Value and uncertainty management in seaports

"To develop an integrated method for value capture and preservation of port infrastructure investments, applicable to Rotterdam seaport and allowing for future uncertainty"

Background:
Ports are important national assets and investments in them add value in multiple ways. Not all of these are expressible in economic terms. Value can be seen from different perspectives and are subjective. Port managers have limited insight into what can happen in the future. The drive to make sustainable investment decisions is gaining momentum. What is considered valuable now can be different in some years' time. A tool or method is required to make more robust decisions for port investments.

This PhD research aims to arrive at such method.

Requirements
- Applicable to infrastructure investments by Port of Rotterdam Authority
- Produce ordinal decision results
- Satisfy the requirements of business and society while ensuring that basic human rights of individuals are safeguarded
- Robust for input bias
- Tested on cases

Issues:
- Balancing value types e.g. economic versus non-use
- Value incommensurability
- Impact of monetising value
- Non-revealed value, role of emotions in eliciting value
- Analysis inclusion and exclusion of value factors
- Distribution of value
- Limitations of discounting
- Long term effects, intergenerational carry-over

Research Questions
- Which concepts, tools and mechanisms for value and uncertainty management of ports are currently applied in comparable sectors?
- How do trends in society influence choice of value and uncertainty tools?
- How will the relevance of types of values and uncertainties be determined?
- Which practical issues would need addressing in the implementation of a theoretical value and uncertainty management framework?

Approach
- Literature research
- Exploration of methods: a.c. case studies
  (Cost Benefit Analysis, Exploratory Modelling)
- Group Decision Room, (structured) interviews
- Method selection, model building
- Expert panel feedback

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Value and uncertainty management of investments in port infrastructure

Steve Sol graduated as a Chemical Engineer from Delft University of Technology in 1995. Upon graduation he was offered to take a PhD position on a topic related to catalysts physics. Instead he chose to join Air Products and Chemicals, where he was enrolled in an international management development programme. During multiple years assignments in the UK he gained experience in engineering, operations and commerce. Upon his return to the Netherlands, he was sponsored to take on an executive MBA at Rotterdam School of Management. Graduating from the programme with Deans Honours he was hired by Port of Rotterdam (PoR) in 2002. After an initial role in marketing & strategy, performing business development activities to attract more chemical industry to the Port industrial zone, he was asked to manage an asset management unit. In 2008 he took a role at PoR’s joint venture in Sohar, Oman (SIPC), being operationally responsible for the JV’s daily activities. After returning to the Netherlands he joined PoR international development department, taking up port development projects in Eastern Europe, Far East and West-Africa. With an ambition to expand his knowledge base and to still obtain his PhD, he chose to return to university in 2012 to research wider impact and implications of investments in port infrastructure. His work is sponsored by Port Research Centre, which is cooperation between PoR and TU Delft.

Contents of research

Value, uncertainty and complexity

Ports are important national infrastructural assets requiring significant investments to construct, maintain and operate. These assets add value in multiple ways. Port Authorities responsible to operate, develop and maintain the port have to balance their resources and investments between private and public objectives. Value is a subjective notion, given different perspectives of parties operating (in) ports as well as those affected by it. On a high level a difference can be found between those approaches originating from economics, sociology or ethics. Port project valuation from an economic perspective can be done on the basis of discounted cash flow analysis. Value contribution to the society is not or hardly accounted for. For such evaluations (Social) Cost Benefit Analyses (CBA) are widely used. This requires so-called non-use values (such as cost or benefits to the environment) to be monetized. There are a number of objections against CBA stemming from philosophical/ethical point of view: not every effect can or should be monetized; values may change over time; outcomes can vary greatly, depending on whom is doing the analysis; it does not take the distribution of cost or welfare
over society into account. Different approaches lead to different insights as to which values should be relevant for Port Authority managers that are making investment decisions in port infrastructure.

Economic value calculations are sensitive to the forecast of costs and income. Future economic situation and competitive situation of the port needs to be taken into account. Too often forecasts of the returns are based upon some form of trend extrapolation or some simplified scenario. The uncertainty in assessing future situations may lead to a wrong investment decisions.

The development of a port has a profound, sometimes irreversible impact on its surroundings. Infrastructure is built within months or years and in general will be there for a number of decades, and could serve multiple generations. The recovery time of the environment can take decades as well. In the meantime the business environment of a port can change drastically. Some could include: changing global economy (trade patterns, investment climate), changing public opinion (about the function of the port and the impact a port has on the environment), changes in institutional settings, national and international rules and regulations, politics, legal framework. Timescale is therefore an important factor to take into consideration when addressing uncertainty regarding future values, that are being used to base investment decisions upon. Currently, (financial) uncertainty is captured in a project discount rate. However, discounting has its limitations. E.g. long term (and intergenerational) effects are hardly accounted for. Or it is simply not quite understood how to capture unknown effects in discount rates.

