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TNO report

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SEDIMENT & SOCIETY
Report on Work package 1: Oslo harbour sediment remediation project

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Extended summary

Introduction

In Norway, serious contamination of marine sediments has been found in more than 120 areas. This has resulted in restrictions on the consumption of fish and fishery products in 24 fjords and harbours covering an area of 820 km^2. Since the restoration of contaminated marine sediments is a national environmental policy priority, most of the harbours in Norway are being planned for remediation. One of the harbours in which a large sediment remediation project was executed is the Oslo harbour project (2005-2009). The goals of this project were; 1) to remove contaminated material from the harbour basin, thereby preventing the re-suspension and dispersal of environmental contaminants in the inner Oslo fjord, 2) to improve navigation depth in the interests of safe vessel traffic. At the same time various road and urban development projects were carried out in Oslo harbour. In the Oslo harbour project an aquatic disposal site (ADS) was selected as a solution for the disposal of the dredged contaminated sediments. This sediment remediation project received a lot of attention from society, which included actions against the dredging itself, large media coverage – both in newspapers and on television – and public discussions on the project.

Study objectives

Because of the societal unrest surrounding the project, keeping in mind that for more harbours in Norway sediment remediation needs to take place, it is relevant for society and government to see what we can learn from the process in Oslo harbour. This report analysis the decision-making and implementation process of the project divided into three relevant areas of investigation:

1. *Involvement. In what way was the involvement of stakeholders organised in the Oslo harbour contaminated sediment remediation project, and how was it perceived by the different stakeholders?*
2. *Communication. How has the communication of data, information and opinions been perceived by the stakeholders of the Oslo harbour contaminated sediment remediation project?*
3. *Risk perception. How do stakeholders approach risks and what is their perception of the risk of sediments in the case of the Oslo harbour contaminated sediment remediation project?*

The report is descriptive in nature and does ***not*** **'**judge**'** the process. We aim at learning from the Oslo harbour project by identifying possible directions for (future) sediment remediation processes in Norway. This is done in the outlook part. These directions are based on relevant literature or examples from practice from Europe and the United States of America.

Materials and methods

In the project the following work process for collecting data were used.

First of all a document analysis was performed. This resulted in a timeline, indicating what happened at what time during the process in Oslo harbour. The second result from the document analysis was an overview of the stakeholders that were involved in the project or the debate concerning the sediment remediation of Oslo harbour during 1992-2009. In this case stakeholders were identified as: people, organisations or groups affected by the issue with the power to make, support or oppose the decision or with the opportunity to provide relevant knowledge to the decision making process. Based on the result from the document review a list of stakeholders was constructed, consisting of 160 people and organisations. From the stakeholder list, key stakeholders were identified. These stakeholders were identified having high formal or informal interest and/or high formal or informal influence in the process and represented both supportive and critical views. 23 interviews of key stakeholders were conducted. These interviews were followed by an internet survey, sent to the people interviewed with the request to send them on to people that they thought would be relevant to reflect on the process. Furthermore the internets survey was sent too the stakeholders that were not interviewed but that were on the constructed list of 160. This survey was used to validate the answers given in the interviews and 93 respondents filled out the internet survey. Both the interviews and the survey were structured along the lines of the three areas for investigation.

Results from document analyses: timeline

The process of defining the issue concerning sediment in Oslo harbour, the selection of the solution to deal with the contaminated sediments and the implementation of these solutions can be described as follows:

- In 1992 high levels of contamination in the sediments in Oslo harbour were detected relating to dumping of snow in the harbour basin. Therefore a ban of dredging was imposed. Between 1992 and 1996 the process was oriented towards research, gathering data in an attempt to find out and describe what the actual problem concerning the contaminated sediments in Oslo harbour consisted of. In addition some preliminary conceptual remediation studies were performed;
- After 1996 the process became more of an administrative and political issue. At first no dredging permit was given. However after several land based options for the disposal of the sediments were dismissed, the aquatic disposal site at Malmøykalven became the main option for the disposal of the sediments. An environmental impact assessment was performed including a hearing;
- After the decision for the aquatic disposal site had been taken in 2005 and permits were given, the process shifted to the ‘public arena’, becoming less formal, and attracting the media to became part of ‘open’ discussions that resulted in (societal) actions, both opposing and supporting the project;
- Between 2006 and 2008 critical opinions are voiced more often on the aquatic disposal site solution, but also on the actual dredging and disposal work in general. This caused a change in the nature of the process fluctuating between informal to formal, with the extra-ordinary hearing, the referendum and the accusation by : the Norwegian Polution Control Authority (abbreviated as SFT) of Oslo Port Authority

(abbreviated as HAV) and Secora for violating the dredging permit as the most prominent events;
- In 2009 the dredging and the capping of the contaminated sediments in Oslo harbour was completed. After July 2009 the discussion still continues because in April 2009 the district attorney of Oslo chose to press charges to Secora, HAV and NGI. The case will be taken up in court in November 2009.

Results from interviews and survey

From the interviews and the survey the following general conclusions can be drawn:

Participation
- Early involvement is important for the influence on the process. The interviews show that one group of the respondents became active in the project in the early years (1993-2004) and another group became active after 2005 when the actual decision of remedial solution was made. The results indicate that the respondents that were involved earlier were more convinced that they could have influence on the process compared to the ones that became involved later on;
- Based on the results the Oslo harbour sediment remediation project can be described as a moderately structured problem according to the theory by Hisschemöller (1998). This means that decision makers and stakeholders to a large extent share the same values, but have different opinion about knowledge that may be used to solve the problem;
- The position of governmental organisation might become unclear in a decisionmaking process if this organisation incorporates two roles in one stakeholder for example both quality assurance and (legal) decisionmaking powers.

Communication of information and knowledge
- Timely and targeted communication of information and knowledge in the developing project is perceived as important for the respondents;
- Scientific reports, direct communication with the project organisation and the opinion of colleagues are seen as the most trusted communication sources;
- Estimating a separate budget for communication of information and knowledge and allocating it in time is perceived to be important for keeping various groups of participants up to date with (the progress of) the project.

Risk perception
- A substantial part of the respondents pointed out that they changed their opinion on the risk of contaminated sediments during the Oslo harbour project. Theses changes were not predominantly in the direction of more or less risk. For the majority of the respondents that changed their opinion scientific information and personal experience served as a source for the change of opinion;
- The view of endangerment and safety may have an influence on risk perception in the Oslo fjord case. This is illustrated by the fact that there is a difference in how people perceive the degree of controllability between a land and sea disposal solution.

Discussion

The discussion is based on a confrontation between the aforementioned overall conclusions and theoretical insights about participation, communication of information and knowledge and about risk perception.

Participation
The results from the study shows that there was a formal involvement process where governmental organisations with decisive powers and some organisations with technical expertise where brought together. In general the interviews indicate that the formal decision-making *process* was considered of sufficient quality, although some of the respondents pointed out that the involvement of stakeholders should have received more attention in the start of the process. The means that were available now for stakeholders to give input to the process was by means of hearings, as is possible through the plan and building act. A hearing can describe as 'stakeholder consultation' based on the degrees of influence according to the scale by Gerrits and Edelenbos (2004). This means that stakeholders act as advisors, but the decision makers are not obliged to adopt their recommendations. With this form of involvement the stakeholders only have a very limited amount of influence on the outcome of the formal decision process.

To achieve consensus in a moderately structured project such as Oslo harbour where the underlying values are similar but opinion on knowledge differs, the appropriate policy strategy according to Hisschemöller (1998) is 'negotiation'. The character of a 'negotiation process' might sound as an 'open' stakeholder involvement process with a lot of influence for the stakeholders. However this is often not the case in large infrastructural/spatial planning projects, as we can also describe the Oslo harbour project. The reason for this is that in these cases the goal of a project has already been decided on, and the only 'space' for negotiation is in the means, instruments or solutions to reach this goal (Drogendijk & Duijn, 1999). This limited 'space' may also be an explanation for the outcome of the informal stakeholder process in the Oslo harbour project.

If involvement however *is* organised in a way in which stakeholders have more influence than 'consultation' Slob et al. (2008) describe several pitfalls that could be kept in mind, when organising stakeholder groups:

- *Asymmetry* which exists when some parties have an advantage over other parties in the group. The existing asymmetries are an important factor for the design of the process. Signs of asymmetry are:
    - Lack of representation of certain views. This means that stakeholders are not representing the target group. In some cases this leads to 'extreme views' that are not representative for the opinion of the target group;
    - Different interests and needs of participants. Stakeholders all have different agendas and a pitfall is ignoring some of them or assuming that everyone is aiming at the same goal.
- *Clashing expectations* exist often, as participants have different expectations and consequently expect different outcomes of the process. The result will be that their expectations rise too high, thus cannot be met, resulting in distrust, downright pessimism and obstruction of the process;
- *Stakeholder out of sight* often exist in the formal decision making process. Unfortunately, a sharp separation is made between the stakeholder process and the actual decision-making. The process of stakeholder involvement is then regarded as a way to pacify the opposition, where the actual decision mainly serves the interests of the formal decision maker. It is therefore important for the quality of a stakeholder involvement process that decision makers should commit themselves to the process, whatever the outcomes.

Communication of information and knowledge
Based on the interviews there are a number of aspects in the communication of data, information and opinions that were identified by the different stakeholders. When it comes to the accessibility of information this has, in general, been perceived positively by the majority of the respondents. The fact if information should be provided to the stakeholders early in the decision-making process was ranked as important in the internet survey. This points out that timely and targeted communication of information and knowledge in the developing project is perceived as important for the respondents.

Some of the local interest groups pointed out that to their opinion the level of transparency of the information provided was not always optimal. This could refer to the so-called knowledge gap, indicating that not all stakeholders have an equal level of expertise and possesses different types of information and knowledge. On the other hand the sediment issue is a highly specific topic, which requires sophisticated knowledge to understand and even among experts there is still considerable debate concerning different issues, thus making it difficult to present clear conclusions to stakeholders. At the same time, experts may lack 'lay-knowledge' like valuable information about the local situation etc. that is possessed by laymen. To avoid this gap a flow of information to the other participants, and the development of a common ground of knowledge is necessary. Next to bridging the knowledge gap, the process of creating a shared body of knowledge could also increase the level of trust that stakeholders have in the information and knowledge available. An important factor to keep in mind is the added value of having an experienced and independent process facilitator at the table that is accepted by the different stakeholders at the table in the process.

Risk perception
The results from the internet survey and the interviews show that most of the people in the survey see risk as something acceptable as long as it is properly regulated (for example through by a discharge permit). The conclusion could be that risk perception is not actually an issue, because risks are perceived as something which can be explained rationally. However the results of the study indicate that other perceptions of risks do exist, which can have a strong influence on a decision-making process. When dealing with risks in a sediment remediation project some of the following aspects should be kept in mind:

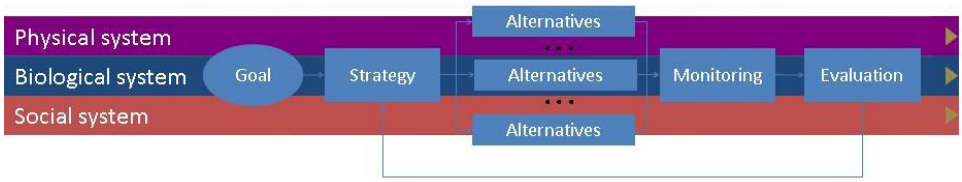
- In sediment management issues, it is essential to respect the risk perception of all stakeholders, even when this does not comply with the scientifically estimated risk;
- Different stakeholders have different perspectives, meaning that they also have different views on risks. The different perspectives also have different vocabularies and blind spots, which should always be addressed in communication with these groups;
- A diversity of communication tools that use different approaches, images and media that respect the language and blind spots of these different perspectives will help to reach the different stakeholders and to integrate them into the decision-making process, increasing support for decisions taken.

Future outlook

The study has showed that projects like the Oslo harbour sediment remediation project can be considered as complex involving several dimensions. This complexity is composed of three systems:

1. the physical system: in this case the requirements and functions of Oslo fjord;
2. the biological system consisting of the aquatic life in the Oslo fjord;
3. the social system; the people and institutions functioning around Oslo fjord.

Due to this complexity it is difficult to foresee the entire possible outcome from the decision making process at an early stage. One way to handle this as shown in the figure below may be to implement several management alternatives and to monitor the effect in the whole system before making the final decision. We call this adaptive management (cf. Lee, 1993).



In an adaptive management process, changes are expected and discussed, learning is emphasized, and even objectives can be revised based on the performance of a management alternative, changing societal values, or institutional learning. The whole process of constructing a monitoring system could also be done collaboratively between decision makers, stakeholders and experts, which again could increase the level of trust in the information from the monitoring system.

The reason for adaptive management to be the principle approach to governing complex sediment remediation projects is threefold:

1. It acknowledges the complexity of the physical, biological and social aspects;
2. It emphasizes the importance of stakeholder involvement and monitoring;
3. It builds upon monitoring, evaluating and learning as guiding principles making it easier and more flexible to make changes in strategy.

The obvious challenge with adaptive management is that several processes may have to go in parallel to a great level of detail in the planning or even in execution phase.

Applying such an adaptive strategy may however be a way to pull complex projects such as Oslo harbour sediment remediation project away from fault finding to good housekeeping and stewardship allowing more flexibility in the disposal alternatives, and the strategy how to deal with these alternatives once they are in place.

Utvidet Sammendrag (In Norwegian)

Introduksjon

I Norge er det funnet forurensning i marine sedimenter i mer enn 120 områder. Dette har medført restriksjoner for spising av fisk og sjømat i 24 fjorder og havner som dekker et område på 820 km^2. Siden opprenskning i forurensede marine sedimenter er et prioritert miljøområde, er det planlagt tiltak i de fleste av havneområdene i Norge. En av de havneområder hvor det er utført et stort oppryddingsprosjekt er Oslo havn (2005-2009). Målsetningen for dette prosjektet var; 1) å fjerne forurenset materiale fra havnebassenget for hindre oppvirvling og spredning av forurensning i indre Oslofjord, og 2) å forbedre navigasjonsdybden av sikkerhetsmessige årsaker, samt å tillate byfornyelse. I dette prosjektet ble et sjødeponi valgt som løsning for disponering av forurensede sedimenter fra mudringen. Dette prosjektet har mottatt stor oppmerksomhet fra samfunnet, inkludert aksjoner mot mudringen, stor mediadekning fr både aviser og fjernsyn – og offentlige diskusjoner om prosjektet.

Målsetning for arbeidet

Fordi det har vært samfunnsmessig oppmerksomhet rundt prosjektet og med tanke på at det er behov for tiltak i flere havner i Norge er det relevant for samfunnet å se hva vi kan lære fra prosessen rundt opprenskningsprosjektet i Oslo havn. Denne rapporten analyserer beslutning og gjennomføringsprosessen av prosjektet delt på tre relevante områder:

1. *Medvirkning. På hvilken måte var medvirkningen organisert i prosjektet, og hvordan ble den oppfattet av forskjellige interessenter;*
2. *Kommunikasjon Hvordan har kommunikasjon av data, informasjon og synspunkter blitt oppfattet i prosjektet?*
3. *Oppfatning av risiko. Hvordan tilnærmer seg interesser risiko og hva er deres oppfatning av risiko med sedimenter i prosjektet.*

Denne rapporten er beskrivende i natur og "dømmer" **ikke** prosessen. Mulige retninger for (fremtidige) sediment oppryddingsprosesser pekes ut i anbefalingsdelen. Disse anbefalingene er basert på litteratur og praksis i Europa og USA

Material og metoder

I prosjektet har følgende arbeidsprosess for innsamling av data blitt brukt

Første trinn i prosessen var gjennomføring av en dokumentanalyse. Dette resulterte i en tidslinje som viser hva som har skjedd i løpet av opprensningen i Oslo havn.

I tillegg identifiserte analysen interessenter som har vært involvert i prosjektet eller debatten om sedimentoppryddingsprosjektet i Oslo i perioden 1992-2009. I dette tilfelle ble interessenter identifisert som; personer, organisasjoner eller grupper påvirket av saken med mulighet å ta, støtte eller motsette seg beslutninger alternativt gi relevante kunnskap i beslutningsprosessen. Basert på resultatene av dokumentgjennomgangen ble det laget en interessentliste på 160 personer/organisasjoner. Fra denne liste ble nøkkelinteressenter identifisert basert på om de hadde høy formell eller uformell interesse i saken og/eller høy formell eller uformell innflytelse på prosessen. Både positive og kritiske synspunkter var representert i utvalget. 23 intervjuer av nøkkelinteressenter ble avholdt. Disse intervjuene ble fulgt av en webundersøkelse som ble sendt til de som ble intervjuet med oppfordring å videresende undersøkelsen til personer som kunne ha relevante synspunkter på prosessen. I tillegg ble undersøkelsen sendt til de som ikke var intervjuet, men som var på listen med interessenter. Denne undersøkelsen ble brukt til å validere svarene fra intervjuene og 93 personer besvarte undersøkelsen. Både intervjuene og undersøkelsen var laget rundt de tre fokusområdene.

Resultater fra dokument gjennomgangen: tidslinjen

Prosessen med å definere oppgaven, valg av løsning og gjennomføring av tiltak kan beskrives som følger:

- I 1992 ble det påvist høy forurensning i sedimentene i Oslo havn i forbindelse med snødumping og mudringsforbud ble innført. Mellom 1992 og 1996 var prosessen orientert mot forskning, data ble samlet inn for å beskrive problemstillingen med forurensede sedimenter i Oslo havn og gjennomføring av konseptuelle studier av oppryddingsalternativer;
- Etter 1996 ble prosessen mer en administrativ og politisk sak. Først ble det ikke gitt tillatelse til mudring, men etter at flere landbaserte alternativer for disponering av sedimenter var forkastet ble sjødeponi ved Malmøykalven valgt som hovedopsjon for deponering av sedimentene. En konsekvensutredning med høringsprosess ble gjennomført;
- Etter besluttet om sjødeponi var tatt i 2005 og tillatelser var gitt overgikk prosessen til den ”offentlige arena” og ble mindre formell. Media ble en del av den ”åpne” diskusjonen som resulterte i (samfunnsmessige) aksjoner som både støttet og protesterte mot prosjektet;
- Mellom 2006 og 2008 ble det flere kritiske stemmer mot den valgte deponiløsningen, men også mot mudringen og deponeringsarbeidet generelt. Dette forårsaket en prosess som gikk mellom uformell og formell, med en ekstraordinær høring, folkeavstemming og politianmeldelse fra SFT mot HAV og Secora for brudd på utslippstillatelsen som de mest dominerende hendelsene;
- I 2009 ble mudring og deponering av forurensede sedimenter avsluttet. Etter juli 2009 er det fortsatt diskusjoner om prosjektet fordi det i april 2009 ble tatt ut tiltale mot Scora, HAV og NGI. Saken kommer opp for retten i november 2009.

