivers for valuation can be decomposed in two cognitive systems, intuition and reasoning. The observational part of these two cognitive systems is perception. Perception has no intrinsic value, but is related to the consideration of value and decision making. It is an answer on the definition of social value and its problem of subjectivism. The 'usefulness' or 'importance' of something is determined by perception, because something has value when people perceive it that way. Perception can therefore function

as an indicator of value and is proposed as a composition of detection and its context. Detection is meant as the way people detect their environment through sensory or knowledge information. Although, detection can be variable for different people (dependent of for instance sensory sensitivity or level of interaction), it is an absolute component of perception. The combination with the context in which something is detected by people is resulting in the observation of a situation and composes perception.

Valuation by people is stated as the main driver for people's decision making. The perceptional value of options determines, conscious or unconscious, which option will be chosen. Because decision making is dependent on perceptional value, it is driven by the interaction of rationality and irrationality.

The distinction between rationality and irrationality in people's decision making behavior is scientifically specified in the Von-Neumann Morgenstern and Savage axioms. The Von-Neumann Morgenstern and Savage axioms are stated as conditions for rational decision making behavior. Although, the axioms distinct situations of rational and irrational decision making behavior, they do not give an explanation for it. Therefore, five main and broadly applied decision making theories are investigated to search for an explanation of the interaction of rationality and irrationality in people's decision making behavior. The theories are generally classified as irrational decision making theories, but in fact are these theories about the interaction of rationality and irrationality in people's decision making behavior. The investigated theories are: elimination by aspects, satisficing, Ellsberg paradox, prospect theory, and regret theory.

Analyzed towards nine different stakeholder characteristics, prospect theory is the most appropriate theory to describe the way people value in a public stakeholder role. The core principles of prospect theory are 'reference state', 'loss aversion', and 'diminishing value'. The 'reference state' can be marked as the context component of valuation. It is an expression of the context component of perception. From this reference state, situations are valued as losses or gains, for which the two other principles of prospect theory count. 'Loss aversion' is the expression of the natural tendency of people to value losses higher than gains. People show up risk averse behavior in choice problems regarding losses and risk seeking behavior in choice problems regarding gains. When gain or loss levels are further off the reference state level, the increase or decrease of value with respect to value creation or destruction efforts is diminishing. The core principles of prospect theory describe the proposed interaction of detection and its context. The proposed composition of perception is therefore further translated to the composition of detection and reference state to describe social valuation of people in a public stakeholder role.

Insight in the way people value in a public stakeholder role regarding social issues is essential for the Port of Rotterdam Authority to align its strategies and strategic tools to it for the creation of social value. This statement is confirmed by the fact that all of the ten success factors for the realization of Port of Rotterdam Authority's visions 'Global Hub' and 'Europe's Industrial Cluster' (as expressed in the Port Compass 2030) are directly or indirectly related to social value. The total group of investigated strategies and strategic tools of the Port of Rotterdam Authority are the Port Compass 2030, Drivers of Change, Key Performance Indicators, Portfolio Grid, Risk Matrix, and Strategic Stakeholder Management.

Although, all investigated strategies and strategic tools incorporate social value, only Strategic Stakeholder Management incorporates perception. Strategic Stakeholder Management is based on the Mutual Gains Approach, which is focusing on stakeholder interests instead of opinions. Through this approach, stakeholders' perception about the social value creation related to port projects can be incorporated in the dialogue with the Port of Rotterdam Authority. The Port of Rotterdam Authority negotiates project conditions with its stakeholders to reach agreement about project implementation with mutual gains for all stakeholders. However, agreement about project conditions can become under pressure when perception of created mutual gains changes. Perception can change when its components detection or reference state change over time.

Uncertainty about future levels of detection and reference state can be classified as deep uncertainty, which means that 'we know that we don't know'. The lowest level of perception uncertainty is the estimation of a multiplicity of plausible futures. The number of interaction variables between external forces and the response to these external forces is so large that this uncertainty can only be answered by the incorporation of flexibility. The proposed 'perception uncertainty quadrant' can function as a strategic tool to categorize port projects and apply strategic flexibility approaches on projects with different degrees of perception uncertainty. A project with a zero degree perception uncertainty is estimated to be insensitive to changes in detection and reference state over time. Projects with a first degree perception uncertainty are estimated to be sensitive to changes in detection or reference state over time. The last group incorporates projects with a two degrees perception uncertainty and are estimated to be sensitive to changes in detection and reference state over time. Every degree of perception uncertainty has its strategic options to handle uncertainty and incorporate flexibility to adapt to perception changes and maintain the created value over time.

It is recommended to the Port of Rotterdam Authority to consider social valuation from a perception point of view. Perception can function as a measure for social value creation and should be monitored over time through dialogue, as part of Strategic Stakeholder Management. An additional strategic tool to incorporate perception uncertainty would be supportive for the alignment of strategies and people's perception over time. The 'perception uncertainty quadrant' and related strategic options can create new opportunities for value creation and can create more sustainable mutual gains for all stakeholders over time. Finally, this greater insight in different perspectives on value and people's psychological drivers for valuation, and the translation of this in Port of Rotterdam Authority's strategies and strategic tools will contribute to the port's success in the future.

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1. Introduction

Since there is trade between people, ports have an important infrastructural, social and economic role in society. They are dynamic places and crucial in local, regional and national development. The prosperity from wealthy trade relations can still be seen in the rich architecture of cities like Bruges, Antwerp and Amsterdam and in the art of those days (municipality of Bruges, A brief historical background). However, only a few people were able to gather a very high level of prosperity from the trade through these ports, it created employment and the ability to get certain goods for a much larger group of people in the region. This interaction between ports and the surrounding society made it a place which was associated with prosperity and hope. Hope for people to get a job and obtain a small piece of that prosperity.

Although, ports are still centers of trade and economic power, their role has changed over time (Van Hooydonk, 2007). The Industrial Revolution in the late 18th and early 19th century and the large inflow of even persecuted immigrants from Eastern Europe, changed the image of ports in Western Europe dramatically. They still created large employment opportunities, but ports became also more a place associated with criminality and pollution (Van Hooydonk, 2007).

Today, ports and societies are in an increasing process of segregation. The recent development of the Maasvlakte 2 showed the physical movement of the port activities to even new created land. However, the development of the Maasvlakte 2 and the process towards finalization underlined also the changing relation between port and surrounding society in a non-physical way. Never, such comprehensive and capital intensive compensation projects were initiated to satisfy stakeholder interest. It increased the sense of urgency for research towards this stakeholder satisfaction. How do stakeholders value their environment and is the 'right' value created to their interest? The question is also if the valuation tools and strategies are still up-to-date towards stakeholder valuation. This question is in this research related to port activities, and especially the Port of Rotterdam Authority, but could also be related to a broader societal trend. People valued their environment thirty years ago different from people now, and in thirty years from now society will change again to new considerations of value. This change on the long term, but also change in the short term, should be taken into account when port authorities design their strategies and value the activities which go through their port.

The research, described in this report, focused on the decomposition of value and the way people value, expressed as social valuation. This theoretical framework was added by research to rational and irrational decision making theories and their relation with stakeholder valuation. Although, stakeholders can differ from port's clients to NGO's, this research will focus on the surrounding society. What is the perception, influence and valuation of the public and the components of these concepts. The rationality of value and measurement of perception will be discussed, like already discussed in the 60's of the 20th century. On March 18 in 1968, Robert F. Kennedy spoke at the University of Kansas. In his speech, he already criticized the limited value scope of rational measurement tools. In this case it was the GNP rate, another extensively applied measurement number for development:

> *'Our Gross National Product…counts air pollution and cigarette advertising, and ambulances to clear our highways of carnage. It counts special locks for our doors and the jails for the people who break them. It counts the destruction of the redwood and the loss of our natural wonder in chaotic sprawl. It counts napalm and counts nuclear warheads and armored cars for the police to fight the riots in our cities…, and the television programs which glorify violence in order to sell toys to our children. Yet the Gross National Product does not allow for the health of our children, the quality of their education or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our wit nor our courage, neither our wisdom nor our learning, neither our compassion nor our devotion to our*

country, it measures everything, in short except that which makes life worthwhile. And it can tell us everything about America except why we are proud that we are Americans.'

This discussion is still part of the political domain, as shown in the fact that French and German economists presented a report for their governments in 2010, in which they proposed to measure welfare instead of GDP (Franco-German Ministrial Council, 2010). The search for a broader method to measure value is continuing.

Although, this research will not focus on the revision of the GDP or GNP rate, the example indicates the need for research towards the social value creation and the related measurement methods of authorities. In this research, the theoretical analysis will be linked to the practice of the Port of Rotterdam Authority.

2. Problem definition

The Port of Rotterdam Authority has structured its business to the landlord model and has a facilitating role for companies in the port region. In addition, the port authority has an important role in the coordination of the nautical operations and controls these processes and operations from the control room in the World Port Center. This is the main responsibility of the port authority regarding their internal business operations. However, there is an increasing call for a broader responsibility of the Port Authority from its stakeholders. The very recent discussions and issues about the added value of the port for the city of Rotterdam (OECD, 2013), the issues at Odfjell (NRC, 2013), the debates about the coal plants at Maasvlakte II (National Government, 2012), and the whale meat discussion (IFAW, 2013) show the growing pressure of society and politics on the responsibility of the port authority beyond their contractual obligations. Port authorities also have to deal with ever faster changing societal interests and a higher demand for participation, influence and transparency. They are being forced to rethink their strategy and extend it beyond their classical core activities.

When port authorities cannot keep pace with the growing pressure from society, their 'license-to-grow' could come under pressure. This because of the inadequacy of the port authorities' performance regarding societal demands. People become more demanding regarding social value(s), such as the livability of their environment, safety, accessibility, etc. However, assessment of social value creation is not a always result of rational calculations and this limits the possibilities of methods we are accustomed to use (Kahnemann & Tversky, 1979).

Although, research showed the subjectivity and time dependency of these social value elements, business and governmental systems are still highly dominated by quantitative objective methods, strategies and subsequent policies. The question is if these methods and strategies reflect the social value(s) for the stakeholders in the way they value it. Without the availability of a general accepted method to measure social value(s) and the growing demand for a focus on social value, there is an increasing need for research to gain more insight in social valuation to guarantee the Port of Rotterdam's 'license-to-grow' in the long-term.

3. Research Set Up

The problem definition indicates the core of the research. Social value(s) are already researched for decades. However, the valuation of social aspects, as studied in social sciences, and the way these aspects are valued and monitored through Port of Rotterdam Authority's strategies and strategic tools is questionable in its alignment. This knowledge or linkage gap is researched and presented in this report.

The research set up will be a chronological description of the research components. It starts with the main research question and the research framework.

3.1 Main Research Question

The main research question is directly derived from the problem definition:

> *'Is the way social valuation is incorporated in Port of Rotterdam Authority's main strategies and strategic tools in line with the theoretical principles of social valuation by people?'*

The research question on its turn will lead to the objective of this research. An answer on this main research question can be found by answering the central questions and related sub-questions. The central questions and sub-questions will be formulated later in this report.

3.2 Research Framework

3.2.1 Objective

The objective of this research is to obtain more insight in different perspectives on value and people's psychological drivers for valuation and compare this with the way the Port of Rotterdam Authority incorporates social value in its strategies and strategic tools to confirm or improve the social valuation approach of these strategies and strategic tools.

3.2.2 Expected result

The expected result of this research is an overview of different perspectives on value and people's psychological drivers for valuation in comparison to the social valuation approach of Port of Rotterdam Authority's strategies and strategic tools.

3.2.3 Hypothesis

> The hypothesis of the research is: *'the way social valuation is incorporated in Port of Rotterdam Authority's main strategies and strategic tools is in line with the theoretical principles of social valuation by people'.*

This hypothesis is tested with the results from the research and the answer on the main research question. The design of this research is described with the research framework and the technical research design.

3.2.4 Conceptual framework

The conceptual framework of the research is built upon different building blocks. These are derived from the general scientific research building blocks and consist of 4 levels: descriptive, explicatory, evaluative and prescriptive or conclusive. The research will be executed through these consecutive phases. In figure 1, the general set up of the framework for the research is given. The whole research is a problem-analyzing practice-oriented research (Verschuren & Doorewaard, 2010).

The descriptive phase has two important drivers of input. The first one is a study to the social valuation approach of Port of Rotterdam Authority's strategies and strategic tools by interviewing port experts and studying official port documents, related to the port's strategies and strategic tools. Port authority experts will in interviews be asked about the port's strategies and strategic tools to obtain more insight in their social

valuation approach. Preferably, these port experts are directly involved in social value determination and decision making processes. The other driver is a literature study to the concept of value and people's psychological drivers for valuation.

To summarize the key concepts and their key sources:

Key concepts	*Knowledge frameworks*
• Value and social valuation	Relevant literature
• Port of Rotterdam Authority's social valuation approach in its strategies and strategic tools	Port experts and official port documents

The conceptual model of Port of Rotterdam Authority's strategies and strategic tools on social value creation will be reflected against the principles of valuation theories. This comparison is used to highlight the dominant elements of the problem and set a structured overview of the differences in practice and literature. In this phase (b), the research questions can be answered.

As shown in figure 1, (a) an analysis of the Port of Rotterdam Authority´s social valuation approach (b) by means of which the current port authority´s strategies and strategic tools on social valuation will be compared with social valuation principles from literature. (c) A comparison between the main strategies and strategic tools, and social valuation theory provides (d) more insight in the social value creation of the Port of Rotterdam Authority and corresponding recommendations for business implementation.

The overview of the conceptual framework is given in figure 1.

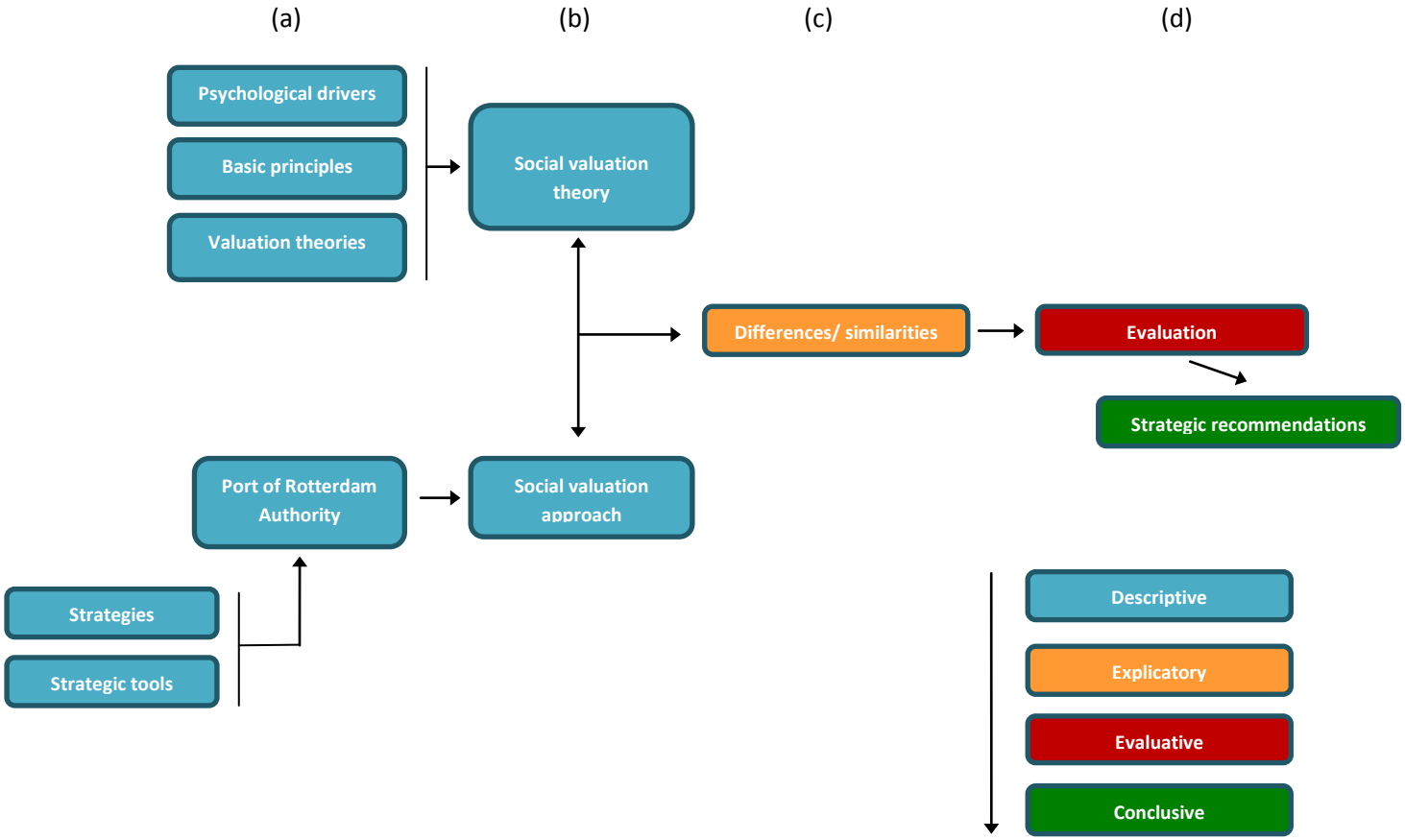


Figure 1 Conceptual research framework

3.2.5 Central research questions

The central research questions (CQ) are derived from the different segments of the research framework. They are the pillars under the main research question, which is the main question directly derived from the problem definition. The central research questions are closely related to the different framework components and are answered in (a), (b) and (c). With answering the central research questions, the hypothesis can be tested in phase (d). The central research questions steer the research to test the hypothesis.

CQ 1 Which trends and developments suggest a need for research into social valuation?

CQ 2 What are the basic principles of the most appropriate valuation theory regarding social valuation from a stakeholder point of view?

CQ 3 In which way social valuation is incorporated in the Port of Rotterdam Authority's strategies and strategic tools to measure the social value created by their port activities?

CQ 4 What are the main differences and similarities between social valuation principles in theory and the social valuation approach of the Port of Rotterdam Authority?

3.2.6 Sub-questions

Like the central questions are directly derived from the main question and the research objective, the sub-questions are directly derived from the central questions. They are descriptive and compose together an answer on the related central question. In the overview below, the central questions (CQ) with their sub-questions (SQ) are given.

CQ 1 Which trends and developments suggest a need for research into social valuation?

SQ 1.1 Which trends and developments indicate an increasing discussion about the appropriateness of current social valuation methods?

SQ 1.2 In which way social value is incorporated in the current social valuation methods?

SQ 1.3 What is the relation between Port of Rotterdam Authority's development visions and social valuation?

CQ 2 What are the basic principles of the most appropriate valuation theory regarding social valuation from a stakeholder point of view?

SQ 2.1 In which components value can be decomposed?

SQ 2.2 In which psychological components valuation can be decomposed?

SQ 2.3 Which theories describe the psychological principles of valuation?

SQ 2.4 What are the parallels between the principles underlying valuation theories and valuation by stakeholders?

SQ 2.5 In which way underlying valuation principles can affect the valuation of port activities?

CQ 3 In which way social valuation is incorporated in the Port of Rotterdam Authority's strategies and strategic tools to measure the social value created by their port activities?

SQ 3.1 In which way social value creation is measured by the Port of Rotterdam Authority's main strategies and strategic tools?

SQ 3.2 For which strategies and strategic tools the (possible) outcome is directly driven by the way people value this (possible) outcome?

CQ 4 What are the main differences and similarities between the social valuation principles in theory and the social valuation approach of the Port of Rotterdam Authority?

SQ 4.1 Which theoretical principles of social valuation are incorporated in the strategies and strategic tools of the Port of Rotterdam Authority?

SQ 4.2 For which strategy or strategic tool social valuation principles are directly supportive in measuring social value creation?

4. Which trends and developments suggest a need for research into social valuation?

Before the theoretical body of the research is described, this chapter presents the possibilities for research to social valuation. Several factors of influence are described in their relation to the consideration of social value. This research is separated in a general part regarding politics, corporations and social valuation methods, and a more specific analysis to the importance of social valuation for the Port of Rotterdam Authority.

4.1 Which trends and developments indicate an increasing discussion about the appropriateness of current social valuation tools?

The focus on social value developed over the years, but before analyzing the trends and developments, it is first important to define the concept of 'social value' in more detail.

'Social' is according to Oxford dictionaries:

> 'Relating to society or its organization'

'Value' is according to Oxford dictionaries:

> 'The regard that something is held to deserve; the importance, or usefulness of something'

Later in this report the concept of value will be further explained and decomposed. For this moment, this definition is sufficient. The total definition of social value is now more broadly 'the regard that something is held to deserve; the importance, or usefulness of something that is related to society or its organization'. But which tool or number expresses the importance or usefulness of something to society or its organization that can be used by governments and companies?

4.1.1 Trends and developments in the political focus on social value

From its development in the 30's of the 20th century, the Gross Domestic Product (GDP) number is leading in the evaluation of development of countries. The GDP rate is a generally accepted reference point for development and is used as the main factor societal development in political debates. However, GDP is originally a measurement number for economic growth, it transformed to a proxy indicator for societal development in general. Yet, as known from the creator of the GDP rate, Simon Kuznets, the GDP was never intended for this role (Kuznets, 1934). It is a gross of products and services bought and sold, with no distinctions between transactions that enhance well being and those that diminish it. Instead of distinguishing costs from benefits, productive activities from destructive ones, or sustainable ones from unsustainable ones, the GDP simply assumes that every monetary transaction adds to social well-being by definition.

The gaps between what the GDP rate expresses and the broader societal development increased the need for a more comprehensive tool or an addition on the GDP rate. In 2007, the European Committee organized (together with the European Parliament, the Club of Rome, the WWF and the OECD) the 'Beyond GDP' conference. The conference revealed strong support from policy-makers, economic, social and environmental experts and civil society for developing indicators that complement GDP and aim provide more comprehensive information to support policy decisions.

The idea of a complementation of GDP is not new. Several routes to develop this idea were already explored last years. The United Nations Development Program (UNDP) has developed a Human Development Index (HDI), which measures the development of countries on a combined rate of GDP, health and education. The World Bank was also a frontrunner with its calculation of the wealth of countries, taking into account social and environmental aspects. The OESO has the 'Global Project on Measuring the Progress of Societies' to stimulate the use of new indicators. Several NGO's measure ecological footprint to analyze the performance and which is formally recognized as a target for environmental progress by some public authorities. The European Union

(EU) and its members developed a spectrum of social and environmental indicators and France initiated even a 'Commission on the Measurement of Economic Performance and Social Progress' (Commission of the European Communities, 2009). These developments show an increasing focus on a more comprehensive model to incorporate other values than only the economic value.

The more comprehensive incorporation of value is gaining interest under pressure of the public opinion. A 2008 Eurobarometer poll showed that more than two thirds of EU citizens have the opinion that social, environmental and economic indicators should be used equally to evaluate progress. Only just under one sixth preferred evaluation, based on economic indicators only. An international poll in 2007 gave similar results (European Commission, 2008).

As an alternative to the GDP rate, some countries use the Genuine Progress Indicator (GPI) to express their development. Since 1995, the GPI indicator has grown in stature and is used in Canada and the United States of America. However, both these countries still report their economic information in GDP to remain in line with the more widespread practice (Investopedia, GPI). The GPI is a variant of the Sustainability Economic Welfare (ISEW), which was first proposed by Daly and Cobb in 1989.

The GPI has 26 different indicators from economic, environmental and social content. So, it can be, in contradiction to the GDP rate, that the GPI rate decreases although the economic wealth increases, because criminality or negative environmental impact increases.

The GDP and GPI rate were researched in their development in the US over the period 1950 till 2004 in retrospect. Figure 2 shows the increasing differentiation between the GDP and GPI rate, especially from the mid 70's of the 20th century (Talberth, Cobb & Slattery, 2006).

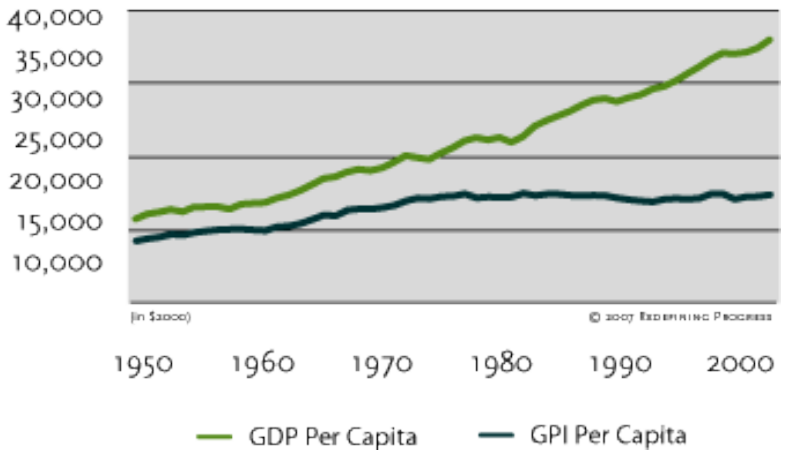


Figure 2 Gross Production vs. Genuine Progress, 1950 – 2004
Source: Talberth, Cobb & Slattery (2006)

This research is not focusing on the redefinition of the GDP rate, but the increasing discussion about how societal progress can be expressed motivates the research towards the social value creation and the way people value their environment. However, the history about the GDP rate discussion and new initiatives over time give a good indication of the public search for a new expression of value. It is clear, that the mean numbers of measurement for value are not incorporating the whole spectrum of it. The need for a broader insight in the value concept and social valuation is increasing in its urgency. This is not only the situation for governmental bodies, but also for the strategies and businesses of corporations.

4.1.2 Trends and developments in the corporate focus on social value

Besides political interest, the focus on a broader definition of value becomes also part of corporate interest. In the corporate environment, this is translated to business in the concept of Corporate Social Responsibility (CSR). It is now an important topic in board rooms and influences the image of companies and institutions more than ever. It is an increasing subject of lectures and presentations and it looks if it is the new flagship of many multinationals. Former Prime Minister Jan Peter Balkenende devoted, from his new position as Corporate Responsibility expert at Ernst & Young, a lecture on this topic in his presentation for College-Club on the 15th of May 2013. His topic was: Corporate Responsibility, a trend or a paradigm shift? It says something about the value issue shown earlier. A broader definition of value is needed.

From interest to influence

Although, the concept of Corporate Social Responsibility (CSR) won on interest, it was already designed in this formulation in the late 1960s and early 1970s after many multinational corporations formed the term stakeholder, meaning those on whom and organization's activities have an impact.

The principle of CSR developed and gained more influence over time. It became not only a matter of philanthropic activities, but part of the identity of corporations. The coupling of this identity made it part of the brand value of corporations and therewith of influence on the total corporate value. This transition of CSR to a valuable non tradable asset became of interest by investors, and financial indices where needed to align valuation in this respect. In 1990, the first social responsibility index, named the FTSE KLD 400 Social Index, was launched to help socially conscious investors to weigh social and environmental factors in their investment decisions. The index was developed by KLD, which is now part of MSCI, an investment management consultancy company of pension and hedge funds. This index is still used to express social responsibility performance of companies.

Another index which is used to express the corporate performance on social aspects is the MSCI World SRI. These two indices are the most important indices to measure the social responsibility performance of companies. To obtain more insight in the social indices, the FTSE KLD 400 Social Index will be explained in its components and rating methodology.

FTSE KLD 400 Social Index

In the social responsibility assessment in the FTSE KLD 400 social index, a committee selects companies that have positive social and environmental records based on the following issues: community relations, diversity, employee relations, human rights, product quality and safety, and environment and corporate governance.

Companies that have activities in alcohol, tobacco, civilian firearms, gambling, nuclear power, adult entertainment, genetically modified organisms or military weapons are not eligible for the index. The same holds for companies that do not meet the financial screens (market capitalization, earnings, liquidity, stock price and debt to equity ratio).

The research model generates numerous sub-scores for the company across each data category applicable to the industry group. The model aggregates the sub-scores to generate separate environmental, social and governance scores for the company, which are ultimately expressed as a single composite performance score. A company's score is mapped to a 9-point letter scale, with ratings from AAA (highest) to C (lowest) (Bechetti & Borzaga, 2010). An overview of the components and subcomponents of the index is given in figure 3.

Corporate Social Responsibility and shareholder interest

The growing interest of investors or shareholders is also shown in the statistics regarding CSR issues. From 1999, the number of shareholder resolutions about CSR issues has grown sustained. With the financial crisis, the number of CSR resolutions decreased, but recovered rapidly in the years after. This development is shown

in figure 4. In 2011, resolutions addressing social and environmental issues comprised the largest portion (50%) of all shareholder proposals that came to a vote, figure 5.

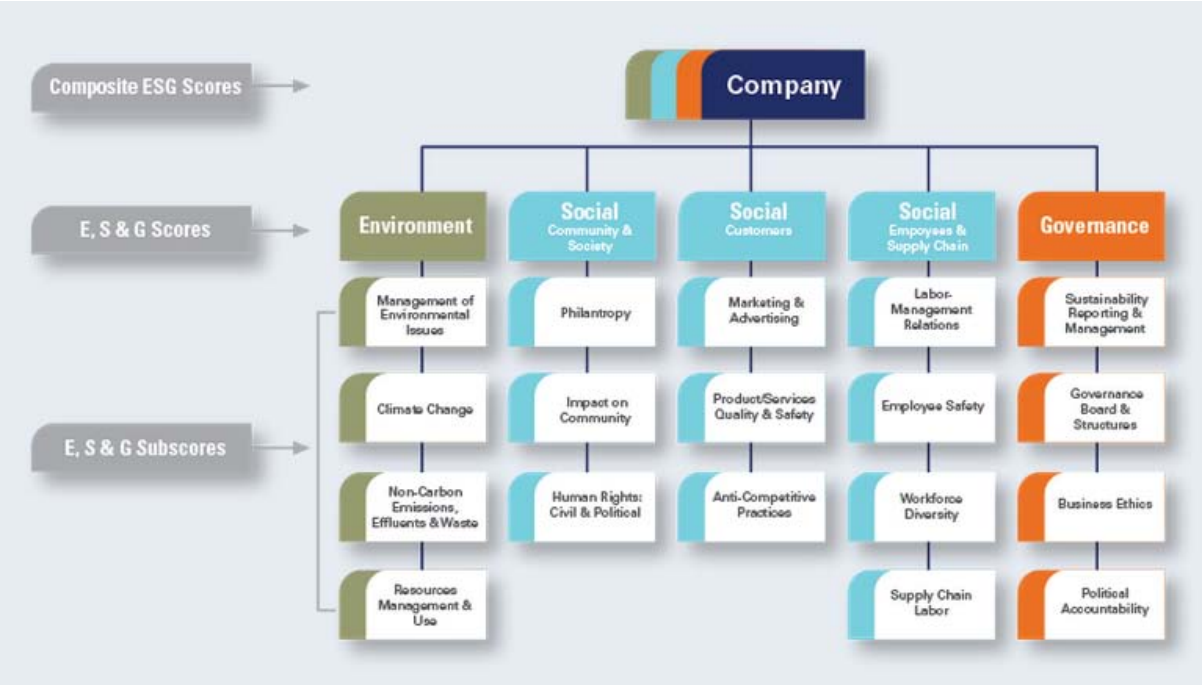


Figure 3 Composition of FTSE KLD 400 Social Index rating
Source: MSCI

The proposals of shareholders are important, because they have their influence on the decision making in the boards rooms and the corporate landscape. Commentators belief the tipping point is reached, where the investor's interest in CSR performance is sufficient to affect valuations. Both sell-side firms (broker dealers) and buy-side firms (hedge funds, insurance firms and pension funds) are interested in CSR performance and try to integrate CSR data in valuation models (Ioannou & Serafeim, 2010).

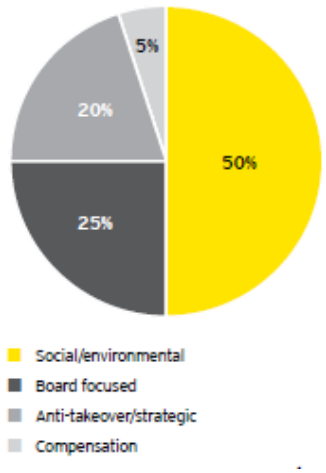


Figure 5 Shareholder resolution distribution 2011
Source: Ernst & Young (2011)

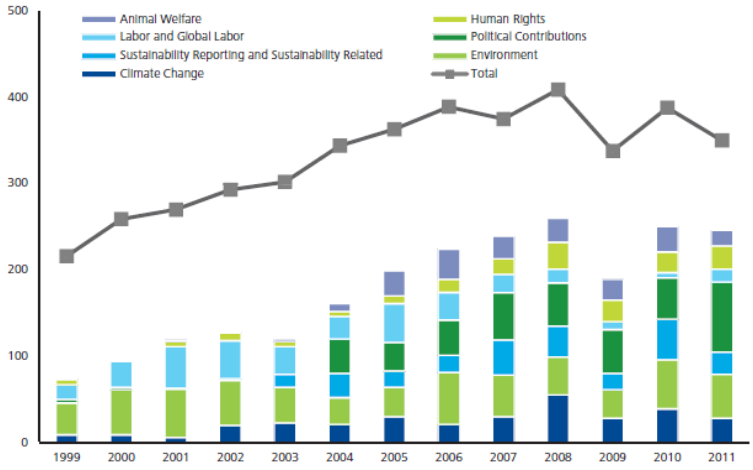


Figure 4 Trends in shareholder resolutions CSR issues
Source: MSCI

A 2010 survey conducted by Institutional Shareholder Services, a proxy advisory firm, shows that 83% of investors believe environmental and social factors can have a significant impact on shareholder value over the long term. This belief is also visible in the rising level of support for shareholder proposals requesting action related to social and environmental issues (Ernst & Young).