The world of the Port Authority is complex. Their managers has to balance between various factors: changing port business, changing demands of stakeholders, potentially changing organizational setup and institutional environment. A set of business decision tools which is primarily based on economic criteria which is currently the case, may not suffice. Changing values need to be taken into account. However, in order to assess uncertainties surrounding these values and in order to make sensible decisions about an uncertain future, a multi-disciplinary approach is required.

**Goal**

Policy makers and executives in Port of Rotterdam that are responsible for managing the ports' infrastructure require new insights into dealing with value and uncertainty when making (investment) decisions. From a scientific point of view there is a knowledge gap as to which approaches to value and uncertainty management related to ports and waterways exist and how they may be applied.

The goal of the PhD research project is to come up with a contemporary integrated, scientific method as to how value and uncertainty in Port of Rotterdam can be managed, in view of the many approaches and insights that currently exists but which do not give decision-makers a uniform framework. The method should do justice to a broad range of the Ports' stakeholders.
and should robust for the input or preferences of those persons using it. 

**Approach**

In this research the different aspects of value and uncertainty theory related to port business are explored. Scientific literature analysis and bibliographic mapping provide research directions. We will seek to understand how creation of value is dependent on one's perspective of the ports (business) environment through qualitative (interviews) and quantitative (Group Decision Room) research. The environment, in which authorities responsible for ports and waterways operate in, is changing, adding to the uncertainty surrounding investment decisions.

We will seek to understand the potential impact of changes using exploratory modeling techniques. Other case studies in which we will analyse and test various scientific methods should provide clues as to the applicability of the methods found. A decision model is to be built on the basis of these insights. We will test the applicability of the model found on selected cases and using the input of expert panels.

**Relation with Port of Rotterdams’ strategy**

The decision models applied by PoR provide insights into how the companies’ executives currently manage the value of their investments and activities. The ports’ authority value management models are impacted by changes in the ports’ business environment. PoR is nowadays operating in a global corporatised, highly competitive environment.

PoR has to be agile in its decision making processes, corporate financing and human resources, putting more emphasis on commercial results and financial control. This also means that in the companies “Home-base & Show-case” strategic initiative, public values such as the ports’ safe nautical operations and caring for a sustainable environment of the port may have to compete for resources against private values PoR has laid out in its Port Strategy such as attracting best-in-class customers from selected market segments, entrepreneurial development of new projects, investments’ in logistical chains, accessibility or growth markets overseas.

Nowadays the focus on sustainability of port activities is increasing. Values driven by sustainability demands of stakeholders and society, are assuming greater importance. A larger public scrutiny, perhaps fuelled by the current economic crisis, requires PoR to become much more aware of those, and perhaps other intangible values. In its Port Vision 2030, the company has laid out a number of challenges and objectives. The mix of public-private business objective gives rise to the question whether or not the existing tools of the PA for managing value are still valid. Investments may contribute in different ways to creation of value and, as intimated before, this value cannot always be expressed solely in financial terms.

Value to business of investments and activities undertaken used to be based on contribution to PoR’ safe nautical operations, cargo throughput or to leasing/selling land to the port tenants. Public projects were often coined as “strategic”. Also it is often unclear who benefits from the Port Authorities’
investments: the company itself, the port operators, the local community, society as a whole, or a combination of these? PoR seeks to make their value contribution explicit, in terms of added-value reporting ("Havenmonitor") or network value assessment.

It remains unclear how non-use values (such as the PoR current drive for sustainability, emission control, energy reduction) should translate in the existing value framework. Though from an intuitive point of view these non-use values seem important, and the company has publicly committed to many of them, PoR requires a way to assess the merits of various types of values whilst deciding on their investments.

PoR decision makers need to balance between focusing on specific strategic directions and retaining sufficient degrees of freedom in their decision making to cope with changing circumstances. How robust is PoR decision framework for circumstances as they develop that are not captured in their Port Vision? Current value calculation methodologies based on discounted cash flows and corporate risk management frameworks may not always provide sufficient decision information to fully encompass potential unplanned & unknown effects, besides those arising out of stakeholder and societal concerns. This may well lead to rethinking business models, performance indicators and business decisions in the future. This research aims to provide a decision framework encompassing the latest insights in value and uncertainty management theories, so that various decision alternatives, encompassing the dimensions described herein, can be weighed against each other.

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