Resultater fra intervjuer og undersøkelse

Fra intervjuene og undersøkelsen kan følgende konklusjoner trekkes:

Deltakelse
- Tidlig deltakelse er viktig for påvirkning i prosessen. Intervjuene identifiserte en gruppe av deltakere som ble involvert tidlig (1993-2004) og en annen gruppe som ble involvert etter 2005 når besluttet om løsning var tatt. Resultatene viser at de som var involvert tidlig var mer overbevist at de kunne påvirke prosessen sammenlignet med de som ble involvert senere;
- Basert på resultatet fra Oslo fjord prosjektet kan problemstillingen beskrives som semi-strukturert i følge teorien til Hisschemöller (1998). Dette betyr at beslutningstakere og interessenter i hovedsak deler de samme verdiene, men har forskjellig synspunkter på kunnskap;
- Myndighetenes rolle kan bli uklar i en beslutningsprosess dersom denne organisasjonen for eksempel både har kvalitetssikring og tilsyn og samtidig (formell) beslutningsmakt.

Kommunikasjon av informasjon og kunnskap
- Presis og målrettet kommunikasjon av informasjon og kunnskap i utviklingsprosjekter oppleves som viktig for deltakerne i undersøkelsen;
- Vitenskaplige rapporter, direkte kommunikasjon med prosjektorganisasjonen og synspunkter fra kollegaer oppleves som de mest pålitelige informasjonskildene;
- Å ha et separat budsjett for kommunikasjon av informasjon og kunnskap til rett tid oppleves som viktig for å holde forskjellige grupper oppdatert i prosjektgjennomførelsen.

Risiko oppfatning
- En vesentlig del av deltakerne endret oppfatning om risiko av forurensede sedimenter i løpet av prosjektet i Oslo havn. Endringen gikk her begge veier mot mer og mindre risiko. For majoriteten av de som endret oppfatning var vitenskaplig informasjon og personlig erfaring kilden til endringen;
- Synet på faren og sikkerheten med løsningen kan ha en betydning for oppfatningen av risiko i prosjektet. Dette kan illustreres med at det er en forskjell på hvordan folk opplever kontrollerbarheten mellom en landløsning og et sjødeponi.

Diskusjon

Deltakelse
Resultatene fra studien viser at det var en formell deltakelsesprosess der organisasjoner med beslutningsmyndighet og noen organisasjoner med teknisk ekspertise var samlet. I intervjuene var denne formelle beslutningsprosessen ansett som god, men noen av deltakerne poengterte at interessenter skulle ha fått mer oppmerksomhet tidlig i prosessen. Mulighetene for interessenter å gi innspill var gjennom den høringsprosess som er en del av kravene i plan- og bygningsloven. En høring kan beskrives som ”interessent konsultasjon” basert på graden av involvering i henhold til klassifiseringen av Gerrits og Edelenbros (2004). Dette betyr at interessenter agerer som rådgiver, men beslutningstakeren er ikke nødd til å ta hensyn til anbefalingene. Denne type involvering gir interessentene kun en begrenset innflytelse av den formelle beslutningsprosessen.

I tillegg til den formelle prosessen i prosjektet var det også en uformell prosess som hadde som hensikt å gi en større involvering av interessenter. For å nå enighet i et slikt semi-strukturert prosjekt som Oslo havn er strategien i følge Hisschemöller (1998) å ”forhandle”. Termen ”forhandling” kan synes som en ”åpen” prosess med store påvirkningsmuligheter for interessentene. Imidlertid er det ofte ikke tilfelle i store infrastruktur/areal planleggingsprosjekter som Oslo havn. Årsaken er at prosjektets målsetninger allerede er besluttede og det eneste ”rom” for forhandling er måten og metodene for å nå målet (Drogendijk, 1999). Dette begrensede ”rommet” kan også være en forklaring for utfallet av den uformelle interessent prosessen i Oslo havn.

Hvis deltakelse er organisert på en mate der interessentene har større innflytelse enn “rådgiving” beskriver Slob et al. (2008) flere fallgruver som man bør tenke på når man organiserer interessentgrupper:

- *Asymmetri* som eksisterer når noen parter har et overtak ovenfor andre parter. Tegn på dette er:
    - Noen synspunkter mangler. Dette betyr at interessenter ikke er representerer målgruppen. I noen tilfeller kan dette gi ”ekstreme synspunkter” som ikke er representative for opinionen i gruppen;
    - Forskjellige interesser og behov for deltakerne. Interessenter har forskjellige agendaer og en fallgruve er å ignorere disse å anta at alle har samme målsetning.
- *Ikke omforente forventninger* eksisterer ofte da deltakerne forventer forskjellig utfall fra prosessen. Resultatet vill bli at forventningene er for høye og kan ikke nåes, som igjen leder til misstillit, negativt syn og protester mot prosessen;
- *Fravær av interessenter i beslutningsprosessen* eksisterer ofte i en formell beslutningsprosess. Dessverre er det ofte et skarpt skille mellom interessent prosessen og beslutningen. Involvering av interessenter blir da en måte å berolige motstand når beslutningen i hovedsak er i den formelle beslutningstakerens interesse. Det er derfor viktig for kvaliteten på en interessentprosess at beslutningstakeren forplikter seg til prosessen uansett utfall.

Kommunikasjon av informasjon og kunnskap
Basert på intervjuene er det en del aspekter i kommunikasjon av data og informasjon som er identifisert av de forskjellige interessentene. Når det kommer til tilgjenglighet av informasjon har den i hovedsak blitt oppfattet som positiv av deltakerne. At informasjon skal gis tidlig i en beslutningsprosess er oppfattet som viktig i web undersøkelsen. Dette viser at målrettet kommunikasjon til rett tid er viktig i utviklingsprosjekter.

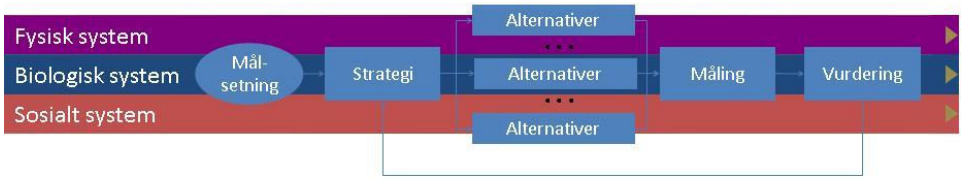
Noen av de lokale interessentgruppene poengterte at i følge dem var ikke informasjon gjennomsiktig nok. Dette kan medføre et avstand i kunnskap mellom forskjellige grupper som gir et inntrykk at ikke alle er likverdige og har den samme informasjonen og kunnskapen. På den andre side er sedimentsaker høyt spesialiserte og krever sofistikert kunnskap å forstå. Også mellom ekspertgrupper er det betydelig debatt om forskjellige tema, noe som gjør det vanskelig å presentere klare konklusjoner til interessenter. Samtidig kan eksperter sakne viktig kunnskap som verdifull informasjon om lokale forhold etc. som lokalkjente har. For å unngå denne avstanden er det viktig å dele informasjon samt å skape en felles kunnskapsplattform. I tillegg til å overbrygge avstander vil dette også skape tillit til informasjonen og kunnskapen som gis. Her er en viktig faktor å ha en erfaren og uavhengig tilrettelegger som er akseptert av alle interessenter rundt bordet

Oppfatning av risiko
Resultatene fra web undersøkelsen og intervjuene viser at de fleste ser risiko som noe man kan akseptere så lenge det er riktig regulert (for eksempel gjennom en utslippstillatelse). Konklusjonen kan derfor være at oppfatning av risiko ikke er et tema fordi risiko oppleves som noe man kan forklare rasjonelt. Imidlertid viser resultatene fra undersøkelsen at det faktisk eksisterer andre oppfatninger av risiko som kan ha en sterk påvirkning på beslutningsprosessen. Når man håndterer risiko i sedimentoppryddings prosjekter bør man derfor tenke på de følgende aspektene.

- I sedimentspørsmål er det grunnleggende å respektere risiko oppfatningen av alle interessenter selv om det ikke sammenfaller med den vitenskaplig beregnede risikoen;
- Forskjellige interessenter har forskjellige perspektiver som betyr at de også har forskjellig syn på risiko. Forskjellig perspektiv gir forskjellig språk og "blinde punkter", som alltid skal tas hensyn til i kommunikasjonen;
- Et utvalg av kommunikasjonsverktøy som bruker forskjellig tilnærming, bilder og media som tar hensyn til perspektivene vil hjelpe å nå forskjellig interessenter. Dette vil integrere dem i beslutningsprosessen og øker støtten til beslutningene.

Framtidige utsikter
Studien viser at prosjekter som Oslo havn er komplekse og har flere dimensjoner. Denne kompleksiteten består av:
1. Fysisk system; i dette tilfelle kravene og funksjonen til Oslo havn;
2. Biologiske systemet som består av det marine livet i fjorden;
3. Sosial systemet; folk og institusjoner som fungerer i Oslofjorden.

På grunn av denne kompleksiteten er det vanskelig å forutse alle forskjellige utganger av en beslutningsprosess på et tidlig stadium. En måte å håndtere dette på er vist i figuren nedenfor kan være å implementere flere tiltaksalternativer og måle effekten i hele systemet før man tar endelig beslutning.



I denne tilpassede prosessen forventer man endringer og disse diskuteres. Man tar lærdom og til og med målsetningene kan revideres basert på resultatene i gjennomføring, endrede verdier eller ny kunnskap. Hele prosessen med måling og oppfølging kan også gjøres som et samarbeid mellom, interessenter og eksperter som igjen kan øke tilliten til data/resultater som kommer ut av systemet.

Årsaken til hvorfor tilpassing kan være en nytt prinsipp for sediment tiltak kan være:

1. Fordi det tar hensyn til kompleksiteten i det fysiske, biologiske og sosiale systemet;
2. Setter fokus på interessent involvering og måling og oppfølging;
3. Fordi det bygger på måling og oppfølging, evaluering og læring noe som gjør det lettere å endre strategi eller å gjøre tilpassinger.

Den åpenbare utfordringen med tilpassing er at flere prosesser må kjøres samtidig til en mye mer detaljert nivå i planeringsfasen eller til og med i gjennomførelsesfasen.

Å tillempe en slik tilpasset strategi kunne vært en måte å få et komplekst prosjekt som Oslo havn over fra negativ fokusering til god forvaltning med større fleksibilitet i håndtering av deponeringsalternativene.

Contents

1 General introduction

In Norway, serious contamination of marine sediments has been found in more than 120 areas (SFT, 1998). This has resulted in restrictions on the consumption of fish and fishery products in 24 fjords and harbours covering an area of 820 km^2 (SFT, 2000). Thus a main objective in the management of marine sediments lies in the goal to achieve contaminant levels in sediment and biota which are acceptable for ecological and human health risk. However, management options for large scale contaminated sediment remediation projects can be in conflict with stakeholder interests. These are due to high upfront remediation costs, often unequal distribution of these costs, scientific uncertainty about health and environmental risk, and differing stakeholder interests and perceptions of those risks (Heise et al., 2004; Ellen & Slob, 2007; Ellen, Slob & Gerrits, 2008). These issues illustrate the limitations of technological solutions without the participation of stakeholders throughout the process. Stakeholders are: people, organisations or groups affected by an issue or conflict, with the power to make the decision or block the decision, or with relevant expertise (cf. Susskind, 1999).

Since the restoration of contaminated marine sediments in Norway is a national environmental policy priority, as described in The Ministry of Environment's proposition to Parliament "Pristine and abundant sea" (parliamentary decree nr. 12, 2001 – 2002)[1], more harbours are being planned for remediation. Bergen harbour has been designated by the Norwegian Pollution Control Authority as one of four contaminated harbours particularly in need of sediment remediation efforts. Although different alternatives have been suggested, including recommendations based on scientific assessments (Soldal et al., 2005), public participation by stakeholders, including citizens, in the assessment of measures has so far been absent. The Oslo harbour case suggests the need for a methodology for engaging stakeholders in the process of identifying measures and sediment management options early in the sediment management process - a framework of complementary methods for such multi-stakeholder involvement is lacking.

The approach that the Sediment & Society research project has to constructing such a framework is shown in Figure 1.1. This schematic gives an overview of the three work packages included in the Sediment & Society research project.

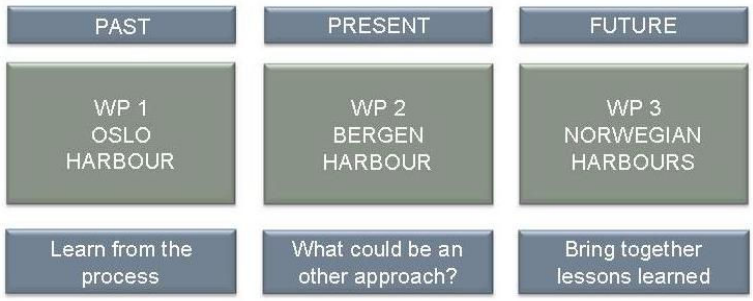


Figure 1.1 Schematic overview of the Sediment & Society research project

[1] See: http://www.regjeringen.no/Rpub/STM/20012002/012/PDFA/STM200120020012000DDDPDFA.pdf

The first work package (WP 1) is based on the case study of Oslo harbour. To be more specific, it encompasses the process of the Oslo harbour sediment remediation project, and the management of contaminated sediments. The focus of WP 1 is explicitly *not* on the technical aspects of the Oslo harbour sediment remediation project and choices, and will therefore *not assess* any of the technical details or choices. WP 1 is however focused on the public decision-making and implementation processes of the Oslo harbour sediment remediation project.

The process of finding a solution for dredging and disposing of the contaminated sediments started in the 1990's and after over a decade of technically based studies and discussion, the outcome resulted in the dredging and disposal of the sediments in an aquatic confined disposal site near the island of Malmøykalven. The actual dredging and disposal was initiated in February 2006 and finished in April 2009. The solution that was chosen, an aquatic confined disposal site, met with opposition from citizens, NGO's, researchers, governmental organizations and politicians. This public opposition could well have an impact on sediment remediation projects in other parts of Norway. Therefore the main goal of WP 1 is to learn from the process in Oslo harbour by using insights from social science and from the view of the stakeholders. Because of the sensitive nature of this project, and the fact that the Sediment & Society project team also includes NGI and NIVA as two important stakeholders in the Oslo harbour sediment remediation project, we clearly want to state that all the work in WP 1 has been performed by TNO and Magnus Sparrevik, in his role as a NTNU doctorate student. Sparrevik also completed the translations between English and Norwegian. Furthermore a summer student at NGI helped with the research and construction of the timeline.

The second work package (WP 2) deals with a sediment remediation project yet to be fully implemented in the Bergen harbour. Learning from the Oslo harbour project, the main goal for WP 2 is to try another approach in Bergen in which stakeholders are involved from the start of the process in the form of a stakeholder panel and by using a multi-criteria decision analysis. The results of WP 2 will be available in the near future.

The goal of the third work package (WP 3) is to integrate the learning experiences from the case study of Oslo harbour and Bergen harbour and reflect on them by using a state-of-the-art description on stakeholder involvement and risk governance. This will result in a number of guidelines that can be used by stakeholders dealing with sediment remediation projects in Norwegian harbours.

The current report focuses on WP 1. Chapter 2 describes the theoretical framework. Chapter 3 described the research methodology that is used in WP 1. The findings of the interviews and the internet survey that was conducted is presented in chapter 4. In this chapter you can also find the timeline of sediment remediation in Oslo harbour, which includes the Oslo harbour contaminated sediment remediation project, from the 1990's until April 2009. Finally, in chapter 5, the research findings from practice are confronted with the theoretical framework, and also an outlook is given on what can be done with these observations.

2 Theoretical Framework

2.1 Introduction

In order to be able to place the Oslo harbour sediment remediation project into perspective it is important to create a framework regarding the decision making and implementation process. In this work package the choice was made to define this framework by looking at the Oslo harbour contaminated sediment remediation project as a policy problem. A problem occurs when a factual situation is in discrepancy with a desired situation. This implies that policy problems are not objectively given, but highly subjective social constructs (Hisschemöller, 1993, Van de Graaf & Hoppe, 1996). Taking the subjectivity into account, two dimensions can be used to distinguish different policy problems. These dimensions are: consensus about values and norms (normative standards) and the certainty of the knowledge base or content. Using these two dimensions, four types of policy problems can be distinguished (see Table 1). Well structured problems (type 1) are problems for which a certain knowledge base and consensus about values and norms exists. Some problems are moderately structured due to uncertainty about knowledge (type 2) or because disagreement exists about values and norms (type 3). When values are at stake and knowledge is uncertain, a problem is unstructured (type 4) (Douglas & Wildavsky, 1982; Van de Graaf & Hoppe, 1996, Hisschemöller, 1993).

Table 1 Classification of policy problems (adapted after Hisschemöller, 1993)

Knowledge base / *Values and norms*	**Certain**	**Uncertain**
Consensus	1-Well structured	2-Moderately structured
Disagreement	3-Moderately structured	4-Unstructured

The Oslo harbour sediment remediation project can be described as an example of (partly) unstructured problems. This means that the project could be a type 2, 3 or 4. The main reason that the Oslo harbour sediment remediation project is not a well structured project is the observation that there has been a public discussion about what the problem was and how it should be solved, thus implicating a disagreement either about the 'knowledge base' or 'values and norms'. A characteristic of moderately structured/unstructured problems is that the problem formulations of the stakeholders involved in these projects "have a tendency to change over the course of time as a result of new information, interaction between stakeholders and external developments" (Edelenbos & Klijn, 2005). Another characteristic of moderately structured /unstructured problems, is that its formulation cannot be separated from its solutions. In fact, discussions are often not driven by a problem that has to be solved; they are dominated by solutions, which appear to be attractive and to be in reach for a number of actors (De Bruijn & Ten Heuvelhof, 1999). Instead of an exact formulation of the problem, a choice for a solution is made. This indicates that an implicit choice as to which problems are considered and which are not. Due to the fact that it is not possible to define an unambiguous problem and its solution that all stakeholders agree upon, such a process will end. As a result of negotiation, a formulation of a problem and/or solutions can become authoritative (De Bruijn et al., 2002). What is needed to solve moderately structured/ unstructured problems is a problem structuring approach which

also pays attention to communication of knowledge and information and stakeholder involvement (Hisschemöller, 1993, Van de Graaf & Hoppe, 1996). When risks are also concerned the problem structuring approach should also include the aspect of risk perception (Renn, 2008) These three aspects: stakeholder involvement, communication of information and knowledge, and risk perception will be discussed in more detail in sections 2.3, 2.4, 2.5 respectively.

2.2 Characterization of decision making from theory: stakeholder involvement, communication of information and knowledge, and risk perception.

To characterize the decision-making process based on theory means that we want to identify theoretical key elements of the decision-making process. In chapter 1 we described the process as moderately structured problem, based on the classification by Hisschemöller (1993). Based on this classification the following important characteristics of the decision making process and related theoretical perspectives are listed:

- Involvement of stakeholders[2] in the decision making process at different levels. This involvement is based on the interdependency between stakeholders in the context of a sediment remediation project. This aspect will be theoretically explored from the perspective of stakeholder involvement;
- Communication between stakeholders concerning information and knowledge concerning different aspects of the project, such as: options for the disposal of the sediments, effects of the disposal and dredging on the ecology in Oslo fjord and its use (such as fishing, recreation, shipping). Theory on information and knowledge communication will be used to describe the theoretical perspective of this characteristic element of the Oslo harbour sediment remediation process;
- Different perceptions by stakeholders of risks concerning contaminated sediments and the remediation solution (mainly focussing on the concept, information and knowledge on which the risks were calculated). This aspect of the process will be theoretically described using theory on risk perception.