Outside the exchange market

But besides the growing attention among shareholder and investment managers on the financial markets, there is another trend which confirms a stronger global focus on social responsibility. The still increasing number of Non-Governmental Organizations (NGO) confirms the rising interest for social aspects, also outside the exchange markets. The term NGO originated from the United Nations and refers to an organization which is independent from the government, is a non-profit organization, and has a certain interest in a societal aspect. The number of NGO's grew fast over time. This development is shown in figure 6. It does not say anything about the development of NGO's in a certain region, but is shows the development of the total number of NGO's worldwide. It can be stated from these statistics that the total focus on issues which are part of the total spectrum of NGO's is increasing and therefore the need for stakeholder valuation tools.

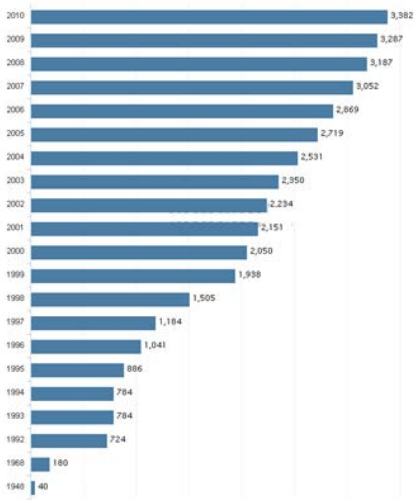


Figure 6 Number of NGOs from 1948 till 2010
Source: UN Economic and Social Council (2010)

4.2 In which way social value is incorporated in the current social valuation methods?

Besides the general trends and development regarding social value in the former paragraph, it is also interesting to look at the way social value is incorporated and measured in the most important and used social valuation methods. The question is in which way this social value is incorporated and if this social value incorporation is equal for all valuation methods. First of all, the most used social valuation methods are analyzed on their intention, content and weaknesses. Thereafter, the social valuation methods are analyzed on the social values they incorporate.

4.2.1 Social valuation methods

Last decades, several valuation methods were developed to measure social value. Mulgan (2010) studied these valuation methods and described them with an example and the problems of the valuation methods. The most influential methods to measure social value are summarized in table 1. The valuation methods are all different in their content and valuation scope. The general differences between the valuation methods are a consequence of a different intention for measurement. It can be stated that the large differentiation of valuation methods show the inconsistency of social value measurement.

An analysis of the problems for the different valuation methods show some similarities. The main similarity is the problem of inconsistency between the representation of value in the valuation methods and the way people value according to their behavior. Further, problems concentrate on the variability of indicators or input sensitivity. It is because of this inconsistency and discussion questionable if the valuation methods express social valuation as perceived by people themselves. Research towards social valuation should be necessary in this context.

Table 1 Most used social valuation methods
Source: Mulgan (2010)

Method	Description	Example	Problems
Cost-Benefit Analysis/ Cost-Effectiveness Analysis	The most widely used family of tools; counts up costs and benefits and applies discount rates. Often used for large public programs	A recent study in the UK found that using a mix of drug treatment, surveillance and behavioral interventions instead of prison saved taxpayers up to 130.000 USD per offender	Disagreements about the actual numbers and weightings in the calculation, as well as the conclusions of the analysis
Stated Preferences (contingent valuation method)	Asks people what they would pay for a service or outcome	A typical example would ask people what they might pay to preserve an endangered species or to build a park	Stated preferences often do not correlate with actual behaviors
Revealed Preferences	Examines the choices that people have actually made to infer the relative worth of different options	A researcher analyzes house-buying patterns and real estate prices to infer how much people value public parks	Few fields have enough usable data
Social Impact Assessment/ Social Return on Investment Assessment	Estimates the direct costs of an action, the probability of it working, and the likely change in future outcomes, sometimes with discount rates	There are many examples of such tools	Disagreements about numbers, weightings and conclusions; values; how to handle time and discount rates; and intended audience of the calculation
Public Value Assessment	Judges how much the public values a service	The British Broadcasting Corporation assessed its public value	Not rigorous enough
Value-added Assessment	In education, assesses how much a school adds to the quality of its students	Recent uses often show that apparently successful schools are actually good at attracting clever pupils	Sometimes too complex for parents or the media to understand
Quality-Adjusted Life Years/ Disability-Adjusted Life Years Assessment	In health care policy and research, accounts for patients' objective health and patients' subjective experiences	Widely used set of measures. Provides a common way to judge the relative effectiveness of clinical treatments and public health measures	Can be controversial when a particular treatment is not cost-effective
Life Satisfaction Assessment	Judges social projects and programs by how much extra income people would need to achieve an equivalent gain in life satisfaction	An imaginative study in Wales showed that modest investments in home safety, which cost about 3 percent as much as home repairs, generated four times more life satisfaction	New approach that remains unproven; highly sensitive to input assumptions
Government Accounting Measures	In government, accounts for government spending and its effects	France's bilan societal is a set of 100 indicators showing how enterprises affect society. Italy has a similar bilancio sociale	Much variability across regions; disagreements about which indicators to include
Other field-specific assessments	Every field has its own cluster of metrics	A recent Young Foundation study identified nearly 30 measures of value in the built environment	Diversity of these measures means that they are little used for public decision making

A limitation in the quantification of social value is the lack of agreement about which aspects to measure and the interpretation of these aspects. To function well in an absolute system, social value should have the same characteristics as for instance environmental conditions to measure and compare them in an objective way. These models demand an objectivism of social value. The limitation to the use of objective tools with absolute numbers to measure social value is because of the fact that social value is a subjective value. The issues faced by those wishing to examine social value have been summarized by Mulgan (2010), who stated:

> *'Funders, non-profit executives and policymakers are very enthusiastic about measuring social value. Alas, they cannot agree on what it is, let alone how to assess it. Their main obstacle is assuming that social value is objective, fixed and stable. When people approach social value as subjective, malleable and variable, they create better metrics to capture it.'*

4.2.2 Incorporated social values

The subjective character and lack of agreement about social value was already explained with the analysis of the different social valuation methods. In the analysis of these measurement methods, there was a search for the identification of social components. The results of this are presented in table 2.

Table 2 Social valuation methods and identified social values

Method	Identified social components
(Social) Cost-Benefit Analysis/ Cost-Effectiveness Analysis	Accessibility Safety Livability Social quality Cultural quality Nature Cultural history Soil Water Indirect effects
Stated Preferences (contingent valuation method)	Not identified in advance. Identified from stakeholder input. Willingness to pay or accept
Revealed Preferences	Not identified in advance. Identified from stakeholder behavior or choices
Social Impact Assessment/ Social Return on Investment Assessment	Not identified in advance
Public Value Assessment	Economic Political Social, impact on family or community relationships, social mobility, status and identity. Not further identified. Strategic Quality of life, impacts on individual and household health, security, satisfaction and general well-being Ideological, impacts on beliefs, moral, or ethical commitments, alignment of government actions or policies or social outcomes with beliefs, moral, or ethical positions Stewardship, impacts on the public's view of government officials as faithful stewards or guardians of the value of the government in terms of public trust, integrity and legitimacy
Value-added Assessment	Education related
Quality-Adjusted Life Years/ Disability-Adjusted Life Years Assessment	Healthcare related
Life Satisfaction Assessment	Personal evaluation of: Health Education Income Personal fulfillment Social conditions
Government Accounting Measures	Not identified in advance
Other field-specific assessments	Not identified in advance

Looking at the social values of the valuation methods in table 2, it is very hard to define a couple of agreed social values. The methods do not identify social values in advance, or they differ in their formulation of these components. Further, some valuation methods are very broad defined (broader than only social components), like the Public Value Assessment, or they are very specific, like the Value-added Assessment and the Quality-Adjusted Life Years.

In addition, the majority of the valuation methods are monetary expressed methods. This is also the case for the most used broad methods like the Social Cost-Benefit Analysis, the Stated Preferences Method, Social Return on Investment Assessment (SROI) and the Public Value Assessment, which uses SROI. Although, these monetary methods are usable in the economic system, the discussion about the relation between subjective values and fixed financial indicators continues.

4.3 What is the relation between Port of Rotterdam Authority's development visions and social valuation?

Looking at the Port of Rotterdam Authority, they also defined trends and developments in their Drivers of Change as a supportive part of the Port Compass 2030. The Port Compass is the port vision for the coming 20 years and a new version is made every ten years. In 2011, the Port of Rotterdam Authority published the Port Compass 2030. The Drivers of Change of 2011 are the fundament of the four main economic scenarios of the Port Compass 2030 (Port of Rotterdam Authority, Port Compass, 2011).

The Drivers of Change were formulated more broadly than only social aspects, because they also included economic and technological or logistic aspects. However, the economic and technical developments can also have their influence on social value. In total, 35 drivers were formulated by the Port Authority (Port of Rotterdam Authority, Drivers of Change, 2011). The total list of drivers is given in Appendix A.

A driver which is closely related to the already researched social value trends is the 'transition to sustainable macro economy'. Below, shortly the formulation of this driver.

> **Transition to sustainable macro economy**
> *With the financial crises, the discussion about the current economic system is more and more a topic of discussion. The current economic system is based on the never ending drive for economic growth. The Gross Domestic Product (GDP) is the most important measurement factor for economic analysis. The idea of continuous economic growth is under pressure, especially in a time of crises, when economic growth is not obvious any more.*
>
> *French and German economists presented a report in 2010 to their governments in which they propose to measure welfare instead of GDP (Franco-German Ministerial Council, 2010). It marks a transition from an economic framework to a broader value framework for valuation.*
>
> *Also ideas like a value extracted tax (tax on extracted value) instead of value added tax (tax on added value) are proposed to increase more a focus on value in a broader sense instead of only the GDP.*

The driver expresses the same discussion which was already mentioned in the former paragraphs. Social value creation and the measurement tools to measure it are under pressure.

From the Drivers of Change, several scenarios were developed by the Port of Rotterdam Authority. In the Port Compass 2030, 4 main economic scenarios were constructed in relation to the cargo throughput. The 4 main scenarios are:

- Global Economy: 750 million tons
- European Trend: 650 million tons
- High Oil Price: 575 million tons
- Low Growth: 475 million tons

These 4 scenarios were translated in 2 visions for development, namely:

Global Hub
Rotterdam is in 2030 the leading European center for intra-Europe cargo streams. It is the global hub of Europe on cargo, fuel and energy. Rotterdam and the hinterland are an integrated network and Rotterdam is a frontrunner on sustainability and efficient chains.

Europe's Industrial Cluster
The industrial and energy facilities of Rotterdam functions as an integrated cluster, together with Antwerp, and is the largest and most modern sustainable chemical and energy cluster of Europe in 2030. This cluster is competitive on world scale by large network advantages, integrated supply chains and energy efficiency. The transition to sustainable energy generation and biobased chemicals is on top.

Expect these scenarios and visions for development of the port cluster, the Port Compass also pays attention to the implementation of these visions and defined 10 factors of success:

- Investment climate
- Space
- Accessibility
- Shipping
- Environment, safety and living
- Work
- City and region
- Laws and regulations
- Development of knowledge and innovation
- Europe

Interesting to notice is the large number of success factors which are related to social aspects. It indicates that the, on first sight, purely economic scenarios and visions are strongly related to social aspects for success. It confirms the need for an extensive research into people's value spectrum and valuation.

4.4 Conclusion CQ 1

The first central question (CQ1) was defined as follows:

> ***CQ 1*** *Which trends and developments suggest a need for research into social valuation?*

To answer this question, the developments in political and corporate value approaches were studied and reported. Besides, social valuation methods were analyzed on their approach, scope and possible problems. In addition, a short research was done to the success factors of the Port of Rotterdam Authority to realize their expressed visions in the light of the social value discussion.

First of all, the trends and development towards social value were analyzed in sub-question 1:

> ***SQ 1.1*** *Which trends and developments indicate an increasing discussion about the appropriateness of current social valuation methods?*

In the political environment, the development of countries is most of the time derived from GDP rates as a measure for societal development. However, the GDP rate, initiated by Kuznets (1934), was developed to measure economic performance and economic development of countries, and not as a measure for the total welfare. In 1995, the GPI rate was introduced to incorporate more aspects of value than only economic value. This GPI rate showed increasing differences with the GDP rate. However, GDP rates are still dominant in the political debate and development evaluations.

Despite the slow political movement towards another tool for development, the discussion is continuing. More recently, French and German economists presented a report in 2010, in which they propose to measure welfare instead of GDP (Franco-German Ministerial Council, 2010). There is, from a political point of view, a great interest for a more comprehensive tool for measuring value. Although, this research is not focusing on the GDP or GPI rate, the examples give an indication of the political and public search for more insight in the concept of value and the way people value.

Besides, the search for a more comprehensive tool for value measurement in politics, this search is also part of the corporate world. From the 1970's till today, the interest in Corporate Responsibility on societal aspects grew sustained (Ernst & Young, 2011). This development is shown in all corporations of influence. Within the economic market system, Corporate Social Responsibility got its place with social indices and a growing interest of shareholders in corporate social performance. The increasing line in shareholder CSR issues and the fact that in 2011 50% of the shareholder issues were related to social performance are indicators that social performance has also gained its influence on the market value of companies. Outside the financial market, the increasing focus on social aspects is shown in the growing total number of NGO's (UN Economic and Social Council, 2010). The growing number of NGO's can also be seen as an indicator of a growing awareness of social value in total.

The growing interest in social value was clearly visible from corporate statistics of the 90's. It is a factor of influence in strategic and operational decision making and cannot be denied any more. A lot of companies have therefore a special Corporate Responsibility department with certain performance goals. However, the question is how to measure social value and which social values should be incorporated in these valuation methods. This question was studied in the second sub question:

> ***SQ 1.2*** *In which way social value is incorporated in the current social valuation methods?*

The research showed a large differentiation of social valuation approaches with different social values, which were taken into account. The inconsistency is resulting in a lack of agreement about the created social value. The main problems of the social valuation methods were concentrating on the question if the valuation methods were representative for people's value perception and the variability of indicators or input sensitivity.

The third sub question was focusing on the relation of the valuation factors of the Port of Rotterdam Authority and social value(s). It was expressed as follows:

> ***SQ 1.3*** *What is the relation between Port of Rotterdam Authority's development visions and social valuation?*

Within the Port of Rotterdam Authority, the Drivers of Change form a total set of 35 drivers, which are formulated as the most influential trends and developments for the Port Compass 2030 (Port of Rotterdam, Drivers of Change, 2011). One of the drivers was the 'transition to a sustainable macro-economy', in which the French-German report of 2010 was also mentioned. The Port Authority also noticed the increase in the search for a broader value focus, as a measurement for development. The factors for success for their port visions 'Global Hub' and 'Europe's Industrial Cluster' were strongly related to social aspects. When these social aspects are essentially for success, it is necessary to obtain more insight the valuation of these social aspects.

Looking back at the central research question, it can be stated that both politics and corporations are searching on the highest level for new methods and tools to express social value. The current methods for social valuation are not consistent in their scope and questionable in their representation of people's value perception. In addition, the more detailed research into the Port of Rotterdam Authority showed that the main visions till 2030 are closely related to social value success factors. The combination of this shows the urgency for research into social valuation and the opportunities for the Port of Rotterdam Authority to search for implementation possibilities to realize their visions for port development.

5. What are the basic principles of the most appropriate valuation theory regarding social valuation from a stakeholder point of view?

In the former chapter, the increasing focus on social value was discussed. It was concluded that there is an increasing focus on social value, both from politics and corporations. However, this was also added with the statement for more research towards the concept of value and valuation to adjust rules, regulations and strategies close to the scientifically proven characteristics of value and social valuation. In which categorical components social valuation can be decomposed from a psychological point of view and which categorization can be made towards the concept of value are of central attention in this research question.

5.1 In which components value can be decomposed?

Although, people make choices based on value considerations the whole day, it is difficult to give a definition that comprehends the whole concept of value. People can rank valuable aspects, assets, characteristics, etc. They have the ability to rank their environment on value. This characteristic is of all times and is essential for survival. It is about choices and is the main driver of activity in nature. However, value is a broad concept and to get more grip on value, the concept has to be decomposed.

The word value can have very different meanings in different contexts. Used in the singular, value is understood as expressing the worth of something. Used in the plural, value is seen as belief and social behavior (Fernandes, 2012). The way people value in the singular form will however be influenced by value in the plural form.

The definition of value in its broad sense according to the dictionary is (Oxford Dictionaries):

> 'The regard that something is held to deserve; the importance, worth, or usefulness of something'

The definition of values is (Oxford Dictionaries):

> 'Principles or standards of behavior; one's judgment of what is important in life'

When trying to decompose these concepts, based on the existing literature, six categories of value(s) can be identified (Jensen, 2005):

- Religious values, values as belief system
- Behavioral values, values as moral and ethics
- Cultural value(s), value as meaning and sign
- Economic value, value as exchange
- Use value, value as utility
- Perception value, value as experience

In this research, value will be analyzed from a perceptional point of view. The perceptional value or experience value is influenced by the other singular and plural categories of value. The definition of the different categories of value(s) of Jensen (2005) will be explained in the next paragraphs. The singular forms of value, the economic, use and perception value, will be explained in more detail. The plural categories will be explained very shortly. It is not in the scope of this research to analyze all categories of value in detail. The focus will be on social valuation.

5.1.1 Religious values

Religious values are ethical principles founded in religious traditions, texts and beliefs. People judge situations regarding these values. These values have also a relation with behavioral values. There can be a strong influence of religious values on behavioral values. They are related to so called norms and values.

5.1.2 Behavioral values

Morals have a greater social element to values and tend to have a very broad acceptance. Morals are far more about good and bad than other values. Ethics tend to be codified into a formal set of rules which are explicitly adopted by a group of people. Behavioral values can be culture and education related. They have also an influence on for instance perception value. They way people experience things is related to their moral judgment.

5.1.3 Cultural values

Cultural value(s) do also have a relation with religious and behavioral values. It is related to a community or society as a whole. It tells something about identity and interrelations within the community network.

Religious, behavioral and cultural values are three forms of value, which are normally educated and shaped from some ones birth. They have a strong influence on the way people value things and situations in their life. It is a sort of basic framework with a strong irrational component.

5.1.4 Economic and use value

In the classical economic thinking, exchange value and use value became the central elements of trade. This was especially driven by the strong industrial value of labor. This free market system was based on supply and demand, which were also described by one of the first influential economist of the modern economy, Adam Smith. In his book from 1776, 'The Wealth of Nations', he propagates the idea that the search for the highest individual economic value would also create the most value for society as a whole. The sum of the individuals would create the total economic sum. The market system would regulate society, with the interference of government in this system as less as possible. This idea is still the fundament of liberal economic thinking.

With the supply and demand system driven by scarcity, the proportion between use and exchange value lead to the paradox of value. Most clear is the water and diamonds example. Elements with a high use value (water) have no value in exchange and elements with a high exchange value (diamonds) have almost no value in use.

Intangible economic values

Where in the time of Smith, this system was exploited for commodities, it broadened in modern economy with non-tradable or intangible assets, like knowledge, service concepts, experience and brands. One of the most well known models to measure intangible values is the Balance Scorecard (Kaplan & Norton, 1992). Kaplan and Norton identified three major categories of intangible values, namely human capital (skills and knowledge), information capital (databases and networks) and organization capital (culture, leadership and teamwork) (Kaplan & Norton, 2005).

Micro and macroeconomic perspective

Besides the differentiation of tangible and intangible assets as the tradable goods of economic systems, economic analyses were also divided in micro and macro perspectives. Important concepts in this regard were value creation and added value. Value creation is the creation of new value, so value created in a way that was never done before. The concept of added value is related to the production of more value than extracted. In micro economic terms, added value represents the difference between the revenues and the costs of a firm in relation to a product of activity.

One of the most well known and used models to investigate the micro economic value of a firm is the Porter Value Chain Model (Porter, 1985). The model is a set of interrelated activities over different elements of the supply chain from supplies of resources, through firms, to buyers of products and services from firms. Value is created by all players and by each firm. This set of activities consist of two part, namely primary activities, the activities that create added value over the product or service. The second part is formed by support activities, with the purpose to facilitate the primary activities (Fernandes, 2012). This Porter Value Chain model is given in figure 7. This model is the central concept of the micro economic thinking.

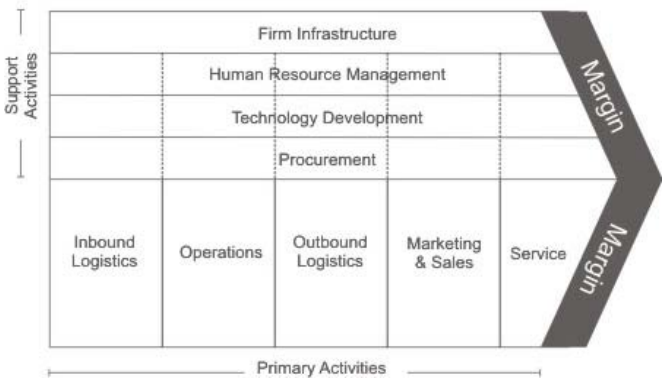


Figure 7 Porter Value Chain model
Source: Porter (1985)

When translated to the macro level, added value is the contribution for the gross domestic product (GDP), what serves as the base for the value added tax (VAT). The GDP is today the most influential factor to assess the economic welfare of a country as shown already. When GDP rates are under pressure, politics are under pressure. The idea of modern economic thinking is that politics, business and society as a whole should strive for an endless grow of this GDP rate. In modern China, the pressure on GDP growth is so high that local government falsifies the growth numbers of their region to keep in the running for higher positions or keep their job. (New York Times, June 22, 2012)

Shareholder value

The micro economic concept, expressed in Porter's Value Chain model in figure 7, is in line with the drive for shareholder value. The added value for the shareholder is created by the micro economic margin of firm's activities. In the capitalistic market economy this drive for shareholder value was the main objective and responsibility of companies. This was also the statement of the American economist Milton Friedman when he wrote about the social responsibility of business activities in 1962. His statement was that the only social responsibility of a company was to create as much value as possible for shareholders without illegal activities, like fraud, in a free capitalistic market with a small government. His opinion about the structure of the capitalistic market had a great impact on the development of the capitalistic market economy and he received for his work the Nobel Prize in Economics in 1976 (Investopedia, Milton Friedman). The more a company could produce, the more value was created for everyone was the idea. When a consumer bought a product, the consumer's opinion was the product would add value to his or her life. So, when more products were sold, more value was added to society. This system would further be regulated by the concept of supply and demand. The willingness to pay was a regulator for the maximum generation of value in society. Purely seen from an micro economic point of view, this could be true. However, this discussion about companies' responsibilities continued. This broader impact was also described by Adam Smith, in his 'Theory of Moral Sentiments', which he published in 1759, almost two decades before his more famous and referred book 'The Wealth of Nations'. Was a company only responsible for his products or should the company also held responsible for its possible broader impact?

Stakeholder value

More than two decades after the statement of Friedman, the economist Freeman proposed his stakeholder theory (Freeman, 1984). The core of the stakeholder theory was that the responsibility of the company's activities was not only bound to the shareholders, but to all its stakeholders. Stakeholder value was much more complex to measure than shareholder value, because the value created cannot be measured in the market and

cannot always be monetized. Although, Freeman did not give a straight method to measure this stakeholder value, he proposed some principles for further research to build a framework for value creation and trade. He linked valuation to its social nature: 'Value is not discovered, lying around the market, but created through shared assumptions and beliefs in a community. We must create value in a context, with the help of other and with others who value what we create' (Freeman, 2010). With this statement, Freeman indicated that stakeholder value is fundamentally socially constructed and psychologically driven.

Before Freeman, this concept was not so well formulated, but even after this formulation the theory was not broadly implemented. It was difficult to measure and interpret stakeholder value, when it was already generally possible. This was the case until the 1992 Earth Summit. The book of Schmidheiny (1992) was representative for the central idea of the Summit. Governments and businesses had to change their course in their environmental development policies. Scientist had now the ability to measure (environmental) impacts and could interpret the consequences for society. From this point in time, the measuring possibilities developed rapidly and the introduction of internet created possibilities to share information in this respect. Although, this measurement revolution could not give an answer on all value aspects, it increased the focus on for instance environmental impact, which broadened the discussion with numbers and calculations.

Corporate Social Responsibility

The discussion about the reach of corporate responsibility developed further from stakeholder theory. Like already shown in the chapter about trends and developments, corporate responsibility became increasingly a topic of discussion with the development of the ability to measure companies' impact. This developed from a CO_2 footprint to an environmental supply chain footprint, which is the up to date state of the footprint concept. Several independent institutions measure the impact of companies' activities on the environment.

Corporate Responsibility programs are now an important part of corporate activities. It is essential for their license to grow and became a matter of influence on the exchange markets and outside the exchange markets. With this development, Corporate Social Responsibility has now its role in the economic trade-offs. The growing awareness for social responsibility issues in politics and corporations is the current state of the increasing focus on social added value.

5.1.5 Perception value

Perception is different from the already explained value(s) in the sense that it has no value in itself, but is the perception of a certain value. Perception is a choice of which people are not aware, and people perceive what has been chosen. Perception is always accounting from a certain reference state. When a person gets 2 USD and loses 1 USD, his perception of the net 1 USD gain will be different from a person who just got 1 USD. The perception of this monetary value will be different. This perception statement not only holds for monetary situations, but also for non-monetary situations and is influenced by religious, behavioral and cultural values (Kahneman, 2003).

For the consumer market, a lot of research was done to customer satisfaction and customer experience. A couple of the insights from these researches are also applicable to perception value of stakeholders. Some researchers describe perception value as the experience of value. It can be counted under the same denominator. Holbrook mentions that 'value resides not in the product purchased, not in the brand chosen, not in the object possessed, but rather in the consumption experience(s) derived there from' (Holbrook, 1999). This idea leads to the conclusion that what people may desire is not a product but the experiences that it provides (Pine & Gilmore, 1999). Pine and Gilmore described the evolution of economic offerings from commodities to products to services to experiences. Jensen defines this experience value as perception value (Jensen, 2005). This perception value is highly dependent on its context. The environment at the time of the transaction and use is of influence on the perception. But not only the environmental circumstances influences perception, also the personal emotional status has its influence on the perception. A more mathematical

differentiation of perception and context will be explained later in this report, when social valuation and perception are considered.

5.1.6 Interrelationship value(s)

Looking at the six different categories of value(s) as defined by Jensen (2005), the value(s) have a strong interrelation. In this report a more general segmentation of these categories is proposed, namely plural values like religious, behavioral and cultural values and singular values like economic and use value. Plural values, as categorized by Jensen (2005) are strongly related to identity, education and beliefs, and are hardly to measure or monetize. They are also presented as soft values and irrational. On the other side, singular values are more absolute and market related. They are generally presented as hard values and rational. Perception of value cannot be categorized to one of these segments. Perception is the experience of value with irrational and rational components in mind. In some cases, the irrational segment is more influential and in other cases the perception is more influenced by rational hard values. Perception is influenced by both segments of value.

So, in this research a relation between the plural values and singular value is proposed, as given in figure 8. It has its influence on perception. Possibly, more soft and hard values can be imagined, but the visual presentation of figure 8 gives insight and segmentation of value and the position of perception in this consideration. The plural side and the singular side indicate that perception can have a plural and a singular component. The rationality and irrationality of value was researched by Kahneman and Tversky (1983). They found that the four axioms of rationality as the basis of the expected utility theory, described by Neumann and Von Morgenstern (1944), were not supported in all situations. It meant more acceptance for theories with irrational valuation components. Till then, most theories were only taking rationality into account, which fitted well in the rational characterized markets they were applied to. However, the question was if it was representative for the way people value, expressed as social valuation.

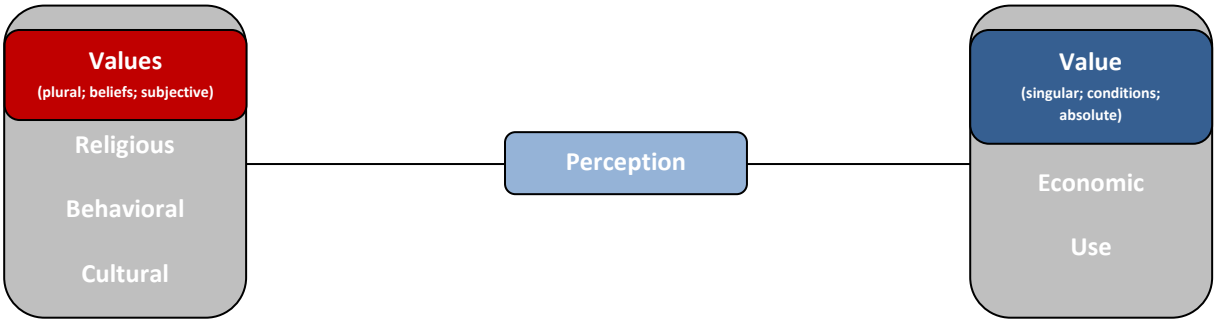


Figure 8 The plural and singular form of value and its influence on perception

5.2 In which psychological components valuation can be decomposed?

Where Jensen decomposed the concept of value in a plural and singular form and its influence on perception, Kahneman and Tversky researched the psychological drivers of people's decision making and its influence on value perception. Kahneman and Tversky worked together in a long and unusually close collaboration and did research to the territory that Herbert A. Simon had defined and named 'the psychology of bounded rationality' (Simon, 1955).

5.2.1 Valuation through cognitive systems

Kahneman and Tversky constructed a model to express the cognitive systems which formed the basis of the way people value. It was a two system view in which intuition was named as system 1 and reasoning as system 2 (Kahneman, 2003). In terms of rationality and irrationality, the system of intuition could be set as the irrational component and reasoning as the rational component. However, to mark intuition or for instance emotions as irrational is argued by some researchers. Psychologists have provided strong evidence that emotions guide actions in situations of imperfect knowledge and conflicting goals (bounded rationality) (Oatley & Johnson-Laird, 1987; Damasio, 1999; Scherer & Tran, 2001). People's mind works from intuition and reasoning (Kahneman, 2003) and the emotional part in intuition is an important aspect for valuation. Neurologists (Damasio, 1994; LeDoux, 1998) have shown that reasoning alone does not enable people to make good social/ economic decisions if they are separated from their emotions. Emotion is important in these decisions, because it can instantaneously influence brain activity and response, with major emotion processing capacities in much older sections of the brain with access to stimuli. In this context it is certainly possible that the brain can mark something as good or bad before it knows exactly what it is (LeDoux, 1998). An important quality of emotions is that they can have an algorithmic quality. They tend to follow repeated patterns or rules, conditioned over the long course of people's development and engaging physiological reactions and various mental functions (Damasio, 1999). These emotions form the basis of the rational intelligence in these situations (Loch, 2007). Besides the short discussion just mentioned, it is not in the scope of this research to discuss rationality and irrationality of the way people value from a philosophical point of view. In this research, rationality is meant in the way and people's choices or judgments are in line with calculative results or measurements. Irrationality is meant in the way that people's choices and judgments are not in line with possible calculative results or measurements.

Besides intuition and reasoning, perception was also part of this model, but not part of the systems. It was expressed as the perceptual value of system 1 and system 2. The model of Kahneman and Tversky shows direct linkages with the decomposition of Jensen (2005). The economic and use value could be part of reasoning and religious, behavioral and cultural values part of intuition. In the system model of Kahneman and Tversky, perception is separated from system 1 and system 2, but in its psychological process it has the same characteristics as intuition. The model with the two cognitive systems is given in figure 9.