In the next paragraphs each of these characteristics are discussed from a theoretical point of view. The theoretical deliberations are used as input for the design of the research.

2.3 Stakeholder involvement theory

In contemporary European and American policy-making, an increase of interactive processes and stakeholder involvement in relation to policy making can be observed (inter alia Renn et al, 1995; Healy, 1997; Coenen et al, 1998; Tunstall et al., 1999; DeLeon, 1992 and 1994; Durning, 1993; Fischer, 2000; Mason, 2000; Dobss and Moore, 2002; Murray and Greer, 2002). These processes bear different names, like interactive governance, co-production, and participatory processes. In the relevant academic and professional literature, many definitions and descriptions of stakeholder participation can be found (Renn et al, 1995; Healy, 1997, Verweij and Josling, 2003). The core theme in those definitions is that governments develop policies in consultation and co-operation with stakeholders, as defined above. Edelenbos (2000) defines stakeholder involvement as "the early involvement of individual citizens and other organized stakeholders in public policy-making in order to explore policy problems and

[2] For a definition see the introduction of the report.

develop solutions in an open and fair process of debate that has influence on political decision-making." Stakeholder involvement as a process differs from traditional public consultation procedures in that stakeholders are involved early enough to influence policies when they are formulated. This is opposed to the classical European approaches to public decision-making where decision-making power remains firmly with the representatives.

Definition of stakeholders

The concept of stakeholders has been elaborately discussed in scientific literature from different disciplines. Billgren & Holmen (2008) give an overview of definitions as displayed in Table 2. For an overview of stakeholder literature we refer to Mitchell et al. (1997) and Achterkamp & Vos (2007).

Table 2 Different definitions of stakeholders (Billgren and Holmen, 2008)

Source	Who is a stakeholder?	Kind of research
Freeman (1984, p. 46)	''can affect or is affected by the achievement of the organization's objectives''	Business management
Bowie (1988, p. 112, n. 2)	''without whose support the organization would cease to exist'' (cited in Mitchell et al., 1997)	Business management
Clarkson (1995, p. 106)	''persons or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future.''	Business management
Grimble and Wellard (1997, p. 175)	''any group of people, organized or unorganized, who share a common interest or stake in a particular issue or system''	Natural resource management
Gass et al. (1997, p. 122)	''any individual, group and institution who would potentially be affected, whether positively or negatively, by a specified event, process or change.''	Natural resource management
Buanes et al. (2004, p. 211)	''any group or individual who may directly or indirectly affect—or be affected—…planning to be at least potential stakeholders.''	Natural resource management
Varvasovszky and Brugha (2000, p. 341)	''actors who have an interest in the issue under consideration, who are affected by the issue, or who—because of their position—have or could have an active or passive influence on the decision-making and implementation process.''	Health policy
ODA (1995)	''persons, groups or institutions with interests in a project or programme.''	Development
Susskind (1999)	people, organisations or groups affected by an issue or conflict, with the power to make the decision or block the decision, or with relevant expertise.	Public administration

Of the definitions presented in we will use the definition of stakeholders by Susskind (1999): people, organisations or groups affected by an issue or conflict, with the power to make the decision or block the decision, or with relevant expertise.

There are two main arguments to use this definition. Firstly, it is the only definition that also recognizes the role of expertise/knowledge within the concept of stakeholders, and thus also recognizes the role of scientists, researchers and people with local knowledge, from practice or personal experience, as stakeholders concerning an issue or conflict. Secondly, the definition discerns stakeholders from the general public, the latter being, for example an entire population of a nation. We interpret this as stakeholders having an 'active' role, and thus determining that 'a stakeholder' is not the general public.

There are several arguments for stakeholder involvement with respect to sediment remediation projects. The main arguments can be grouped into three themes: obstructive power, enrichment and fairness (Gerrits & Edelenbos, 2004).

In modern society, government does not automatically possess all resources (such as money, knowledge and power) to do whatever it wishes to do. These resources are in most cases distributed among several stakeholders. For instance, parties other than government have obstructive power. They have the ability to obstruct or even block a decision or the implementation of a certain policy. Disposal sites for dredged material may alarm citizens living near the site. They can, and often do, protest against it or take other measures. The early involvement of stakeholders reduces the risk of the policy not being carried out. Stakeholder involvement therefore can be regarded as counteracting obstructive power (Renn et al, 1995; Healy 1997). Such a choice will slow down the policy process in the early phases but will speed it up in a later phase.

The aforementioned arguments for stakeholder involvement is sometimes regarded as a negative one, born out of strategic considerations. However, there is a positive motive as well, that of, enrichment. Governments do not possess all the resources required for the design, planning and implementation of sophisticated policies such as environmental policies. This is important for sustainable management of sediments, a subject where knowledge is still fragmented and debated. From that point of view it is wise to invite stakeholders from the relevant fields in order to obtain and apply knowledge and information generated by them (Fischer, 2000). No one can provide as much local insight to aid planning for the development of a disposal facility for dredged material as the local dredging companies, the people living in the vicinity of the site and the pressure groups that work to protect the natural and human environment in the area (Gerrits & Edelenbos, 2004). In this way, stakeholder involvement can provide good ecological practises.

The last argument for stakeholder involvement is fairness. It is fair to involve actors affected by a certain policy, such as the construction of a disposal site, and give them a say in the decision-making process. Politicians are often in favour of this argument, especially when it comes to controversial topics such as contaminated dredged material. Norris et al. (1998) show a global increase of support for such democratic arrangements. Besides that, Van Ast (2000) shows that internalization of sustainable behaviour among stakeholders of a river(basin) can only be reached through the involvement of those actors in the policy process concerning this river(basin). This raises awareness and creates support for the issue and its solutions.

Involving stakeholders

A process of stakeholder involvement usually benefits from hiring an independent chairman or process manager. Such a person should not be attached to the involved parties and should be as independent as possible. The arrangement for his or her

payment, for instance, should reflect that. He or she should be paid by a mix of stakeholders in order to avoid the appearance of a conflict of interests.

The first step for the process manager in the organization of stakeholder involvement is to find out who the stakeholders are that should be involved. The definitions of stakeholders will be used for this selection. For the stakeholder selection, the following questions should be answered: Will the stakeholders be affected by the policy? Are they the target group of the policy? Do they have the power to obstruct or the resources to enrich the decision making process? The questions that should be posed differ with the aim of the process (Edelenbos, 2000). A crucial criterion here is variety. Although, at first glance, it seems to make more sense to focus on representativeness, variety should be the guiding thread. This triggers the enrichment of the process and serves as a safety valve against overlooking stakeholders. A good way of collecting a stakeholder panel is to ask other stakeholders who they regard as vital for the process. Through the so-called snowball-method, other stakeholders can be invited to the process, who otherwise might have been overlooked initially.

Next, it is vital to collect information about the goals, ambitions and problem definitions (from the various perspectives) of the stakeholders. The process manager should ensure that all these interests are heard and acknowledged in the course of the process. If not, stakeholders might pull out which will damage the process. In order to guarantee that all interests are present in the process, the manager should be sure to know them. One must be aware of the difficulties of acquiring the desired information, as stakeholders can show strategic behaviour. The stakeholders might want to shield off their real interests, as they prefer to hide their agenda. Their real interests can sometimes better be obtained through asking other parties (Slob, Gerrits & Ellen, 2008a).

The mobilization of the stakeholders is an important issue. Too often, decision-makers feel that the majority of the potential stakeholders lack interest whereas some with strong but specific interests dominate the agenda. So it is the duty of the manager to let stakeholders realize what's in it for them. Why should they join the process? A sound and deliberate consideration of interests might persuade less-interested parties to join and will be a signal to dominant forces not to overact. Furthermore, awareness and urgency should be emphasised. This can be done by pointing out the drivers behind sediment-related issues. These include the regulations issued by the European Commission such as the 'polluter pays principle' in the Environmental Liability Directive (Directive 2004/35/CE of the European Parliament). Finally, the fairly technical nature of sediment-related problems such as contamination and morphological change require 'translation'. Laymen and the public cannot be expected to fully understand the technical backgrounds of the problem and therefore communication must be understandable for layman, one of the most important aspects is that it is free of jargon (Slob et al. 2008a).

The process of involvement can be arranged at different levels (Gerrits & Edelenbos, 2004):

- information: providing information to the stakeholders;
- consultation: consulting what stakeholders think that must be done;
- advising: letting stakeholders advise on the policy and taking their recommendations into account;

- co producing: stakeholders are regarded as equal policy makers but decision-making remains in the political domain;
- co deciding: decision-making power is handed over to stakeholders.

Every situation is unique and therefore the level of involvement should be chosen such that it fits the specific situation. It is of great importance that, once a level is chosen, this is communicated towards stakeholders and that the level is not abandoned in the course of the process. Doing so will create uncertainty and distrust. It should also be understood that not every stakeholder has to be involved at the same level. Some just want to stay informed whereas others want to be heavily involved. But it is important to recognize that there can be different processes at different levels – a tiered process – without forgetting that once a level is chosen, this should not be changed. Also see Table 3.

A common feature of processes that involve some kind of uncertainty is that they are often made resistant against unforeseen events. This means that either 1) every step that should be taken in the project is considered as 'written in stone' or 2) the project involves stakeholders visible in the start and then 'closes its doors'. This should not lead to a process of stakeholder involvement where stakeholders cannot enter the process in later stages. A certain amount of openness is required, however openness has two dimensions. The first is openness with respect to new stakeholders. Once the process is on its way, new stakeholders should still be able to participate. At the same time, this should not mean that the process should restart over and over again. New participants are asked to comply with the state of affairs in the process at the time of their entry. The second dimension of openness concerns the results. In rational processes, often a timeframe is set. Processes of stakeholder involvement have their own dynamics, which makes it fairly difficult to predict what results will be delivered at what time. So, when the process is fixed in time, the results that will be delivered should be left quite open, and not fixed, beyond change. To create more certainty into the process, the process requires certain "rules of the game", that include the procedures for entering the process in later stages, how decisions are made, how information is brought into the process etc. These "rules of the game" should be discussed and approved by the involved stakeholders (Slob et al., 2008a).

Tools, processes, instruments

As described previously, literature usually distinguishes between five levels of stakeholder involvement ranging from informing the stakeholders to making the stakeholders co-deciders. With these different levels of stakeholder involvement come different approaches in actually involving them. It would be impossible within the context of this report to describe all the different methodologies of stakeholder involvement. We have therefore provided a selected overview in Table 3 of possible tools, processes and instruments that can be used in the different levels of stakeholder involvement (Gerrits & Edelenbos, 2004). Some methods are left out from the table because they are not specific for the degree of influence of the stakeholders. These methods can be used in any process with some form of stakeholder participation: surveys, interviews, panel-research, idea- and complain-feedback forms, observations and hearings. For a more elaborate overview on methods of stakeholder involvement, we refer to the Consensus Building Handbook (Susskind, 1999).

Table 3 Stakeholder involvement and tools (source: adapted from Gerrits & Edelenbos, 2004)

Degrees of influence (adapted from Gerrits and Edelenbos, 2004)	**Role of the stakeholder**	**Role of the expert**	**Role of the policy-maker**	**Possible tools, processes and instruments to be used (source: Pröpper & Steenbeek, 1999)**
1. Stakeholders are informed – they remain passive	Stakeholders receive information but don't deliver input to the process, they remain passive	Delivers information to the stakeholders on demand from the policy-makers	Policy-makers determine policy; information is issued to the stakeholders	Folders, brochures, leaflets, newsletters, advertisement, commercials, reports, exhibitions
2. Stakeholders are consulted	Stakeholders are consulted, act as interlocutors	Delivers information to the participants on demand from all parties; experts provide another flow of information to the process, next to the flow to the stakeholders	Policy-makers determine the policy and opens the process to input by stakeholders, but are not obliged to adopt their recommendations	Creative group sessions, study groups, focus groups
3. Stakeholders give advice	Stakeholders become advisors to the process	Delivers information to all parties on demand of all parties and investigates suggestions from participants on demand from the policy-makers	Policy process is open to input (other ideas, suggestions etc.) by stakeholders; they take the input into account, but have the right to deviate from it in their decisions	Creative group sessions, advisory boards consisting of stakeholders, internet discussion
4. Stakeholders become co-producers	Co-decision makers within the set of preconditions Policy-partners on the basis of equivalence	Experts treat policy-makers and stakeholders as equal clients; advice and knowledge provision to both actors Experts treat stakeholders as equal knowledge providers; they need approval of the stakeholders	Policy-makers take the input of stakeholders into account, and honour it if it fits into the set of preconditions Policy-makers interact with stakeholders on the basis of equivalence	Creative group sessions, project group were stakeholders also take part in producing solution, internet discussions Organizing workshops, create a common ground for discussion, for example by joint-fact finding
5. Stakeholders not only produce solutions but also decide on them	Taking initiatives, making decisions	Experts support stakeholders with knowledge; experts treat stakeholders as their clients, need no approval of the policy-makers	Joint role of policy makers and actors: offer support (money, time of civil servants, etc.) and leaves the production of solutions and decisions to the participants	Joint groups that decide about implementation of solutions

2.4 Communication of Information and Knowledge theory

Knowledge, and the underlying information, is a crucial resource for policy-making. As a consequence, the production and utilisation of (applied or applicable) knowledge is an issue of prior concern, in particular in modern, largely expert driven western societies. In the classical, so-called 'two communities' view on the relationship between science and politics Caplan (1979) suggested a clear and sharp demarcation of tasks. In this 'two communities' view policy makers asked for useful information from experts, to which experts responded with valid, reliable and useful knowledge, which the policy makers in turn were assumed to build upon. The adage 'speaking truth to power' (Wildavsky 1979) to express the role of scientists reflects the different worlds or communities scientists and politicians were assumed to live and work in. These communities were said to have quite different ambitions and goals, different drives and rationales, different responsibilities and different systems of quality control (Hage, Leroy & Willems, 2006).

These are not merely academic observations. Over the 1980s and 1990s, the environmental policy domain gradually became the example of some paradoxes and questions on the interface and interaction between science and policy, as questions were raised by both academics and societal groups. Scholars from science studies, policy sciences and environmental studies (Jasanoff 1990, Irwin 1995) increasingly asked two (strongly interrelated) main questions. On the one hand, as the actual impact of scientists and experts on society grew, the question emerged as to 'who is actually speaking to whom?' In 'The Fifth Branch' Jasanoff (1990) highlighted the important but largely invisible and uncontrollable role of experts and advisers. On the other hand the functioning of expertise was increasingly questioned (Wynne 1996). In other words, parallel to what was the case with traditional government, traditional forms of knowledge production and utilisation in policy-making were debated in terms of their quality, their problem solution capacity and their legitimacy (Hage, Leroy & Willems, 2006).

This development resulted in such a trend that the current knowledge production for decision-making, often referred to as policy analysis, is increasingly organized and executed in a participatory way. In addition to the previously named factors this is largely caused by the networked nature of our society. In scientific schools as well as in policy practice, society is perceived as a network in which increasing numbers of (interdependent) actors take part and different subjects or fields overlap. A decision making process is no longer perceived as rational and linear but as a process that may take many different forms, consisting of several arenas, feedback loops, and flexible boundaries; it is perceived as a process defined by its context (Teisman, 1992; Castells, 1996). Different parties have different goals and interests resulting in varied perceptions of problems and solutions as well as causes and effects. Hence, actors are perceived as having a 'bounded rationality' in their decision making (Simon 1985; Hisschemöller & Hoppe 1998; Birkland 2001). Therefore, unilateral knowledge cannot simply be 'imported' into the process; rather multiple forms of knowledge must be taken into account during decision making. Rational and objective knowledge is no longer the aim, for it is acknowledged that this cannot exist; knowledge has become subject to a network in which different perceptions can be found (Klijn, 2002; Van Buuren, 2006). This means that knowledge and information are valuable assets in any decision making process.

This short overview emphasizes both the difficulty and importance of knowledge communication. But how may we define knowledge communication? Knowledge Communication is 1) the (deliberate) activity of interactively conveying and co-constructing insights, assessments, experiences, or skills through verbal and non-verbal means, and 2) the exchange of know-how, know-why, know-what, and know-who through face-to-face or media-based interaction (source: http://www.knowledge-communication.org/types.html). Using this definition of knowledge communication there are various methods for (participatory) knowledge communication. For example[3]:

- Joint fact-finding is meant to be a strategy for resolving factual disputes. In short, employing joint fact-finding means addressing a factual dispute by forming a single fact-finding team comprised of experts and decision-makers representing both sides of a conflict. The team works together in an effort to come to agreement regarding relevant facts, often in the form of scientific, technical, or historical claims. In this respect, joint fact-finding is really mediation within mediation; an attempt to resolve a sub-conflict over facts as part of an effort to deal with the overall conflict. While joint fact-finding is not always a viable or appropriate option, a strong case can be made for it being the preferred method for settling a factual dispute. Often, in carrying out a joint fact-finding endeavour, the benefits go beyond reaching consensus on the facts (Schultz, 2003 and Susskind, 1999);
- Knowledge dialogue: heedful and open conversations between knowledgeable people upon analyses, values, experiences, processes and forecasts. Knowledge dialogues combine analytical rationality with emotional authenticity, turn group dynamic and mental models explicit and create new knowledge, sharing existing knowledge, asses knowledge and help to move from abstract to more concrete knowledge;
- Knowledge visualization: knowledge visualization designates all graphic means that can be used to construct and convey complex insights. Examples of knowledge visualisation formats are concept maps, interactive visual metaphors, or value charts.

To apply the methods described above, it is important to have an experienced and independent process facilitator that is accepted by the different stakeholders at the table (Susskind, 1999). Furthermore it is important that when there are drastic power differentials, extreme mistrust or hatred of the other side, or volatile social/political concerns, participatory knowledge production and communication may be impossible. The process must involve a relatively even playing field so that one side cannot dominate the efforts. And if the sides are extremely far-removed from working together amenably, attempting close contact between them may do more harm than good. So although participatory knowledge production and communication holds the potential for great benefits both in terms of agreeing on facts as well as improving conflict relationships generally, it must be executed well and attempted in the right context (Schultz, 2003).

2.5 Risk Perception

Since the beginning of the 90s, the use of the concept of risk to address general aspects of decision-making in modern society has been advocated. Contemporary risk analysis can be described as a scientific approach towards risk, used for public policy making on

[3] For a more elaborate overview of possible tools and methods on knowledge communication we refer to: http://www.knowledge-communication.org/types.html and http://www.beyondintractability.org/

technological, environmental and health issues. It is an active field involving many different disciplines, e.g. mathematics, statistics, system analysis, psychology, policy sciences and even philosophy. Within the evolution of the field of risk analysis, the attention and approach towards risk perception has also changed. The concept of risk perception has evolved from a one dimensional measurement into a multidimensional concept involving beliefs, attitudes, judgments and feelings, as well as the wider social or cultural values and dispositions adopted towards hazards and their consequences (Montalvo, 2002, Royal Society, 1992). Risk perception denotes the processing of physical signals and/or information about potentially harmful events or activities, and the formation of a judgement about seriousness, likelihood and acceptability of the respective event or activity (Renn, 2008).