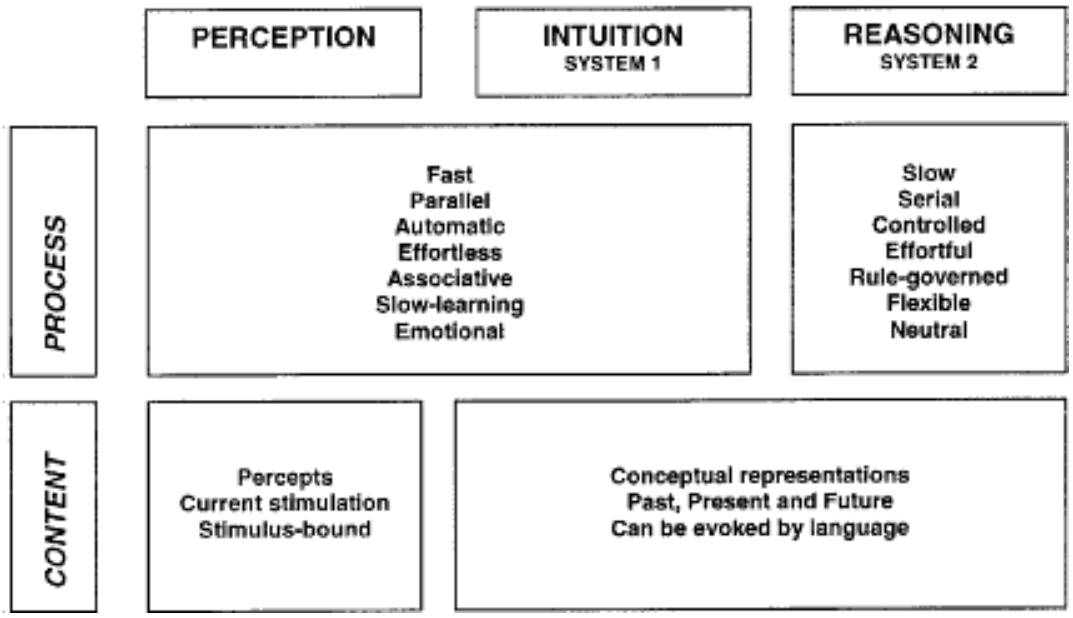


Figure 9 Process and content in two cognitive systems
Source: Kahneman (2003)

The differentiation between system 1 and system 2 was already translated to rationality and irrationality, in which intuition was marked as irrational and reasoning as rational. Together, they form the conceptual representation, as given in figure 9. Perception was in this figure segregated from the conceptual representation in its content. According to the model of Kahneman and Tversky, perception forms the reflection of the conceptual representation. Further is it important to say that that Kahneman and Tversky purely focused from an psychologically point of view. Intuition and reasoning are mental systems to process information for decision making.

5.2.2 Secondary situation

Where Kahneman and Tversky focused on the cognitive mental systems, Goddard (2003) researched people's observation more from an interactive point of view. He defined a primary and secondary situation in people's detection of the environment. The primary situation was formed by the environment and the secondary situation by the detection of the environment. This is presented in figure 10. The difference between the primary and the secondary situation can be explained by the example of color. From the viewpoint of the primary situation it could be stated that no object has an intrinsic characteristic related to color, but a characteristic to absorb or reflect certain wavelengths of light. However, the secondary situation gives the, in this research called, 'detection' of color (Goddard, 2003). This detection is essential for the construction of perception.

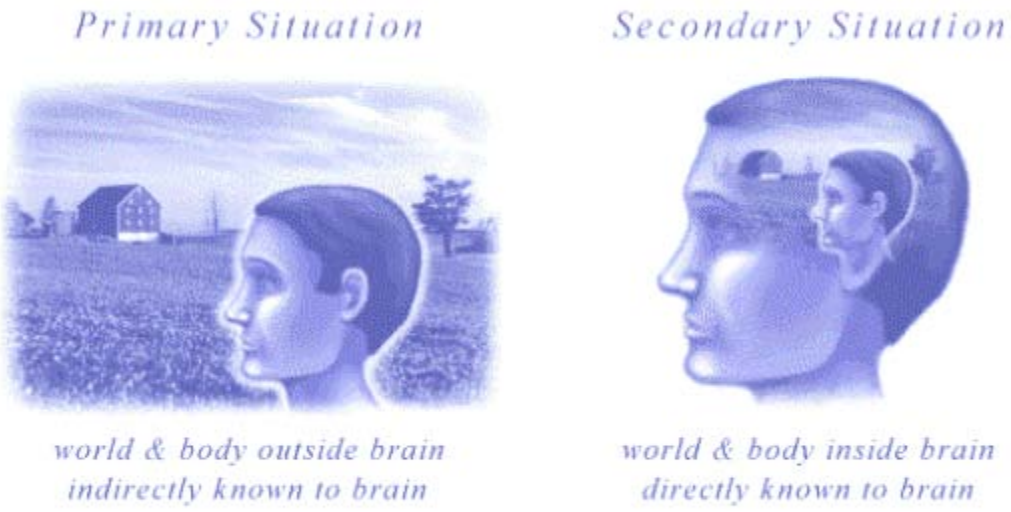


Figure 10 Primary and secondary situation
Source: Goddard (2003)

The example of color gave an indication of detection by people's senses. Detection can work in the way that information can be detected by people through sensory stimuli, like sight, sound, smell, taste and touch. But when elements are not sensory detectable by people, they still can be detected by for instance instruments. This is for example the case for CO_2 and NO_2. People can get information about these measurements, but are not able to measure or control them by their own senses. Detection of certain aspects can also be obtained through for instance media opinions, scientific information, the story of the man in the street, etc. In such situations, information is obtained in another way than by measurement instruments. The secondary situation is composed of the information people obtain through direct or indirect detection.

When the stimuli are translated from the primary situation to the secondary situation, this is called representationalism. Probably, the first representationalist was the French philosopher Rene Descartes, who proposed that sense-data are transmitted via sensory nerves to the pineal gland in the brain wherein they are perceived by the soul as an image of the world. Seventeenth-century philosopher John Locke said that our senses conversant about particular sensible objects, do convey into the mind several distinct perceptions of things (Goddard, 2003).

With the decomposition of people's detection in sensory detection and detection by knowledge, the secondary situation can be constructed. This composition is summarized and presented in figure 11. Although, the secondary situation of figure 11 is decomposed in sensory detection and detection through knowledge, there still exists a certain bandwidth and variability within these elements. Some people can be more sensory sensitive or react differently on the same type of information. It is important to keep this variability in mind and do not present sensory detection as an absolute general value for evaluation.

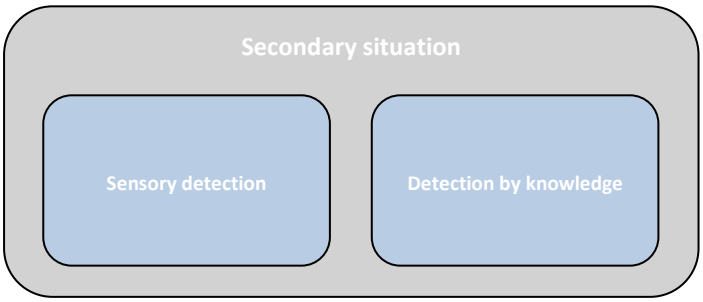


Figure 11 Composition of the secondary situation

5.2.3 Context dependency

Goddard researched the secondary situation as shown in figure 10. He was looking from a physical point of view instead of mental processing, like Kahneman (2003). However, Kahneman also made the coupling with the physical situations in their experiments.

Besides their conceptual mental processing presentation, Kahneman also proved that perception cannot be seen uncoupled from the context. Perception is reference dependent. This was illustrated in figure 12 with the luminance example of the two inner squares have the same brightness, but because of the different brightness of the outer squares they look different. Besides this visual example, they did also several experiments with the perception of temperature when people's hands were hold in three buckets of water with different temperatures. The perception of the temperature in the buckets was dependent of each other.

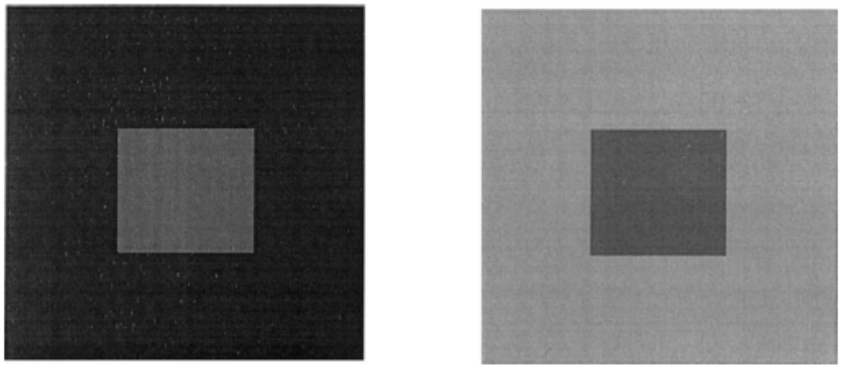


Figure 12 Brightness and reference dependency
Source: Kahneman (2003)

5.2.4 Perception

The detection and context together form the ingredients of perception. Perception was built up from the detection of an object or situation and interpreted in a context. The detection in the secondary situation was derived from sensory detection and/ or knowledge detection (Goddard, 2003). The object or situation in the context could be indicated in this model as the next situation and the perception as a reflection on this total situation. This conceptual model is given in figure 13 and presented in the same lay-out as the primary and secondary situation of Goddard (2003) in the lower section.

The psychological view of Kahneman and Tversky in their system model could be translated to this conceptual model as the mental processing of the secondary situation and the context of this situation. Perception follows from this process. In this research, the focus will be on the detection of object or situation in its context. The mental processing will not be explained in more detail.

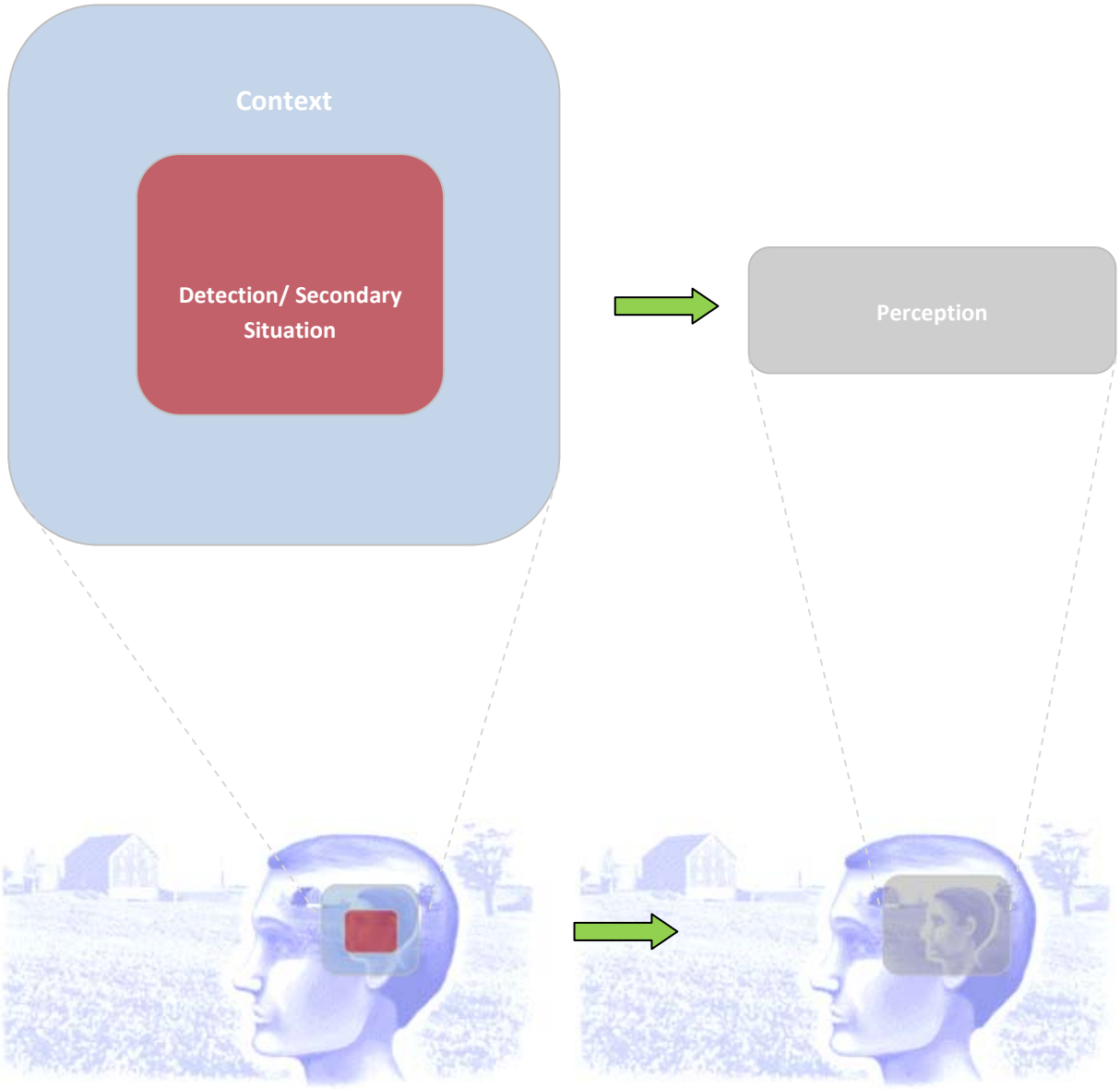


Figure 13 Conceptual perception model

5.3 Which theories describe the psychological principles of valuation?

5.3.1 Axioms of the rational component of valuation

Like earlier mentioned in this report, people make value trade-offs every day and make decisions on these value trade-offs. What has a higher value for them at a certain moment in time. This decision making looks very easy, but is already a topic of research for decades.

According to rationality, this value decision making is described from probability theory. In this theory, the expected value is composed of a certain value and a probability on getting this value. So, for example when there is a gamble in which the probability of getting 100 USD payment is 1 in 80 and the alternative, and far more likely outcome, is getting nothing. Then the expected value of this gamble is 1.25 USD. Given the choice between this gamble and a guaranteed payment of 1 USD, the probability function would answer this choice with an advice to gamble. The question is if people always choose according to this probability function and if not, which basic principles or axioms should be met to prove rational behavior.

St. Petersburg Paradox

The purely rational calculation from the probability theory is in a lot of situations not the way people value and choose. This deviated situation was already described as the St. Petersburg paradox by Nicholas Bernoulli in 1713. Nicholas Bernoulli wrote about his experiment in a couple of letters to Pierre Raymond de Montmort. The problem in the St. Petersburg paradox was published in the St. Petersburg Academy Proceedings in 1738 by Nicholas' brother Daniel Bernoulli and is therefore called the St. Petersburg paradox.

The St. Petersburg game is played by flipping a fair coin until tails comes up. The total number of flips, n, determines the prize which equals 2^n. So, if the coin comes up tails the first time, the prize is $2^1 = 2$, and the game ends. If the coin comes up heads the first time, it is flipped again. If it comes up tails the second time, the prize is $2^2 = 4$, and the game ends. If it comes up heads the second time, it is flipped again, and so on. There is an infinite number of possible consequences. The probability of a consequence of n flips is 1 divided by 2^n and the expected payoff of each consequence is the prize times its probability. Table 3 lists these figures for the consequences where n = 1….10. (Kraitchik, 1942).

Table 3 The infinite payoff of the St Petersburg Paradox
Source: Stanford Encyclopedia of Philosophy

n	P(n)	Prize	Expected payoff
1	½	2	1
2	¼	4	1
3	1/8	8	1
4	1/16	16	1
5	1/32	32	1
6	1/64	64	1
7	1/128	128	1
8	1/256	256	1
9	1/512	512	1
10	1/1024	1024	1

The expected value of the game is the sum of the expected payoffs of all the consequences and since the expected payoff of each possible consequence is 1, the sum is an infinite number. A rational gamble would enter the game if the price of entry was less than the expected value. In this game, the infinite expected payoff is always larger than the finite price of entry. Therefore, a rational gambler would play the game no matter how large the finite entry price was. However, there would not be any gambler who would pay a high price of entry

for this game. This is the paradox between the rational calculation of the game and the irrational decision making to play the game for a certain price.

The reaction of Nicholas Bernoulli on this problem was that this irrational component could be described to the tradeoff in utility of the extra amount of money. In 1728, Gabriel Cramer, formulated this in a letter to Nicholas Bernoulli as follows: 'mathematicians estimate money in proportion to its quantity and men of good sense in proportion to the usage that they may make of it'.

This formulation and the paradox of Bernoulli where seen as the first formulations of marginal utility, graphically presented against the total utility in figure 14. The same amount of additional money was less useful to a wealthy person as it would be to a poor person.

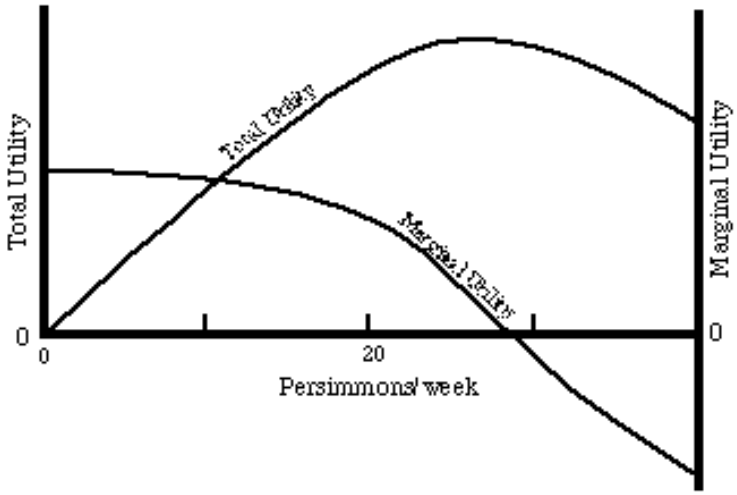


Figure 14 Diminishing Marginal Utility
Source: Friedman (1986)

Von Neumann-Morgenstern axioms

The expected utility function was extended by John von Neumann and Oskar Morgenstern in 1944 with four relatively modest axioms of rationality such that any agent satisfying the axioms has a utility function (Von Neumann & Morgenstern, 1944). Their axioms and consequences for expected utility theory are related to situations of risk. It is an utility theory which uses the principles of rationality to describe people's behavior. In economic modeling, it is the standard to assume that, if people have access to the same information, they will form common subjective probabilities. This is called the common prior assumption (Levin, 2006). Essentially it holds that differences in opinion are caused by differences in information.

The four axioms of the Von Neumann-Morgenstern utility theory are completeness, transitivity, continuity and independence. These axioms will be further explained with several examples (Experimental Economics Center, 2006).

Axiom 1: Completeness

> For any 2 gambles g and g' in G, either g≥ g' and g' ≥ g. This means that people have preferences over all lotteries and can rank them all. In fact, this axiom is related to indifference to one set of options over another. People can always rank a set of possibilities as either better, worse, equal or at least as good/ bad as another.

Axiom 2: Transitivity

For any 3 gambles g, g' and g" in G, if g≥ g' and g' ≥ g", then g ≥ g". If g is preferred to g' and g' is preferred to g", then g is preferred to g". A simple example in this context can be the rank of preferences regarding fruit, like an apple, orange and banana. The apple is at least preferred as the orange, and the orange is as least preferred as the banana.

Apple ≥ Orange

Orange ≥ Banana

then:

Apple ≥ Banana

Axiom 3: Continuity

This assumption states that the upper and lower contour sets of a preference relation over lotteries are closed. Along with the other axioms, there is a continuity to ensure that for any gamble in G, there exists some probability such that the decision-maker is indifferent between the best en the worst outcome. Continuity assumes there is a tipping point between being better than and worse than a given middle option: g≤ g' ≤ g". There is then a probab ility p [0,1] such that p*g + (1-p)*g" = g'. Continuity simply means that there are no 'jumps' in people's preferences. For example, if very large oranges are preferred to apples, large oranges will also be preferred to apples. More abstract, if point A along a preference curve is preferred to point B, points very close to A will also be preferred to B.

Axiom 4: Independency

Independence of irrelevant alternatives assumes that a preference holds independently of the possibility of another outcome: g < g', then for any g" and p (0,1], p*g + (1-p)*g" < p*g' + (1-p)*g". To illustrate this formula with an example, three lotteries X, Y and Z are considered. The independence axiom is an assumption that a lottery X is weakly preferred to a lottery Y, if a compounded lottery that yields X with probability q and some other lottery Z with probability 1-q is weakly preferred to a compounded lottery that yields Y with probability q and Z with probability 1-q, for any lottery Z. Thus, the choice between two lotteries, X and Y, is independent of the possible existence of a common prospect Z (Holt, 1986).

Only when these four axioms are met, the given utility function exists and it satisfies the expected utility properties. In such a situation, a choice can be categorized as rational in the definition of rationality in this research.

Savage axioms

Savage added the subjective aspect to the expected utility model of Von Neumann-Morgenstern. The subjective expected utility model was derived from Bayesian principles in its consideration of probability. The two theories were differentiating in their objective or subjective probability principle. In this way, Savage, extended the model from decisions under risk to decisions under uncertainty. He designed a model that combined three elements: representation of uncertainty, model of preferences and decision making (Savage, 1954). In this subjective model, two factors were incorporated: preferences (value) on the outcome and belief about the likelihood of events (Garnham & Oakhill, 1994). Practically, this can be translated to two subjective concepts, namely a personal utility function and a personal probability function. Savage proved that, people follow the axioms of rationality, if they believe an uncertain event has possible outcomes (x_i) with a certain

utility of $u(x_i)$ and they believe in a subjective probability of each outcome $P(x_i)$. The subjective expected utility is the expected value of utility in such a situation. In a formula this is given by:

Subjective expected utility = expected value of utility = $\Sigma_i\, u(x_i) * P(x_i)$

x_i = possible outcome of an uncertain event

$u(x_i)$ = utility of a possible outcome

$P(x_i)$ = subjective probability of each outcome

For example, a decision about to take an umbrella will take into account the likelihood or degree of belief that it will going to rain and a preference for not getting wet. The degree of belief that it will actually going to rain is represented by the subjective probability (Agusdinata, 2008). This subjective probability related to belief in a certain outcome was expressed in the subjective utility theory of Savage. The axioms of the theory can be summarized in terms of the expected utility theory as:

- Transitivity (preferences: if $g \geq g'$ and $g' \geq g''$, then $g \geq g''$)
- Independency (independent from context: if $g < g'$, then for any g'' and p (0,1], $p*g + (1-p)*g'' < p*g' + (1-p)*g''$)

5.3.2 Valuation theories for irrationality in valuation

Within the theory of expected utility, the only explanation for risk aversion is that the utility function for wealth is concave. A person has lower marginal utility for additional wealth when that person is wealthy, than when that person is poor. However, the expected utility theory is still used in a lot of explanations of decision making under risk in an economic environment. It makes according to Rabin (1999) the wrong predictions about the relationship between risk aversion over modest stakes and risk aversion over large stakes. It is still reasoning from the axioms of rationality with the probability curve as the explaining curve for preferences.

Herbert A. Simon expressed his idea of rationality in people's decision making as follows (Simon, 1955):

> *'Traditional economic theory postulates an 'economic man', who in the course of being economic is also rational. This man is assumed to have knowledge of the relevant aspects of his environment which, if not absolutely complete, is at least impressively clear and voluminous. He is assumed also to have a well-organized and stable system of preferences, and a skill in computation that enables him to calculate, for the alternative courses of action that are available to him, which of these will permit him to reach to highest attainable point on his preference scale.*
>
> *Recent developments in economics, and particularly in the theory of the business firm, have raised great doubts as to whether this schematized model of 'economic man' provides a suitable foundation on which to erect a theory, whether it be a theory of how firms do behave, or of how they should rationally behave. It is not the purpose of this paper to discuss these doubts, or to determine whether they are justified. Rather, I shall assume that the concept of 'economic man' is in need of fairly drastic revision.'*

The statement of Simon was derived from practice that showed that choices among risky prospects show up several effects that were inconsistent with the basic tenets of utility theory. Experiments scientifically proved that for example people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty. Further, it was proven by Kahneman and Tversky that that value function is indeed concave for gains, but convex for losses. People have a natural tendency to value losses higher than gains. This is shown in the steeper part for losses than for gains in the valuation curve. Decision weights are normally lower than the corresponding probabilities, but in the case of low probabilities this does not hold.

Overweighting of low probabilities may contribute to the attractiveness of both insurance and gambling (Kahneman & Tversky, 1979).

So, when decision making does not follow of the axioms of the utility theories, this asks for a broader view on decision making in which the irrational element in decision making is researched. This irrational element was researched for decades and there are at least five influential theories that describe people's decision making (Agusdinata, 2008). These theories are in random order:

- Elimination by aspects (Tversky, 1972)
- Satisficing (Simon, 1955)
- Ellsberg paradox (Ellsberg, 1961)
- Prospect theory (Kahneman & Tversky, 1979)
- Regret theory (Bell, 1982; Bell, 1985)

All theories will be shortly described in their characteristics and deviation from the rationality axioms of the expected utility theory of Von Neuman-Morgenstern or the subjective utility theory of Savage.

Elimination by aspects

Elimination by aspects theory states that people choose a sequence of criteria and for each criterion in the sequence, alternative actions that do not meet the criterion are discarded. At the end there is only one best alternative. Elimination by aspects is applicable to situations of choice between alternatives. Several criteria which can be subjective create a selection of alternatives. It is driven by the search for the best alternative and it can therefore be defined as an optimization method. Elimination by aspects combines satisficing with optimization. Tversky showed that the model can account for certain violations from the independence axiom (Tversky, 1972). Elimination by aspects is an example of lexicographic decision-making, in which attributes are considered sequentially and there is no inter-attribute compensation.

Satisficing

In 1955, Simon was one of the first people who proposed that a theory of rational decision making should take people's cognitive limitations into account. He introduced the term 'bounded rationality'. Satisficing deviates from the Von Neumann-Morgenstern axioms in the same way as elimination by aspects, the independence axiom.

According to Simon, people satisfice, rather than optimize. They look for options which are good enough, instead of the best options. The satisficing method starts with multi attributes criteria with a minimum value for each of the attributes. As soon as an option is found which is above or on the lower bounds, this option is chosen. Although, in these methods the irrational component is taken into consideration, because a set of criteria can be highly subjective, it is not a guarantee that the optimum decision is made.

Satisficing is related to elimination by aspects in the way that they both define a set of criteria. Elimination by aspects is looking for the best alternative within the bandwidth of criteria or in line with an absolute criterion, while satisficing is looking for the alternative which met the lower bound of the criteria. Although, it looks if elimination by aspects creates more value than the satisficing method, research suggests that while maximizers achieve better outcomes, satisficers are more content with the outcomes they achieve (Iyengar et al., 2006). By considering more multi-attribute options, maximizers may be more sensitive to experience regret (Schwartz et al., 2002). For example, aspiring maximizers make more upward social comparisons, thereby inducing regret and counterfactual thinking about what might have been. They rely more on external information sources (Iyengar et al., 2006).

Using the elimination by aspects, the decision which is made is affected by the order of the decision criteria. There is a ranking in decision criteria. In the satisficing method, the decision is affected by the order of the alternative courses of action.

Ellsberg paradox

The Ellsberg paradox deviates from the Savage axioms of the subjective utility theory in the fact that it addresses situations in which people prefer choices with known probabilities than unknown probabilities. The Ellsberg Paradox deviates in that sense from the independence axiom. It can be explained with a short example of a gamble, which was explained by Ellsberg in 1961. In this gamble there is an urn containing 30 red balls and 60 other balls, which can be black or yellow. The gambler does not know the distribution of these balls, but the number of black and yellow balls equals 60. The balls are well mixed so that each individual ball is as likely to be drawn as any other. Now the gambler has the choice:

1.	**Gamble A**	**or**	**Gamble B**
	You receive 100 USD if you draw a red ball		You receive 100 USD if you draw a black ball
2.	**Gamble C**	**or**	**Gamble D**
	You receive 100 USD if you draw red or yellow		You receive 100 USD if you draw black or yellow

From the independence axiom, a gambler should choose for option A and C. However, Ellsberg found in his experiments a strong preference for options A and D. In the first gamble, there is a certainty of chance of⅓ that a red ball is drawn. The chance on a black ball can be higher or lower than⅓, this is unknown. When the axioms of Von Neumann-Morgenstern would stand, gamble C would be preferred over D, because A was preferred over B. In the experiments of Ellsberg, the majority of the gamblers chose option D. This is not in line with the independence principle that states that if A is preferred to B in every possible context, it should be preferred when the context is not specified (Garnham & Oakhill, 1994). The gamblers preferred the⅔ certainty of option D above the unknown chance of option C. This is the basic principle of the Ellsberg Paradox.

Prospect theory

Prospect theory was introduced by the social psychologists Daniel Kahneman and Amos Tversky in 1979 and gives an explanation for irrational decision making under risk. The core of prospect theory consists of three principles, namely:

- Reference point
  People value from a reference state and assess changes in their environment by their decisions in relation to this reference state. The point of reference can be set as the status quo or stakeholder neutral level. When they obtain another level of value than their reference point, they will feel this as a loss or a gain, apart from absolute numbers. This utility in terms of gains and losses was first proposed by Markowitz (1952).

- Loss aversion
  People have a natural tendency to value losses larger than gains. In the theory, this characteristic is explained by the example of weighting the loss of 10 USD over the gain of 10 USD in a gamble. The value function is therefore steeper for losses than for gains (Starmer, 2000; Kahneman, 2003).

- Diminishing value
  In line with the original utility curve, there is a diminishing valuation by people if it has a greater distance to their reference state. In the utility curve, this is called ‘marginal utility’ and is concave in its

curve. Kahneman and Tversky found also marginality at the negative side of the valuation curve from which they experimentally proved that this side of the curve was convex.

These three characteristics form the basis of value function and the weight function in the research of Kahneman and Tversky (Kahneman & Tversky, 1979). figure 15 shows social valuation curve and the graphical presentation of the three core principles of prospect theory.

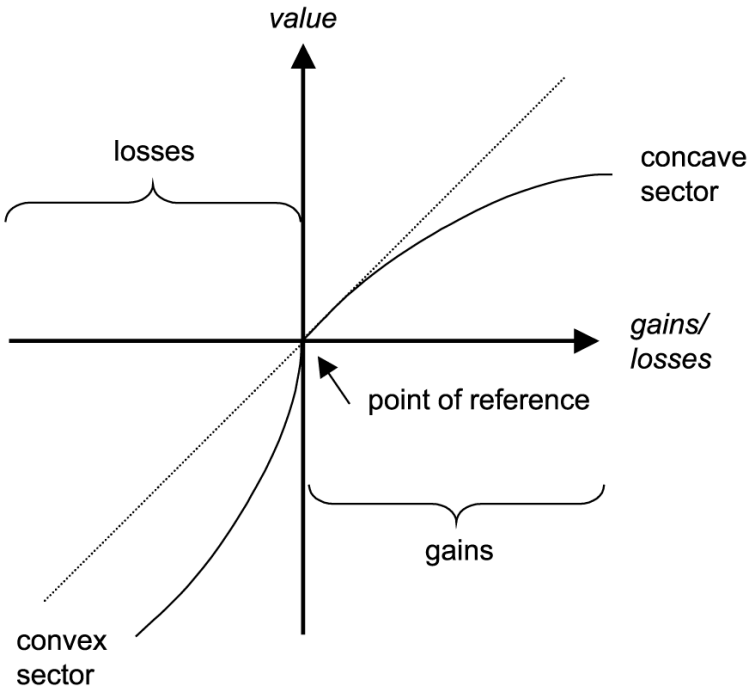


Figure 15 Prospect theory valuation curve
Source: Jacob & Ehret (2006)

Kahneman and Tversky did research to the substitution of outcomes, as stated by the transitivity axiom. The choice experiment is explaining how the results of this experiment deviates from the transitivity axiom (Kahneman & Tversky, 1979):

Choice problem 1 (options in USD):

A: (4.000, 0.80)	or	B: (3.000)
N = 95 [20]		[80]

Choice problem 2 (options in USD):

C: (4.000, 0.20)	or	D: (3.000, 0.25)
N = 95 [65]		[35]

The experiment shows the contradiction between the two choices problems. It permits prediction and description of behavior that deviates from the transitivity axiom (Currim & Sarin, 1989).

Additionally, Kahneman and Tversky also proved that this example was not only influenced by the certainty factor of option B. Therefore, they did another experiment with chances lower than 1.0 (Kahneman & Tversky, 1979):

Choice problem 1 (options in USD):

A: (6.000, 0.45) or B: (3.000, 0.90)

N = 66 [14] [86]

Choice problem 2 (options in USD):

C: (6.000, 0.001) or D: (3.000, 0.002)

N = 66 [73] [27]

Another experiment to test people's behavior against the independence axiom was done by Kahneman and Tversky in their independence test (Tversky & Kahneman, 1992). An overview of the results of this experiment is shown in table 4.

Table 4 A test of independence (Dow-Jones)
Source: Tversky & Kahneman (1992)

		A	B	C	
		if $d < 30$	if $30 \leq d \leq 35$	if $35 < d$	
Problem I:	f	\$25,000	\$25,000	\$25,000	[68]
	g	\$25,000	0	\$75,000	[32]
Problem II:	f'	0	\$25,000	\$25,000	[23]
	g'	0	0	\$75,000	[77]

In the case of independency, f would be preferred to g if f' would be preferred to g'. The results of the experiment show the opposite, f is indeed preferred to g, but f' is not preferred to g'. It illustrates the deviation of people's choices in this situation and deviates from the expected utility model.

Weight function

Besides the value function, prospect theory is also related to the weight function, which describes a non-linear relation between the weight people link to a certain situation and the probability on that particular situation. Empirical research, which is plotted in figure 16, shows the non-linear relation. For events with low probabilities, the estimation weight is higher than its probability. For events with higher probabilities, the estimation weight is lower (Prelec, 1998). This emphasizes the concept of loss aversion which was proved by the experiment of Kahneman and Tversky as part of their prospect theory. They described the decision making situation in which a person could enter a lottery game. A person could enter the lottery game with a 0.001 chance to win 5.000 USD. The other option was a fixed amount of money of 5 USD with 100% certainty. This research 72% of the tested people chose for the 5.000 USD gamble and 28% chose the fixed 5 USD.

Another experiment of Kahneman and Tversky was about a loss game. In this game, people could choose for a 0.001 chance on a 5.000 USD loss or a certain loss of 5 USD. In this situation 83% chose the certain loss of 5 USD instead of the gamble. The experiment showed that people are risk seeking in a loss game and risk averse in a game of gains. It explains the popularity of lotteries and high number of insurances. This experimentally tested results have also a strong relation with regret theory.

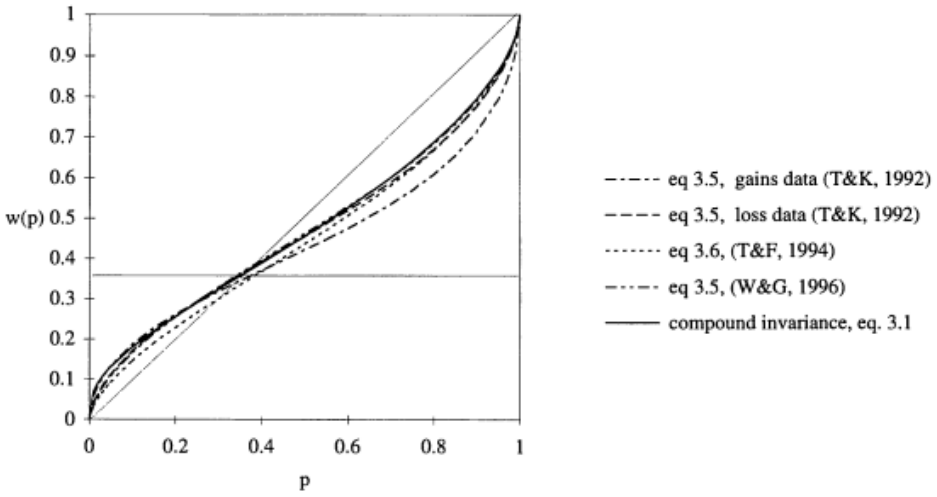


Figure 16 Weight function
Source: Prelec (1998)

Regret theory

Regret theory is focusing on people's emotions which are linked to a certain decision. For instance the chance of rain or sun when they decide to go out for a picnic in the park. The would be disappointed when they chose to picnic and it is rainy. People then make a decision in which these types of emotional responses on the outcomes are taken into consideration in relation to alternative choices (Agusdinata, 2008). Regret theory was experimentally proved by Bell and has a relation with the weight function of prospect theory (Bell, 1982). It gives an explanation for the irrational weighting of people in decision making choice problems with small chances and large consequences. This was already experimentally tested by Allais in his most celebrated and long-standing paradox gamble example (Allais, 1953). The experiment, presented in table 4, was also an example of this decision paradox.

Allais showed that although most people select a prize of 1 million USD for sure rather than a gamble of a 10% chance on 5 million USD, a 89% chance on 1 million USD and a 1% chance of getting nothing. In addition, a majority of the people prefer a gamble offering a 10% chance at 5 million USD and a 90% chance on nothing rather than a gamble of 11% chance at 1 million USD and 89% chance at nothing. In equation form, the two gamble situations are given by:

$$u(1) > 0.10 * u(5) + 0.89 * u(1) + 0.01 * u(0)$$

$$0.10 * u(5) + 0.90 * u(0) > 0.11 * u(1) + 0.89 * u(0)$$

These two equations are contradictory. Even after insight in the expected utility analysis, people wish to act in accordance with their original preferences. This behavior can be explained by decision regret. The idea of getting nothing in the 1% chance is weighting greater in people's mind with respect to the 1% difference in the second equation. It gives an explanation for the weight function of the prospect theory. In the second equation, regret plays a little or no role (Bell, 1982). The deviation from the transitivity axiom which was expressed in regret theory and shows the deviation from the expected utility model (Sugden, 1992).

5.4 What are the parallels between the principles underlying valuation theories and valuation by stakeholders?

Freeman proposed his stakeholder theory as a concept from which business should design their policies and operations. The more stakeholder value is created, the more added value is created in total. Although, Freeman did not give a clear definition of this value and how to measure it. Indeed, when identifying directions for further research, Freeman included the questions of what value really means to stakeholders and how to assess generated value by organizations for its stakeholders (Freeman, 2010).

With the identification of several irrational decision making theories, it is now interesting to look to the appropriateness in the case of stakeholder valuation. Are the basic principles of the theories related to the basic principles on how stakeholders value or judge their environment and the impact of activities on their lives. This paragraph gives the results of the research to the parallels between the identified irrational decision making theories and stakeholder valuation. This is partly supported by quantitative experiments and partly by qualitatively analyses.

The irrational decision making theories had a couple of corresponding characteristics, but were also bounded in their appropriateness for stakeholder valuation. There is a differentiation between social valuation, tested with respect to irrational valuation theories, and stakeholder valuation. The results of the experimentally tested characteristics of the irrational valuation theories and the appropriateness of these irrational theories on stakeholder valuation is therefore important to study.

Stakeholder valuation can be related to risky situations, but also riskless situations. They can have an interest in a certain choice, but most of the stakeholder interests are related to judgment. Stakeholder valuation can be related to monetary units, but a lot of stakeholder issues are not related to monetary units, like for instance the living environment or accessibility. Finally, stakeholders are individuals presented in a group most of the time. Citizens, corporations, NGO's are all stakeholder groups composed of individuals. These stakeholder groups represent a certain interest and opinion.

The irrational valuation theories are described and evaluated towards 9 possible valuation characteristics of stakeholders, derived from the already tested characteristics in the irrational valuation theories:

- Riskless
- Risk
- Uncertainty
- Multiple problem decision making
- Single problem judgment
- Monetary
- Non-monetary
- Individual decision making
- Group decision making

5.4.1 Risk, riskless and uncertainty

Elimination by aspects and satisficing have a lot of equal principles related to stakeholder valuation. The main difference is the choice behavior, in which elimination by aspects searches for the best alternative and satisficing for the first sufficient alternative. The principles of valuation and applicability are further equal in a lot of situations. Elimination by aspects and satisficing are both applicable to riskless choices. Stakeholders can define a set of criteria and assess the alternatives to these criteria. Riskless decision making is for instance the search for a house within certain price boundaries, space and additional facilities. However, these riskless selection of criteria and decision making can follow from criteria which are related to risk behavior. An example is for instance the choice for certain shares with a high return on investment and its corresponding risk on

investment. A research to the elimination by aspects of wool producers in Australia indicated that price and attitude to risk were important factors in all decisions (Murray-Prior, 1994). So, the criteria of elimination by aspects or satisficing can be risk related, although the methods in itself are not designed as a tool for decision making in situations under risk. The same holds for uncertainty. There can be criteria related to uncertainty behavior, but it is not an intrinsic principle of elimination by aspects that it is strictly applicable to situations under uncertainty.

The Ellsberg paradox is applicable to risk and uncertainty decision making. Experiments proved that people prefer risk above uncertainty (Ellsberg, 1961). Risky choices are choices where the outcome is unknown, but the possible outcomes are known with their probabilities. In uncertainty, the probabilities and even possible outcomes are unknown (Knight, 1921). Because Ellsberg paradox is directly related to risk and uncertainty and people's behavior in decision making, it is not applicable in riskless situations. In this research, no examples of the applicability of this theory in riskless situations were found. In addition, it has to be said that Ellsberg paradox can also be used in situations with a bandwidth of uncertainty or risk. This bandwidth is more related to uncertainty than risk, which is in this research defined as a situation with known probabilities.

Prospect theory is a theory which focuses on the decision making of people under risk. It explains elements of the irrational component in people's decision making and valuation (Kahneman & Tverksy, 1979). After the broad analysis of decision making under risk, Kahneman & Tverksy researched the applicability to riskless choices. They did several experiments to the sustainability of the principles 'reference state', 'loss aversion' and 'diminishing value' in relation to riskless choices (Tversky & Kahneman, 1991). Kahneman, Knetsch and Thaler (1990) tested the 'endownment effect' in a series of riskless experiments. Their most influential test was the experiment in which half the participants were given a mug and were asked to state, for a given list of prices, whether, for each price, they would give up the mug in exchange for that amount of money. They were asked for their willingness to accept. The remaining participants were asked to state, for a given list of prices, whether, for each price, they would be willing to pay that amount of money to obtain the mug. They were asked for their willingness to pay. According to traditional choice analysis, there should be almost no difference between these two aspects. However, the experiment results indicated large differences between the two levels. The median willingness to pay was 2.25 USD and the median willingness to accept 5.75 USD. The 'endowment effect' was explained by a shift in reference state. Not only in the case of risky choices, but also in the case of riskless property trade-offs, the principles of prospect theory were applicable. That prospect theory was also applicable under uncertainty was proven in the advanced version of prospect theory in which they also researched uncertainty (Tversky & Kahneman, 1992).

The last irrational theory which was described was regret theory. Regret theory is directly related to opportunity costs or losses. These losses have their influence on decision making. The implication of opportunity costs or losses can be related to risk or uncertainty and regret theory was therefore initially intended as a theory for decision making under risk or uncertainty (Bell, 1982). However, regret theory can also be applied in choice problems with for instance two certain options. In this case there is choice under risk, but a critical voice could say that the future possible regret is related to risk or uncertainty. Therefore, the applicability of regret theory in riskless situations is not clear or proven.

5.4.2 Multiple and single problem decision making and judgment

When it comes to decision making, this is related to choices and judgment of these choices. Stakeholders do not have to make decisions all the time, but judge for instance possible alternatives or a single option. However, in this research, judgment is taken into account as part of decision making. To make a decision or choice, the judgment of alternatives or risks is part of the decision making process. Kahneman said about this: 'the psychology of judgment and the psychology of choice share their basic principles and differ mainly in content' (Kahneman, 2003). So, choice and judgment can assumed if they are common in their psychological valuation principles.

However, a differentiation can be made with respect to the principles of the irrational valuation theories. Are they intended to apply in multiple option decision making or choice or are they also applicable in single option judgment. This is an important characteristic in stakeholder valuation applicability.

Elimination by aspects is related to criteria which form the fundament for selection of alternatives. The method was intended to choose the best alternative from multiple options within the bandwidth of criteria. So, a single option can be judged along the criteria from this method, but this is not the basic intention of the method. The same situation holds for satisficing. In this method, a single alternative can be judged and selected when it is in line with the set of criteria, but this is also not its intention for use.

The basic principle of Ellsberg paradox is that risk is preferred over uncertainty in situations of choice. It is applicable in multiple choice problems under the condition that the choice problems contain risk and uncertainty differences. This condition makes this theory only applicable under certain conditions of multiple option decision making. Single option judgment cannot be analyzed with Ellsberg paradox, because it is a theory of choice.

Like already mentioned by Kahneman, 'the psychology of judgment and the psychology of choice share their basic principles and differ mainly in content'. The applicability of prospect theory is therefore broader than only multiple choices. It is also applicable to single option judgment situations. The basic principles of prospect theory, 'reference state', 'loss aversion' and 'diminishing value' hold for multiple and single option situations.

Finally, regret theory has a strong judgment component in the way that opportunity losses or gains are judged and are leading for the decision making of stakeholders (Sugden, 1987). The core principle of the theory is the influence of the possible regret of a decision on this decision on beforehand. Although, a single option problem can be judged on its possible regret, the intention of the theory is initially related to multiple choice problems instead of single option judgment.

5.4.3 Monetary and non-monetary outcomes

Besides monetary criteria, elimination by aspects can also contains non-monetary criteria. It can even be the case that all criteria are non-monetary aspects. This is also the case when combining elements like risky or riskless choices and non-monetary aspects.

Satisficing can also have non-monetary criteria. When these criteria are met in a certain alternative, this alternative can be chosen. It is applicable to monetary and non-monetary outcomes.

Ellsberg paradox is also related to monetary and non-monetary outcomes. The basic idea of the theory is that chances are preferred over uncertainties. The outcome of such a situation can be a non-monetary or monetary outcome.

In the experiments of Kahneman and Tversky, the decision making was related to monetary outcomes. However, monetary outcomes are only a part of the concept of value expression. In stakeholder valuation it is therefore important that the principles of prospect theory are also applicable to non-monetary outcomes. Kahneman and Tversky did in 1979 already research to the applicability on non-monetary outcomes. They did an experiment and presented two problems to the people in the experiment:

Choice problem 1: (N=72)

A: 50% chance to win a three-week tour of England, France and Italy
[22]
B: A one-week tour of England, with certainty
[78]

Choice problem 2: (N=72)

C: 5% chance to win a three-week tour of England, France and Italy
[67]
D: 10% chance to win a one week tour of England
[33]

It showed that the transitivity axiom was not met in a non-monetary example. The way people value was related to gain and losses instead of only absolute monetary terms. Research of Leclerc et al. (1995) indicated that people make decisions involving time losses consistent with prospect theory. Although, the choice problem shows a broader applicability than only monetary outcomes, it can be discussed that prospect theory is only applicable to properties. This distinction is not made in the presented choice problem. To prove the broader applicability to non-monetary aspects, another experiment was done by Kahneman and Tversky, the 'Asian Desease' problem. This experiment concerns an upcoming outbreak of a rare disease expected to kill 600 people. Participants were asked to choose between two proposed programs to combat the disease. The given options were (Tversky & Kahneman, 1981):

Choice problem 1:

Program A: 200 people will be saved

or

Program B: Probability of ⅓ that 600 people will be saved and a ⅔ probability that no people will be saved

Most of the participants chose program A.

Choice problem 2:

Program A': 400 people will die

Program B': Probability of ⅓ that nobody will die and a ⅔ probability that 600 people will die

Most of the participants chose program B'.

From the viewpoint of 'expected utility', in terms of lives saved , programs A' and B' are equal to programs A and B. The presentation of the outcome had influence on the decision making of the participants. The description focused on gains or losses and had in its formulation a substantial impact on the decisions made. The reference state was influenced by the presentation of the options and the principle of loss aversion. So, there is empirical support that loss aversion and reference state of prospect theory can also be linked to non-monetary situations.

In regret theory, the theory holds for both monetary and non-monetary outcomes. The example was given about the picnic with a chance of rain. In such a situation, the opportunity loss of sitting in the rain is not related to monetary circumstances, neither a picnic itself. Another example was the difference in regret when losing a mug. The difference in regret was expressed in the willingness to pay and willingness to accept (Tversky & Kahneman, 1992; Köszegi & Rabin, 2003).

5.4.4 Individual and stakeholder group decision-making

All the irrational decision making theories were proposed after experiments on an individually basis. However, stakeholders operate in groups most of the time. Stakeholders are normally a group of people which are categorized on their interest. Wolfe and Putler (2002) argue that individuals in stakeholder groups most of the time do not have homogeneous preferences. Although, not all stakeholder participants in the same group have to adopt the same opinion, it is assumed that there is a uniform presented opinion or interest in practice. When there are more problematic differences on opinions or interests, normally the stakeholder group will be divided in smaller subgroups. Sometimes such a distribution is related to the stakeholder's geography.

Although, stakeholders are groups of individuals, the applicability of the irrational decision making theories is researched for group decision making. Are the principles of the theories also appropriate to choice problems for stakeholder groups?

Elimination by aspects and satisficing set certain criteria. These criteria can be expressed by an individual, but also as the criteria of a certain group. The group has to define the criteria for the whole group. This process can be more difficult, than the criteria for an individual, but the individual criteria can be translated to a summation of the criteria for the group. When all criteria are taken into account, this can have its influence on the final chosen alternative. It is also possible that the most mentioned criteria form the basis of decision making. It limits the possibilities for a sufficient solution for all stakeholders when the interests and criteria are different from each other. The result can be different in group decision-making, but the principles of the methods are the same.

The principles of Ellsberg paradox are applicable to individuals and groups. It is scientifically proven that people prefer chances over uncertainties in their choices (Ellsberg, 1961). This is the same for groups as for individuals. Ellsberg paradox is therefore applicable to group decision making.

Prospect theory was originally tested in the experiments on individual's decision making, but were resulting in general decision making principles (Kahneman & Tversky, 1979). The reference state, loss aversion and diminishing value were highly related to individual valuation, but showed consistency in their principles on a group scale. Steel and König (2006) noted that many individual-level decision-making theories and biases about valuation principles apply to groups of individuals.

The principle of opportunity losses or gains of regret theory were researched in an individual decision making situation. However, this setting is not dependent on the scale of the group. It can be applied to individuals and organized individuals in a stakeholder group. The principles are not dependent on an individual or a group.

5.4.5 Applicability analysis of irrational valuation theories in relation to stakeholder valuation

The irrational valuation theories were all analyzed on their applicability and intention of applicability on several aspects of stakeholder valuation. The overview of theories and stakeholder valuation aspects is given in table 5. 'Green' means appropriate, 'orange' means partly appropriate or appropriate under certain conditions and 'red' means not appropriate. It is shown that prospect theory is the most appropriate theory to the stakeholder valuation aspects. Especially, the difference between prospect theory and the other theories when it comes to single problem situations or judgment is notable. This can be lead back to the fact that prospect theory is strongly related to context factors in its principles and is therefore more appropriate to judgment of multiple and single options.

Although, all the theories are separately defined and given in their description and in table 5, they have common principles. For example, the criteria of elimination by aspects or satisficing are influenced by the reference point of the stakeholder. A change in reference point can result in a change in criteria for these valuation theories. Besides, elimination by aspects is related to regret theory in decision making and possible

regret when not the best option is chosen. Ellsberg paradox is about the preference for risk instead of uncertainty. This is in line with loss aversion from prospect theory and regret theory. The opportunity loss of for instance a certain alternative results in a loss aversive attitude of stakeholders and preferences for risk instead of uncertainty. Like already mentioned, prospect theory and regret theory are related in the principle of loss aversion. In addition, regret is constructed from the reference state of the stakeholder.

Table 5 shows also a segmentation in theories, where elimination by aspects and satisficing are very similar in their valuation principles and prospect theory and regret theory have a lot of common characteristics. Ellsberg paradox is more focusing on risk and uncertainty in multiple problem decision making and is less general appropriate in that case.

With the broad applicability and comprehensive scope of prospect theory, this theory is chosen to explain in more detail. In this explanation, the reference state and its possible influence on people's perception of value will be of central attention.

Table 5 Theory appropriateness analysis on stakeholder valuation aspects

Aspects / Theory	Riskless	Risk	Uncertainty	Multiple problem decision making	Single problem or judgment	Monetary	Non-monetary	Individual decision making	Group decision making
Elimination by aspects									
Satisficing									
Ellsberg paradox									
Prospect theory									
Regret theory									

5.5 In which way can underlying valuation principles affect the valuation of port activities?

The former chapter showed most influential theories for people's behavior in valuation decision making. The test and evaluation of the theories was resulted in the statement that prospect theory was most appropriate to stakeholder valuation, both in intention and content. The distinctive characteristic of prospect theory was its focus on the context of social valuation. The three core principles, 'reference state', 'loss aversion' and 'diminishing value', were all context factors. This made the theory also appropriate in stakeholder valuation.

The core principles of loss aversion and diminishing value were dependent of the reference state or point of the stakeholder. Not in its content, but in the appearance of these principles. Because of the structural importance of the reference state, this principle will be explained in more detail.

5.5.1 Factors of influence for the definition of the reference state

Besides the detection of the environment in the secondary situation, this detection has also a certain context. This context was already explained in the principles of prospect theory. This theory had three core principles, namely reference state, loss aversion and diminishing value. Loss aversion and diminishing value were constructed from the reference state. Without the reference state, these principles could not be constructed. The reference state determines the perception of value and is a main element of people's context valuation. When for example a company improves its technology so that the amount of emissions decreases, but it is still below the reference state of the stakeholder, the increase of value will be experienced as an avoided loss.

On the other side, when again a company performed above the reference state, but decreases its performance, the new situation will be experienced as a forgone gain by the stakeholder. This situation describes the paradox between absolute performance and stakeholder perception from his or her reference state. According to Lankoski et al (2011), the level of the reference state is derived from three main drivers, namely: status quo, external comparison and internal aspiration.

Status quo

When the reference state is in line with the status quo, people value regarding the recent past performance of the company. When the performance is better than the status quo, this will be experienced as a gain. When the performance is lower than the status quo, people will experience this performance as a loss. This valuation is related to the recent past experienced performance by the stakeholder. The reference state is therefore highly dependent on performance over time, and can change over time (Lankoski et al, 2011).

External benchmark

When stakeholders focus at value in comparison to an external benchmark, the reference state is derived from the performance of this benchmark. Such benchmarks can be taken from norms, markets or ideals. Stakeholders are valuing regarding regulations or for instance competitors. In the case of ideals, benchmarks are created by using best available technology or best available practices. Two special reference states in this case are the ideal state and the zero state.

The ideal state stands for the situation when a stakeholder values performance towards the ideal state, as imagined by the stakeholder. In practice, this means that for instance a company can only operate on the loss side. When it tries to improve its performance it will be experienced as an avoided loss. A company can only reduce the gap from the ideal situation, but cannot exceed it and perform in such a way that stakeholders experience it as a gain. This is only possible if this company can perform better than the ideal state of the stakeholder. An example is the case of greenhouse gas emissions, in which a commonly quoted ideal is carbon neutrality. Emissions mean a loss and less emissions mean an avoided loss. Only when greenhouse gasses are reduced separately from the companies' business, this can be experienced as a gain in relation to the ideal reference state. This reference state is not fixed an can change over time.

The other special situation is the zero state. The core of the zero state concept is the comparison of the companies' performance with the situation without the existence of the company. In contradiction to the ideal state, the zero state is fixed in time. The comparison with the situation without the company can change in value, but not in reference state. This is an example in which performance is analyzed to the existence of the performance producer. In this situation, the total stakeholder experience is translated into a 'good' company or a 'bad' company (Lankoski et al, 2011).

Internal aspirations

Finally, stakeholders can also derive their reference state from internal aspirations. These internal aspirations are sometimes less clear than external benchmarks or the status quo. The internal aspiration can be derived from external yardsticks, but can also be derived from his or her beliefs, morals and ethics about a company's performance (Lankoski et al, 2011). This reference state is leading when the stakeholder evaluates the performance and can also change over time.

The different fundaments of the reference state are given in the in this research proposed framework of figure 17. This framework can be used as a tool to construct people's perception from a situation or object and its context.

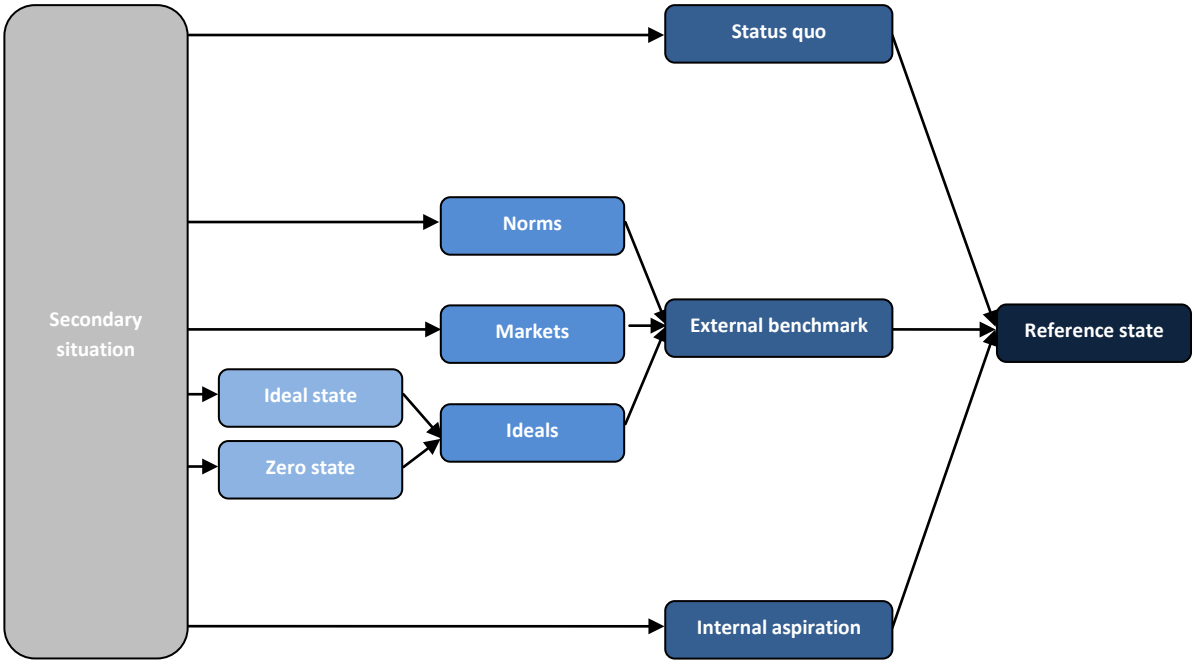


Figure 17 Reference state framework

Which reference state

From the analysis of the reference state it was shown that people can value from different motivations. To map the stakeholder value it is important to determine which reference state has taken into account. In fact, a unique reference state cannot be found, because stakeholders can have different reference states (Lahdelma & Salminen, 2009). For example, a government can take the laws and regulations as a reference state, while on the same topic a NGO can have the zero state as reference state.

Also within stakeholder groups, people can have different reference states, because stakeholder groups are not homogeneous most of the time (Wolfe & Putler, 2002). For example, one stakeholder person can adopt the past corporate responsibility performance level of the company as a reference state, another the corporate

responsibility performance level of the key competitor, and for a third one the corporate responsibility performance level of the most proactive company that he or she is aware of (Lankoski et al, 2011). In addition, a stakeholder can also have a certain internal aspiration about stakeholder value and derives his or her reference state from this belief. So, reference states can be very different within stakeholder groups and influenced by internal and external factors. It is difficult to point out one reference state in a certain situation or for a certain object.

External information and internal involvement

Reference states can be derived from three different perspectives, in which different factors are leading to the choice of the reference state. For reference states which are derived from external benchmarks, information is the most important source. The more information is available, the better a stakeholder can define its arguments for the chosen reference state. The stakeholder derives his or her reference state from external information.

For reference states, derived from internal aspirations, internal involvement is the most important component. The issue at stake has to be important for the stakeholder and that the stakeholder is sufficiently involved to set an internal goal (Klein & Oglethorpe, 1987). The segmentation in external information and internal involvement is shown in figure 18. Although, the ideal state and zero state reference can also be influenced by internal aspirations, it can be more reflected on general societal ideals than internal aspirations, which can be highly personal.

To make it more clear, it is important to mention that a certain issue can be of equal importance for a stakeholder, independent from the reference state derived from external information or internal involvement. Involvement is in this context not meant as the level of importance for the stakeholder. It can be that the stakeholder's reference state about an issue, derived from the status quo, is of much more importance for him or her than an issue derived from internal aspirations.

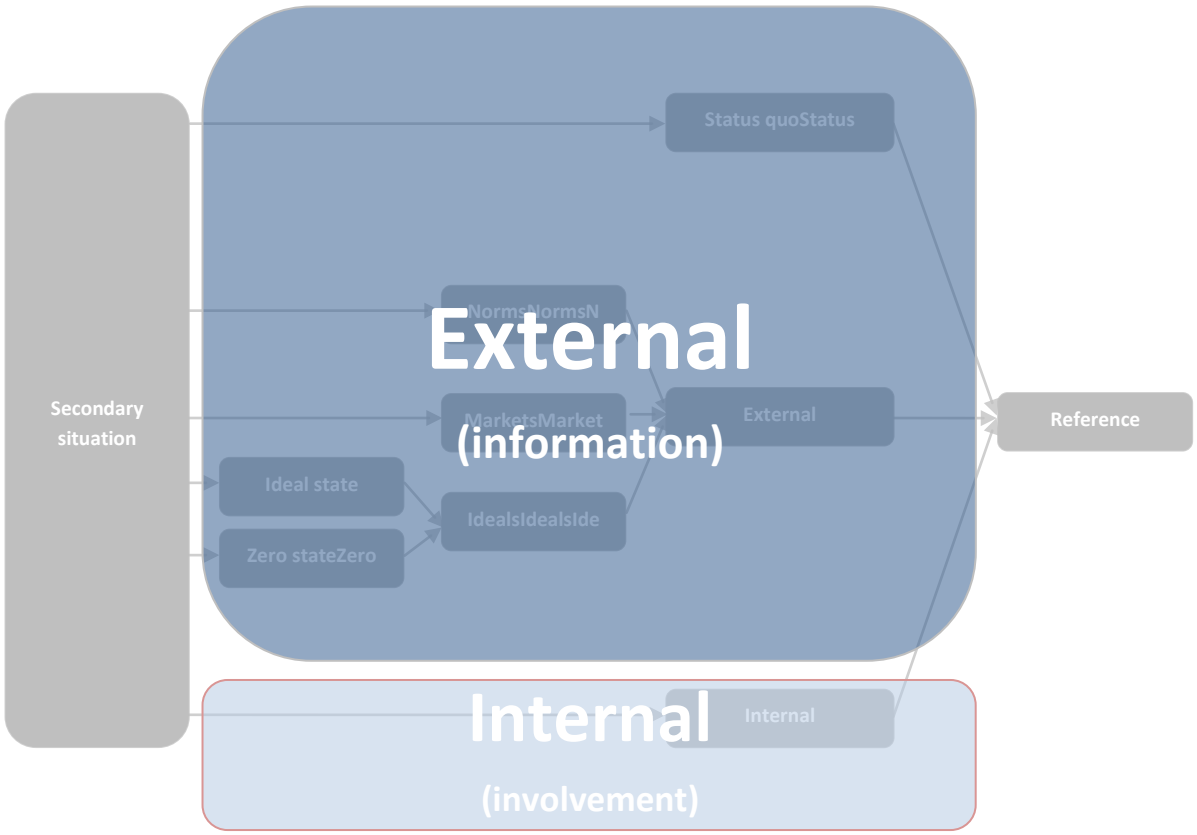


Figure 18 Reference states translated to factors of influence

5.5.2 Composition of perception value

In this report, perception was already explained in a value concept context. Besides, perception was researched and described from the way people value. It became clear that perception is the combination of 'detection' and 'context'. This together forms people's perception and perception is leading for social valuation. With the research results of detection and context, this conceptual model can be translated to a formula for people's perception. In a formula this could look like:

Perception = Detection – Reference State

Detection and reference state were explained in this report. These two components were decomposed in smaller parts and considered on their input drivers. These input drivers are essentially for the strategic plans of companies and institutions. An overview of the earlier defined decomposition and related drivers is given in table 6.

Table 6 Drivers of detection and reference state

Detection			Reference state	
Type	**Driver**		**Type**	**Driver**
Sensory	People's senses		Status quo	External information
Knowledge	Information and communication		External benchmarks	External information
			Internal aspirations	Internal involvement

Besides, the presentation of detection and reference state in table 6, the components of perception can also be graphically expressed. This graphically expression is in accordance with the graphical presentation of prospect theory (Kahneman & Tversky, 1979; Deloitte, 2012) and is given in figure 19 for positive perception and in figure 20 for negative perception. In this graphical presentation, the blue dot is the reference state or reference point of the stakeholder. The green dot is the performance or situation above the reference point and the red dots are performances or situations under the reference point. The distance between the performance or situations levels and the reference state are given and indicate the dimension of the positive or negative perception.

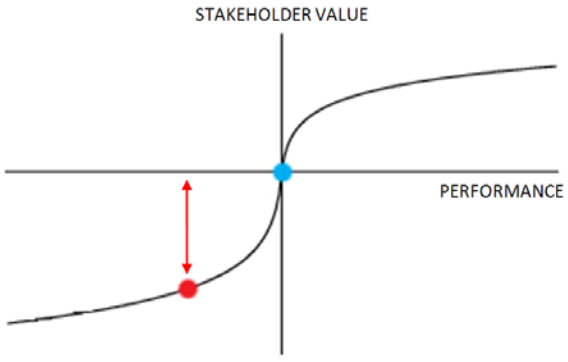


Figure 20 Graphically presented negative perception

Negative detection point (example)

Reference state

Negative perception

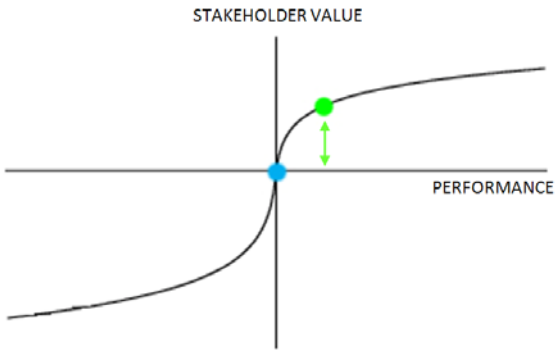


Figure 19 Graphically presented positive perception

Positive detection point (example)

Reference state

Positive perception

5.5.3 Possible effects of reference states in stakeholder's evaluation of policies

Additionally to the theoretical decomposition of people's perception and related valuation, this research will also focus on the impact of perception on people's opinion and on public decision making. It will be researched in a qualitative way.