Empirical research by Van Asselt (2000) has shown that there is a gap between scientific estimates and the estimates by lay people. Starr (1969) introduced the distinction between objective and perceived risk to discriminate between the scientific definition and the perception of people. Natural scientists often consider this gap between the experts view and the view of lay people as 'simple misperceptions, biases or plain deviousness' (Van Asselt, 2000). Natural scientists often consider perceived risks as inherently wrong, because lay-people often overestimate involuntary risks (Van Asselt, 2000). According to Van Asselt the 'gap' between lay people and experts can only be bridged by putting enough effort in communication and involvement, and by putting the same emphasis on lay perception as on technical knowledge and data used to estimate the risks.

Why is it important to do so? In a world where lay-people have learned to become more vocal, and where power increasingly is handed over to them, the main motive for listening to their opinions and views is that the chance that they will use their obstructive power increases if not done so (Gerrits & Edelenbos, 2004). Opposition to plans will grow, as citizens do not feel that they are taken seriously. This opposition can be persistent and have serious consequences for the progress of a decision-making process; something which decision-makers will want to avoid at all costs. So the conclusion can only be that, if citizens are to be taken seriously, their views must be incorporated in the risk assessment. Particularly in the early years of development of what is now called 'risk governance structures', there was a great belief that (at least important elements) of risk could be assessed more or less objectively. It was assumed that facts and values could be separated rather easily, which also defined the role of science and politics. Scientists would have to submit 'robust knowledge' where possible, and indicate any uncertainties in their data. Policy makers and politicians should make the value choices that would be needed in the assessment procedure (e.g. about standards, norms or risk thresholds) and in this way an 'objectified' risk assessment system could be set up. After the assessment, risk management could follow - administrative and political procedures in which decisions are made regarding what to do about risks (clearly separated from the risk analysis/assessment arena). The role of risk communication from this perspective is considered to be used instrumentally: communicating the expert view when informing and reassuring the public.

This is a quite rational view on the interplay between science and policymaking in risk governance. This view has proven to work quite well in relatively 'simple' risk questions, but appeared to be much less successful in controversial and complex issues such as debates on the acceptance of nuclear power, Genetically Modified Organisms,

the chlorine industry, or building harbours facilities for the reception of liquefied petroleum gas (Renn, 2004, Tukker, 1998).

It is therefore important to shed some light on how people think about the seriousness and acceptability of risks, and how they make judgements of other risks. The mental models and other psychological mechanisms which people use are internalized through social and cultural learning and are constantly moderated (reinforced, modified, amplified or attenuated) by media reports, peer influence and other communication processes. This confirms that technical and solely quantitative approaches for characterizing risk are obviously inadequate to reflect the complex pattern of individual risk perception. The latter has been stressed by many authors (Renn, 2008).

There are a number of factors that cause people to increase the perception of risk they adhere to in particular situation. The factors that influence risk perception have been described by different authors. Plattner (2005) describes four important aspects, as shown in below. The column 'Direction' of influence has been added to the table based on Renn (2008).

Table 4 Overview of factors influencing perceptions of risk (source: Plattner, 2005 and Renn, 2008)

Perception affecting factors	Description (representation)	Direction of influence
Voluntariness	Free choice, a person can choose to take a certain risk	Increases risk tolerance
Knowledge	Familiarity Knowledge about risk Manageability	Increases risk tolerance
Endangerment	Number of people affected Fatality of consequences Distribution of victims (over space and time) The scope of the area affected The immediacy of effects and directness of impact.	Decreases risk tolerance
	Controllability[4]	Increase risk tolerance
Reducibility	Predictability Avoid ability	Increase risk tolerance

The factors influencing risk perceptions are defined on a personal and group level; however, to gain insight at a larger level of a society or large population, cultural and social influences become more important. The cultural theory applies in these instances. At the basis of this theory is Mary Douglas's observation that in different cultures, two basic dimensions of social organisation are present: a group dimension and a grid dimension (Douglas, 1970). The group dimension describes the extent to which individual behaviour is influenced by group membership. A strong group membership leaves less room for individual behaviour, while weak group membership translates to strong individual behaviour. The grid dimension describes the extent to which an

[4] This row is separated because in the case that controllability increase, this also increases the tolerance of risks, this in contrast with the other elements of endangerment, which all create and decrease in the tolerance of risk

'individuals' or 'groups' behaviour is prescribed by rules. The theory was developed by Thompson, Ellis and Wildavsky (1990) for policy analysis and distinguishes four basic types of social organisation by combining the group and grid dimensions. These four types of social organisation, often defined as 'rationalities' are named hierarchists, egalitarians, fatalists, and individualists. The theory has been extended to the 'myths of nature' by Schwarz and Thompson (1990), which 'translates' the grid-group typology into how people look at the environment and physical systems. Based on this translation, different orientations of the perspectives towards risk can be deduced as shown in Figure 2.1.

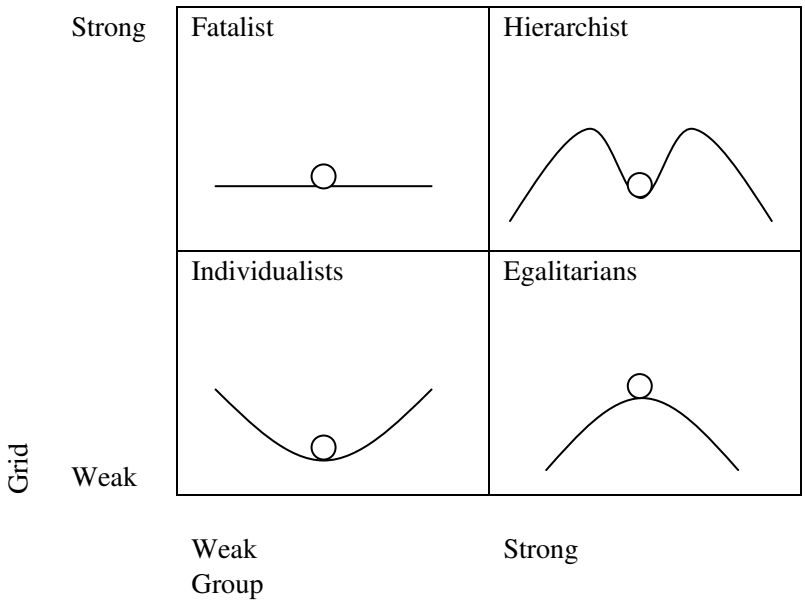


Figure 2.1 Overview of the cultural theory (source: Schwarz & Thompson, 1990)

The attitude of the different types can be summarised as follows: fatalists feel that risks are unmanageable, hierarchists feel that risks are acceptable within boundaries, egalitarians feel that risks have to be avoided at all costs and finally individualists feel that there is no reason to avoid risks. From these different perspectives, different perceptions of risks arise and this in turn leads to different approaches to risks. The emphasis on values and world views by the cultural theory, rather than interests and utilities is a major accomplishment of this theory (Renn, 2008). Therefore the theory can be valuable in practice when dealing with projects in which a different perception of risks might be expected. The cultural theory could then function as a 'lens' through which a project and especially the values surrounding a project could be viewed (Ellen et al., 2008).

3 Research questions and Methodology

In this chapter the research questions that are central in workpackage 1 of the sediment and society project. Furthermore the methodological approach of answering these questions is discussed.

3.1 Research questions

Based on the characteristics of the Oslo harbour sediment remediation project, as described in chapter 1, and the theoretical aspects described in the previous chapter, the main research question for this work package is:

What can be learned from the Oslo harbour contaminated sediment remediation project concerning the design of the public decision-making and implementation processes of projects dealing with contaminated sediment remediation?

This research question will be answered using the following three sub-questions:

1. *In what way was the involvement of stakeholders organised in the Oslo harbour contaminated sediment remediation project, and how was it perceived by the different stakeholders?*

One important characteristic of a public decision making process is if and how stakeholders are involved. The reason why this is important is because stakeholders often hold certain powers. These can either be obstructive powers (i.e. the right to object by law to a certain decision or voicing their opinion through the media) or cooperative powers (i.e. (tacit/local) knowledge, supporting the process through the media or even financial means). The manner in which stakeholders use their powers might depend on how they are involved in a certain process.

2. *How has the communication of data, information and opinions been perceived by the stakeholders of the Oslo harbour contaminated sediment remediation project?*

In projects that can be considered complex, either because of the number of stakeholders that are involved, the public perception of the issues that are being dealt with in the project or the amount of media coverage of the project, communication is a crucial aspect of staying connected to the societal context in which the project is taking place. Important tools in this are the means of communication such as websites, newsletters, meetings etc. Furthermore, communication can have an important role with regard to transparency of the decisions being made and the influence stakeholders perceive to have when it comes to the decision making process.

3. *How do stakeholders approach risks and what is their perception of the risk of sediments in the case of the Oslo harbour contaminated sediment remediation project?*

When dealing with an issue such as the remediation of contaminated sediments, stakeholders can be uncertain about what is actually happening and how it might affect them, their peers, the environment, or any other aspect of the area involved. This uncertainty can result in the situation where the perceived risk is greater that the calculated risk. It is important to be aware of this in the decision making process, as perceived risks are very real to the stakeholders that feel affected by them.

To describe how the research questions will be answered, the methodological choices are described in the next paragraph.

3.2 Methodology and data collection

The main methodology used in this research is the form of a 'case study'. Silverman (2005: 126) describes a case study as: "the basic idea is that one case will be studied in detail, using whatever methods seem appropriate. While there may be a variety of specific purposes and research questions, the general objective is to develop as full an understanding of that case as possible". In the case study of the Oslo harbour sediment remediation project, we want to describe our case study as an *instrumental* case study, examined to provide insight into the three issues described in the research questions. The reason for the selection of a case study as methodology is that the Oslo harbour case has thus far been the largest sediment remediation project that has taken place and it has caused substantial societal unrest in the Oslo region.

The research process in the case study of the Oslo harbour sediment remediation project consists of three different methodologies of scientific research. The first step is desk research based on a historical document analysis of available documents that describe or have been used as input to the project during the time period between 1992 and 2009. This historical document analysis is used as input for the next step: interviews with stakeholders. The interviews are semi-structured, meaning that most of the questions are 'open', allowing new questions to be brought up during the interview as a result the answers of the respondent. Only some questions have a limited selection of answering categories. The third step consisted of a survey designed to validate the responses from the interviews. Because of the usually relatively high expected response-rate, a web survey was utilised.

With the variety of data collection methods, an attempt at triangulation of the research design was made. According to Yin (2003: 97), triangulation is needed when collecting "multiple sources of evidence" because it enables a researcher to address a broader variety of cultural-historical, attitudinal and behavioural aspects of the object of study. Additionally, an important advantage of triangulation is "the development of converging lines of inquiry" (Yin, 2003: 98) that will support, legitimize, and make a reasonable case for the findings or conclusions because they are rooted in several sources of information. Patton (1990) identifies four types of triangulation: 1) triangulation of data resources, 2) of researchers, 3) of theoretical perspectives on the same data set and, 4) of methods. We have emphasized the triangulation of data collection through the execution of in-depth, semi-structured interviews as well a web based survey research.

3.2.1 Stakeholder selection

Because we are determining the position of the stakeholders *after* the decision-making process has started gave us already some insight in determining who the stakeholders are or were (see paragraph 4.2.2 for an overview of the identified stakeholders). We were able to use different policy documents, hearings, newspapers articles etc. to identify the stakeholders that had an active role in the process. However we will take a few steps back to describe how we 'mapped' the stakeholders in the project. The goal of the stakeholder selection was to identify a group of stakeholders that could be interviewed in more depth. With this selection we aimed for a group that was characterised by 'diversity'. This is in contrast to the often aimed for

'representitiveness' in social sciences. The reason we opted for diversity is that we earlier identified the Oslo harbour sediment remediation project to be a moderately structured problem and Gerrits (2008) describes diversity as an important aspect when it comes to understanding such complex issues. As indicated earlier we will use the definition of stakeholders by Susskind (1999): *people, organisations or groups affected by an issue or conflict, with the power to make the decision or block the decision, or with relevant expertise.*

As described in paragraph 4.2.2 the reconstruction of the stakeholder network resulted in a list of stakeholders that had a role in the Oslo harbour sediment remediation project. Each stakeholder in this list was then 'scored' on five aspects; this scoring took place based on the information collected as input for the timeline (see Appendix 1) and also on qualitative assessment by the researchers. The aspects that were used to 'score' the list are described in.

Table 5 Aspects used to select stakeholders to be interviewed

Aspect	Description
Influence	The amount of power, in any form that a stakeholder can mobilize: this can include formal and informal influence. Formal influence is based on procedures/rights as laid down in legislation. For example governmental organizations with legislative rights/possibilities to enforce the law and private organizations/individuals with certain (user) rights, for example property rights, fishing rights. Informal influence is based on other factors than procedures laid down in legislation, for example in the case of an interest group or non-governmental organisation. If they are able to mobilize media, use resources (money or otherwise), or organize a lobby to put pressure on the political level they can have a high level of influence.
Interest	What does a stakeholder gain or lose (potentially) with the issue/project at hand? The 'amount' of interest, can be very diverse in nature. For example, money when it concerns a company, or safety and security when it concerns local inhabitants. Formal interests: responsibility to uphold law and regulation on this issue or losing/gaining of property/money; Informal interest: losing/gaining of political popularity, image of a company, emotional.
Argumentation	This aspect is based on the time period after the selection of the aquatic disposal site at Malmøykalven was communicated to the stakeholders. It describes the point of view of stakeholders concerning the aquatic disposal site at Malmøykalven. The following two categories are discerned: Support: supportive/positive arguments/attitude towards the realisation of the aquatic disposal site at Malmøykalven; Critical: critical/negative arguments/attitude towards the realisation of the aquatic disposal site at Malmøykalven. The comments that were sent in during the various hearings were used to establish the argumentation of the different stakeholders.
Role of the identified stakeholders	Based on Edelenbos (2000) five roles were discerned depending on the degree of participation in the project: Not involved: has no knowledge or an opinion about the sediment remediation of Oslo harbour; Listener: has knowledge or an opinion about the sediment remediation of Oslo harbour but did not participate in the project or in the debate; Information supplier: has knowledge about the sediment remediation of Oslo harbour and gave information to others when asked or wrote these down in reports; Critical observer: has knowledge or an opinion and participated in the debate, concerning the sediment remediation of Oslo harbour, when asked; Participant: has knowledge or opinion and actively participated in the debate, concerning the sediment remediation of Oslo harbour.
Perception of risks	Based on Cultural theory as described in paragraph 2.5. This theory identifies cultural clusters in society with different views on risk, and discerns three important prototypes (Renn, 2008, Ellen et al., 2008): government institutions as *hierarchists*: this group relies on rules and procedures in order to cope with risks. active civil society movements (i.e. NGOs) as the *egalitarians*: when facing risks this group tends to focus on the long-term effects of human activities and are more likely to abandon an activity (even if they perceive it as beneficial) than to take chances. the private sector as the *individualist*: this group perceives risk-taking as an opportunity to succeed in a competitive market and to pursue their personal goals.

When mapping the stakeholders based on the different aspects, we want to stress that this is a hypothesis, rather than an 'empirically proven label'. Based on the aspects described we 'scored' the large list of stakeholders. The next step was then to narrow down the list based on the outcome of this process. We used the following 'scores':

- *Influence & Interest*: the stakeholders that were identified as having a low interest and a low influence (either formal or informal) were not selected to be taken along into the interview round, because they are neither involved nor have in interest in the process;
- The *roles* that were selected for the interviews consisted of 'participant', 'critical observer' and 'information supplier'. This was because the other two roles: 'not involved' and 'listener' were more passive;
- *Argumentation:* to get both 'supporters' and 'critical' stakeholders into the interview round, we checked that the list of stakeholders selected consisted of both 'supportive' and 'critical' stakeholders;
- Finally the assumed *perception* of risk based on the cultural theory was also used as a check to see if all three perspectives were covered.

The different stakeholders with the different scores can be found in Appendix 3.

3.2.2 Interviews

The interviews were focused on constructing the perception of the process of sediment remediation in Oslo harbour. Based on the elements described in paragraph 2.1 these were: stakeholder participation, communication of knowledge and information, risk perception. A set of open interview questions was constructed. The goal of the interviews was to identify the views and underlying values and arguments of various stakeholders on different societal aspects of the sediment remediation project. The interview questions can be found in Appendix 4, including the handout that was used on risk perception as well as two visual aids that were added to the questionnaire.
The interviews were conducted in English with two interviewers present. At least one of the interviewers mastered the Norwegian language fluently, to overcome any language issues that might come up. The interviews have been recorded on tape, with permission of the respondents, this material will only be used for research purposes and will be destroyed once the project is finished. The respondents' information and suggestions have been used anonymously.

3.2.3 Internet survey

Based on the results from the interviews, initial observations of the most important aspects of the Oslo harbour case on the theme's of participation, communication, knowledge and information and risk perception were created. We wanted to validate these observations by utilising the internet survey as well as gathering additional data to gain more insight into the relation between the different theme's. The internet survey was conducted in Norwegian. The English language version of the internet survey can be found in Appendix 1.

The choice for the internet survey is based on the desire to reach people at different levels of participation. Therefore the respondents were asked to identify their own role in the process as explained in Table 5: not involved, listener, information supplier, critical observer or participant. The respondents who classified themselves as 'not involved' was thanked for their cooperation and did not have to fill out the survey any further. The respondents that classified themselves as 'listener' were not asked to fill out the questions on participation, but were asked to fill out the rest of the survey

questions (see Appendix 1). The other respondents were asked to fill out the entire survey.

The selection of an internet survey instead of a telephone or paper survey was influenced by two arguments. The first argument was the availability of e-mail addresses of many of the people having a role or a connection to the Oslo harbour sediment remediation project. These people were involved on different levels on an irregular basis. This included amongst others: consultants, politicians, NGO's, citizens, companies and government organisations. The second argument was that we wanted to make it possible for the people who received the survey to forward this to people they thought could also add to the insights in the process of the Oslo harbour project. This process is usually referred to as 'snowballing'. For this reason we also sent the survey to the people we interviewed so they could sent it on to others. This 'snowballing' approach means that the internet survey is not a random sample of the Norwegian society or the Oslo-community and surrounding municipalities.

4 Oslo harbour project case study: research findings

4.1 Reconstruction of the decision making process and implementation: Time line

4.1.1 Introduction

In this section an overview of the chronological events that took place and choices that were made in the decision making process concerning the remediation of contaminated sediments in Oslo harbour, is provided. It is important to define the boundaries of what has been taken into account in this overview. There are three important aspects in the reconstruction of the decision making process that have been defined at the start of this study: time, place and process.

First of all, the time frame that we focus on runs from 1992 until April 2009. In 1992 the dumping of snow in Oslo harbour was prohibited, due to the discovery the year before that the snow contained contaminants that could end up either in the water or in the sediment of Oslo harbour. This put the subject of contaminated sediments on the policy agenda. This sense of urgency initiated extensive investigations of the pollution state and as well as the search for viable solutions for disposing the contaminated sediments. In April 2009 the sediment remediation project was finished and the aquatic disposal site was capped. The place that the reconstruction of the decision making refers to is the geographic area of the Inner Oslo fjord as displayed in the detail on the map in Figure 4.1. For a more detailed version we refer to Appendix 4.

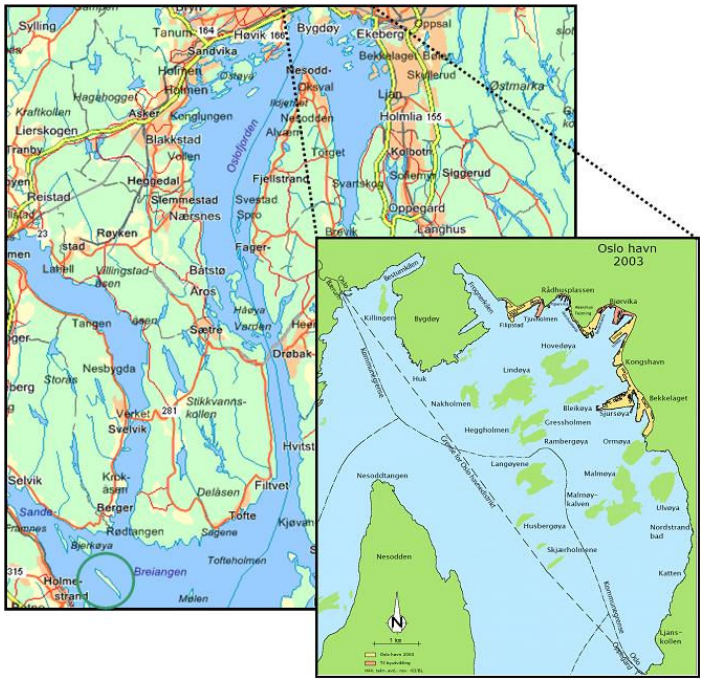


Figure 4.1 Map giving an overview of the Inner Oslo fjord

This area includes the city that gives the fjord it's name, the capital of Norway. The city has a blue-green image, as it is surrounded by the blue Oslo fjord and green hills and forests. The geographical area of Oslo is 450 km2, and only 1/3 of the area is developed. The city centre is surrounded by woods, lakes and 40 islands in the fjord

(http://www.oslo.kommune.no/). Oslo has 540,000 inhabitants in a region of about 1 million people. Oslo's population is growing rapidly, as is the labour market. The railway lines, motorways and freight and passenger terminals at the waterfront - a legacy of the city's seafaring history - form a barrier between the city and the fjord (http://www.waterfrontcommunitiesproject.org/).

The authors would like to recall the boundaries of the research process, as described in the introduction. The focus of this study is explicitly *not* aimed at the technical aspects of the Oslo harbour sediment remediation project and choices, and will not go into any technical details or choices. The objective of this study is to examine the public decision-making and implementation process of the Oslo harbour sediment remediation project, excluding an assessment of the legal procedures followed in the process. More precisely: this study focuses on the *formal* decision-making process and the implementation phase of Oslo harbour project. With *formal* we refer to the steps and decisions taken by (government) organizations that are responsible for the legislative and administrative procedures to make a decision on how to deal with the remediation of contaminated sediments in Oslo harbour. These organisations are also responsible for the formal implementation of the decided sediment remediation project.

Context: sediments in Oslo harbour
The sediments in the harbour of Oslo have been contaminated through decades of pollution from several sources. Most contaminants derive from industry-, harbour operations-, wastewater- and surface run-off in the vicinity of the harbour. Typically, the sediments in the harbour- and Inner Oslo fjord comprise 90 % clean sand, silt and clay. 5 %-10% is organic material, e.g. plant -and waste water residues. The contaminants are identified as heavy metals and organic contaminants, comprising a relatively low concentration of contaminants which does not qualify for a classification as "hazardous waste". The layer of contaminated sediments is ranging from 0.1 to 4.5 meters in thickness (Oen, 2006; Oslo Havn KF, 2007).

To gain insight in the decision making process it is important to examine the events that took place during the preparation and implementation of the project (1992-2009). The next 4 pages contain a timeline which schematically shows the process, by describing it in four layers:

1. In blue: formal plans that were made and decisions that were taken;
2. In pink: knowledge based input for the formal process. For example responses to hearings or results from contract research such as an environmental impact assessment;
3. In yellow: input by stakeholders to a hearing, meetings or 'actions', publications or newspaper articles;
4. In green: potential solutions that were a suggested/feasible option (at that time) for the disposal of the contaminated sediments in Oslo fjord.

A more detailed timeline of the process can be found in Appendix 1. The authors of the report would like to state that the timeline is a schematic overview of important events and not a day to day description of the decision making and implementation process.

The abbreviations that are used in the timeline are displayed in Table 6.

Table 6 Abbreviations used in the timeline

Organisations	Concepts
FMOA: the County Governor of Oslo- and Akershus	EIA: Environmental Impact Assessment
SFT: Norwegian Polution Control Authority	ADS: aquatic disposal site
NIVA: Norwegian Institute for Water Research	
NGI: Norwegian Geotechnical Institute	
HAV: Oslo Port Authority	
CHM: Cultural Heritage Management Office Oslo	
MD: Norwegian Ministry of the Environment	
NMM: The Norwegian Maritime Museum	
NRA: The Norwegian Road Administration	
DNV: Det Norske Veritas	
NGU: The Geological Survey of Norway	

4.1.2 Timeline before 1992:

Although this project does not consider the situation before 1992, a short summary of the time before 1992 is given to show the reason why the remediation of sediments in Oslo harbour was put on the policy agenda. The first recognition of contaminated sediments in the Oslo harbour was made during PhD-work in the period 1966-67 (HAV, 2001). This was also around the moment in time when 'environment' became an (policy and science) issue, for example the Club of Rome and their 1972 report 'Limits to Growth'. The detection of contaminated sediments however was not acted upon until some decades later. Contaminated sediments became an (policy or societal) issue in 1991 when questions were asked to *Havneoppsynet*[5] (the Port Authorities) on the practice of dumping snow from the streets of Oslo into the harbour area. Concerns about this practice arose because of:

1. decrease in visual quality caused by the old, dirty snow often including garbage;
2. potential of pollution from contaminants contained in the snow;
3. decrease in water depth at the quayside and in deeper waters resulting from accumulating sand sized particles.

The aim of the Port Authorities as the head administrator of the harbour, was first of all to put an end to the practise of snow dumping. Together with the Norwegian Road Administration, responsible for the maintenance of Oslo's streets, it was decided that analysis of the sediments had to be made to get an overview of the conditions. The analysis was conducted by NIVA. The results showed high concentrations of pollutants. The degree of contamination in the analysed sediments was formally communicated in the autumn of 1991. According to the classification system that was in use in 1991, as established by SFT (SFT, 2007), the sediments were defined as heavy to very heavily polluted. The layer of polluted sediments was as much as 0.1-4.5 meters deep. An application for dredging for filling purposes in the sea at Kongshavn was disapproved December 19th 1991 by the FMOA. The Port Authorities treated this disapproval as a general ban on all dredging in the harbour.

[5] *Havneoppsynet* was later integrated in the Oslo Port Authority .

4.1.3 Timeline between 1st of January 1992 and 31st of December 2008

The events taking place between 1992 and 2009 are schematically displayed in the following figures
Figure 4.2,
Figure 4.3,
Figure 4.4 and
Figure 4.5.

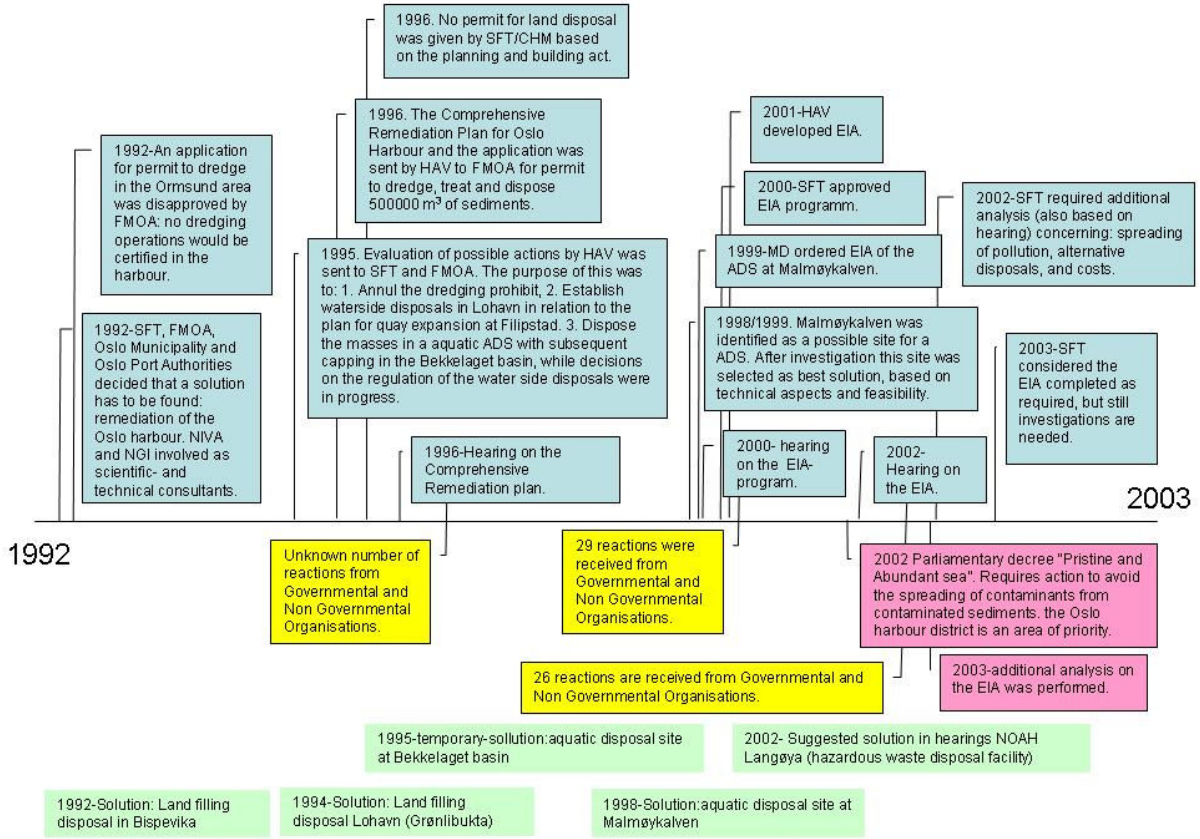


Figure 4.2 Timeline from the 1st of January 1992 until the 31st of December 2003

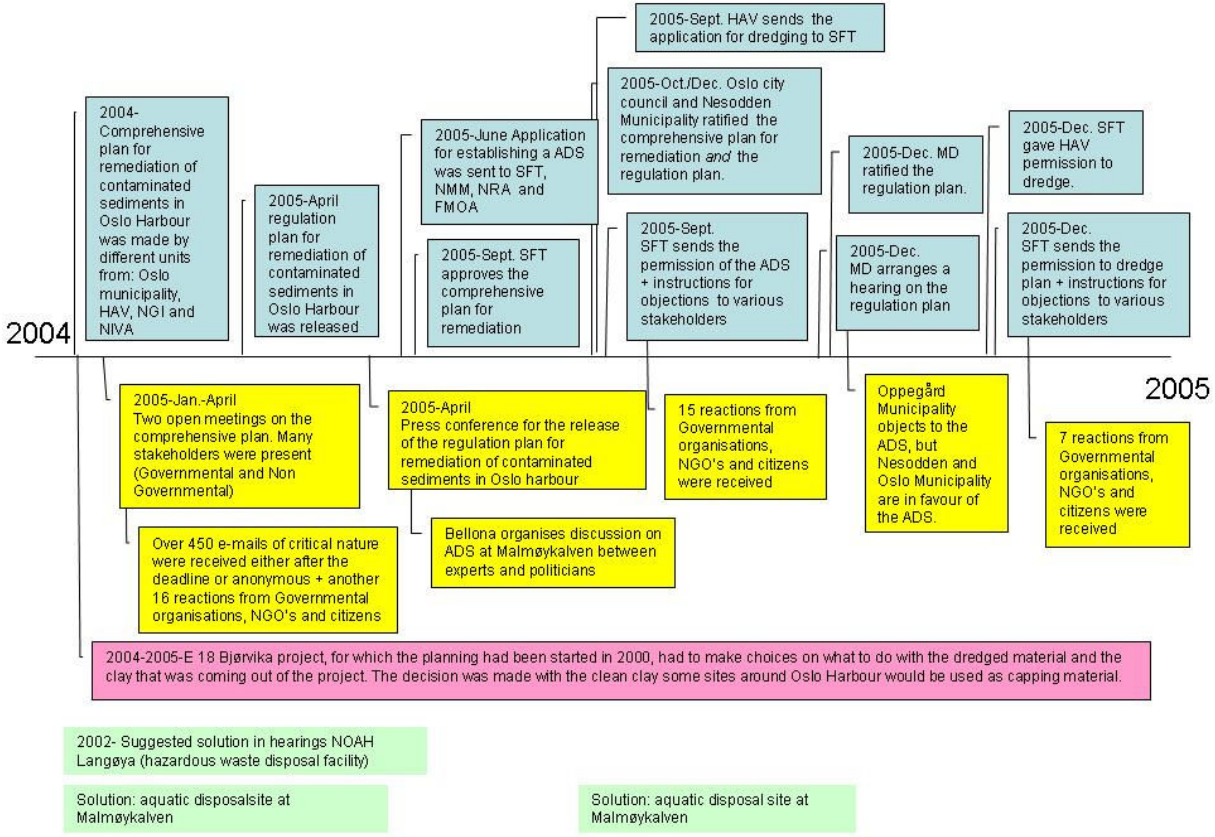


Figure 4.3 Timeline from the 1st of January 2004 until the 31st of December 2005

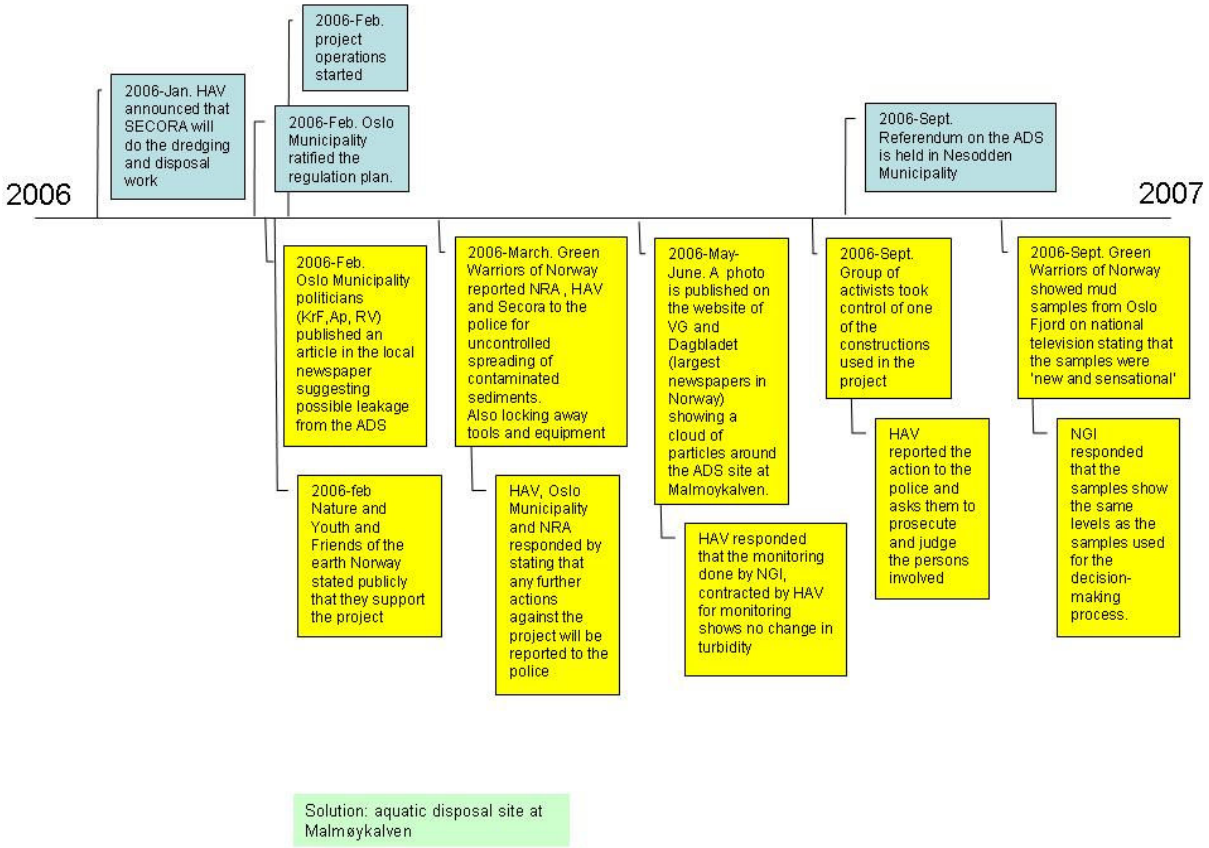


Figure 4.4 Timeline from 1st of January 2006 until the 31st of December 2006

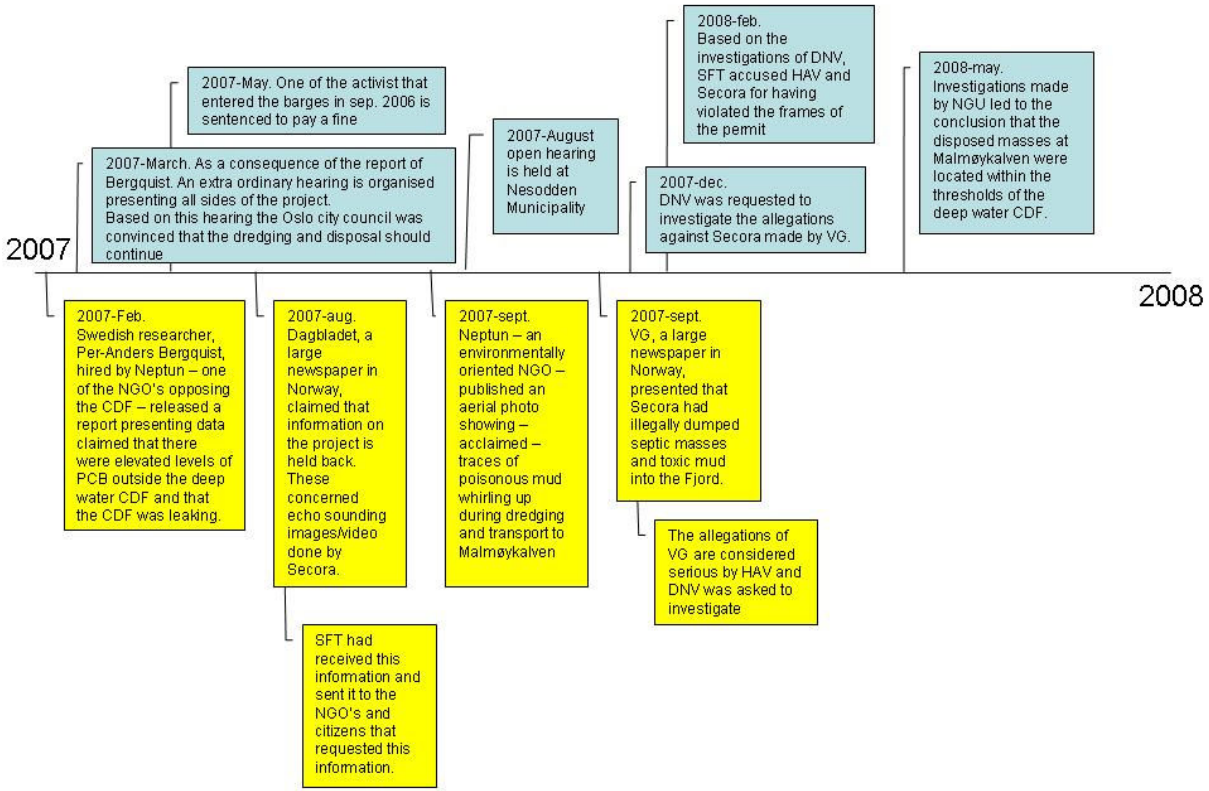


Figure 4.5 Timeline from the 1st of January 2007 until the 31st of December-2008

4.1.4 January 2009 until August 2009

The dredging and disposal of sediments continued until July 2009. During this period of time there were no events that had a large impact on the project implementation. Work on the capping of the disposed sediments was conducted by Secora in the period of November 2008 to July 2009. The documentation on the quality of the work is not finished. However, this does not finalise the project, as the monitoring of the aquatic disposal site will continue, and official approval/closure of the project has yet to be granted by SFT. Furthermore in April 2009, and based on the police investigations, the district attorney of Oslo chose to press charges to Secora, HAV and NGI. The case will be taken up in court in November 2009.