The impact of perceptional value categorization

The graphical expression of prospect theory showed social valuation from a reference state. This reference state or reference point is essential in the performance categorization of people. When companies or institutions perform below this reference point, people will experience this as a loss or an avoided loss. In more sensitive situations, this can be experienced as irresponsible behavior. Below or on the reference point is valued as responsible behavior (Lankoski, 2011). This category effect can be very dominant in valuation and perception and is therefore important to take into account. The shift from one category to another category will have a greater impact than an improvement within a certain category (Kahneman & Tversky, 1984). The categorization of performance or a situation was given in figure 21.

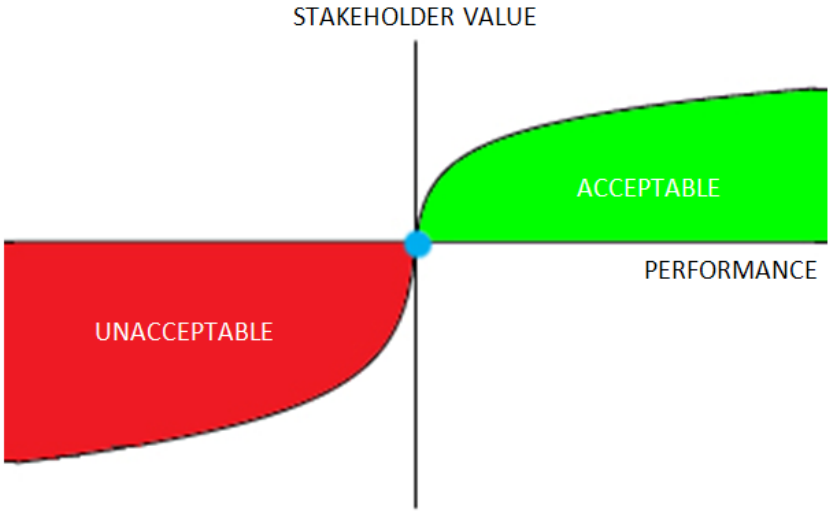


Figure 21 Categorization of created stakeholder value

With the categorization of perception, it is now interesting to translate this into a policy framework. In this report a policy manual is proposed to analyze the value perception of a certain policy. In this context, two evaluation stages for policies were identified, namely norms and reference states. A norm in this context is a general rule, set by the government to which the policy will be evaluated on legitimacy (laws and regulations). It is a clear, quantitative, and rational rule which should be equal for every person or corporation. These norms are dominant in contracts and corporate obligations.

Reference states have another character than norms. Like shown earlier, reference states are less obvious defined, subjective and most of the time irrational. They have a very different character than rules and are more personal. The value perception will therefore be dependent on the reference state instead of norms. However, it has to be said that norms can also be leading in the determination of someone's references state.

For the value perception in this analysis, three levels were identified, namely 'gain', 'neutral' and 'loss'. Neutral means equal to the reference state in this context. Perception was already categorized in 'responsible' and 'irresponsible' or 'acceptable' and 'unacceptable', but now it will be translated to a value perceptional point of view. The perceptional levels of value were categorized in three categories of value: value creation, loss

avoidance, and value destruction. This categorization of value is derived from the ABN AMRO sustainability learning curve, which is shown in figure 22. This figure shows the example of the development of the banking policies regarding sustainability issues. It developed from value destruction to value creation. This development went through several phases of stakeholder participation and perception. It is an example of the impact of different categories of value perception on policy making. The example shows that till 2000, companies which had destructive activities in rainforest could get a funding by banks. After a strong protest event regarding the rainforest funding programs of the Citi Group, the banks stopped the funding of rainforest destructive activities. This lead in 2003 to the Equator principles and finally in 2004 to the general statement of the banks in which they declared to stop funding rainforest destructive projects. This was in line with the reference state of valuation of stakeholders and the banking policy was acceptable for them. They were neutral in terms of gains and losses. However, the banks even further developed their policies and in 2005 JP Morgan Chase set their 'No Go' zones for investment in relation to rainforests (Deloitte, 2012). The banking sector developed in this policy from a value destructive policy to a value creation policy. The example showed the influence of the 'public opinion' beyond agreements or laws and regulations. The development in value categorization was also shown in the valuation curve of prospect theory in figure 23.

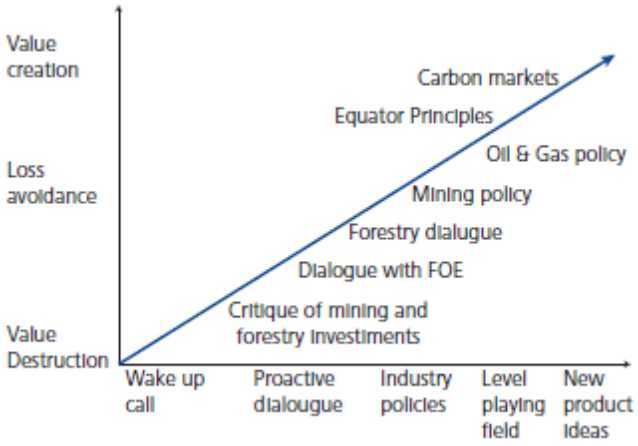


Figure 22 ABN AMRO sustainability learning curve (banking sector example)
Source: ABN AMRO (2005)

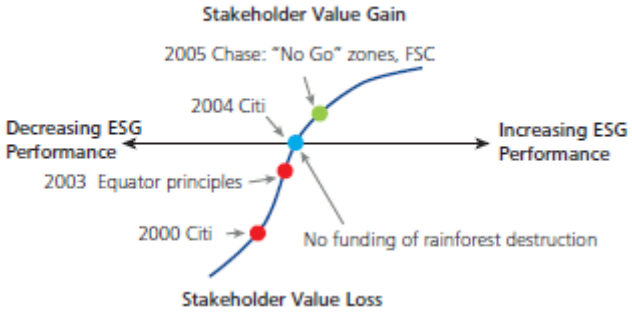


Figure 23 Reference state development (banking sector example)
Source: Deloitte Development LLC (2012)

Stakeholder value evaluation framework

The former paragraph already showed the difference between acceptability regarding general norms and acceptability in the light of perception. These two levels can show great difference from each other. In this paragraph, the difference between the value perception of the created stakeholder value is analyzed regarding governmental laws and regulations and the reference state of stakeholders. This roadmap to the categorization of value is evaluated in sequential steps. The stakeholder value evaluation framework is given in figure 24.

First, created stakeholder value with respect to norms is evaluated. This evaluation is shown in figure 25. Thereafter, created stakeholder value with respect to reference states is evaluated. The manual has three evaluation levels, namely 'above norm/reference state', 'neutral norm/ reference state', and 'under norm/ reference state'. So, this means that stakeholder value can perform above, neutral, or under a norm or reference state. In these evaluations, the stages are marked as acceptable (green) when created value is above or under a norm or reference state, and unacceptable (red) when created stakeholder value is under a norm or reference state. The evaluation of the created stakeholder value with respect to the reference state is given in figure 26.

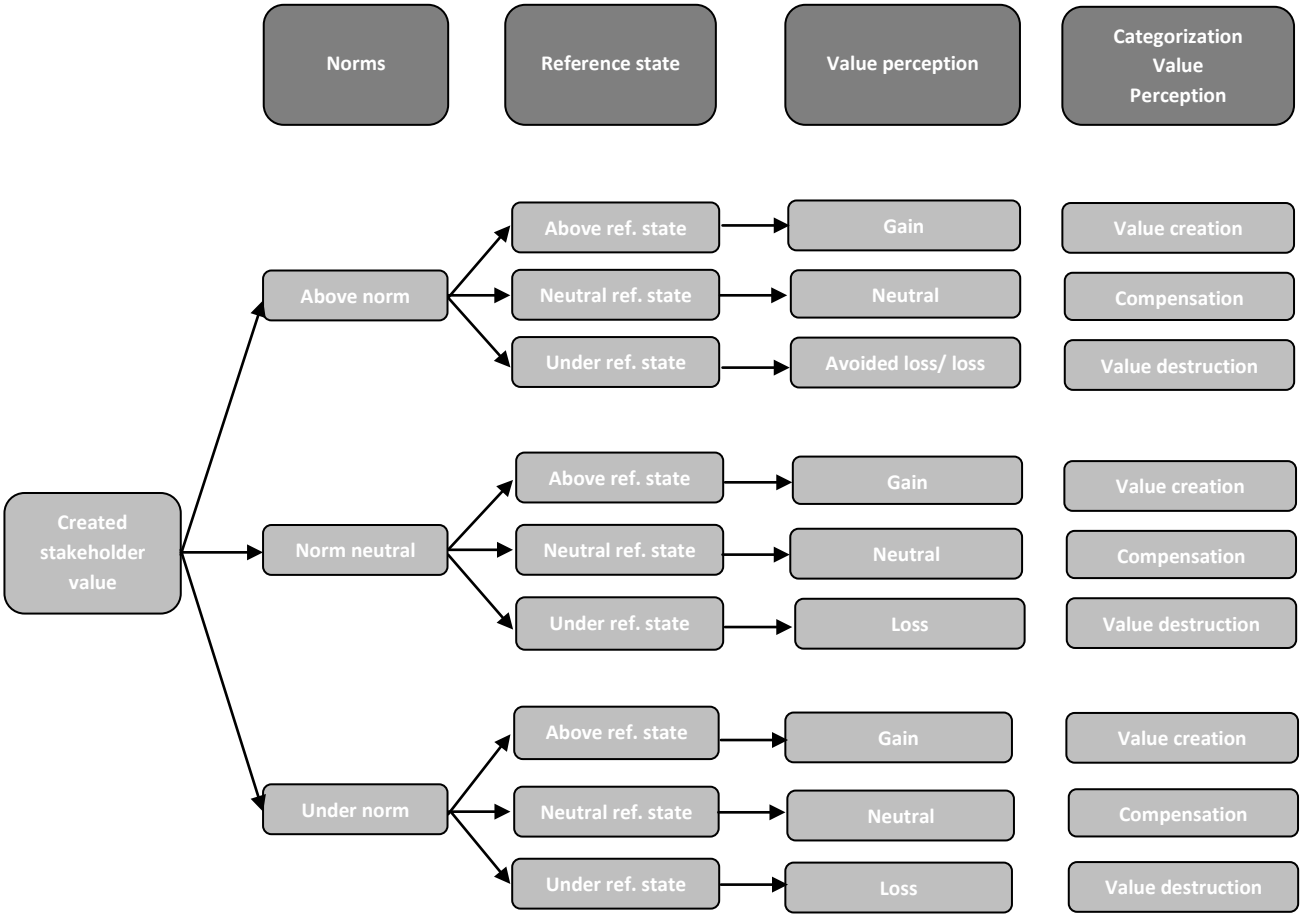


Figure 24 Stakeholder value evaluation framework

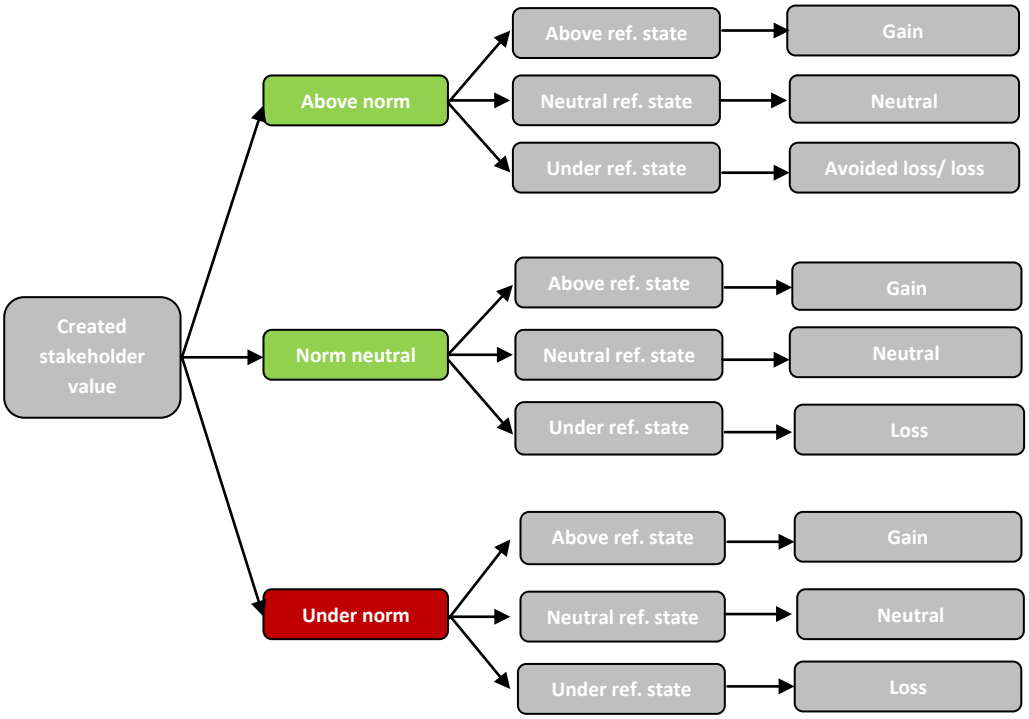


Figure 25 Evaluation of created stakeholder value with respect to norms

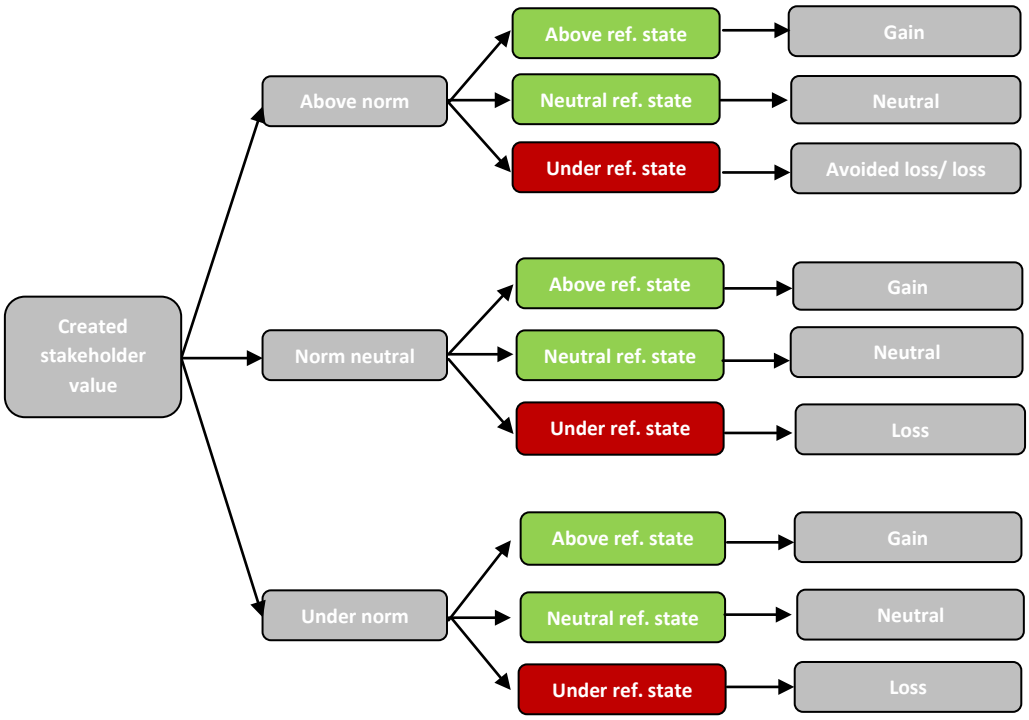


Figure 26 Evaluation of created stakeholder value with respect to reference states

Looking at figure 25 and figure 26, there are two situations of evaluation which are remarkable. Stakeholder value can be created to a level above a norm or norm neutral, but still under the reference state. The value will then be experienced as an avoided loss or loss. This is contradicting with the norm evaluation. On the other side, the stakeholder value can also be created to a level under the norm, but above the reference state. However, this situation will occur less frequently, because laws and regulations normally follow the stakeholders reference state in time. The total valuation framework is given in figure 27.

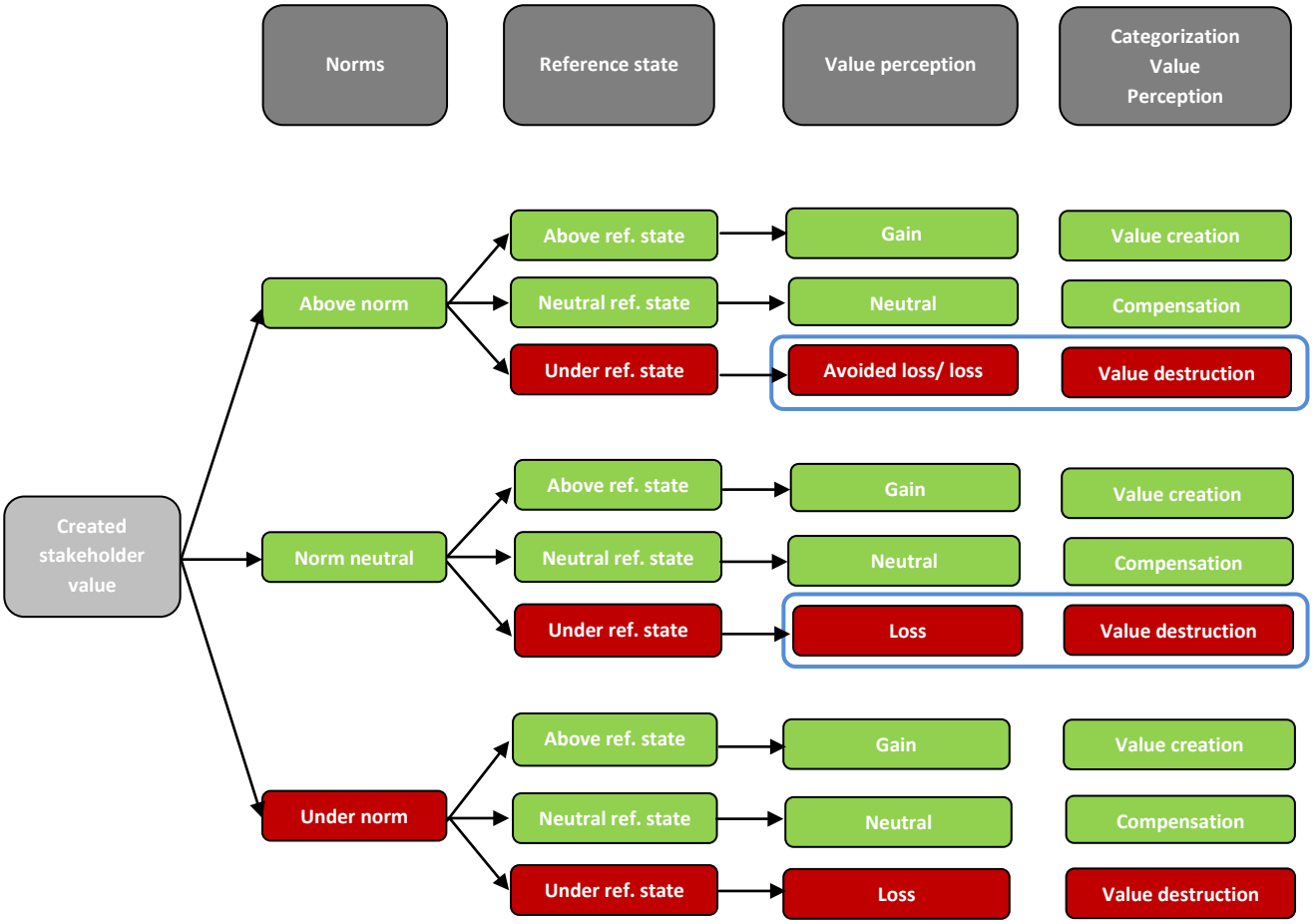


Figure 27 Total evaluation of created stakeholder value

It is shown in figure 27 that there is perceptional creation of value when the created stakeholder value is above the reference state. This is independent of the norm. So, norms can have an influence on the chosen reference state, but are not of influence when it comes to perceptional value creation. In addition, perceptional value can also be categorized as value destruction, although the created stakeholder value is above laws and regulations. This is the case when the created stakeholder value is under the reference state. The creation of stakeholder value beyond norms and under the reference state is experienced as an avoided loss. The difference between the level of created stakeholder value and the reference state is experienced as a loss.

From this analysis two levels of value perception regarding the created stakeholder value need special attention in stakeholder processes in the light of loss aversion, because they could form a non-visible value perception problem when only norms were leading in stakeholder value evaluations. These value perception situations are marked by a blue contour in figure 27 and listed below:

- Created stakeholder value above norm and under reference state
- Created stakeholder value norm neutral and under reference state

5.6 Conclusion CQ2

The second central question (CQ2) was:

> ***CQ 2*** *What are the basic principles of the most appropriate valuation theory regarding social valuation from a stakeholder point of view?*

The answer to this central research questions was found through five sub questions. The first sub question was:

> ***SQ 2.1*** *In which components value can be decomposed?*

Value can according to Jensen (2005) be decomposed in six components. Religious, behavioral and cultural as plural values and economic and use value as singular values. Perception value is differentiated from these other values, because it does not have an intrinsic value in itself. It is the observation of a value and is influenced by plural and singular components of value. Interesting were the similarities with the decomposition of people's psychological drivers of valuation in the second sub question:

> ***SQ 2.2*** *In which psychological components valuation can be decomposed?*

People's psychological drivers of valuation were researched by Kahneman and Tversky (2003) and categorized in two different systems. The model is differentiated in two cognitive systems, system 1 and system 2. These systems are the main psychological drivers for decision making processes. System 1 was translated in intuition and system 2 in reasoning. Perception is also part of the model, next to intuition and reasoning. Although, it is in its process equal to intuition, it is separated from the systems, like also was the case in the differentiation of Jensen (2005). In this research, intuition was marked as the irrational and reasoning as the rational component of people's decision making. Perception was marked as the reflection of intuition and reasoning in this system model.

Goddard (2003) made a differentiation in the detection of the environment. He separates his model in a primary and secondary situation. The secondary situation is the detection of the environment by sensory or information/ knowledge stimuli. This secondary situation cannot seen independently of its context, like was experimentally proven by Kahneman and Tverksy (2003). The combination of detection and context results in perception.

The third sub question was from that point focusing on the representation of people's principles in proven theories:

> ***SQ 2.3*** *Which theories describe the psychological principles of valuation?*

The first central question showed the rational and irrational part of people's decision making. Von Neumann and Morgenstern (1944) researched this rationality and irrationality and stated their four axioms for rational decision making or valuation. These axioms were: completeness, transitivity, continuity and independence. When these axioms were met, people's behavior could be marked as rational. This was in addition on the expected utility theory, which proposes that people were acting from a utility point of view, in which decision making was dependent of probability evaluation. Later this theory was added by Savage (1954) with the subjective utility theory, in which decision making under uncertainty with estimated probabilities was incorporated. The main axioms of Savage was summarized in the transitivity and independence axiom, referred to the axioms of Von Neumann and Morgenstern.

For the irrationality of behavior, five influential and broadly accepted theories were described (Augusdinata, 2008), namely: elimination by aspects (Tversky, 1972), satisficing (Simon, 1955), Ellsberg paradox (Ellsberg, 1961), prospect theory (Kahneman & Tversky, 1979) and regret theory (Bell, 1982; Bell, 1985). These theories

are different in their content or intention, but all have a relation with irrationality in decision making or valuation.

The fourth sub question focused on the parallels between the theoretical valuation theories and stakeholder valuation:

> ***SQ 2.4*** *What are the parallels between the principles underlying valuation theories and valuation by stakeholders?*

Although, the five theories give a broader explanation of the interaction rationality and irrationality in decision making, they were only researched for decision making, and therefore still are experimentally limited in their description towards valuation by stakeholders. The theories were therefore qualitatively and quantitatively tested on nine characteristics, related to stakeholder valuation. These characteristics were: risk, riskless, uncertainty, multiple problem decision making, single problem judgment, monetary, non-monetary, individual decision making and group decision making. The evaluation showed that prospect theory was most appropriate to stakeholder valuation. The principles of this theory were researched in more detail in sub question five. In the fifth sub question the focus was on the influence of the valuation principles of prospect theory on the valuation of port activities.

> ***SQ 2.5*** *In which way underlying valuation principles can affect the valuation of port activities?*

The influence of the valuation principles of prospect theory were analyzed by a proposed stakeholder value evaluation framework. This framework is build on the basic principles of prospect theory, namely: reference state, loss aversion and diminishing value. The influence of the reference state is expressed in the categorization of value creation by the activities of the port authority. The ABN AMRO learning curve (ABN AMRO, 2005) defines three categories of value development: value creation, loss avoidance and value destruction. The corresponding segments, expressed in the curve of prospect theory, were ‘responsible’ and ‘irresponsible’ or ‘acceptable’ or ‘unacceptable’. Although, performance could be above the laws and regulations, people marked it as value destruction when it was below their reference state. It showed the interaction of valuation principles and business practice.

The central question could be answered from the five sub questions in a short answer about the principles of the most appropriate valuation theory regarding social valuation from a stakeholder point of view. The main principles were ‘reference state’, ‘loss aversion’ and ‘diminishing value’. The influence of the application of these principles was shown in the stakeholder value evaluation framework and indicate their importance in strategic decision making. Further was perception constructed of detection and reference state in the expression:

Perception = Detection – Reference State

The curve of prospect theory could be used to further analyze perception consequences.

6. In which way social valuation is incorporated in Port of Rotterdam Authority's strategies and strategic tools to measure the social value created by their port activities?

The theoretical decomposition of detection and reference state or context created insight in people's drivers for valuation. These drivers are important in the set up of strategic plans for companies, institutions and authorities. In this research question, the focus will be on the Port of Rotterdam Authority's strategies and strategic tools in relation to social valuation. In which way this valuation is incorporated in the businesses of the Port of Rotterdam Authority. First of all, the strategies and strategic tools will be researched on their relation and approach towards social value(s). Thereafter, the research will continue with a study to the general determination approach of social value creation of the port authority through these strategies and strategic tools. Finally, this research will form the basis for the research towards the share of social valuation in the valuation approach of the port authority.

6.1 In which way social value creation is measured by the Port of Rotterdam Authority's main strategies and strategic tools?

To gain more insight in the social valuation practice and business of the Port of Rotterdam Authority, the most important strategies and strategic tools are researched on their relation with social valuation. To define the main strategies and strategic tools of the Port of Rotterdam Authority and obtain information about the practical implementation, several interviews were held with people from different divisions within the port authority. Besides, corresponding literature and port documents were studied.

The identified strategies and strategic tools were:

- Port Compass 2030
- Drivers of Change
- Key Performance Indicators
- Portfolio Grid
- Risk Matrix
- Strategic Stakeholder Management (Mutual Gains Approach)

All of these strategies and methods will be shortly described and (partly) qualitatively evaluated on their relation to the determination of the social value creation.

6.1.1 Port Compass 2030

It was already mentioned that the four main scenarios of the port development were translated to two main port visions for 2030, named: 'Global Hub' and 'Europe's Industrial Cluster'. These visions express the ambition of the Port Authority and count 10 conditions for success:

- Investment climate
- Space
- Accessibility
- Shipping
- Environment, safety and living
- Work
- City and region
- Laws and regulations
- Knowledge development and innovation
- Europe

Looking at these factors for success, a lot of these factors are related to social issues. To research the intention and approach of the port authority regarding social values in their Port Compass 2030, one success factor was chosen to research in more detail. This success condition was 'environment, safety and living'. The ambitions towards this condition were qualitatively described by the port authority, and therefore the evaluation is based on several passages with a valuation component.

First of all, the port authority expresses their vision on the development of societal demands. The society will demand a cleaner and quieter living environment. The ambition of the port authority is to take responsibility to cope with these increasing demands. However, the ambition does not give a degree of improvement for a cleaner and quieter port.

> *'Industry and transport have become considerably cleaner in the last few decades, reducing environmental pollution. Nevertheless, the port still has a big impact on its surroundings. The surrounding area wants a cleaner and quieter port. It is largely up to the port community to grant this wish.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 59)*

Further the vision describes not only an increasing demand of society, but also more stringent laws and regulations from government.

> *'Laws and regulations concerning air quality are expected to become more stringent in the future.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 59)*

They express the prospect of new findings about the effects on health and the societal pressure in an open information society. It indicates the influence of context factors.

> *'New findings about the effects on health, the availability of improved technologies and social pressures will lead to more stringent environmental legislation, affecting individual companies and the port complex as a whole. It will involve tightening up existing standards and probably also creating standards for 'new' substances of effects.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 59)*

The statement about the priorities of the Port Authority are also clearly described. The economic component of value has the priority above other components of value.

> *'Nature in the port is important for the quality of the surrounding area. The port should be a place where people like to work and spend leisure time. The port's primary purpose is economic. But if wildlife does not interfere with this, it is more than welcome.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 60)*

It is the port authority's ambition to perform above and beyond legislation. However, the investments to deliver this performance will be weighed against their effectiveness. This is the idea of the Social Return on Investment method (SROI). It says something about the willingness to compensate of the port authority with respect to social issues.

> *'In the course of time, the available environmental space will probably be further reduced by new legislation. Wherever possible, it will be used to allow the port to develop within the legal and regulatory framework. At the same time, specific local nuisance in the area surrounding the port should be dealt with as much as possible. This nuisance could be from noise, traffic congestion, stench or dust caused by port activity. These measures, which go above and beyond legal requirements, will be checked for their cost effectiveness: the cost of reducing nuisance must remain reasonable also in relation to the number of people involved. In addition, green and recreational facilities can be improved*

to further enhance the quality of the living environment.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 61)

In addition, there is a strong and clear ambition to reduce the number of incidents involving emission in 2030. The level of reduction is not clearly mentioned in this.

> *'There will be far fewer incidents involving emission nuisance in 2030. This means that businesses will have to invest in processes and facilities that reduce, or even totally eliminate, the probability of emission being released.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 62)*

The last statement of these passages is about the reach of responsibility of the port authority. The vision states that the responsibility can have a reach which is beyond the physical borders of the port. It expresses qualitatively the ambition to improve the overall quality of life in the region.

> *'Besides tackling the two tasks involved (expanding within the limits of the law and dealing with the main nuisance problems), it is good that governments, NGO's, the business sector and the port authority enter into dialogue with each other on how to boost the overall quality of life in the region. Given the physical scope of the Port Compass, that region does not have to be restricted to Rijnmond.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 62)*

The passages show that the port authority identified an increase of societal demand for a better performance towards social value(s). Laws and regulations will become more stringent as a result of this societal demand and will be supplemented with new regulations for new discovered impacts of port activities. Although, these social value(s) become more important and influential for the port's license-to-grow, the economic component will stay the most important component of value for the port authority. The port authority has the ambition to go beyond laws and regulations when it comes to social value(s), but is critical in the effectiveness of the investments. It is therefore connected to the idea of Social Return on Investment (SROI). Besides, the port authority has the ambition to lower the number of incidents involving emission in 2030. The responsibility of the port can go beyond the physical borders. Where the port authority has its influence, they should take care of social value(s) is the statement of the port authority from the Port Compass 2030.

6.1.2 Drivers of Change

The Drivers of Change are closely related to the Port Compass. It indicates the possible developments which can have their influence on the scenarios of the Port Compass. The Drivers of Change were described and separated in different categories. These categories are:

- Port related industry
- Technology
- Information technology
- Transport
- Supply Chains
- Energy
- Geopolitics
- Global economy
- Society
- Environment

These main categories have sub trends in their turn. In total, 35 trends and developments were identified by the Port of Rotterdam Authority in this document. The total list of Drivers of Change is given in Appendix A.

The Drivers of Change are part of the context factors of influence. They form the context factors for the development of the Port Compass. The Drivers of Change are partly directly related to social value(s). The categories 'society' and 'environment' can be selected as direct linkages to social value(s). The Drivers of Change express a qualitative prospect for the different trends and developments.

6.1.3 Key Performance Indicators

The Key Performance Indicators (KPI's) of the Port of Rotterdam Authority are strategic and operational applicable. They are of strategic importance to set a clear goal for the internal employees and as a document of communication for the environment. Operational do they have their influence in the fact that the performance of the company is evaluated towards these KPI's. When the KPI's are met, the company's goals can be realized. The KPI's also give a short term performance goal for the organization and environment. The overview of the published KPI's are given in Appendix B.

In total, 14 KPI's were published. From these 14 KPI's, 9 had an economic character, directly related to the economic competing position of the Port of Rotterdam Authority. Besides, 3 KPI's were related to sustainability, 1 to port safety, and 1 to the client relation. The KPI's contained 1 sub goal which was related to accessibility. This was a goal towards the congestion maximum on the track Vaanplein-Maasvlakte.

Like stated, the KPI's were mainly focusing on economic and financial goals. In the interviews, it became clear that the KPI's have to be checked by an accountant and every element of the KPI's have to be clearly explained and founded. This is also the reason that not all KPI's could be published. The non-published KPI's consisted elements which could not founded explicitly. They had for instance a political character. When linking KPI's to the subjective character of social value(s), it is very hard to claim this value. The determined KPI's are defined in absolute numbers.

6.1.4 Portfolio Grid

The portfolio management plan of the port authority goes beyond the traditional business case. A project is assessed on its value-to-business (x-axis), the Net Present Value (y-axis), the investment budget (size of the ball) and the risk level (color of the ball). The value-to-business and risk level components are assessed on a 1 to 5 scale, in which level 5 is a better performance than level 1. The categories and sub categories are 11 assessment components, which are derived from the Port Compass 2030. In this way, they try to translate their broader ambitions from the Port Compass 2030 in their operational portfolio management.

For the value-to-business, projects are assessed in three categories:

- Client
- Space
- Environment

All the categories are decomposed in smaller pieces which have their own weight factor. This decomposition for public and private projects with their weight factors is given in table 7.

Social value(s) are incorporated in this evaluation of projects. 'Nuisance' has a high weight factor in public projects, as part of 'environment'. This has a direct relation with the livability of people. The same holds for the other aspects of 'environment'. In the category 'space', 'accessibility' is directly related to social value. This aspect has also a high weight factor in public portfolio analysis. It is shown in table 7 that the score of public projects is dependent on social values. However, the social value aspects are limited in their scope and chosen by the Port of Rotterdam Authority and are not directly related to social valuation of a specific project.

Table 7 Value-to-business weight factors
Source: Portfolio Grid, Port of Rotterdam Authority

Category	Client (%)	Public (%)
Client	33⅓	0
Concept fit	30	0
Preferred partner/ World's best player	20	0
HIC enhancing competition	30	0
Improve of Cluster/ Chain efficiency	20	0
Space	33⅓	80
Fit master plan	50	40
Space productivity	25	0
Accessibility	25	60
Environment	33⅓	20
Air quality (NO_x emission)	30	15
Deposition (deposition NO_x)	30	15
Nuisance (odor/ sound/ dust)	20	60
Sustainability	20	10

Like already mentioned, the risk score is not of influence on the position of the project in the portfolio grid, but only on the size of the ball. The risk level is composed of the risk score (total risk reservation as percentage of the total investment, exclusive inflation, inclusive building interest) and the Strategic Stakeholder Management image score, which is about stakeholder risks. The weights of the components in client projects is 80% risk score and 20% Strategic Stakeholder Management score. The total decomposition of the risk score is given in table 8.

Table 8 Risk score composition Portfolio Grid
Source: Portfolio Grid, Port of Rotterdam Authority

Risk score components			Client (%)
Risk score			80
Risk reservation as % investment budget	%	Score	
	≥10	5	
	≥7 <10	4	
	≥3 <7	3	
	≥1 <3	2	
	≤1	1	
SSM image score			20
SSM profile	Level of SSM	Score	
	SSM	5	
	SSM light	3	
	No SSM	1	

The risk profile is represented by the color in the portfolio grid. Red is a project with a high risk profile (score 4-5), orange a medium risk profile (score 3) and green a low risk profile (score 1-2).

An example of the portfolio grid and its qualification of projects is given in figure 28. This figure is only indicative for the composition of the portfolio grid. It shows the axis, and the color and size of the project balls. The projects given in figure 28 can be seen as example projects.

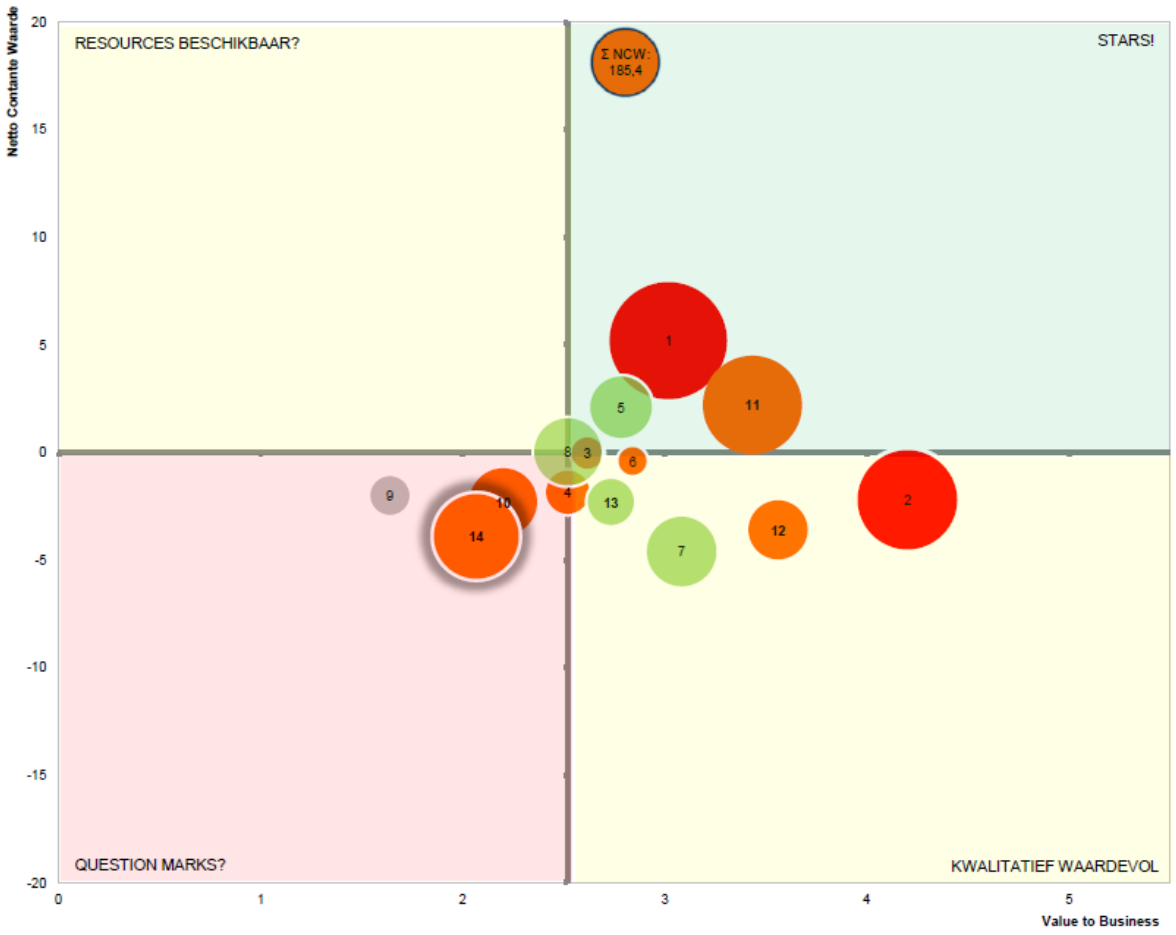


Figure 28 Portfolio Grid example
Source: Port of Rotterdam Authority (2013a)

6.1.5 Risk Matrix

The risk matrix which is used by the Port of Rotterdam Authority goes beyond project level. It is a risk matrix which is applicable to overall corporate risk. The risk matrix has 5 levels of impact in 5 categories of risks. These categories are: financial, image, safety, environment and accessibility. These impact levels and risk categories are further reflected against a probability frequency distribution, which also has 5 levels from possible to monthly. The total matrix and recommended actions are given in Appendix C.

The categories are related to social value(s), but are in the corporate risk matrix intended as a tool for the business value of the Port of Rotterdam Authority. Social valuation is not of central attention in this approach.

6.1.6 Strategic Stakeholder Management

Strategic Stakeholder Management, SSM (in Dutch: 'Strategisch OmgevingsManagement', SOM) was designed to intensify and structure stakeholder relationships, applied to project management. This program was used for the development of Maasvlakte 2 and became part of the broader Port of Rotterdam Authority's business from then (Wesselink & Paul, 2010).

Projects are increasingly confronted with complex European legislation and an increasing influence of stakeholders in decision making processes. The license-to-operate is directly linked to laws and regulations. However, the license-to-grow is linked to the stakeholder interests, which have an influence on laws and regulations with a delay of three to five years. The growth of the port is dependent on these two factors for legitimacy, like shown in figure 29.

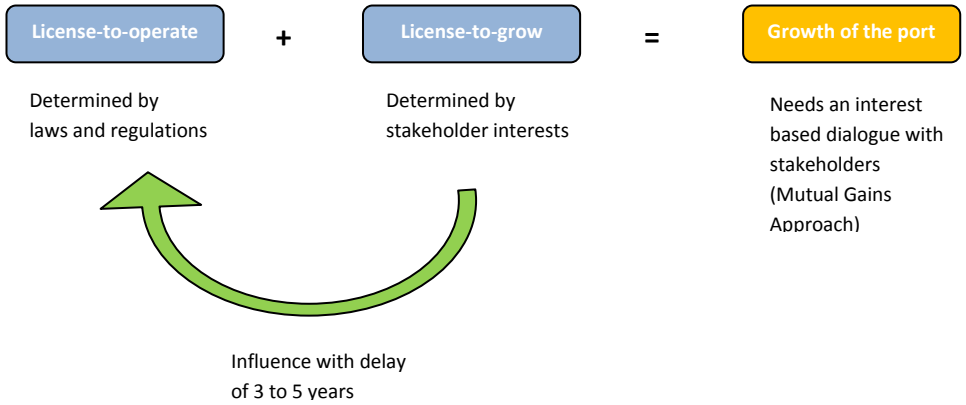


Figure 29 Growth of the port
Source: Port of Rotterdam Authority (2013c)

SSM was introduced because of the fact that the stakeholder support for port activities is not always obviousness. A sustainable dialogue with stakeholders is therefore an important condition for successful stakeholder management. SSM is now used in all complex and strategic projects in which the Port of Rotterdam Authority is involved. For every new project, the SSM profile is defined. The SSM profile is the result of a qualitative analysis of the strategic stakeholder sensitivity of a certain project. The questionnaire which forms the basis for the analysis is given in Appendix D.

The result of this analysis determines the strategic action of the Port of Rotterdam Authority in this project. There are three options for action, which are given in the buildings blocks of the SSM profile of figure 30. SSM can be applied to initiated projects, but also in issue situations.

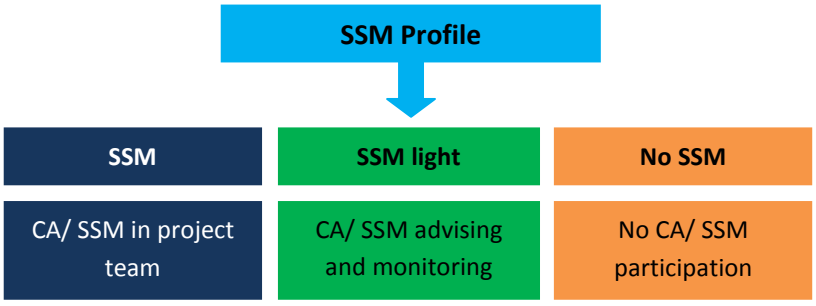


Figure 30 Strategic Stakeholder Management profile action building blocks
Source: Port of Rotterdam Authority (2013c)

Mutual Gains Approach

The core of SSM is the 'Mutual Gains Approach' (MGA), developed at Massachusetts Institute of Technology (MIT) (Fisher, Ury & Patton, 1981). SSM is derived from this approach. In the book of Fisher, Ury and Patton (1981), the following core steps were described to create mutual gains:

1. Separate people from the problem, do not make it personal
2. Focus on interests, instead of opinions or positions. Be open about that interests
3. Search for solutions in line with mutual interests
    a. Neutralize obstacles for solution possibilities, like prejudices, the one-and-only solution, the fixation of negotiation space and the 'we/they' separation
    b. Enlarge the solution space. Define the problem and solution strategies
    c. Look for mutual gains. Do not focus on a fixated quantitative solution. Enlarge the pie
    d. Mitigate decision making
4. Focus on objective criteria
    a. Translate every dispute into a joint search for objective criteria (Joint-Fact-Finding)
    b. Stimulate reasoning and be open for reasoning about relevant norms and their application
    c. Do not allow pressure on for instance time or quality, but keep the central attention on the interests of the stakeholders

Lawrence Susskind and Patrick Field of Harvard and MIT (1996) developed these steps to the six principles of the Mutual Gains Approach (MGA).

1. Know the interests of the other stakeholders
2. Stimulate 'Joint-Fact-Finding'
3. Strive for minimizing the impact on the stakeholder environment or promise compensation
4. Take responsibility, be open about failures and share power
5. Stay credible
6. Focus on constructive and sustainable relationships

The intention of the Mutual Gains Approach and the derived Strategic Stakeholder Management program, as used by the Port of Rotterdam Authority is focusing on the central idea of mutual understanding and stakeholder's interests. The search for common interests to create mutual gains is visually given in the Strategic Stakeholder Management pyramid of figure 31.

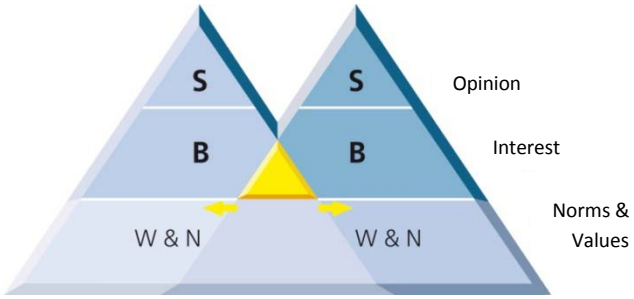


Figure 31 Strategic Stakeholder Management pyramid
Source: Port of Rotterdam Authority (2013c)

Issue and stakeholder management process

To implement the principles of the Mutual Gains Approach (MGA), Strategic Stakeholder Management (SSM) contains a process description and corresponding actions. The total SSM process consists of four sequential phases or quadrants, namely: internal, preparatory, external and implementing. In every phase, the dialogue in line with the Mutual Gains approach is leading. The total sequential issue and stakeholder management circle is given in figure 32.

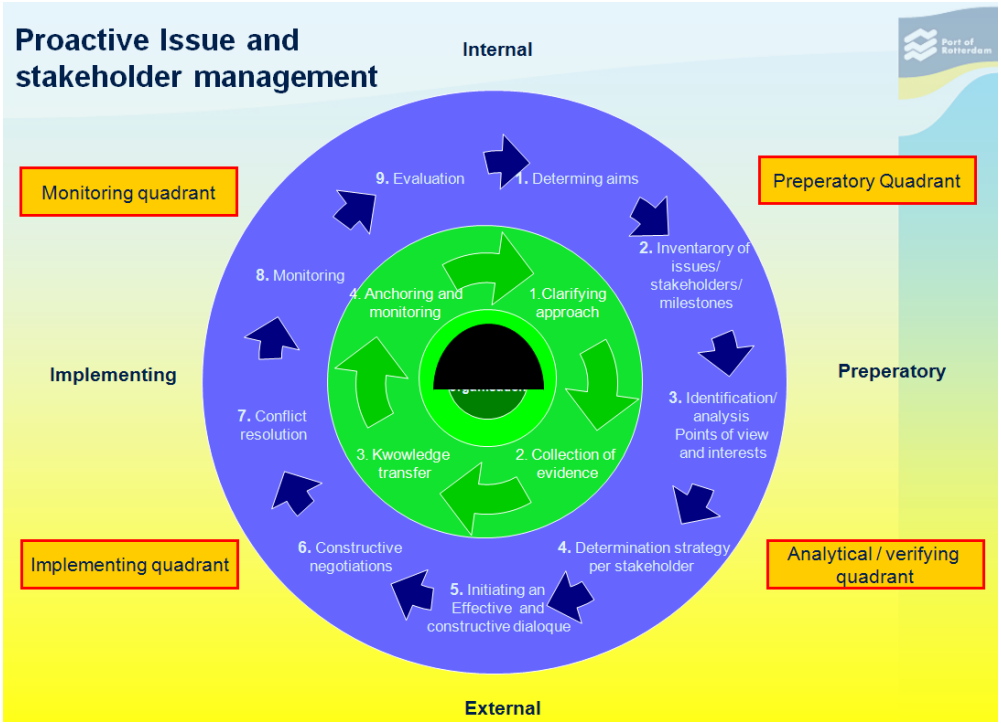


Figure 32 Strategic Stakeholder Management phasing
Source: Port of Rotterdam Authority (2013c)

The analytical quadrant has a differentiation in issues and initiated projects. The analysis of initiated projects is in table 9 called 'stakeholder analysis'. The analysis is meant to create insight in the relation of issues and projects with the stakeholder environment. The questionnaire for analysis is given in table 9 and is the fundament for the SSM profile.

Table 9 Decomposition of the analytical quadrant
Source: Port of Rotterdam Authority (2013c)

Issue analysis	Stakeholder analysis
Are the arguments against the issue plausible?	What is the stake of the stakeholder?
Does the issue evoke emotion? Is it understandable by the public?	What is the power of the stakeholder?
Is the issue media friendly?	What is the legitimacy of the stakeholder?
Are there connections to other issues involving the company or other companies?	What is the urgency of the stakeholder?
How strong is the key activist group?	What is the emotion of the stakeholder?
How isolated is the company?	How cooperative is the stakeholder? (cooperative or confronting)
How far have the dynamics of the issue already evolved?	What funding does the stakeholder have, where do financial resources come from?
How easy is the solution?	

The implementing quadrant of figure 32 shows that constructive negotiations are the basis of this quadrant. Supportive to this statement, a more detailed strategic explanation was given with several levels of impact and involvement, like presented in figure 33. Important to mention is that involvement is in this context not meant as earlier explained in this report. The earlier term was referring to internal aspirations from which a reference state could derived. In the context of figure 33 it is meant as the degree to which stakeholders are part of the negotiation process. Impact is also not meant as the level of importance or influence on the stakeholder, but the stakeholder's impact on the negotiation process.

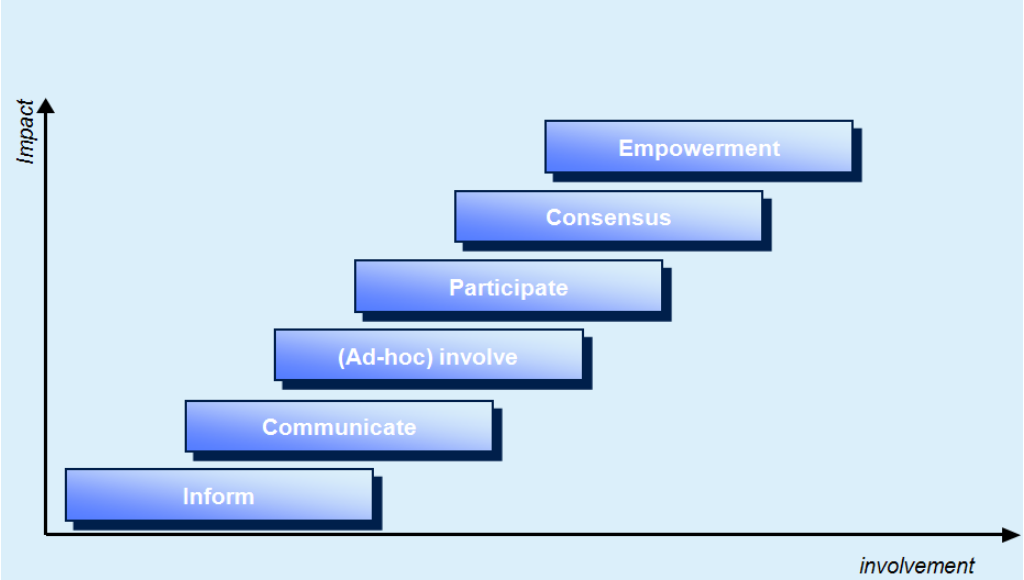


Figure 33 Levels of constructive negotiation in Strategic Stakeholder Management
Source: Port of Rotterdam Authority (2013c)

6.2 For which strategies and strategic tools the (possible) outcome is directly driven by the way people value this (possible) outcome?

The former paragraph showed the intention and approach of the most important strategies and strategic tools of the Port of Rotterdam Authority regarding the determination of social value creation. It showed which aspects of social value were taken into account and how they were incorporated in business mechanisms. This paragraph gives an overview of the strategies and strategic tools which are in their outcome results driven by social valuation. Social valuation is in this context not meant as a consideration of the strategies and methods with respect to the valuation principles, but to interactive valuation feedback or development.

6.2.1 Social valuation indirectly related

The overview of the main strategies and strategic tools was already given in the former paragraph:

- Port Compass 2030
- Drivers of Change
- Key Performance Indicators
- Portfolio Grid
- Risk Matrix
- Strategic Stakeholder Management (Mutual Gains Approach)

The Port Compass 2030 and Drivers of Change are closely related. The Drivers of Change form input for the development of the scenarios and visions of the Port Compass. They express social value(s) in a qualitative way. Social valuation was incorporated in these strategic tools through the input for development. Stakeholder interests were part of the input for the definition of the Drivers of Change and Port Compass 2030. However, these tools incorporate social valuation in advance and are not directly related to the current situation of social valuation. This is also caused by the strategic character of the tools. They have to set a vision for future development and are not variable dependent of social valuation. When the public situation changes, visions and drivers of change can be adjusted to the new situation, but the intention of these strategic tools is not that they are directly dependent on social valuation of certain situations. In the long term, social valuation can become visible when this valuation is constant in its new state.

The Key Performance Indicators (KPI's) and the Risk Matrix were related to direct business performance. The KPI's were not incorporating social valuation directly. The KPI's were set in advance and most of them were related to value drivers. They were not dependent on social valuation in the short term. The corporate risk matrix was also indirectly related to social valuation. A change in social valuation would not change the KPI's or Risk Matrix on the short term. The same holds for the Portfolio Grid. For this grid, social values were selected to take into account in the portfolio management. However, these aspects were scored by the port authority itself and not dependent on social valuation. The Portfolio Grid uses fixed weight factors for several social aspects.

6.2.2 Social valuation directly related

The only strategic tool which is used by the port authority with a direct relation with social valuation is the Strategic Stakeholder Management approach (SSM). The Mutual Gains Approach (MGA) is the central approach in SSM and has a strong relation with people's or stakeholder's valuation. The MGA focuses on stakeholder's interests, which have influence on the growth opportunities of the port. Because of the dialogue character of this tool, the influence of social valuation is directly expressed in the outcome of the tool. SSM is a strategic tool on the project level. Like already shown in the analysis of the determination of social value creation of SSM, several aspects with a possible influence on social valuation are taken into account. This is done in the analytical quadrant.

6.3 Conclusion CQ3

The third central question as formulated as follows:

> ***CQ 3*** *In which way social valuation is incorporated in the Port of Rotterdam Authority's strategies and strategic tools to measure the social value created by their port activities?*

This central question was on its turn composed of two sub questions. The first sub question was:

> ***SQ 3.1*** *In which way social value creation is measured by the Port of Rotterdam Authority's strategies and strategic tools?*

First, the main strategies and strategic tools of the Port of Rotterdam Authority were selected with the information of interviews and port documents. These were:

- Port Compass 2030
- Drivers of Change
- Key Performance Indicators
- Portfolio Grid
- Risk Matrix
- Strategic Stakeholder Management

The strategies were researched on their relation with social value. The Port Compass 2030 expressed ten success factors for the realization of the port visions. The success factors were merely related to social values. However, the strategic character of the Port Compass on the long term made the terminology of the social values abstract and qualitative. The executive agenda added more detail to the implementation of the visions, but still on a abstract level. The same holds for the Drivers of Change in their expression of the trends and developments, as a supportive document for the Port Compass.

The Key Performance Indicators (KPI's) were developed in a audit way. This meant that only fully calculative aspects were publishing in the KPI's. The KPI's were related to business performance and less to social valuation. This was also the case for the Risk Matrix in which corporate risk were investigated and classified on impact and frequency. The categories and impact were on their turn stated in advance. In the Portfolio Grid, social values were selected and taken into account, but with in advance selected values and fixed weight factors for the development of the grid. Finally, the Strategic Stakeholder Management (SSM) approach was driven by stakeholder's input. In that way, social value was incorporated through the stakeholder dialogue. Stakeholders could express their value perception in the SSM process. The second sub question went further from this point, and was formulated as:

> ***SQ 3.2*** *For which strategies and strategic tools the (possible) outcome is directly driven by the way people value this (possible) outcome?*

The Port Compass 2030, Drivers of Change, KPI's, Portfolio Grid and Risk Matrix, were all indirectly related to social value in their outcome. Some tools were just focusing on corporate value, like the KPI's and Risk Matrix. Others, like the Port Compass 2030 and the Drivers of Change, were long term strategic tools which were not intended to be variable in relation to social valuation. The Portfolio Grid takes social values into account, but is a fixed tool, with fixed weight number for valuation of social aspects. It is not directly related to the way people value in theory.

The only tool which was directly related to social valuation was the SSM. In this strategic tool stakeholders were analyzed on their interests, power and valuation in a process of dialogue. The outcome of the SSM process was therefore directly related to social valuation.

From both sub questions, the answer on the central question can be composed. Social valuation is only directly of influence in the SSM approach. The SSM approach is distinctive from the other strategic tools, because of the dialogue in the short term which creates opportunities to incorporate social valuation by stakeholders. The other strategies and strategic tools are indirectly related to social valuation and are long term tools or fixed in advance. They do not have an opportunity to incorporate people's input and social valuation in their current state.

7. What are the main differences and similarities between the social valuation principles in theory and the social valuation approach of the Port of Rotterdam Authority?

This part of the research describes the comparison between the theoretical framework and the practical fieldwork. It was already shown that the practical fieldwork was composed of the information from interviews and documents within the Port of Rotterdam Authority. In this comparison, the valuation approach of the port authority is reflected on the theoretical valuation principles of people as found in the literature.

First of all, the strategies and strategic tools of the port authority will be tested on their relation with social valuation principles. Thereafter, from these strategies and strategic tools, one is selected for which social valuation principles could be directly supportive for the determination of the social value creation of port activities.

7.1 Which theoretical principles of social valuation are incorporated in the strategies and strategic tools of the Port of Rotterdam Authority?

The theoretical research investigated five main theories for social valuation behavior. These theories were analyzed on their deviation from the axioms of rational behavior. Besides, they were analyzed on their parallels with stakeholder valuation. This analysis showed that prospect theory was the most appropriate theory for social valuation from a stakeholder point of view and was further explained in more detail. The three core principles of prospect theory were (Kahneman & Tversky, 1979):

- Reference state
- Loss aversion
- Diminishing value

Loss avoidance and diminishing value were derived from the reference state in the location of their position. The reference state was the core principle of prospect theory and a component of perception (Kahneman & Tversky, 2003; Goddard, 2003). Perception was defined as:

Perception = Detection – Reference state

The influence of this consideration of value was expressed in the stakeholder value evaluation framework, with a categorization for value perception.

The research to the main strategies and strategic tools of the Port of Rotterdam Authority resulted in the conclusion that the Strategic Stakeholder Management approach (SSM) was the only strategic tool which was directly related to social valuation in its outcome. Through the dialogue character of the tool, social valuation was of direct influence on project stakeholder input. Again, it has to be said that social valuation is in this context not meant as the theoretical principles of social valuation, but the general concept.

In this part of the research the investigated social value approach of the selected strategies and strategic tools of the port authority are now researched on their relation with the core principles of the theoretical framework of social valuation.

7.1.1 Strategic ambitions and the Port Compass 2030

In the former research question, the determination of social value creation by the Port Compass 2030 was illustrated by phrases from the Port Compass. The conclusion in this part was that the success factors for the development of the port visions were mainly related to social values and were given in abstract definitions.

One of the selected phrases with an expression of social value in the success factor 'environment, safety and living' was:

> *'Industry and transport have become considerably cleaner in the last few decades, reducing environmental pollution. Nevertheless, the port still has a big impact on its surroundings. The surrounding area wants a cleaner and quieter port. It is largely up to the port community to grant this wish.' (Port of Rotterdam Authority (2011), Port Compass 2030, p. 59)*

It already shows the dependency on social valuation. Terms like 'considerably', 'reducing', 'cleaner' and 'quieter' are highly dependent on perception. The perception of a concept like 'cleaner' is dependent on detection and reference state. The final outcome will not be the same for everyone. This has to be taken into account, like already expressed in the stakeholder value evaluation framework.

Another interesting phrase in this context, was the last selected phrase about the ambition of the port authority:

> *'In the course of time, the available environmental space will probably be further reduced by new legislation. Wherever possible, it will be used to allow the port to develop within the legal and regulatory framework. At the same time, specific local nuisance in the area surrounding the port should be dealt with as much as possible. This nuisance could be from noise, traffic congestion, stench or dust caused by port activity. These measures, which go above and beyond legal requirements, will be checked for their cost effectiveness: the cost of reducing nuisance must remain reasonable also in relation to the number of people involved. In addition, green and recreational facilities can be improved to further enhance the quality of the living environment'. (Port of Rotterdam Authority (2011), Port Compass 2030, p. 61)*

The sentence in which the port authority expresses their ambition to perform beyond legal requirements is interesting in the light of the reference state. The stakeholder value evaluation framework already showed that the categorization of policies and strategies can sometimes deviate in a perception context from the legal context. So, the ambition to perform above the legal requirements can be encouraged. However, till what level this ambition should go? The Port Compass does not give an indicator for the level of performance in this context. One of the social valuation principles is 'diminishing value' and policy makers should taken into account that they do not perform too far from the original reference state. The cost effectiveness of their investment would then become too low. The cost effectiveness of social value investments is namely also an ambition of the port authority.

Like shown, a lot of phrases from the port visions are related to principles of the theoretical valuation analysis. The basis for these port visions are the Drivers of Change, which are expressing a certain development in reference states. It can be indicated that the port visions are derived from the expected development in reference states regarding several issues. However, as concluded earlier, the port visions are long term strategies, which are not directly influenced by social valuation in their outcome. Only new structural trends in new Drivers of Change could finally become translated in the new Port Compass. The time scope of this is ten years. Every ten years, a new Port Compass is published.

7.1.2 Trends in reference states from Drivers of Change

The Drivers of Change are context factors which can be of possible influence on the development of the visions and scenarios, explained in the Port Compass 2030. These context factors are directly related to the principle of the reference state. Were the expression for perception is the combination of detection and reference state, the Drivers of Change are therewith related to people's perception. They indicate trends for the development of the context or reference states regarding several themes.

7.1.3 Key performance detection

To implement the ambitions from the Port Compass, the Key Performance Indicators (KPI's) were stated to realize this. The KPI's are more related to detection, absolute numbers about performance, without the influence of context factors for perception. This is also the result of the reporting obligation of the KPI's. Before publishing the KPI's, they are audited and only absolute results are allowed to publish. This makes that there is less room for more abstract theoretical principles of social valuation to build on.

7.1.4 Fixed grid input

The Portfolio Grid indicated eleven criteria, directly derived from the Port Compass 2030, with a certain weight factor. So, indirectly the Portfolio Grid expresses social valuation principles, but in a statically way. It is a portfolio valuation tool with fixed criteria and weight factors. Variable context factors are therefore not expressed in this method for valuation. The score regarding the eleven is further determined by the port authority itself and not determined by social valuation principles. The interaction between the theoretical principles of social valuation and the Portfolio Grid is therefore weak.

7.1.5 Risk Matrix and loss aversion

The categories of the risk matrix are strongly related to the value drivers of the Port Authority. A negative effect on finance, image, safety, environment and accessibility would directly have its influence on the value drivers of the Port Authority. However, these categories of risks could also have their influence on social value(s). The risk categories can have their influence on the reference state of stakeholders. A serious incident has its influence on for instance the image of the port and the chosen reference state of stakeholders. An earlier mentioned example of the possible influence of such a change in reference state is the Fukushima disaster. It changed people's reference state and the societal pressure had such an influence on political decision making that nuclear energy was cancelled from the political agenda in Germany. So, for the reference state, 'image' is an important element. Actually, this element is also composed of the other categories like safety, environment and accessibility. It has to be said that accessibility is related to client accessibility in this context. See Appendix C for a more detailed explanation. Image cannot evaluated independently from the other categories. 'Image' has also the strongest relation with the loss aversion principle of prospect theory and its influence on the reference state of stakeholders.

The risk matrix is a clear example of the loss aversion focus of the Port Authority. There is special matrix to identify possible losses with their impact and probability. This is not the case for opportunities. There is not an opportunity matrix.

7.1.6 Strategic Stakeholder Management and perception

An interest in its broad definition, like livability, can be decomposed in more personal states when the reference state is taking into account. When someone grew up in a place with a low rate of livability, his interest for a livable environment will not change, but his reference state can be very different from someone who grew up in a very livable environment. The dialogue which is propagated in the Mutual Gains Approach should therefore focus on the interest and the corresponding reference state of the stakeholders.