4.1.5 Main observations

In our view the following observations clearly show the changes in the nature of the discussion about the decision making process of the remediation of sediments in Oslo harbour:

- In the beginning, the process was oriented towards research, gathering data in an attempt to find out and describe what the actual problem concerning the contaminated sediments in Oslo harbour consisted of;
- After 1996 the process became more of an administrative and political issue. At first no dredging permit was given. However after several land based options for the disposal of the sediments were dismissed, the aquatic disposal site at Malmøykalven became the main option for the disposal of the sediments;
- In 2004 a 'window of opportunity' was opened both on the financial and policy side with the start of the E18/Bjørvikaproject (which consists of building a submerged tunnel in Bjørvika area of Oslo harbour). The financial synergy this offered, and the fact that the remediation of contaminated sediments had been put higher on the agenda by national policy ('pristine and abundant sea'- parliamentary decree nr. 12, 2001 – 2002) and local policy (City of Oslo Ecological program 2002-2014);
- After the decision for the aquatic disposal site had been taken and permits were given, the process shifted to the 'public arena', becoming less formal, and attracting the media to became part of 'open' discussions that resulted in societal actions, both opposing and supporting the Oslo harbour sediment remediation project;
- Between 2007 and 2008 critical opinions are voiced more often on the aquatic disposal site solution, but also on the actual dredging and disposal work in general. This caused a change in the nature of the process fluctuating between informal to formal, with the extra-ordinary hearing and the fines for HAV and Secora as the most prominent events;
- In 2009 the dredging and the capping of the contaminated sediments in Oslo harbour was completed. After July 2009 the discussion still continues because in April 2009 the district attorney of Oslo chose to press charges to Secora, HAV and NGI. The case will be taken up in court in November 2009.

4.2 Reconstruction of the stakeholder network: actor selection and involvement

4.2.1 Introduction

The reconstruction of the stakeholder network that was involved in the Oslo harbour sediment remediation project helps us to understand the role of stakeholders in the decision making and implementation process. The reconstruction of a stakeholder network can be approached from different rationalities such as means-end rationality,

political rationality, procedural rationality and other factors in policy making, such as power, personal relations, strategic behaviour and strategic use of information (Hermans and Thissen, 2008).

The decision making process in the Oslo harbour case was in the start mainly structured by legislative procedures in which the different (governing) stakeholders had different formal roles. We have defined this as the 'formal' process. Next to this, another process was driven by opinions, discussions and activities that revealed the interests of stakeholders that were not responsible for the formal decision making and implementation process, we will call this the 'informal' process.

4.2.2 Stakeholder network in the formal process

To identify the stakeholders in the formal decision process we reviewed the relevant legislative framework in the Oslo harbour project. This analysis resulted in the overview of the decision-making process and the roles of different stakeholders in this process. For an overview of this review we refer to Appendix 2. The Norwegian society has a governance structure that is composed of three layers: central government, county government and municipal government. In the figure below the highlights (in blue) show the government organisations that play a central role in projects related to the remediation of (contaminated) sediments. The formal decision-making process is illustrated in more detail with respect to the applied legislative framework and responsible authorities in Appendix 2.

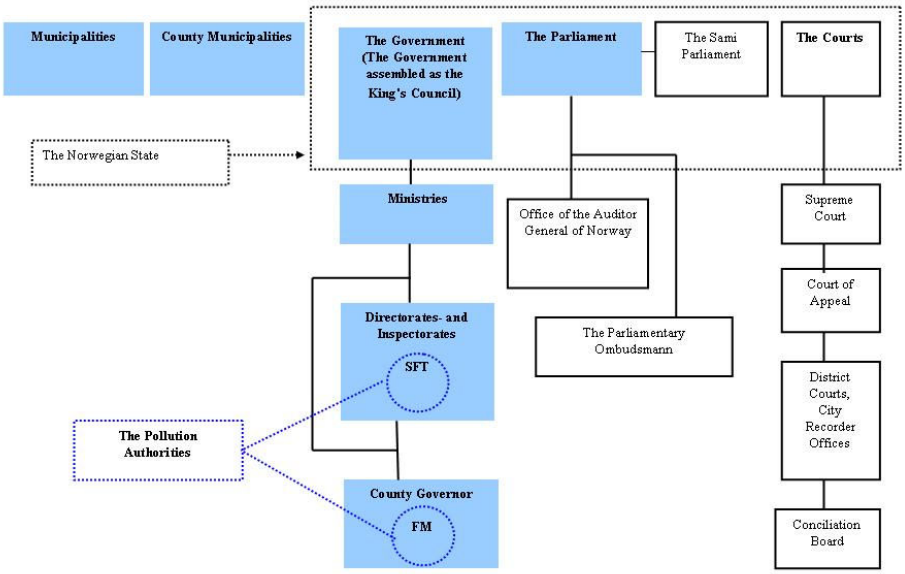


Figure 4.6 The most central authorities involved in the remediation processes of (contaminated) sediments. The figure shows the Norwegian State, consisting of the Courts-, the Parliament- and the Government with respect to other administrative institutions on local - and regional level. The most involved authorities in cases dealing with contaminated sediments are shown in blue (with modifications from www.norge.no)

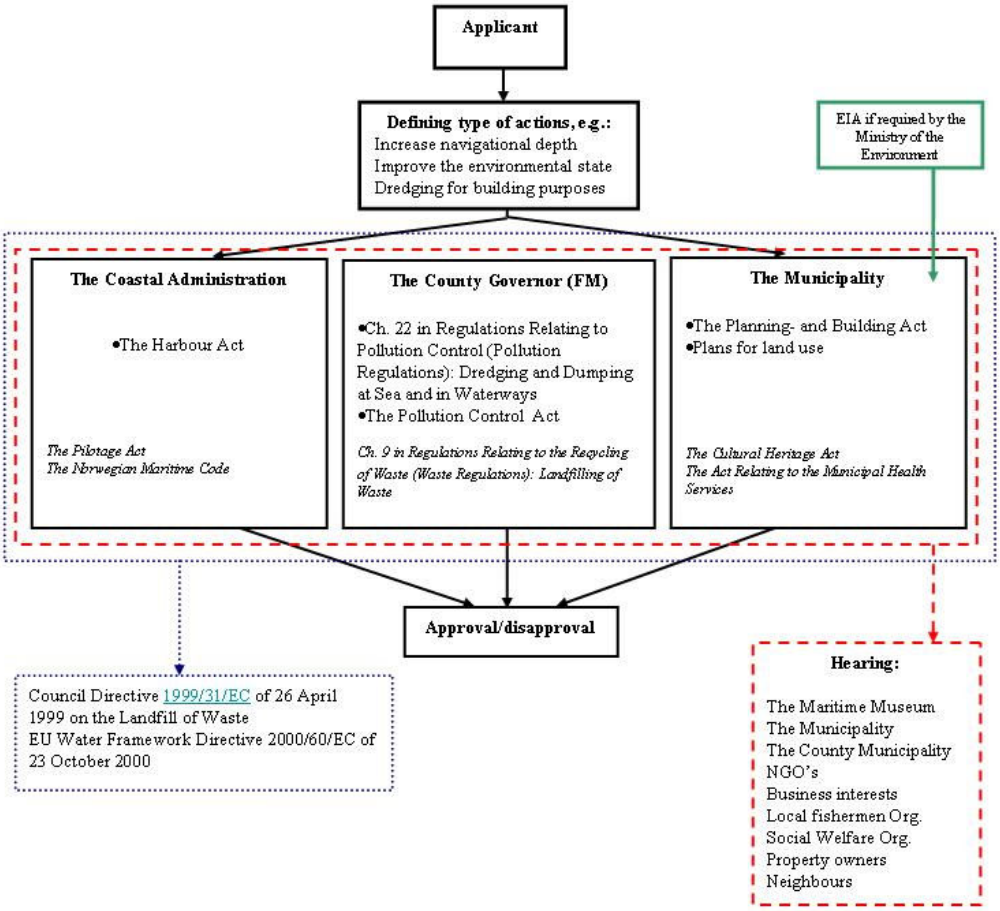


Figure 4.7 Overview of the typical decision-making process from application to approval/disapproval for a dredging and disposal project. In the case of the Oslo harbour sediment remediation project the Applicant was the Oslo Port Authority. Next to this the responsible authorities and the central law and regulations, and EU-directives are displayed. The order, in which the different administrative authorities are involved in the case and requirements for the content of documents, varies with the objective of a certain action and with the type of action (with modifications from HAV, 2001)

In the formal process we identified the stakeholders that participated based on legislative requirements, for this specific region, but also those stakeholders that became a part of the formal process. These stakeholders participated because of:

1. the knowledge, research and consultancy that they supplied, and
2. the work that was executed, such as the contractor doing the dredging the disposal and the capping of the sediments.

Table 7 Stakeholders participating in the formal process, either on a legislative base or because of a contract

Organisation	Stakeholder description	Role
Oslo Port Authority	Local governmental organisation	Applicant
Ministry of the Environment	Governmental organisation	Decision maker
Norwegian Coastal Administration, 1 district, Region Southeast	Governmental organisation	Decision maker
County Governor (FM) in Oslo- and Akershus	Governmental organisation	Decision maker
Akershus County Municipality	Governmental organisation	Decision maker
Pollution Control Authorities (SFT)	Governmental organisation	Decision maker
Municipality of Oslo – various departments	Local governmental organisation	Decision maker
Municipality of Nesodden – various departments	Local governmental organisation	Decision maker
Norwegian Road Administration, Region East	Governmental organisation	Decision maker
The Norwegian Maritime Museum	Governmental organisation	Decision maker
NGI	Research organisation	Information Supplier
NIVA	Research organisation	Information Supplier
Secora	Water infrastructure construction company	Contractor

The stakeholders that were more 'voluntarily' involved, for example by responding to hearings, were identified based on:

- list of organisations receiving the invitation to respond to the comprehensive remediation plan (from 1996), no responses on this hearing could be retrieved by the authors;
- the reactions on the regulation plan and the 'new' comprehensive plan, during the hearings (2005);
- stakeholder presence during the extraordinary hearing (2007) and
- through the interviews that were conducted.

Table 8 Stakeholders taking part in the formal process on their own initative or without legal obligations

Organisation	Stakeholder description	Role
Bekkelaget Welfare Society	Local welfare society	Respondent to the hearing request
Bleikøy Welfare Society	Local welfare society	Respondent to the hearing request
Nesodden Welfare Society	Local welfare society	Respondent to the hearing request
City Region Nordstrand-Childrens' representative	Local stakeholder	Respondent to the hearing request
Bygdøy Welfare Society	Local stakeholder	Respondent to the hearing request
Directorate of Fisheries, Region South	Local governmental organisation	Respondent to the hearing request
Oppegård Municipality	Local governmental organisation	Respondent to the hearing request
Inner Oslo fjord Fishing Organisation	Local special interest group	Respondent to the hearing request
"Citizen initiative at Nesodden"	Local interest group	Present at the extra ordinary hearing
Bellona	Environmental NGO	Respondent to the hearing request
Green Warriors of Norway	Environmental NGO	Actions against the dredging operation and critical through the media
Friends of the Earth Norway	Environmental NGO	Respondent to the hearing request
Nature and Youth	Environmental NGO	Respondent to the hearing request
Neptun	Environmental NGO	Actions against the dredging operation and critical through the media
"Public movement against dumping of pollution"	Local interest group	Actions against the dredging operation and critical through the media
Institute of Marine Research	Research organisation	Responded to the concept of the aquatic disposal site through the media
The Christian Democratic Party (Kfr)	Political party	Took part in the decision making process in the Oslo Municipality city council also responded to the concept of the aquatic disposal site through the media
Socialist Left Party of Norway (SV)	Political party	Took part in the decision making process in the Oslo Municipality city council
The Red Party (RV)	Political party	Took part in the decision making process in the Oslo Municipality city council also responded to the concept of the aquatic disposal site through the media
The Labour Party (AP)	Political party	Took part in the decision making process in the Oslo Municipality city council also responded to the concept of the aquatic disposal site through the media

The list of stakeholders shows that a number of the stakeholders were involved during the start of the decision making process, e.g. in the hearings held until 2005. Other stakeholders that were more action oriented became involved after a decision was taken.

4.3 Population characteristics

In order to provide an overview of the people that were interviewed and the people that returned the internet survey, a general description of the research population is presented below.

4.3.1 Characteristics of the respondents to the interviews

Of the 23 persons interviewed, 15 were male (65%) and 8 were female (35%). The average age of this group was 48, the highest age was 61 and the youngest person interviewed was 25. The majority of the respondents had a university degree. Governmental, political, research and non-governmental organisations were represented in the interview material. The responses represent persons from Oslo, Nesodden and other cities, such as Bergen and Oppegård.

4.3.2 Characteristics of the respondents to the internet survey

The number of people that received the e-mail with the request to fill out the internet survey directly from TNO was 92. The people that received an invitation were the people/organisations that had responded to the hearings and the people interviewed. Of this population 46 respondents filled out the internet survey, which is a response rate of 50%. Another 47 people received the internet survey through forwarding[6] by the initial group of recipients. Thus the total number of respondents that filled out the internet survey was 93. The division of these respondents over the five different roles that were described in paragraph 3.2.1: participant, critical observer, information supplier, listener and 'not involved' - is displayed in Figure 4.8.

[6] Because we do not know to whom the internet survey was forwarded to it is also impossible to give a response rate.

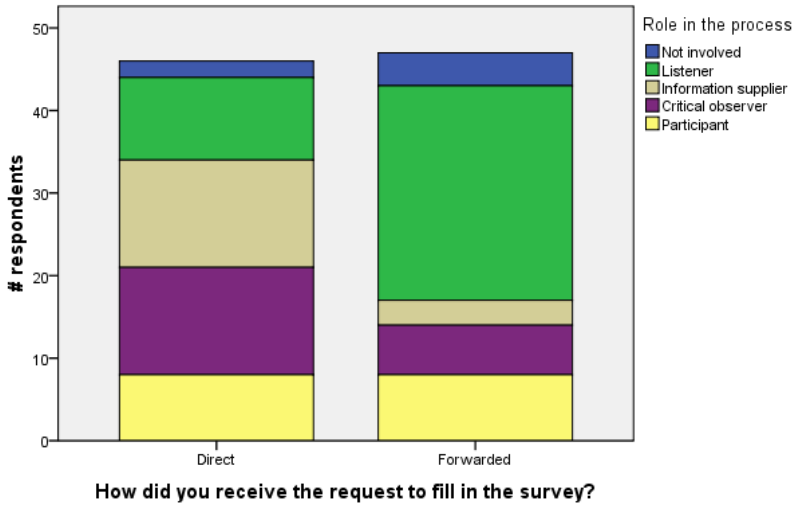


Figure 4.8 Division of the internet survey respondents over the five different roles in the process

As can be seen from Figure 4.8, the 'snowball sampling'(see paragraph 3.2.3) did result in a higher number of respondents in the more passive role of listener. This was also the most difficult group to identify by the project team during the stakeholder mapping. The reason for this is that this group is not readily visible in the process or in the debate. Based on the introductory questions in the survey, the population that filled out the survey is characterised is largely male. However between the age of 19-40, the percentage of woman is relatively high (49%). The majority of the respondents are between 41-65 years old. Also the vast majority (94%) of the respondents has a university education (bachelor, master or doctorate). The greatest portion of the respondents are either working for a private firm (46%) or for a governmental organization (41%). The majority of the participants' residence, at a municipality level, is Oslo (62%).

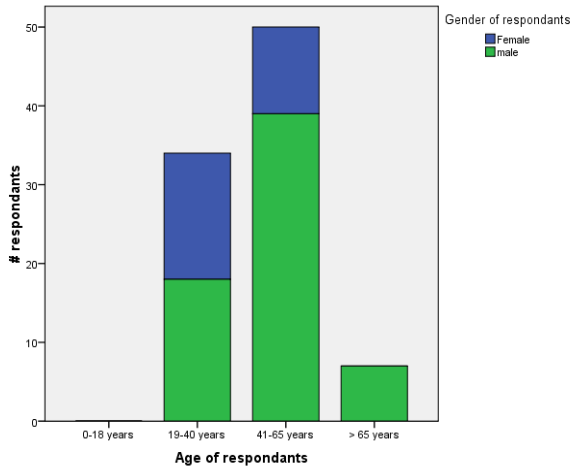


Figure 4.9 Age and gender of the respondents to the internet survey

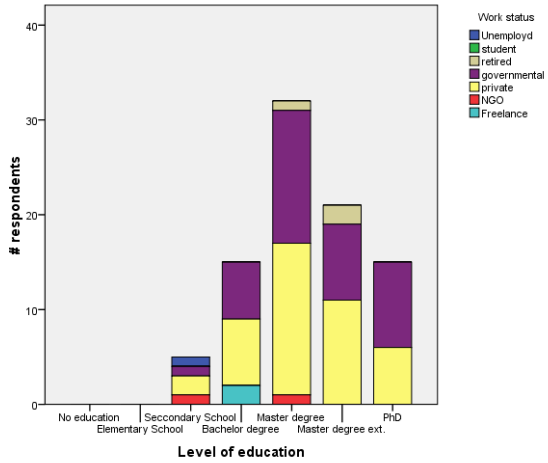


Figure 4.10 Level of education and work status of the respondents to the internet survey

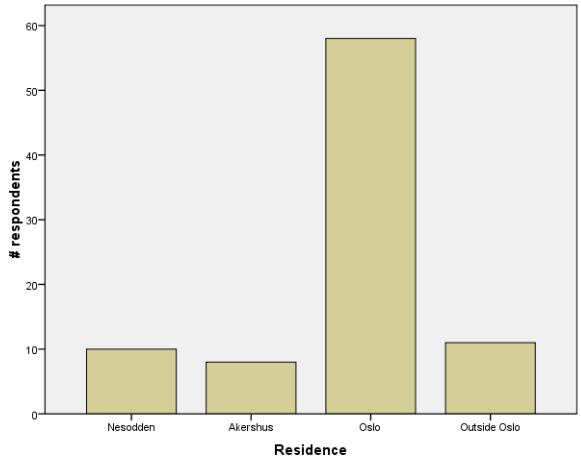


Figure 4.11 Residence of the respondents to the internet survey.

In order to gain insight into the preferred option and the selection criteria that were important for the respondents two questions were asked. The first question was:

"Which of the following solutions would have been the best solution to deal with the contaminated sediment in Oslo fjord?"

Table 9 Answers to the question: which of the following solutions would have been the best solution to deal with the contaminated sediment in Oslo fjord?

Which of the following solutions would have been the best solution to deal with the contaminated sediment in Oslo fjord?						
Answer category	deep water disposal site;	land disposal at NOAH Langøya	land disposal at local site	another solution	Non-response	**Total # of respondents**
# of respondents	40	20	17	11	5	**93**

These responses show a specific preference for the deep water disposal site, however, about 54% of the respondents who answered preferred another option including disposal at the NOAH Langøya site and land disposal. Under the category 'another solution' it was possible to include more specific remarks regarding the other three options (aquatic disposal site, Noah Langøya, and land disposal). These responses included:

- land reclamation;
- the project could have used the area at Sjursøya[7];
- disposal or new methods for binding contaminated material in sediments;
- another basin in Oslo fjord.

The next question was:
"Please score the following criteria on their importance for the selection that you used to come to the decision for a certain solution"

The answers to this question are displayed in Table 10.

[7] Sjursøya is a peninsula located in Oslo, Norway. The peninsula is used by the Port of Oslo as a container and petroleum port, and serves as the primary oil port for Eastern Norway. This area has been recently used as a landfill project placing contaminated soil out into the water to reclaim land.

Table 10 Answers of the internet survey respondents to the question: Please score the following criteria on their importance for the selection that you used to come to the decision for a certain solution

Please score the following criteria on their importance for the selection that you used to come to the decision for a certain solution							
Criteria	Very Important	Impor-tant	Neutral	Un-importan t	Very unimpor-tant	Non-response	Total # of respon dents
1) Avoid using a disposal site designed for the management of hazardous waste	16	26	16	10	6	19	93
2) Maintain low costs/good ability to be able to complete the project	10	34	12	20	1	16	93
3) Local solution handling the problem near the source	16	31	24	5	1	16	93
4) Obtain more economic value than that which is achieved by the environmental effect	12	23	23	17	1		93
5) Achieve the lowest human risk in the Oslo fjord.	33	39	5	0	0	16	93
6) Achieve the lowest risk for the marine environment in the Oslo fjord.	38	36	4	0	0	15	93

The table shows that the first four criteria are being scored very diversely. This could be explained by the different views of the respondents on the project because these criteria are strongly related to the disposal solution that was finally selected. However if we look at the criteria number 5 and 6, which address human risk and ecological risk respectively low risk for humans and the marine environment in Oslo fjord are scored as ‘very important’ or ‘important’ by most of the respondents. This could indicate that

the population that responded share similar values when it comes to the goal of sediment remediation.

4.4 Participation

Aspects of 'participation' formed an important part of the questions in both the interviews and the internet survey. The results are discussed below.

4.4.1 Main findings on participation from the interviews

Most of the people interviewed were either involved in the project from the start (1993-2004), or became active in the project after the decision to establish an aquatic disposal site at Malmøykalven had been made (December 2005). None of the participants actually became actively involved in the process while the hearings in 2004-2005 were going on. The opinion regarding the Oslo harbour project did not change for most of the participants that were interviewed; they either were positive or critical from the start and remained so throughout the duration of the project. It is important to establish whether this difference of opinion is either based on knowledge or values. We can use the theory by Hisschemöller as described previously in paragraph 2.1 were we defined the Oslo harbour sediment remediation project as a moderately structured problem. However, based on the findings from the interviews it was not possible to establish the source of this difference. We will explore this further in the answers from the survey in 4.4.2.

Another important finding of the interviews was that decision-making process followed the legislative procedures that were required by law, which also functioned for some of the people interviewed as a 'quality assurance' of the process and the decision that would be taken. Many of the persons involved from the start of the project were therefore taken by surprise by the societal opposition that arose and also found a forum in the media. This could indicate that formal procedures are not always a representation of what a reaction from stakeholders might be. This is especially apparent regarding the concept of a 'hearing', which was the main strategy of interaction with the stakeholders at Oslo harbour. A 'hearing' is aimed at 'consultation', as described in Table 3. This type of interaction is not aimed at starting a dialogue, which could have additional value in the case that the source of disagreement on the solution could be found in a lack of 'shared knowledge' or 'shared values'.

The time used to make the decision to establish the aquatic disposal site was an important aspect in the process. The persons interviewed that were critical towards the aquatic disposal site – all involved after the decision had been made in 2005 – thought that there had been too little time and too much pressure on the decision including the politicians in Nesodden Municipality, Oslo Municipality and the Ministry of the Environment.

In response to questions regarding the amount of influence that the persons interviewed had, they almost all pointed out that they thought they could influence the choice for a solution to deal with the dredged material. This could indicate that the respondents all had faith in governmental or the legislative system. There were also a number of observations concerning the role and involvement of stakeholders. First of all, some (government) organisations that were involved in the project were perceived to have multiple roles, such as decision maker and quality assurance. This perception was especially present at the stakeholders that were more critical towards the aquatic

disposal site solution. Secondly, the same group of stakeholders also perceived themselves to be excluded from the process. Thirdly, most people that were interviewed were positive towards the idea of involving local stakeholders as early as possible in the decision-making process. Finally, a majority of the respondents thought it would be beneficial to have more resources available for the information at the start of the decision-making process in order to improve the transparency and accuracy of the information provided.

4.4.2 Main findings on participation from the internet survey

To be able to describe the level of participation of the respondents in the project it is first of all important to see how respondents perceive their role in de decision-making process of the Oslo harbour sediment remediation project. To do so the respondents to the internetsurvey were asked to answer which role they had in the project. The roles that they could choose from are described in paragraph 3.2.1. They were asked the following question

"In what way have you participated in the debate about sediment remediation in the Oslo fjord"

The answers to this question are displayed in Table 11

Table 11 Answers to the question in what way have you participated in the debate about sediment remediation in the Oslo fjord?

Role	**# of respondents (total # of respondents = 93)**
Not involved: I have no knowledge or an opinion about the sediment remediation of Oslo fjord.	6
Listener: I have knowledge or an opinion about the sediment remediation of Oslo fjord but I did not participate in the project or in the debate	36
Information supplier: I did have knowledge about the sediment remediation of Oslo fjord and gave information to others when asked or wrote these down in reports	16
Critical observer: I have knowledge or an opinion and I participated in the debate when asked	19
Participant: I have knowledge or an opinion and I participated in the debate actively	16

About 45% of the respondents either view themselves as someone who is either not involved (7%) or as a listener (39%). The respondents that have a more active role are dived as follows over the different roles: information supplier (17%), critical observer (20%) or participant (17%).

The internet survey was used to examine when a person was first involved. This is important in order to establish whether the time of involvement had any influence on the respondents' perception of the solution, the information provided and their perception of risk regarding the remediation of contaminated sediments. Therefore the following question was asked:

"When did you get/were you involved in the project or the debate concerning the sediment remediation of Oslo fjord"

Figure 4.12, which shows the answers to the question. The results clearly display a peak in the years 1993-2003, which might be largely explained by the 10 years, which makes it possible for more people to be involved, of the decision making and implementation process in this specific project. In 2005 we see a relatively high percentage of people involved in the process for the first time (55% relative to the number of participants between 1993-2003). This could be explained by the fact that in April 2005 the Comprehensive Plan for the Remediation of Contaminated Sediments in Oslo harbour was released.

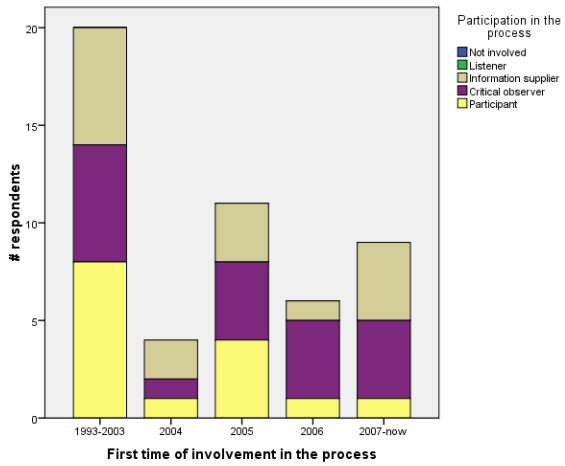


Figure 4.12 First time of involvement in the process and role in the process of the respondents to the internet survey

Each respondent's institutional/organizational background, or lack of it, is also relevant for participation. It is important to determine if they are participating as private persons or as representatives of one of the organizations or institutions that are involved in this project. Table 12 gives an overview of the reason for the respondents' involvement in the process[8] based on the following question:

"In what role have you participated in the debate about sediment remediation in the Oslo fjord?"

The answers to this question are displayed in Table 12

[8] The roles 'listener' and 'not involved' are not mentioned here, as they were not 'actively' involved in the process. Also see paragraph 3.2.3

Table 12 Answers by the respondents to the internet survey to the question: In what role have you participated in the debate about sediment remediation in the Oslo fjord?

Involved category Role	**Private person**	**Journalist**	**NGO**	**Commercial organization**	**Government Organisation**	**Politician**	**Consultant researcher**	**Total**
Information supplier	1				3		13	17
Critical observer	9	1	3	1	2	1	5	22
Participant			1	2	5	6	2	16
Total # of respondents	10	1	4	3	10	7	20	54

Approaching the table from the 'role' perspective, we can see that the largest part of the 'information supplier' role consists of consultants/researchers. From a classical science perspective, this fits the expected role that consultants/researchers are likely to take on. If we look at the 'critical observer', we see that private persons most often see themselves in this role. The 'critical observer' is also the role that is represented in all of the involved categories. Finally, the role of 'participant', which is the most active of the three roles, is mainly represented by the governmental organization and politicians.

In addition to determining the role of the different respondents, it is also important to determine the reason *why* they were involved. For example, was their involvement motivated by their work obligations or was their involvement due to other motives? This is relevant because the percentage of participants involved due to personal interest and/or representing an organization concerned about the project also functions as an indicator for the societal/community concern about a project. The following question was asked:

"Why did you become involved in the project or the debate concerning the sediment remediation of Oslo fjord?"

The answers to this question are displayed in Table 13.

Table 13 Answers of the respondents to the internet survey on the question: Why did you become involved in the project or the debate concerning the sediment remediation of Oslo fjord?

Why did you become involved in the project or the debate concerning the sediment remediation of Oslo fjord?				
Category	Part of my job	Personal interest	Representing an organization concerned about the project	Total
# of respondents	34	16	6	56[9]

[9] The reason that in this table the number of respondents is 56 in stead of the 54 in Table 12 is that the respondents could skip question.

Most of respondents (61%) participated in the project because it was part of their job. However, the number of people that participated in the debate based on a personal interest was 28%, which is considered a significant number based on the number of respondents.

Another important aspect regarding participation is the level of 'control' in selecting a solution. In order to determine this, the following question was asked

"Did you have the feeling that you could influence the choice of the solution for the sediment remediation of Oslo fjord?"

The answers to this question are displayed in Figure 4.13.

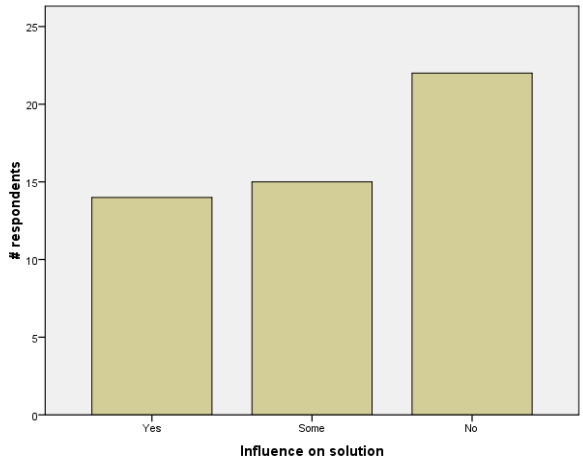


Figure 4.13 Answers of the respondents to the internet survey on the question: Did you have the feeling that you could influence the choice of the solution for the sediment remediation of Oslo fjord?"

Slightly more than half of the respondents (57%) indicate that they believe that they had influence or had some influence on the choice for the disposal solution. The remaining respondents believed they had no influence on the actual choice of a solution; although, they do indicate that they have been involved in some way in the project.

The literature often points out that the stakeholders that are the most involved early in the process often have the most influence. This is due to the often converging nature of a decision making process (Gerrits, 2008). Therefore, we have compared the aspect of influence with the time the respondent was involved. Figure 4.14 mirrors the literature. It shows that more of the respondents involved early in the process indicated that they thought they could influence the project whereas more of the respondents involved later in the project indicated that they had no influence on the selected disposal option.

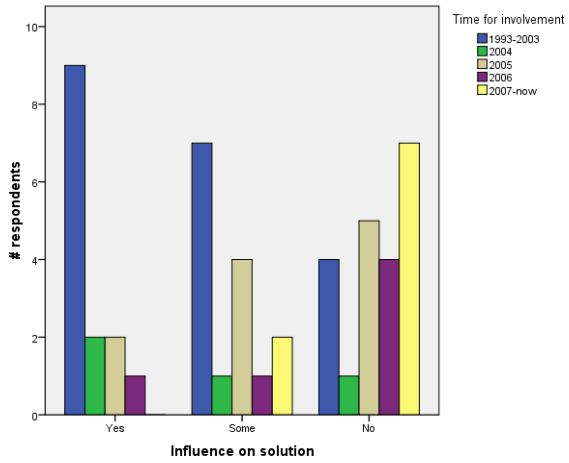


Figure 4.14 The relation between time of involvement of the actors and their answers to the question whether they thought they could influence the decision-making process

Communication with stakeholders is strongly related to early involvement, this is another important aspect of participation. In order to test this relationship, the following statement was presented:

"*Local people, organisations and companies should be informed as early as possible before you take a decision about what to do*".

The response is displayed in Table 14.

Table 14 Answers of the respondents to the internet survey on the statement: Local people organisations and companies should be informed as early as possible before you take a decision about what to do

Local people, organisations and companies should be informed as early as possible before you take a decision about what to do					
Category	Strongly agree	Agree	Neutral	Non-response	Total
# of respondents	50	29	5	9	93

Remarkably none of the respondents disagrees with this statement.

The amount of trust between stakeholders is very important when considering the participation of stakeholders in a decision-making process. If the level of trust is low, it is very difficult to create a process in which people are willing to see each others point of view and/or accept information/knowledge that is brought into the process by other stakeholders. In order to get an indication about the respondents' general level of trust we included this statement taken from the US National Opinion Research Center's General Social Survey (GSS):

"On a general basis can you trust people even if they are unknown to you?"

The answers to this question are displayed in Table 15.

Table 15 Answers of the respondents to the internet survey on the statement: On a general basis can you trust people even if they are unknown to you

On a general basis can you trust people even if they are unknown to you?							
Category	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Non-response	Total
# of respondents	16	33	31	3	2	8	93

The level of trust that the respondents have is also important when we consider their willingness to let other people/organizations decide for them. We have examined their perception of trust by asking the respondents to respond to the following statement:

"Decision on what to do should be made by governmental organizations and experts who have the best competence without involvement of stakeholders"

The answers are displayed in Table 16.

Table 16 Answers of the respondents to the internet survey on the statement: Decision on what to do should be made by governmental organizations and experts who have the best competence without involvement of stakeholder

Decision on what to do should be made by governmental organizations and experts who have the best competence without involvement of stakeholder							
Category	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Non-response	Total
# of respondents	11	17	14	28	10	13	93

Although the respondents generally have a high level of trust in other people, they also think it is important that governmental organizations and experts should not be the only institutions/people that make the decisions.

The following statement was posed to the respondents to distinguish whether the previous finding was based on the conviction that governmental organizations and experts should be solely responsible for making decisions or that other stakeholders should be involved in the decision-making process too.

"*Stakeholders have to be involved in the decision making is necessary even if this means that the process will take more time.*"

The answers are displayed in Table 17.

Table 17 Answers of the respondents to the internet survey on the statement: Stakeholders have to be involved in the decision making is necessary even if this means that the process will take more time

Stakeholders have to be involved in the decision making is necessary even if this means that the process will take more time							
Category	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Non-response	Total
# of	24	41	10	6	2	10	93

respondents							

Of the 93 respondents that answered this question, 78% totally agree or agree with this statement. A conclusion from these answers can be that the respondents view consensus as an important value in the decision-making processes.

Looking at the challenge of the amount of time (and resources) that can be put into a decision-making process, we included the following statement:

"*Time pressure can never be a reason for politicians to take decision in such cases*".

The answers are displayed in Table 18.

Table 18 Answers of the respondents to the internet survey on the statement: Time pressure can never be a reason for politicians to take decision in such cases

Time pressure can never be a reason for politicians to take decision in such cases							
Category	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Non-response	Total
# of respondents	25	28	15	14	1	10	93

This statement showed that 54% of the respondents totally agree or agree with this statement. This could indicate that time should not be an issue in a decision that can have long-term effects.

4.5 Communication of Information and Knowledge

Information and knowledge from science, media, documents, personal experience and many other sources are at the heart of every decision-making process. The following chapter explores how communication of information and knowledge was perceived by the respondents to the interview and the internet survey.

4.5.1 Main findings from the interviews

Most of the people interviewed pointed out that information was either available for them when they needed it, or that it was easily available for them when they approached the organisation that was the owner of the information they required. However, the stakeholders that were critical about the aquatic disposal site pointed out that this was not always the case. This mainly concerned the availability of 'raw' monitoring data collected at the aquatic disposal site and echo sounding images that were made of the area by Secora. After the project started the available information was specifically aimed at different target groups: from the general public to scientists. This approach was not always specifically communicated. For example the scientists were accommodated by the regular way of reporting in this type of projects, such as the Environmental Impact Assessment. However for the lay public specific attention was paid to communicating the goal, solutions and process in lay terms. The communication techniques were mainly internet-based. However, the communication between the stakeholders was occasionally carried out in the media.