There the MGA is the central approach in Strategic Stakeholder Management (SSM), used by the Port of Rotterdam Authority, it has a strong relation with stakeholder's valuation. The MGA focuses on stakeholder's interests, which have influence on the grow opportunities of the port. Interests could be for example accessibility, livability or safety, but these examples already show the broad concept definition of possible interests. In addition to the conceptual consideration, stakeholders can also value the level of satisfaction with respect to their interests. The relation between value and the MGA could then be that stakeholder's valuation of the satisfaction of a certain level of their interest is dependent on the perception of that level. It shows that interests are stable in their concept, but variability sensitive when it is about the valuation of the satisfaction of

a certain level with respect to their interests. On a project level, the discussion and negotiation is about this valuation or perception of the conceptual consideration.

7.2 For which strategy or strategic tool social valuation principles are directly supportive in the measuring social value creation?

All strategies and methods which were investigated had a certain relation with value, valuation or the perception of stakeholders. For the Port Compass 2030 and the Key Performance Indicators (KPI's) it would be interesting to get a tool to categorize or quantify social valuation. With a categorization of measurement, strategic projects and communication could be more specific and effective. This would also be of interest for reporting in KPI's.

The Port Compass is in its turn qualitative and abstractive in its definition. The ambitions of the Port Compass could be translated to a stakeholder environment in which the reference state of people is leading for valuation of social values. However, the Port Compass is intended as a strategic tool to set a certain vision. Therefore the urgency for a measured expression of social value creation is less important in this context.

Besides the possible added value of a perception approach for the Port Compass or KPI's, this approach could also be helpful in the definition of the social values in the Portfolio Grid. The Portfolio Grid is now composed from defined social values with fixed weight factors in advance. It is questionable if the fixed numbers and limited scope of social values is always representative for social valuation. With a more dynamic system for valuation, the fit with social valuation could be increased. Social valuation and corresponding perception can be translated in the risk and Strategic Stakeholder Management (SSM) risk imago score of the risk profile in the portfolio grid. Through SSM, the perception could then also be of influence on portfolio management. However, in the current used weight model of the portfolio grid, this influence would be small. The risk score is not influencing the position of the projects in the quadrant, but only the color of the project ball. It is taken into account, but not essential for decision making.

For the Risk Matrix it was shown that the focus was merely on possible consequences of incidents for the corporate status. The relation with social valuation was weak in this approach. However, categories like 'image' are sensitive to social valuation and a perception approach could also be interesting in this context.

Strategic Stakeholder Management (SSM) is based on the Mutual Gains Approach (MGA) (Fisher, Ury & Patton, 1981), which has a direct relation with social valuation and perception. A principle from the further developed MGA of Susskind and Field (1996) was directly related to the categorization or measurement of social valuation. This principle was:

Strive for minimizing the impact on the stakeholder environment or promise compensation

Two questions rise in this context, namely: what is the impact on the stakeholder environment?, and to what level compensation is justifiable? These questions cannot be answered in a conceptual discussion, and stakeholder's valuation and perception towards these issues should therefore be incorporated.

Conclusively, it can be stated that all strategies and strategic tools are open for social valuation principles and the concept of perception, but SSM is closest related to the determination of the reference state on the lowest scale of implementation. This strategic method is directly related to social valuation on the project level.

7.3 Conclusion CQ4

The central research question was:

> ***CQ 4*** *What are the main differences and similarities between the social valuation principles in theory and the social valuation approach of the Port of Rotterdam Authority?*

This central question was again composed of two sub questions. The first sub question was:

> ***SQ 4.1*** *Which theoretical principles of social valuation are incorporated in the strategies and strategic tools of the Port of Rotterdam Authority?*

The sub question was answered by the statement that all investigated strategies and strategic tools were related to valuation principles. However, most of them were not directly steered by these principles, except from Strategic Stakeholder Management (SSM), as found in the second sub question.

> ***SQ 4.2*** *For which strategy or strategic tool social valuation principles are directly supportive in measuring social value creation?*

From this question it was concluded that social valuation principles from prospect theory could be directly of influence in this SSM. In the dialogue with stakeholders, the Port of Rotterdam Authority is constantly looking for the reference state of stakeholders through their interest. However, the SSM propagates that stakeholder interests are stable over time, the level of satisfaction with respect to these interests can change. An interest like livability is for instance an abstract concept, in which the rate of satisfaction or level of performance can change over time. This is dependent of detection and reference state and therefore directly related to perception. With the incorporation of social valuation principles from theory, the reference state and prospective reference states could be incorporated in the SSM approach as a measure for social value creation.

Looking back at the central research question, the main similarity between social valuation principles and the social valuation approach of the Port of Rotterdam Authority is the incorporation of social valuation principles in these strategies and strategic tools. All of them were related to these principles. The main difference was formed by the fact that they these strategies and strategic tools were not directly operating from these principles. An example in this context is the ambition about 'environment, safety and living' in its success factors. The ambition was formulated beyond laws and regulations, but not in relation to the reference state of stakeholders. In most strategic tools, the value creation was classified as a result of performance regarding laws and regulations. The SSM approach, built on the Mutual Gains Approach (MGA) as defined by Susskind and Field (1996), had a closer relation with social valuation. Because of the incorporation of stakeholder interest on a project level it is possible to translate theoretical principles into practical tools.

8. Final conclusion

In the final piece of this research, all central questions are considered to form the composition of the main research question, which can be tested through its hypothesis. The main research question was composed of four central questions. All these central questions formed a separate building block of the conceptual research framework. In this conclusion the central questions will again be presented from the intention of these building blocks.

The research into trends and developments which suggests the need for research into social valuation was a preamble to the rest of the research. It was researched in central question 1:

Urgency indicators:

CQ 1 *Which trends and development suggest a need for research into social valuation?*

Trends and developments at political and corporate level show the increasing search for tools and methods for social valuation. Corporations are searching for tools to measure, align and communicate their Corporate Social Responsibility activities (Ernst & Young, 2011), and governments are searching for new tools to measure welfare (European Commission, 2008; Franco-German Ministrial Council, 2010).

Although, social valuation is already researched for decades, the subjective character makes it a difficult concept to express it in numbers or capture it in strategic tools. Current social valuation methods are inconsistent in scope and belief about what should be measured regarding social value (Mulgan, 2010). This, in combination with the growing influence of 'the public opinion' and rising power of society representatives in a stakeholder setting shows the need for research into social valuation.

A closer look at the visions of the Port of Rotterdam Authority shows also the need for appropriate social valuation tools. This can be concluded from the fact that the ten success factors for realization of the port visions are directly or indirectly related to social value creation (Port of Rotterdam Authority Port Compass 2030, 2011). The port authority has therewith stated that a successful future of the port is dependent on social valuation by its stakeholders. It is therefore time for research into the basic principles of social valuation to obtain more insight in the way people value. It is expressed in the second central question of this research:

Theoretical framework:

CQ 2 *What are the basic principles of the most appropriate valuation theory regarding social valuation from a stakeholder point of view?*

The second central question was comprised of five sub questions in which the theoretical principles of social valuation were researched, to compare this with the practice of the Port of Rotterdam Authority in a later stage.

The mental process of decision making is according to Kahneman (2003) built up of two cognitive systems, system 1 and system 2, respectively named as 'intuition' and 'reasoning'. Perception is indicated as a separate system next to these two cognitive system. Perception has no intrinsic value in itself, but is the observational part of valuation. Therefore, perception can function as a measure for value and is composed of 'detection' and 'context' (Goddard, 2003; Kahneman, 2003).

People show up rational and irrational behavior regarding valuation. The distinction between rationality and irrationality of people's behavior is expressed in the axioms and theories of Von-Neumann Morgenstern and Savage. However, these axioms and theories do not explain the interaction between rationality and irrationality.

The interaction of rationality and irrationality of people's behavior in decision making is explained in five decision making theories, namely: elimination by aspects (Tversky, 1972), satisficing (Simon, 1955), Ellsberg paradox (Ellsberg, 1961), prospect theory (Kahneman & Tversky, 1979), and regret theory (Bell, 1982; Bell, 1985). Of these theories, prospect theory is proven to be the most appropriate theory to explain social valuation from a stakeholder point of view. Prospect theory contains three core principles (Kahneman, 1979):

- Reference state
- Loss aversion
- Diminishing value

Where reference state is an expression of system response on the context of detection, the composition of perception is proposed to express as:

Perception = Detection – Reference state

The assumption of this composition has consequences for value creation categorization in the stakeholder value evaluation framework. The framework shows the dependency of value creation categorization on the chosen reference state of stakeholders.

To compare this theoretical concept and valuation principles with port's practice, the main strategies and strategic tools of the Port of Rotterdam Authority were evaluated from the interviews with port experts and by studying related port documents. This research part was expressed in the third central question:

Field study:

CQ 3 *In which way social valuation is incorporated in the Port of Rotterdam Authority's strategies and strategic tools to measure the social value created by their port activities?*

Social valuation is in this context meant as the general concept, not related to principles. It is researched for the main strategies and strategic tools of the Port of Rotterdam Authority, which were obtained from the interviews and related port documents. The evaluated main strategies and strategic tools of the Port of Rotterdam Authority are: Port Compass 2030, Drivers of Change, Key Performance Indicators, Portfolio Grid, Risk Matrix, and Strategic Stakeholder Management.

Social value is incorporated in all of these strategies and strategic tools. The Port Compass 2030 expresses ten success factors for the realization of its visions 'Global Hub' and 'Europe's Industrial Cluster'. All of these success factors were, directly or indirectly, related to social value creation (Port of Rotterdam Authority Port Compass 2030, 2011). The Drivers of Change express several development themes, related to social value, as a fundament for the visions in the Port Compass 2030. In the strategic tools, social value is incorporated in a fixed way. The Portfolio Grid and Risk Matrix incorporate social values, derived from the Port Compass, which are fixed in advance in definition and weights. The social value aspects, which are indirectly incorporated in the Key Performance Indicators, are also fixed in advance and need a quantitative basis for publication. A rational consideration is therefore necessary to audit Key Performance Indicators. Only Strategic Stakeholder Management (SSM) determines social value creation by dynamic interaction through the dialogue with stakeholders. Strategic Stakeholder Management is derived from the Mutual Gains Approach (Fisher, Ury & Patton, 1981) and searches for mutual interest to reach consensus with all stakeholders.

To compare this field study with the theoretical framework, central question 4 was formulated as follows:

Comparison:

CQ 4 *What are the main differences and similarities between social valuation principles in theory and the social valuation approach of the Port of Rotterdam Authority?*

The social valuation principles in theory and the social valuation approach of the Port of Rotterdam Authority differ when focusing on the Key Performance Indicators, Portfolio Grid and Risk Matrix. All these strategic tools incorporate social value which is fixed in advance, in definition and weights. This is contradictory with the social valuation principles in theory, in which social valuation is explained as an interaction between rationality and irrationality in people's trade-offs. Only Strategic Stakeholder Management (SSM) is a strategic tool which incorporates social valuation in a dynamic way, through stakeholder dialogue. SSM incorporates people's perception by the fact that stakeholders can express their perception of the created stakeholder value during and after the decision making process. This is in line with the social valuation as found in theory. Only the decomposition of perception in detection and reference state, and the related principles of prospect theory to describe social valuation from a stakeholder point of view, are not used in SSM.

Conclusion regarding the hypothesis:

The comparison between the theoretical framework and the field study is a test of the hypothesis of the main research question. The hypothesis is:

'The way social valuation is incorporated in Port of Rotterdam Authority's main strategies and strategic tools is in line with the theoretical principles of social valuation by people'

With the found research results it can be stated that this hypothesis should be accepted, because SSM incorporates the main representative value consideration of social valuation by people, namely perception. Through dialogue, stakeholders can express their perception of the created social value, and the outcomes of SSM are therefore directly influenced by perception.

9. Recommendations

The hypothesis of this research was accepted regarding Strategic Stakeholder Management (SSM). Although, SSM incorporates perception through stakeholder dialogue, the consideration of perception in SSM leaves room for recommendations. These recommendations are meant to advise the Port of Rotterdam Authority about the possible implementation opportunities of theoretical aspects in their strategic tools to support their port activities over time. With the application of the recommendations, the Port of Rotterdam Authority can be better prepared regarding the interaction of rationality and irrationality in the way people perceive value and to support a sustainable operation and grow of the port from a scientific point of view. The ten main recommendations are:

1. **Consider value as a relative and time dependent concept**

The increase of value for all stakeholders is the core of the Mutual Gains Approach (MGA). However, value should be considered in this approach as a relative and time dependent concept. The value which is created at moment X can be perceived very differently at moment Y. This time dependency becomes increasingly important for long term contracts, agreements and investments, which has the Port of Rotterdam Authority to deal with.

2. **Incorporate two main elements of social valuation in valuation approaches**

Two main components that should be incorporated to determine social value creation from a stakeholder point of view:

- Detection
- Reference state

The Strategic Stakeholder Management (SSM) method can be very suitable for the incorporation of these components, because social valuation has a direct influence on the outcome of SSM. The level of detection of stakeholders regarding their interests can be obtained from the dialogue in SSM, from which the difference with the reference state can be defined. The difference between 'detection' and 'reference state' represents perception, which can function as an indicator for social value creation.

3. **Consider created stakeholder value from a perceptional point of view**

The example of the 'stakeholder value evaluation framework' showed the possible consequences of a different scope of the public and the port authority. Two situations were identified to pay attention to:

- Created stakeholder value above norm and under reference state
- Created stakeholder value norm neutral and under reference state

In both situations, stakeholders will perceive the created value as 'value destruction' or 'loss avoidance'. When the created stakeholder value is also evaluated from a perceptional point of view, these situations can be prevented. It can support the search for consensus in a stakeholder setting. This is especially the case in a dynamic environment with uncertain levels of (future) detection and reference states.

4. **Compensate people as determined in the composition of perception**

Social valuation is constructed of a detection part and a reference state part. The combination of both gives a positive or negative perception. This perception can be assumed as a measure for social value creation. When people perceive activities or situations negatively, this should be compensated towards this perception. It means that port activities should perform on or above the reference state in the case of no compensation.

Below the reference state, people should be compensated to their reference level. In this way, social value categorization is positively and this is positively for port's license-to-grow.

5. **Pay attention to situations with a high impact of category switch**

For every project with SSM, the levels of detection and reference state of stakeholder groups should be defined. The difference can be a gain or a loss in stakeholder's perception. The differences in case of a loss can be compensated to the level of the reference state.

A more extreme situation occurs when the detection of activities below the reference state is labeled as 'unacceptable' and above the reference state as 'acceptable'. Public pressure will be high in case of unacceptable detection. It is important to map the developments which could be lead to a situation of unacceptability. In a more dynamic interaction state of detection and context, these activities should be monitored frequently.

6. **Recognize that representatives of 'the public domain' do not have the power to contractually bind the 'the public domain' over time**

The Mutual Gains Approach (MGA) is focusing on the increase of value for all stakeholders and consensus about the activities towards this increase of value in a formal document. Although, these documents are suitable for monitoring and a handle for discussion, it should be recognized that representatives of 'the public domain' do not have the power to contractually bind 'the public domain' over time. The influence of the 'public opinion' goes beyond agreements from the MGA process or laws and regulations. Representatives can sign for intended efforts to explain or defend agreements, but the power of the 'public opinion' cannot be bound in those documents. Contracts and agreements become less dominant when the 'public opinion' is shifting against an issue. Not in the light of legal obligations, but surely regarding the license-to-grow. Contracts should therefore held room for adaptability to new situations. The license-to-grow can become under pressure when contracts are not adaptable in the case of changes in detection or reference states.

7. **Find conditions for the acceptation of uncertainty in the search for consensus**

Because the future is unpredictable, the perception of agreements is unpredictable over time. Especially new projects can be linked to uncertainty for many aspects. Like shown in the theoretical research, people prefer risk above uncertainty and the feeling of uncertainty will impede the consensus. Agreements should therefore contain options to create room for change and explanation to followers. These options are especially important for the definition of the reference state. Flexibility should be incorporated on a technical, contractual and governance level.

8. **Monitor sensory detection and detection through knowledge**

In the research, detection was separated in sensory detection and detection through knowledge. Sensory detection is controllable in the way that it can be monitored frequently through discussion and the support of institutions like DCMR. DCMR registers detection levels in the case of nuisance from their control room. Detection through information or knowledge is less easy to monitor. Of course, the port authority can publish the numbers and information about port activities, but this domain is more accessible for outer parties. Control these processes in the way that information which is obtained by the surrounding public, also reaches the port authority.

9. **Monitor reference states through dialogue**

Monitor the reference state in SSM through dialogue. When the dialogue with stakeholder is continued after agreement or project implementation, changes in reference states can be monitored in an early phase. The

Port of Rotterdam Authority can than adapt their strategic approach to these changes over time. The monitoring of reference states will support the consensus about port activities between stakeholders and creates time to implement new strategic approaches in the case of changes in reference states. The reference state framework can be used in analyzing and classifying several reference states.

10. **Develop a business tool to analyze the possible detection and reference state development over time**

The research and the former recommendations showed already the importance to incorporate detection and reference state to compose perception as a measure for the way people value regarding the created social value. This is on its turn related to the success factors of the Port of Rotterdam Authority and its license-to-grow in the future. However, it was also stated that detection and reference states can change over time, with large consequences for the categorization of social value creation. To incorporate this changing behavior, a business tool should be developed to analyze the future possible levels detection and reference state regarding certain port activities in the future. This business tool could function as an added element in SSM.

10. A business analysis tool for the Port of Rotterdam Authority to incorporate perception uncertainty

The recommendations expressed the need for additional business tool to incorporate uncertainty of detection and reference state to support existing stakeholder management strategies in the composition of perception as a measure for the social value creation. The research resulted in a tool to categorize projects, which are incorporated in the Strategic Stakeholder Management of the Port of Rotterdam Authority. The categorization and strategic actions will be described qualitatively.

10.1 Perception uncertainty

In the earlier chapters of this research it was proposed that when detection and reference state are fixed points, the difference can be calculated using the formula: Perception = Detection – Reference State. However, in practice detection and reference state can be assumed on a certain level in stakeholder management negotiations and decision making, but over time detection and reference state can change dramatically. A measure for perception is much more difficult when reference point and detection point are more sensitive to variability. In such a situation, perception can change over time. For some projects, the variability of detection over time is known, but for other projects, this variability is less clear. This can be the case for new types of projects, new technologies, but also already existing projects and technologies in new conditions. The change in context conditions can be known, but can also be very uncertain. Before explaining the quadrant, different aspects of uncertainty will be considered.

10.1.1 Locations of uncertainty

First of all, the possible locations of uncertainty are considered. There are three primary locations of uncertainty. With locations, the places where uncertainty can emerge in a certain system is meant. These locations are (Taneja, 2013):

- Uncertainty about the external forces
- Uncertainty about the system response to external forces
- Uncertainty about the valuation of outcomes

External forces could be for example the changing energy market, environmental disasters or the global economy. Uncertainty about the system response to such external forces can be represented by uncertainty about the chosen reference state under the influence of external forces. When the reference state is derived from external benchmarks, this influence can be large. Further can uncertainty about the valuation of outcomes be represented by uncertainty about perception. In the proposed composition of 'perception = detection – reference state', valuation was namely determined by perception.

10.1.2 Levels of uncertainty

Possible variability can sometimes be determined or predicted for projects or port activities. But when this variability is not so clear, it is subordinate to uncertainty. In the perception consideration, this could be translated to uncertainty about the possible variability of detection and/or reference state.

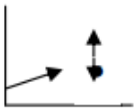
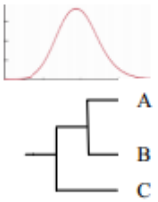
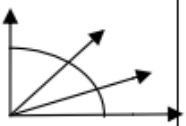
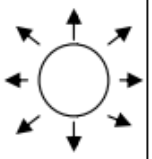
For dealing with this uncertainty in for example developing public policies, business strategies or investment portfolio management decisions, two extreme levels of uncertainty can be distinguished, namely complete certainty and total ignorance or deep uncertainty. These boundaries and the five intermediate levels of uncertainty are given in table 10 (Courtney, 2001; Walker et al., 2003; Makridakis et al. 2009; Kwakkel et al. 2010).

Total ignorance or deep uncertainty is the situation in which 'we don't know that we don't know'. It is not possible to model this situation. Level five is the highest level of uncertainty which is defined as 'know that we don't know'. Taleb (2007) calls these events 'Black Swans'. He defines a Black Swan event as one that lies

outside the realm of regular expectations, carries extreme impact and is explainable only after the fact. Examples are the financial crises and the Fukushima nuclear disaster. Uncertainty management tools will always try to lower the level of uncertainty to make it more subordinate to management tools.

The Port of Rotterdam Authority has to deal with deep uncertainty for a lot of projects (Taneja, 2013). Especially, the response of people on external forces is subordinate to deep uncertainty, level 4 or level 5 uncertainty. Although, the cognitive system model for mental processing of Kahneman (2003) explained the different components for valuing and decision making, however the interaction of input, variables and output is at the moment too complex to incorporate. Deep uncertainty is also the case regarding this cognitive system model. Therefore the future development of the reference state cannot be described without accepting deep uncertainty. The composition of perception is therefore subordinated to deep uncertainty.

Table 10 Levels of uncertainty
Source: Walker et al. (2012)

Complete Certainty		Level 1	Level 2	Level 3	Level 4	Level 5	Total ignorance
	Context	A clear enough future (with sensitivity) 	Alternate futures (with probabilities) 	Alternate futures (with ranking) 	A multiplicity of plausible futures (unranked) 	Unknown future 	
	Systemmodel	A single system model	A single system model with a probabilistic parameterization	Several system models, one of which is most likely	Several system models, with different structures	Unknown system model; know we don't know	
	Systemoutcomes	Point estimates with sensitivity	Several sets of point estimates with confidence intervals, with a probability attached to each set	Several sets of point estimates, ranked according to their perceived likelihood	A known range of outcomes	Unknown outcomes; know we don't know	
	Weightsonoutcomes	A single estimate of the weights	Several sets of weights, with a probability attached to each set	Several sets of weights, ranked according to their perceived likelihood	A known range of weights	Unknown weights; know we don't know	

10.2 Flexibility

The consideration of uncertainty regarding the composition of perception by detection and reference state showed the high level of uncertainty when it comes to the prediction of the future development of perception regarding port projects or activities. To deal with this deep uncertainty, an additional tool to Strategic Stakeholder Management was designed with incorporation of the strategic flexibility approaches as proposed by Taneja (2013). First, the strategic flexibility approaches will be explained, where after they will be combined with the composition of perception, as proposed in this report. Finally, the strategic roadmap and related actions will be described in addition to the current Strategic Stakeholder Management practice of the Port of Rotterdam Authority.

10.2.1 Types of flexibility

Taneja (2013) described flexibility from two different point of view. First of all, flexibility was researched in the system differentiation of de Neufville, Scholtes and Wang (2006). They distinguished two types of real options, namely options 'in' a system and options 'on' a system. Options in a system were meant as flexibility in the system itself. This could be for example flexibility in capacity, functional use, specific environmental interactions like emissions or efficiency. Options on a system were meant as flexibility in terms of management's ability to influence the system. This could be for example expansion, downsizing, abandonment or phasing. In this consideration, the system was unchanged.

10.2.2 Strategic approaches to incorporate flexibility

Three main groups of real options were used by Mauboussin (2000) and further linked to port activities by Taneja (2013). Taneja (2013) proved that the differentiated strategic options were applicable to several examples of port activities. The three groups, as differentiated by Mauboussin (2000) were stated from the perspective of a manager and could therefore also be of added value in Strategic Stakeholder Management of the Port of Rotterdam Authority. The three main groups of options are represented by 'invest/grow', 'defer/learn', and 'disinvest/shrink'. For an investment option, a possible strategic differentiated option could be 'scale-up'. 'Scale-up' indicates the creation of new opportunities, while 'scaled-down' gives an option to downsize of project when new information becomes on power. This new information could be translated to sensory detection or detection through information. A 'switch-up' option creates opportunities for new types of products and processes. A 'switch-down' option creates opportunities to switch to a more cost effective way of working. A 'scope-up' option is the opportunity to diversify the project or activity, while a 'scope-down' option is the possibility to narrow the project or activity to for instance niche markets. Finally, a 'study/start' option is the possibility to wait before action or for instance investing. Below, the options and strategic option differentiation are summarized.

- Invest/grow options
  - Scale-up
  - Switch-up
  - Scope-up
- Defer/learn options
  - Study/start
- Disinvest/shrink options
  - Scale-down
  - Switch-down
  - Scope-down

These strategic options for the incorporation of flexibility in situations of deep uncertainty will be linked to the proposed composition of perception in business tool.

10.3 Perception uncertainty categorization

Different locations and levels of uncertainty were described on a general level. It was stated that deep uncertainty could only be answered with flexibility and this was added with strategic approaches to implement this flexibility. In this paragraph, uncertainty will be described in relation to perception. First of all the possible uncertainty in the different components of uncertainty are described, thereafter the combinations of these components and the composition of perception will be analyzed. Finally, the researched combinations will be added by strategic approaches, derived from the proposed approaches of Mauboussin (2000).

10.3.1 Uncertainty about perception components

First of all, a short explanation of the axes of the quadrant will be given. In total, four combinations of uncertainty situations are possible to this quadrant. The axes and their different extremes will be described.

Detection uncertainty

Detection uncertainty is uncertainty about the possible future level of detection of a project. This can be sensory detection or detection by information. The uncertainty can be high when there are project components for which the interaction level with the environment is not known. In this case 'we know that we don't know' and this situation is classified as level 5 uncertainty. When certain possible situations of detection are known, without ranking, this is classified as level 4 uncertainty. This goes down till a situation of very low uncertainty, level 1. In this situation possible situations or developments of detection are almost certain. Possible detection levels should be determined or estimated by experts.

An example of a low level of detection uncertainty is a situation in which there is a low level of dynamic interaction with the environment or a situation in which the interaction is controlled. When for instance a natural area is created, the boundaries of this area and possible animal and vegetation species are normally clear. Besides, the interaction is location bound and almost not intruding on other locations. The detection uncertainty can then be considered as a low level uncertainty.

Detection can also be very interactive, but for instance controlled by additional technology. This can be the case for an oil terminal, which installed emission filters to control their interaction with the environment. The level of detection uncertainty is then also low.

Reference state uncertainty

Reference state uncertainty is related to the uncertainty about system response. System response is in this consideration the chosen reference state by people. External forces can influence the reference state, but it is uncertain which external forces will become real and in which way they will influence the reference state. It was already discussed in this report that the reference state could be influenced dramatically when the chosen reference state is derived from external benchmarks. Reference state uncertainty is also deep uncertainty, for which 'we know that we don't know', level 5 uncertainty. Internal discussion sessions of the Port of Rotterdam Authority should estimate if reference states of stakeholders would be subordinate to deep uncertainty or partly predictable.

Reference state uncertainty can for example be at stake when new technologies or facilities are introduced. The reference state uncertainty in oil terminal projects can be high, because new sustainable energy alternatives are introduced. But, when for instance a scientific report concludes that bioenergy production is one of the main causes of environmental degradation, reference states can change again. The uncertainty about such developments makes that a project can have a high level of reference state uncertainty.

10.3.2 Combinations of detection and reference state uncertainty

The four extremes of the perception uncertainty quadrant are the combined situations of detection and reference state uncertainty. In this quadrant, the extreme level of low uncertainty is expressed with certainty. It must be mentioned that certainty is relative in this context. Absolute certainty is not possible in estimations

about future detection or reference state, but it is estimated as plausible with the current knowledge. Besides, the extremes are not a representation of future developments, but a handle for strategic action. The combinations will be described and added with strategy recommendations.

Detection certainty – Reference state certainty (DC – RSC)

In this situation, the project is estimated to be detection uncertain at a low level. There are not many interaction components which are uncertain. Also the reference state is estimated at a low uncertainty level. External forces will have little influence on the chosen reference state. The detection and reference state can be stated as constant over time. In such a situation, perception will be also be at a constant level. It also means that the adaptability of people to new value levels is low. When for example value is created in the light of perception, this value creation is more durable over time when detection and reference state are more constant. In figure 34, two example situations of detection are given in red and green. The constant reference state is given in blue. The difference between the red and green detection levels and the horizontal axis through the reference point are a measure for perception. The situation has a zero degree perception uncertainty.

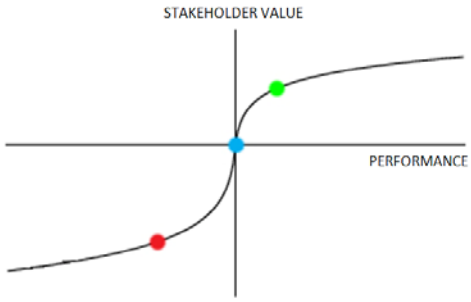


Figure 34 DC – RSC

- Positive detection point (example)
- Negative detection point (example)
- Reference state

Detection uncertainty – Reference state certainty (DU – RSC)

When the detection levels are estimated as uncertain, detection can possibly fluctuate over time. Uncertainty can be on lower levels, level 1 and 2, but also for higher levels, level 4 and 5. In the last situations, detection is subordinate to deep uncertainty. It is uncertain how detection will develop in the future. This can be the case when new technologies are used, but also external forces which have their influence on detection. However, reference states are estimated as more constant over time regarding this detection. It should also be estimated if the reference state is not sensitive to adaptability over time. This means that the reference state would adapt to the new detection level.

Although, agreements can be made about a certain project, the perception of this project and related agreement can change over time, because of a changing detection. In figure 35, the uncertainty about detection (red) and the constant reference state (blue) are given in the valuation curve. An example can be uncertainty about smell nuisance levels of an oil terminal. The reference state regarding smell nuisance is estimated as more constant over time. This situation has a first degree perception uncertainty.

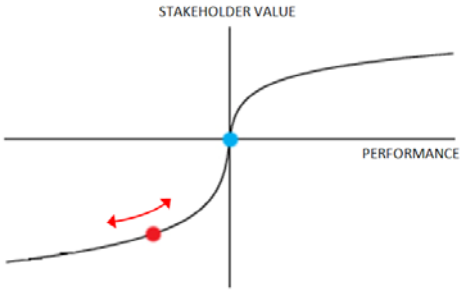


Figure 35 DU – RSC

- Negative detection point (example)
- Reference state
- Detection uncertainty (not bounded)

Detection certainty – Reference state uncertainty (DC – RSU)

Detection can be estimated at low levels of uncertainty. In such situations, the interaction of a system with the environment is controlled on a high level. The controllability of detection is therefore also higher and uncertainty levels lower. However, the reference state regarding the project or possible detection can change over time. This can also be adaptability to detection levels. The reference state can be sensitive to adaption.

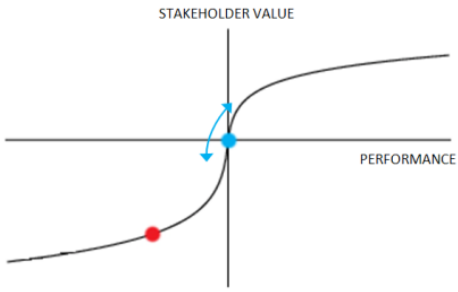


Figure 36 DC – RSU

Reference state uncertainty is further deep uncertainty which cannot be controlled. In figure 36, the uncertainty about the chosen reference state is given in blue and the estimated constant detection level is given in red. Perception about project agreements can change over time when the reference states changes. Although, the agreement can be for many years, keep in mind that perception can change. This situation is first degree perception uncertainty.

- Negative detection point (example)
- Reference state
- Reference point uncertainty (not bounded)

Detection uncertainty – Reference state uncertainty (DU – RSU)

When detection and reference state are estimated as uncertain, perception can change dramatically over time. The detection levels are estimated as uncertain, because of for instance the use of new technology or the high dependency on uncertain external forces. On the other hand, the development of reference states are uncertain over time and possibly adaptable to new detection levels. In such a situation, agreements about projects or performances are sensitive to perception changes over time. The situation of uncertainty about detection and reference state is given in figure 37. The detection level is given in red en the reference point in blue. In this situation the initial detection level is chosen at the negative side of the curve. This situation is second degree perception uncertainty.

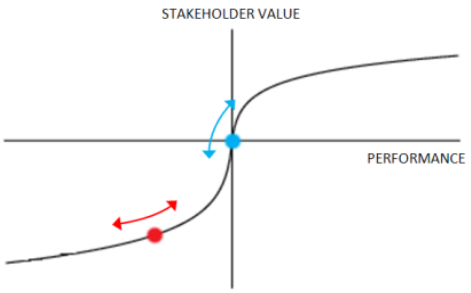


Figure 37 DU – RSU

- Negative detection point (example)
- Reference point
- Detection uncertainty (not bounded)
- Reference state uncertainty (not bounded)

10.4 Perception uncertainty quadrant

To analyze the uncertainty regarding detection and reference state of a project, a tool was designed for the link between categorization and strategic actions. In the perception uncertainty quadrant, given in figure 38, projects can be analyzed on their uncertainty level. For different aspects of a project, different analysis can be made. The total quadrant gives an overview of the different aspects and/or projects.

10.4.1 Perception uncertainty classification

It was already proposed to indicate the perception uncertainty combinations with different degrees of uncertainty. Translated to the perception uncertainty quadrant, the 'left-under' square has a zero degree sensitivity, the 'left-top' and the 'right-under' squares have a first degree uncertainty and the 'right-under' square has a second degree perception uncertainty. When a project or project aspect has a second degree perception uncertainty, the detection and reference state have a high level of uncertainty.

To make the different combinations more clear in the quadrant, different characteristic names are given to the combinations. The names give information about the uncertainty in the combination. The names of the combinations are 'CONSTANT', 'SENSES', 'CONTEXT', and 'DYNAMIC'. For 'CONSTANT' the level of detection and reference state uncertainty is estimated as low. Constant is therefore referring to the uncertainty level. 'SENSES' is related to detection uncertainty, so uncertainty about sensory or knowledge detection. The other first degree uncertainty combination was named 'CONTEXT' and was referring to reference state uncertainty. External forces could influence system responsive. The last combination was named as 'DYNAMIC', because of the second degree perception uncertainty towards detection and reference state. The different combinations and names are summarized below and given in figure 38.

- Detection certainty; Reference state certainty = CONSTANT
- Detection uncertainty; Reference state certainty = SENSES
- Detection certainty; Reference state uncertainty = CONTEXT
- Detection uncertainty; Reference state uncertainty = DYNAMIC

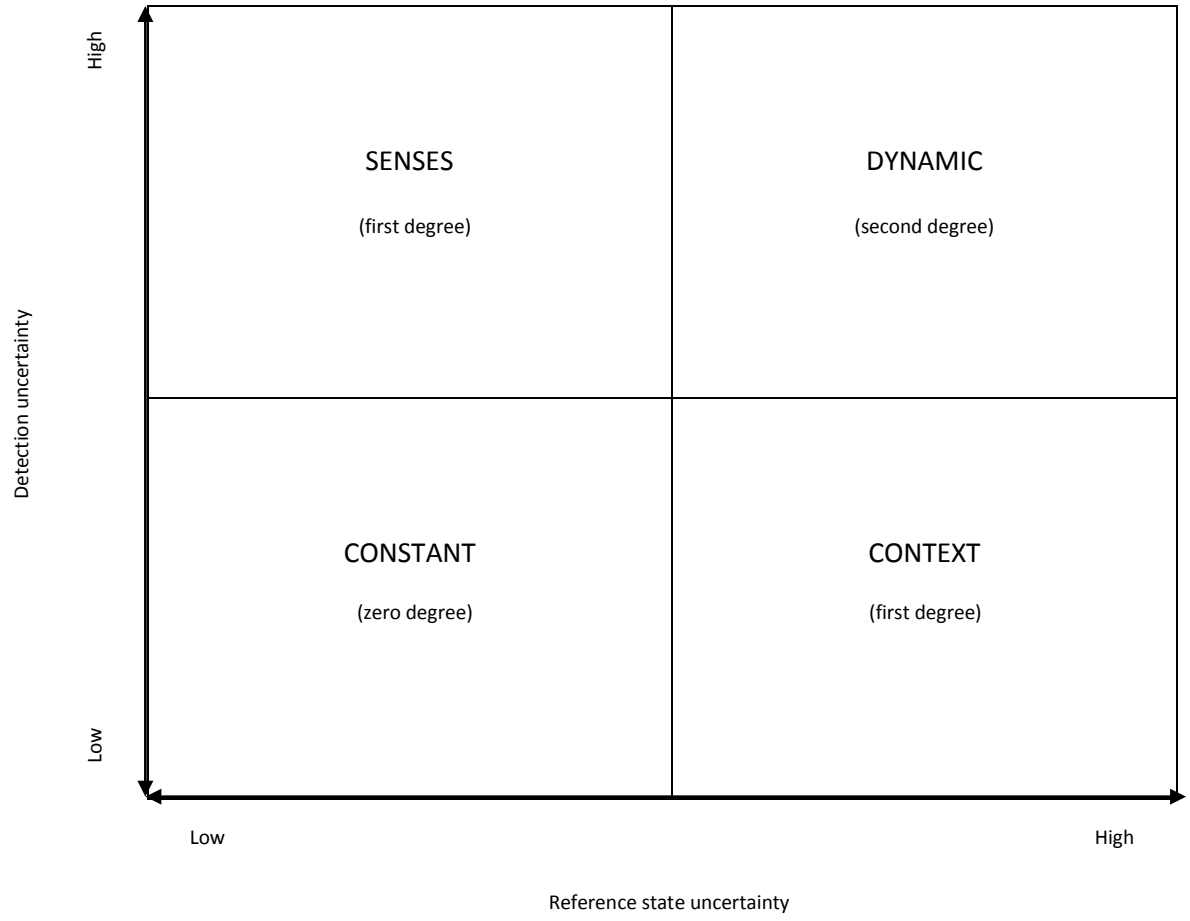


Figure 38 Perception uncertainty quadrant

When the graphical presentation of the sensitivity combinations are translated to the quadrant, the quadrant can be presented more visually, which is given in figure 39.

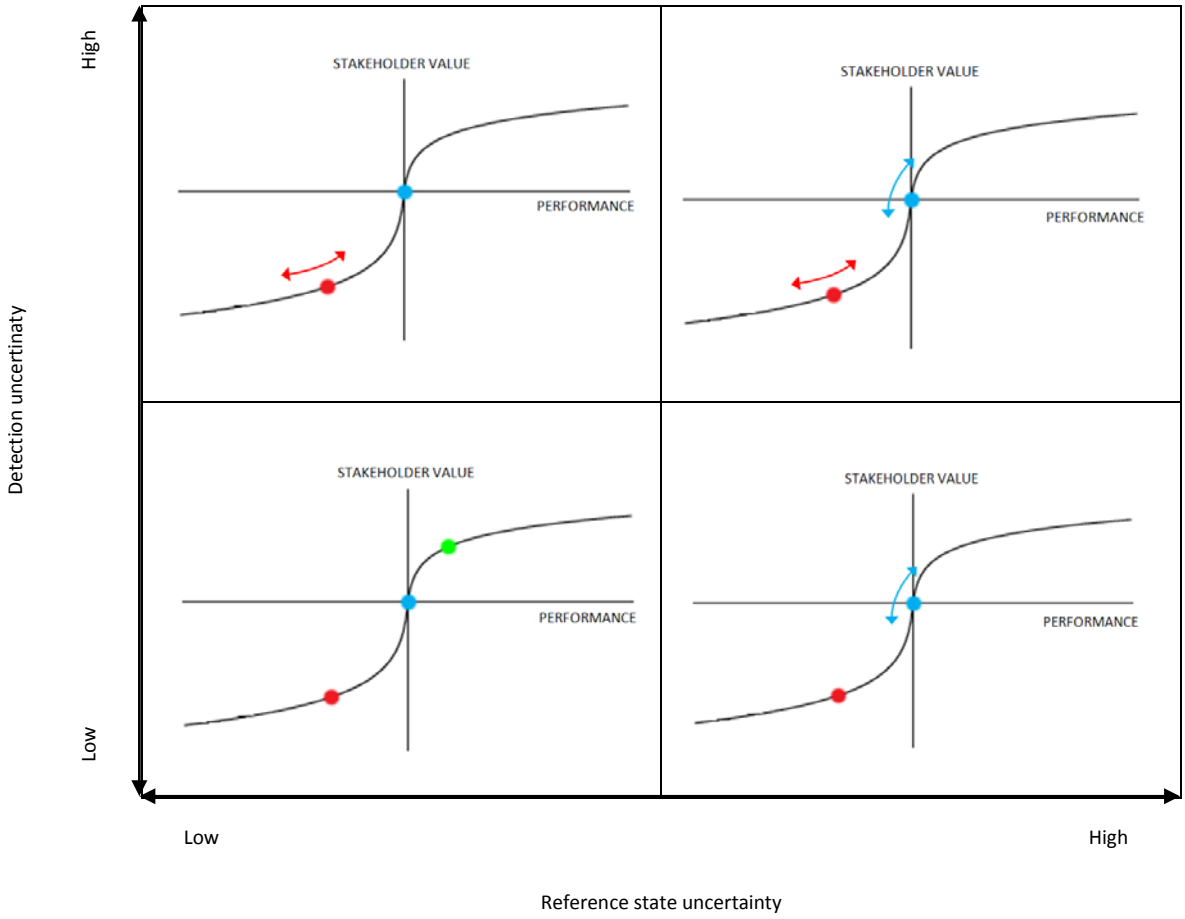


Figure 39 Perception uncertainty quadrant with graphical presentation

Positive detection point (example)

Negative detection point (example)

Reference state

Detection uncertainty (not bounded)

Reference state uncertainty (not bounded)

10.4.2 Strategic actions and implementation

To support already existing SSM, the perception uncertainty quadrant has also a strategic function, besides the categorization of projects or project aspects. Every explained combination of perception uncertainty features strategic actions to deal with that combination and possibly influence it to certain preferences. For every uncertainty combination, the strategic actions are given.

CONSTANT (zero degree perception uncertainty)

- Investigate (possible) detection of stakeholders regarding the defined impact(s)
- Investigate the stakeholder which is responsible for the defined impact(s)
- Investigate reference states of related stakeholders through dialogue
- Compensate stakeholders in cases of negative perception (loss) through Mutual Gains Approach (MGA)
- Monitor perception through dialogue

SENSES (first degree perception uncertainty)

- Investigate detection uncertainties with corresponding impact(s)
- Investigate which stakeholder is responsible for the defined impact(s)
- Investigate reference states of related stakeholders through dialogue
- Investigate the main drivers of the chosen reference states
- Investigate which strategic option would be most applicable to create flexibility for this project (aspect) and reach consensus with all stakeholders
- Monitor detection and perception through professional measurement and dialogue

CONTEXT (first degree perception uncertainty)

- Investigate (possible) detection of stakeholders regarding the defined impact(s)
- Investigate which stakeholder is responsible for the defined impact(s)
- Investigate reference state uncertainties
- Investigate the main drivers of the chosen reference states
- Investigate which strategic option would be most appropriate to create flexibility for this project (aspect) and reach consensus with all stakeholders
- Monitor reference state and perception through dialogue

DYNAMIC (second degree perception uncertainty)

- Investigate detection uncertainties with corresponding impact(s)
- Investigate the stakeholder which is responsible for the defined impact(s)
- Investigate reference state uncertainties
- Investigate the main drivers of the chosen reference states
- Investigate which strategic option would be most appropriate to create flexibility for this project (aspect) and reach consensus with all stakeholders
- Monitor detection, reference state and perception through measurement and dialogue

The implementation column shows that all strategic actions can be executed through Strategic Stakeholder Management with the support of for instance DCMR when it comes to measurement and complaints about impact(s). The implementation in the current Port of Rotterdam strategies was also preferable, because of implementation reasons.

10.4.3 Strategic roadmap for using 'perception uncertainty quadrant'

The proposed 'perception uncertainty quadrant' and corresponding strategic actions are now incorporated to the already existing SSM approach of the Port of Rotterdam Authority. These steps are summarized below as a final strategic roadmap for using the 'perception uncertainty quadrant'.

1. Set up the SSM profile (Appendix D) with incorporation of three extra questions, namely:
    a. Is the project estimated to be sensitive to detection issues?
    b. Is the project estimated to be sensitive to changes in reference states?
    c. Are detection and reference state uncertainty related to each other?
2. Apply the strategic actions related to the degree of perception uncertainty and its classification
    a. When all questions of the SSM profile are answered with no, the project has a zero degree perception uncertainty
    b. When question a. or b. of the SSM profile is answered with yes, the project has a first degree perception uncertainty
    c. When all three questions of the SSM profile are answered with yes, the project has a second degree perception uncertainty
3. Incorporate project information in Port of Rotterdam's database as reference cases for future project investigations

10.4.4 Example cases

As a final explanation part, a couple of port projects will be analyzed regarding the 'perception uncertainty quadrant'. Different types of port projects are selected to explain the 'perception uncertainty quadrant' from different perspectives. Besides, the projects also differentiate in their execution phase and responsibility of the Port of Rotterdam Authority regarding the project impact(s). In this paragraph, the differentiation and classification of the projects is described. The strategic approach, related to the project will be explained in their strategic options with examples. Finally, the projects are given in the 'perception uncertainty quadrant'. The selected port projects are:

- Recreational beach Maasvlakte II
- Abengoa Bioenergy Netherlands
- Blankenburgtunnel

Recreational beach Maasvlakte II

The new recreational beach at Maasvlakte II comprises eight kilometers of soft seawall which protects Maasvlakte II against the North Sea. This so called soft seawall is roughly twice as long as the existing Maasvlakte. Infrastructure and sufficient parking spaces will shortly ensure good accessibility by car or bike (Port of Rotterdam, 2009). An impression of the beach facilities is given in figure 40.

Figure 40 Impression of beach facilities Maasvlakte II
Source: Port of Rotterdam Authority (2012b)

The recreational beach of Maasvlakte II was planned as a compensation for the loss of the beach of Maasvlakte I. While the beach of Maasvlakte I was originally not planned for recreation, it became a popular beach over time. It also resulted in the fact that stakeholders took the situation at Maasvlakte I as their reference state. Because, the new beach is twice as long as the existing beach, the created value of the beach at Maasvlakte II is classified as value creation. Figure 41 gives an overview of the new beach at Maasvlakte II. Because of the adaption of people to the recreation level of Maasvlakte I, this will probably also be the case for the beach at Maasvlakte II. We can say that their reference state will be derived from the status quo. Although, stakeholders showed up adaptive behavior regarding their chosen reference state in the situation of Maasvlakte I, the uncertainty level is estimated as low level uncertainty. This is the case for the reference state, but also for detection. The beach and its facilities are non variable over time, which results in a low uncertainty level regarding detection. The project can therefore be marked as 'CONSTANT'.

Figure 41 Recreational beach Maasvlakte II
Source: Port of Rotterdam Authority (2012b)

The strategic approach, which is related to 'CONSTANT' contains:

- Investigate (possible) detection of stakeholders regarding the defined impact(s)
- Investigate the stakeholder which is responsible for the defined impact(s)
- Investigate reference states of related stakeholders through dialogue
- Compensate stakeholders in cases of negative perception (loss) through Mutual Gains Approach (MGA)
- Monitor perception through dialogue

When perception changes, the project should again be analyzed from the first step of the strategic approach. Information from the stakeholder dialogue can form the input of the iteratively investigations.

Abengoa Bioenergy Netherlands

Abengoa Bioenergy Netherlands is part of the larger Spanish corporation Abengoa. The company's ambition is to apply innovative technology solutions for sustainability in the energy and environment sectors, generating electricity from renewable resources, converting biomass into biofuels and producing drinking water from sea water. They have three core businesses: engineering and construction, concession-type infrastructures, and industrial production.

Figure 42 Smell nuisance Abengoa
Source: De Weekkrant (2012)

From 2010 till 2013, there was a lot of discussion about the smell nuisance of Abengoa, as expresses in figure 42. In 2012, the activities of Abengoa were the cause of almost 200 complaints about smell nuisance. Especially, in Maassluis, Brielle and Rozenburg, the activities resulted in many complaints (DCMR, 2012). The source of this smell nuisance was investigated by DCMR and their conclusion was that the smell nuisance was caused by the fermentation of corn in the production process of the company.

The smell nuisance was first of all a problem for Abengoa itself. After a couple of financial penalties, Abengoa decided to shut down their activities till a solution was found to lower the smell nuisance. This was an extreme consequence for Abengoa. But besides the consequences for Abengoa, Port of Rotterdam Authority's business is also influenced by this issue. It is imaginable that there will be a lot of resistance when new facilities of this type are planned. In that case, the Abengoa problems are linked to the Port of Rotterdam Authority's business result. The detection problem of Abengoa becomes then an external force which influence the reference state regarding the same type of projects. The bioenergy facility of Abengoa Bioenergy Netherlands is shown in figure 43.

Figure 43 Abengoa Bioenergy Netherlands
Source: Katzen International Inc. (2014)

When performance regarding detection levels will not improve, future detection will still have a high level of uncertainty. However, with the decision of Abengoa to install a regeneration system to control their emissions, detection uncertainty levels can be estimated on a lower scale. The reference uncertainty will stay part of the project, because of the fact that the bioenergy is relatively new and reference states regarding this new type of energy have to develop itself over time. With an estimated low level of detection uncertainty and an estimated high level of reference state uncertainty, the project can be classified as a project with a first degree perception uncertainty. In the perception uncertainty quadrant, the project can then be marked as 'CONTEXT'.

The strategic approach, which is related to 'CONTEXT' contains:

- Investigate (possible) detection of stakeholders regarding the defined impact(s)
- Investigate which stakeholder is responsible for the defined impact(s)
- Investigate reference state uncertainties
- Investigate the main drivers of the chosen reference states
- Investigate which strategic option would be most appropriate to create flexibility for this project (aspect) and reach consensus with all stakeholders
- Monitor reference state and perception through dialogue

Strategic options to incorporate flexibility which can be appropriate in the described situation are:

Strategic options:	**Examples**
• Invest/grow options	
o Switch-up	Use of other products for fermentation to lower smell nuisance
o Scope-up	Design infrastructure to capture emission, as for instance pillars with magnetic emission capturing
• Disinvest/shrink options	
o Scale-down	Lower production process levels to lower smell nuisance

The short term implementable options are switch-up and scale-down. Scope-up requires a certain level of innovative thinking and is more difficult to implement in the short term.

With this analysis of perception uncertainty, possible problems can be solved by incorporating flexibility at the start of the project. The Abengoa plant facility could for instance be designed to operate with the possibility of different types of products besides corn. On the other hand, shows it the possibilities for innovation and research to emission capturing installations.

Blankenburgtunnel

The Blankenburgtunnel is a complex project with a lot of stakeholders involved. The project should form a new connection between the A15 and A20 highways. However, many local stakeholders related to environmental themes were against the construction of the new connection, because it would harm the landscape between Vlaardingen and Maassluis (Aalkeetpolder) and the recreational area of the Krabbeplas. Besides, there is discussion about the intended improvement of accessibility of the region with external forces as an decrease of traffic intensity, high oil prices and bad economic prospects. Also, the possibility of toll levies increases the discussion about the traffic intensity on this route, because the free option of the Benelux tunnel is close to the Blankenburgtunnel. These proposed route of the Blankenburgtunnel is shown in the overview of figure 44.

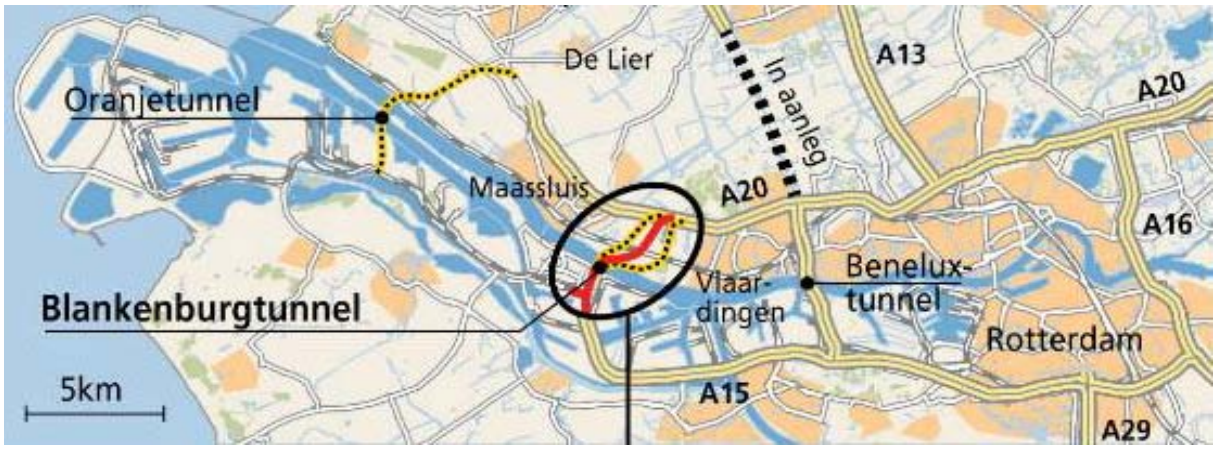


Figure 44 Proposed route of the Blankenburgtunnel
Source: BNR (2012)

Analyzing the project, it is clear that there is still a high level of uncertainty about the possible future performance of the new route. This performance is directly related to detection of for instance congestion, smell and noise nuisance, and detection by information. In addition, the reference state uncertainty is also high. The development of future reference states has a high level of uncertainty at the moment. The project has therefore a two degree perception uncertainty. Perception can very dynamic over time and the project is marked as 'DYNAMIC'.

The strategic approach, which is related to 'DYNAMIC' contains:

- Investigate detection uncertainties with corresponding impact(s)
- Investigate the stakeholder which is responsible for the defined impact(s)
- Investigate reference state uncertainties
- Investigate the main drivers of the chosen reference states
- Investigate which strategic option would be most appropriate to create flexibility for this project (aspect) and reach consensus with all stakeholders
- Monitor detection, reference state and perception through measurement and dialogue

Strategic options to incorporate flexibility which can be appropriate in the described situation are:

Strategic options:	**Examples**
• Invest/grow options	
o Switch-up	Choose another route option with lower perception uncertainty
o Scope-up	Design an integrated plan for the environment in which all interest are incorporated

- Defer/learn options
  - Study/start — Carry the project out in phases in case of high reference state adaption or do research into the consequences to lower detection uncertainty
- Disinvest/shrink options
  - Scale-down — Decrease the project impact through scaling down the project in size

For this project several options can be discussed with stakeholders through dialogue. With the incorporation of these options at the start of the project, the project has a higher level of flexibility and is more sustainable regarding perception uncertainty over time.

Classified projects in perception uncertainty quadrant

The investigated projects are now presented in the perception uncertainty quadrant in figure 45. From the quadrant, projects can be classified and researched on correlations. The recommended database to save project details regarding detection and reference states and project characteristics are a good basis for such research into correlations. These correlations can be supportive in future development of strategic approaches and options to increase flexibility regarding perception uncertainties.

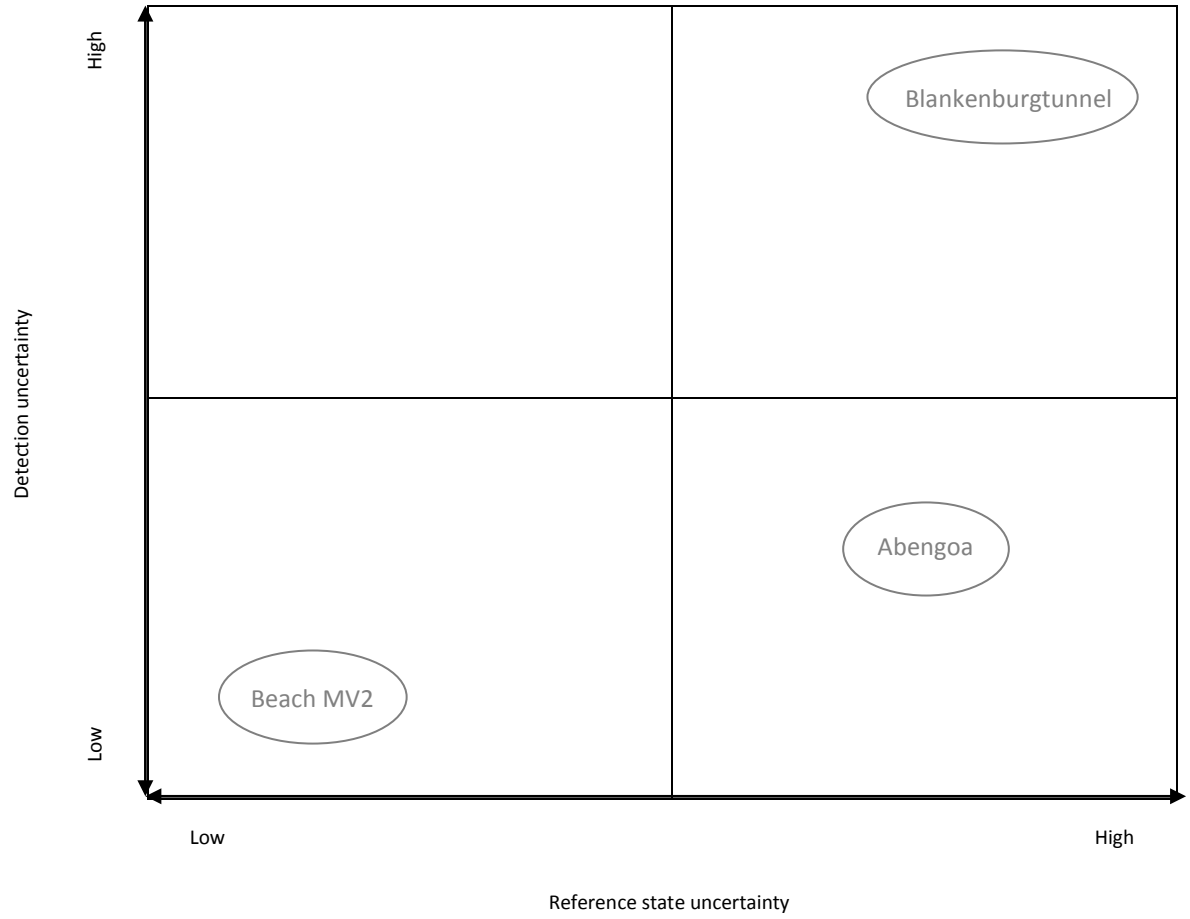


Figure 45 Classification of projects in perception uncertainty quadrant

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12.2 Tables

Appendices

Appendix A Drivers of Change

Source: Port of Rotterdam Authority (2011)

- Port related industry
  - Made in Europe/ Made in Germany
  - Rising ore and coal prices
  - Scarce rare metals
- Technology
  - Electric cars – battery swap system
  - Construction below surface
  - Smart Road
- Information technology
  - Further integration of IT in products
  - Next generation internet: Internet of Things/ web 3.0
- Transport
  - Transition bulk fuel
  - Further scaling of transport
  - Sustainable transport
- Supply Chains
  - Active management of infrastructure
  - CO2 footprint supply chains
  - Closed loop supply chains
- Energy
  - Energy efficiency
  - Solar energy
  - Coals and CO2 reduction
  - Biobased/ green chemistry
  - 3D printing
- Geopolitics
  - Scarcity
  - Crisis in Europe
  - Dependency world economy
- Global economy
  - Shift center world economy Asia
  - Transition to sustainable macro economy
  - Instability European politics and economy
  - Focus on local production or generation/ protectionism
  - Overcapacity and more intense competition in the Hamburg – Le Havre range
- Society
  - Increase of individualizing by fast digital society and freedom of choice
  - Increase of scarcity labor market
  - Increase of transparency
  - Increase of politics of right wing of political spectrum
  - Influence of behavior: from trend to structural change (mobility management/ sustainability)
- Environment
  - Climate change
  - Water
  - Environmental politics

Appendix B Key Performance Indicators 2012

Source: Port of Rotterdam Authority (2012a)

Doelstelling	Ref.	Key performance Indicators	Norm 2012	Realisatie 2012	Norm 2015
Efficiency - Transport	i	DTAT	< 4:27	4:30	nvt
	i	NEI	7,0	9,5	ntb
	i	% spits waar gemiddelde reistijd Vaanplein - Maasvlakte: < 40 min (avondspits haven uit)	> 75%	62%	95%
	i	Havenwegen < 2 maal free-flow reistijd	> 85% voor zeven trajecten	93%	95%
Efficiency - Kosten aanleg en beheer havengebied		Kosten baggeren (€/ha)			
		Kosten kademuren (onderh.kst. vs vervangingswaarde)	< 0,20	0,19	-10% (tov 2010)
	i	Aanleg MV2 volgens planning en budget	1) Sluitgat dicht 2) Infrabundel buitencontour gereed 3) Start doorgraven Yangtzehaven	Conform planning	Fase 1 operationeel gebruiksgereed
		Projectrealisatie conform afspraken over planning (P), budget (B) en rendement (R) voor publieke en klantspecifieke infrastructuur.	> 84%	71%	90%
Veiligheid	i	Nautische ongevallen	< 120	111	nvt
		NSI	< 0,93	0,97	ntb
Verdiepen Klantrelatie	i	Klantbelevingsonderzoek	7,4	7,4	nvt
Duurzaamheid - HbR-bedrijfsvoering	i	HbR footprint	-4% t.o.v. 2010	-6,6% t.o.v. 2010	-10% (tov 2010)
Duurzaamheid - Ruimtegebruik	i	Duurzaam gebruik HIC is samengestelde KPI van prestaties en inspanningen van bedrijven op diverse gebieden gericht op verduurzamen bestaande complex	Alle 5 criteria, zijn in werking	4 in werking	5 in werking
Duurzaamheid - Transport	i	Maximum aandeel wegvervoer in modal split containers van Maasvlakte terminals	< 46,5%	46,9% (t/m Q2)	44%
Groei in groeiconcepten	i	Marktaandeel totaal	> 37,1%	37,5% (t/m Q3)	37,8%
	i	Marktaandeel groeiconcept Container Port	> 29,1%	28,9% (t/m Q3)	29,4%
Verstevigen concurrentiepositie	i	Realisatie project NWO	NWO in Regeerakkoord	In Regeerakkoord	Start aanleg
		Verbeteren verblijfstijd binnenvaart in haven Rotterdam	nul meting + normstelling gereed	conform planning	ntb
Versterken hubfunctie / Maritieme netwerken		% zee/zee overslag t.o.v. totale overslag van containers (gemeten in teu)	> 33,6%	32,8%	32,8%
Deelnemingen in groeimarkten	i	Aantal nieuwe deelnemingen (cumulatief)	2 nieuwe deelnemingen	0	4 nieuwe deelnemingen
Global Strategic Partnerships	i	Aantal partnerships	3	1	10
Organisatie - Resultaatgerichtheid	i	% medewerkers die % van hun doelstellingen hebben gerealiseerd.	90% medewerkers heeft doelstellingen, voor minimaal 75% gehaald	77,5% heeft doelstellingen	100%
Renderende onderneming		NCW berekend tegen de HbR vermogens-kostenvoet (8,5%).	> 0	> 0	> 0

Appendix C Risk Matrix

Source: Port of Rotterdam Authority (2013b)

Risk Matrix Port of Rotterdam Authority - Version June 19, 2013						Possible	Probable	General	Yearly	Monthly
						Multiple times in other ports	Has happened within port region	Multiple times in port region	One or more incidents per year in port region	One or more incidents per month in port region
Corporate values / Impact	Financial	Image	Safety (People)	Environment	Accessibility	≥0.001/y	≥0.01/y	≥0.1/y	≥1/y	≥10/y
Catastrophic	>10M€	Long term negative attention in local, regional and national media (>4 weeks), very serious concerns of environment, governments and clients. Image permanent affected	Deadly victims	Environmental disaster. No recovery or more than 5 years. Permanent impact on region (>50 km)	Loss of large part infrastructure. Intensive zone is not operational for long term	**M**	**H**	**H**	**U**	**U**
Serious	<10M€	Long term negative attention in local, regional and national media (1-4 weeks), serious concerns of environment, governments and clients. Image long term affected	Deadly victim/ very serious injury (>12 months)	Serious environmental damage. Recovery 0.5 – 5 years. Long term impact on environment	Damage to infrastructure. Not operational for long term	**M**	**M**	**H**	**H**	**U**
Major	<1M€	Short term negative attention in local, regional and national media (2 days-1 week), concerns of environment, governments and clients. Image short term affected	Serious injury (2 weeks – 12 months)	Environmental impact. Recovery 1-6 months. Short term impact on environment. More than 10 complaints	Short term nuisance. For about a week lower accessibility of infrastructure	**L**	**M**	**M**	**H**	**H**
Moderate	<100k€	Very short term negative attention in local media (1 day), some concerns of environment. Image short term affected for some interest groups	Injury (<2 weeks)	Small environmental impact. Cleaning necessary. Recovery 1 month. Small impact on environment. Less than 10 complaints	Moderate consequence for infrastructure. Short term accessibility impact (1 day)	**L**	**L**	**M**	**M**	**H**
Small	<10k€	No negative attention in media. No effect on image	Small injury	Very small environmental impact, local, no impact on residents	Small consequence for infrastructure. Short term impact on accessibility (<1 day)	**N**	**L**	**L**	**M**	**M**

Unacceptable (direct action), **H**igh (fast action), **M**oderate (this year action), **L**ow (action on long term), **N**egligible (no action)

Appendix D Strategic Stakeholder Management Questionnaire

Source: Port of Rotterdam Authority (2013c)

Strategic Stakeholder Management Questionnaire	
Project characteristics	
Project goal	
Project scope	
Project Manager	
SSM profile	**(Y/ N)**
1. Do other parties besides to the Port of Rotterdam Authority influence the project goal?	
2. Is the project sensitive to political governing or media attention?	
3. Has the project an impact on the environment?	
4. Is there a relation between the project and another project with the same stakeholders?	
5. Crosses the project the strategic interest of the Port of Rotterdam Authority?	
6. Is the investment higher than 40 million euro's?	
7. Are there environmental related laws and regulations?	
Strategic Stakeholder Management Application	