4.5.2 Main findings from the internet survey

The internet survey explored the distribution of information and knowledge during a process because it might be an indication for the level of transparency of the process

and for the (potential) emergence of a shared knowledge base. In order to gain some preliminary insight in the initial source of information, people were asked the following question:

"Where did you first hear about the project or the debate concerning the sediment remediation of Oslo fjord?"

The answers are displayed in Table 19.

Table 19 Answers of the respondents to the internet survey on the question: Where did you first hear about the project or the debate concerning the sediment remediation of Oslo fjord?

Category: source of information	**# of respondents**
In the media	12
Frorm a friend/neighbour	2
From my colleagues at work	4
Within the context of my job	31
Do not remember	1
Total # of respondents	50

We have examined whether people's opinion about the project might have changed based on the information and knowledge they received during the time they were involved in the project. Therefore we asked the respondents the following questions:

"What was you opinion about the project concerning the sediment remediation of Oslo fjord when you first heard about it?"

and

"What is you opinion about the project concerning the sediment remediation of Oslo fjord now?"

Figure 4.15 and Figure 4.16 illustrate the results which are also divided into the five different participation categories to get some insight in the role of the respondents.

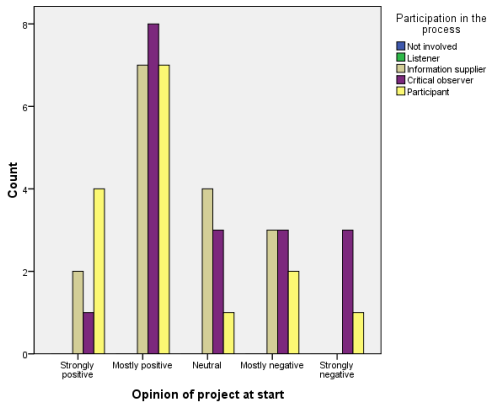


Figure 4.15 Answers of the respondents to the internet survey on the question: what was you opinion about the project concerning the sediment remediation of Oslo fjord when you first heard about it?

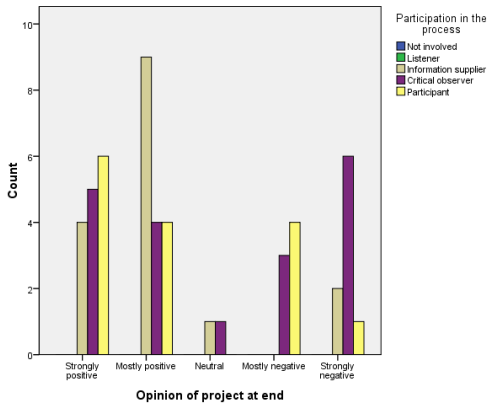


Figure 4.16 Answers of the respondents to the internet survey on the question: what is you opinion about the project concerning the sediment remediation of Oslo fjord now

The figures show that for the majority of the respondents (especially those involved in the start of the project) maintain a positive opinion about the project throughout its progression. Especially Figure 4.16 shows a clear polarisation between opinions.

The respondents were then asked:

"What was is the basis for coming to the opinion about the project? Multiple answers possible"

The main reason for asking this is that we wanted to see what the sources for their opinion were. Table 20 below clearly indicates that scientific information and personal experience are the main sources of information for the formation of opinions about the project.

Table 20 Answers of the respondents to the internet survey on the question: What was is the basis for coming to the opinion about the project?

Source of information	**# of respondents**
Scientific information	42
Media	9
Personal experience	37
Discussions with friends/neighbours	5
Total # of respondents	93

This could indicate that people tend to use a combination of abstract (scientific) knowledge and personal experience/observations in constructing their opinion about the project. To validate this assumption, we asked the respondents the following question:

What are/were your main sources of information about the Oslo fjord Sediment Remediation project?

This question was answered by 83 respondents and since they could provide multiple answers the answers below are displayed in percentages.

Table 21 Answers of the respondents to the internet survey on the question: what are/were your main sources of information about the Oslo fjord Sediment Remediation project?

Main source of information	**% of answers**
Ren Oslo fjord web site	10%
NGO web sites	8%
Scientific reports	16%
Meetings	12%
Direct communication with people involved in the Ren Oslo fjord project	14%
Personal experience	10%
Colleagues	12%
Friends and neighbours	2%
Newspapers (and their websites)	12%
Television	3%
Other	1%
Total %	100 N = 83

The overview shows that scientific reports are most often referred to as the main source of information on the project. The second most important source of information and knowledge is direct contact with people involved in the Oslo fjord Sediment Remediation Project. However, if we add up the percentages for newspapers, websites and television we see that the 'media' tend to be largest overall source of information (in total 33%). Clearly, the use of a wide variety of different media channels is an effective way of communicating information and knowledge to (potential) participants.

Because the actual use of a source of information could also be an indicator for the amount of trust that people have in the reliability of the source, we posed the question:

"What source of information was the most reliable to you?"

Figure 4.17 gives an overview of the answers. The question was answered by 68 of the respondents.

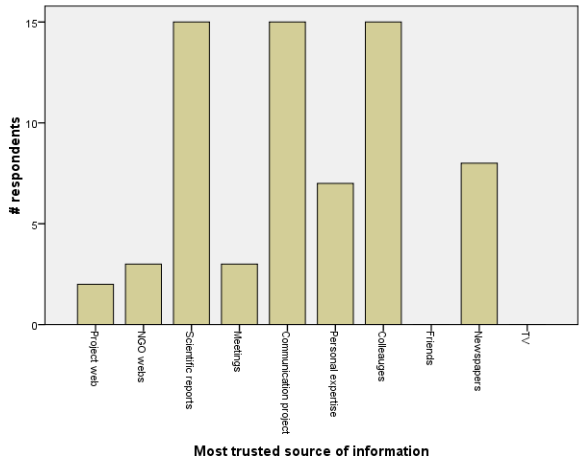


Figure 4.17 Answers of the respondents to the internet survey on the question: what source of information was the most reliable to you?

Figure 4.17 indicates that the three sources of information that were perceived as most reliable are scientific reports, communication with the Oslo fjord Sediment Remediation Project organization and colleagues. The least trusted source is the Oslo fjord Sediment Remediation project website, next to NGO websites and meetings.

Personal communication often refers to interpersonal contact that participants might have experienced with the people working in the project organisation. In order to assess this aspect for the Oslo fjord Sediment Remediation Project between, 2005 and 2009, we included the question:

"*During the communication with the people involved in the Oslo fjord sediment remediation project, did you have the feeling that your interests and concerns were taken seriously?*"

Table 22 gives an overview of the answers.

Table 22 Answers of the respondents to the internet survey on the question: during the communication with the people involved in the Oslo fjord sediment remediation project, did you have the feeling that your interests and concerns were taken seriously?

During the communication with the people involved in the Oslo fjord sediment remediation project, did you have the feeling that your interests and concerns were taken seriously?					
Category	Yes	No	I did not communicate directly with the project	Non-response	Total
# of respondents	35	11	31	16	93

The large majority of respondents (76%) who had communicated directly (with the project organisation of the Oslo fjord sediment remediation project - between 2005 and 2009) had the feeling that they were taken seriously. This means that still 24% of the respondents did not feel that they were taken seriously.

Another factor regarding the dissemination of information and knowledge is the availability of information. This availability is composed of two aspects: 1) was

information available in the first place and 2) the moment when this information is available. In Table 23 you can find the respondents answers concerning these two aspects.

Table 23 Answers of the respondents to the internet survey on the question: Was the information on the Oslo fjord Sediment Remediation project you wanted easily available to you?

Was the information on the Oslo fjord Sediment Remediation project you wanted easily available to you?					
Category	Yes	No	Do not know	Non-response	Total
# of respondents	40	24	14	15	93

This shows that the information the respondents requested, was not always available for them. Yet half of the respondents (n = 78) thought that information was easy available.

Table 24 Answers of the respondents to the internet survey on the question: Was the information on the Oslo fjord Sediment Remediation project you wanted available to you when you needed it?

Was the information on the Oslo fjord Sediment Remediation project you wanted available to you when you needed it?					
Category	Yes	No	Do not know	Non-response	Total
# of respondents	45	29	0	19	93

Finally we explored the preferences of the respondents with regard to the communication of information and knowledge. The preferences were examined through two additional aspects. The first aspect was a question regarding when resources for communication of information and knowledge should be available. Often projects start investing in information and knowledge distribution once a plan has been made that is considered ‘communicable’. The advantage of this is that it gives possible stakeholders a clear image of what they might expect of a solution or plan. A disadvantage is that stakeholders often are confronted with (almost) definite plans, which may lead to the perception that the stakeholders are confronted with a ‘done deal’.

Allocating resources to knowledge and information distribution at the start of the project sends out a signal about the importance of communication with stakeholders during the ‘opinion shaping’ phase of a project. As illustrated in Table 25, the respondents show strong agreement with the statement ‘*Invest resources for communication in the start of such a project*’

Table 25 Answers of the respondents to the internet survey on the statement: Invest resources for communication in the start of such a project

Invest resources for communication in the start of such a project					
Category	Strongly agree	Agree	Neutral	Non-response	Total
# of respondents	57	25	3	8	93

This may relate to the idea that early communication about an intended project or a new project is important for stakeholder involvement.

The second aspect with regard to preferences is a question about the moment when (new) information and knowledge should be made available to the general public. We believe that this provides a relevant indication for the preferred level of transparency of decision making and implementation in a project. We have included the following statement about the degree of availability of information and knowledge:

"*All information from research in such a project should be made available as soon as possible to the general public, even if this is raw data"*.

The answers this statement are displayed in Table 26.

Table 26 Answers of the respondents to the internet survey on the statement: Time pressure can never be a reason for politicians to take decision in such cases

All information from research in such a project should be made available as soon as possible to the general public, even if this is raw data							
Category	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Non-response	Total
# of respondents	22	21	12	23	7	8	93

On this aspect of preferred transparency, people tend to agree less. Half of the respondents agree that all information about the project should be made available to the general public as soon as possible. A large minority (35%) disagrees with this statement. This could point out that respondents have nuanced opinions about the availability of information and knowledge, and thus about the preferred level of transparency, by means of communication.

4.6 Risk Perception

Risk perception is an important factor when dealing with contaminated sediments. In the following text we want to show how this was viewed by the respondents to the interview and the internet survey.

4.6.1 Main findings from the interviews

The stakeholders were asked to describe the meaning of the word Risk to gain some insight in their attitude towards the concept of risk. The two main responses were that risk was something undesirable or that risk was defined as a mathematical equation were risk is the product of change and consequence.. The persons interviewed were asked to rank different activities/situations from low to high risk. On a relative scale

people that have a positive attitude towards the aquatic disposal site rate the deep water disposal site as a very low risk while rating 'Smoking 20 cigarettes a day' or 'Having a fire in your home' as the most risky activities/occurrences. People not in favour of the aquatic disposal site see the risk of the aquatic disposal site as high, but also the risk of smoking is considered high. Interestingly, people did not change their perceptions of sediments during the project or the public debate, they only got more certain on the perception they had at the start of the project. Finally the main criteria for the selection of the best disposal solution were:

- effect on the environment: improving the environment by reducing the spreading of contaminants from the sediments towards the ecosystem;
- risk level: the level of risk concerning the leakage of pollutants from a disposal into the ecosystem;
- costs;
- vicinity of the disposal site to the dredging site;
- use of available scare space to use for the dumping of toxic waste (in relation to the NOAH Langøya).

4.6.2 Main findings from the internet survey

The risk portion of the survey began with a question for categorizing the respondents in their approach and perception of 'risk' in general: *"Which of the following descriptions of risk do you agree with the most?"*

Table 27 Answers of the respondents to the internet survey on the statement: Which of the following descriptions of risk do you agree with the most?

Which of the following descriptions of risk do you agree with the most?	
Category	*# of respondents*
Risk is something that I want to avoid	8
Risk is something that I can accept as long as it is regulated	63
Risk is difficult to define because it doesn't mean anything to me	0
Risk is a natural and could also have an upside as long as I decide what to do	12
Non-response	10
Total	93

The answers show us that most of the respondents (76%) can accept risks as long as it is regulated. In order to establish the perception of risk by the different respondents to the 'calculated' risk, they were asked to: *score the following items based on the risk of having a long-term negative effect on people's health or causing injury?*
The number '1' indicates a very low perceived risk and the number '10' a very high perceived risk.

Table 28 Answers of the respondents to the internet survey on the question: *score the following items based on the risk of having a long-term negative effect on people's health or causing injury?*

Score the following items based on the risk of having a long-term negative effect on people's health or causing injury.												
(1= little effect – 10= large effect)	1	2	3	4	5	6	7	8	9	10	Non-response	Total
Driving an automobile	1	7	12	12	9	5	12	13	2	7	13	80
The deep water disposal site at Malmøykalven	20	22	8	4	4	3	4	7	5	2	14	79
Smoking 20 cigarettes a day	0	1	1	1	2	5	11	20	14	24	14	79
Food additions (E-substances)	4	15	16	10	14	11	6	1	1	0	15	78
Getting a vaccination	12	30	18	8	6	3	1	1	0	0	14	79
Getting an X-ray taken of the chest in a good hospital	27	28	14	6	3	0	0	0	0	1	14	79
Living 20 kilometres from a nuclear power plant	2	14	8	12	9	5	6	8	3	12	14	79
Having a fire in your home	2	8	18	3	7	4	4	2	7	24	14	79

The above table shows us that the in comparison the deep water disposal site at Malmøykalven is considered to be relatively a low perceived risk, the same goes for the risk of getting an X-ray. The statements except for the one about the Malmøykalven site is derived from an investigation published in Slovic (2002);

Table 29 Technical fatalities for a number of risk items (source: Slovic, 2002)

Risk items ordered by perceived risk	**Technical fatalities**
Nuclear power	100
Motor Vehicles	50.000
Smoking	150.000
Fire fighting	195
X-rays	2300
Food preservatives	- (- Not estimated)
Vaccination	10

In paragraph 2.5 we listed a number of factors that cause people to increase the *perception of risk* that they adhere to (cf. Plattner, 2005):

- Voluntariness: this is the factor if a person can choose to take a certain risk;
- Knowledge mainly refers to: familiarity, knowledge about risk and manageability;
- Endangerment: has to do with controllability, number of people affected, fatality of consequences, distribution of victims (over space and time), the scope of the area affected, the immediacy of effects and directness of impact;
- Reducibility: reducibility, predictability, avoid ability.

Because voluntariness does not apply to the Oslo fjord Sediment Remediation project, we can only examine the last three factors: knowledge, endangerment and reducibility.

With regard to knowledge, we have asked whether the respondents had changed their opinion about the risk of contaminated sediment with the following question "*Did you change your opinion about the risk of contaminated sediments after you first read or heard about the sediment remediation of Oslo fjord and today?*"

Table 30 Answers of the respondents to the internet survey on the question: *Did you change your opinion about the risk of contaminated sediments after you first read or heard about the sediment remediation of Oslo fjord and today?*

Did you change your opinion about the risk of contaminated sediments after you first read or heard about the sediment remediation of Oslo fjord and today?				
Yes, more risks	Yes, less risks	No, no change	Non-response	Total
23	19	39	12	93

We would expect that a number of people would change their opinion based on the dissemination of distributed information and knowledge about the project. However the number of people that did not change their mind is almost half.

A large minority of 42% of the people did not change their opinion concerning the risks of (contaminated) sediments, yet a slightly larger group of 45% did change their opinion. Because the focus was on knowledge about sediments it was important to find out what the source/reason was as to why they changed their mind.

Table 31 Answers of the respondents to the internet survey on the question: *in case you changed your mind what was the reason?*

Category	**Number of respondents**
I did not change my mind	31[10]
I received scientific information	27
I received information from newspapers and television	7
Personal experience	8
Discussions with friends and neighbours	0
Other	11
Non-response	9
Total	93

In the category 'other' the following reasons were pointed out by respondents, next to general remarks:
- concerns about the quality control/adherence to the conditions set in the permit for disposal;
- both scientific information and personal experience;
- participation in other projects that concern the remediation of contaminated sediments;
- collected information on my own.

The second factor that we have examined (based on Plattner, 2005) is 'endangerment'. To understand how the respondents perceived this aspect we focused on 'control' and 'the scope of the area affected'.

[10] Because respondents could skip this question, the number differs from the previous table, the same goes for the number of non-response

Table 32 Answers of the respondents to the internet survey on the question To control that the sediments stay in the Malmøykalven disposal site is according to your opinion is: easy, possible, impossible?

To control that the sediments stay in the Malmøykalven disposal site is according to your opinion :				
Easy	Possible	Impossible	Non-response	Total
38	40	2	13	93

The answers in Table 32 clearly shows us that concerning control two of the respondents believe that this is impossible. The other respondents perceive it to be easy or possible.

Table 33 Answers of the respondents to the internet survey on the question To control that the sediments would have stayed in the disposal site, if NOAH Langøya had been chosen would have been: easy, possible, impossible?

To control that the sediments would have stayed in the disposal site, if NOAH Langøya had been chosen would have been				
Easy	Possible	Impossible	Non-response	Total
73	7	0	13	93

For the NOAH Langøya solution this is considered to be easy by 73 of the respondents. Based on these two questions it is possible that the aspect of 'control' is a factor of real influence when it comes to the perception of risk.

The next indication for endangerment is the perceived effect that the project will have on the entire Oslo-fjord. This was assessed by asking the question:

"*What effect do you think the disposal of sediments at Malmøykalven will have on the fjord in the future*".

The responses are presented in the table below:

Table 34 Answers of the respondents to the internet survey on the question: What effect do you think the disposal of sediments at Malmøykalven will have on the fjord in the future?

What effect do you think the disposal of sediments at Malmøykalven will have on the fjord in the future?						
Large positive effect (the whole inner fjord)	Small positive effect (local area)	No effect	small negative effect (local area)	Large negative effect (the whole inner fjord)	Non-response	**Total**
17	19	14	21	11	11	**93**

The answers indicate that the perceived effects on the area that will be influenced are evenly distributed for the various responses. The group of respondents that anticipated positive effect (43%) is almost in balance with the group that expect negative impacts (39%). Apparently, the expectations of the respondents tend to differ. This could indicate that the 'the scope of the area' might be a factor that influences the perception

of risk in the case of Oslo fjord. Perhaps respondents have a different perception of what the scope of the area is and what the effect of the project on this area might be.

The fourth factor that Plattner (2005) refers to is 'reducibility'. The item of reducibility also includes avoidability, that is the extent to which respondents avoid certain behaviour.. To examine whether this factor was an influence on the risk perception of the respondents, we asked two questions, one concerning the consumption of fish/shellfish from Oslo fjord and another about swimming in Oslo fjord.

Table 35 Answers of the respondents to the internet survey on the question: How will the remediation of the Oslo fjord and the disposal of sediments at the Malmøykalven affect your consumption of fish/shellfish from the fjord?

How will the remediation of the Oslo fjord and the disposal of sediments at the Malmøykalven affect your consumption of fish/shellfish from the fjord?						
I do not eat fish/shellfish from Oslo fjord	I will eat more fish/shellfish than before	I will eat fish/shellfish as before	I will not eat fish/shellfish from the fjord anymore	I do not eat fish/shellfish at all	Non-response	**Total**
27	3	43	9	1	10	**93**

Table 36 Answers of the respondents to the internet survey on the question: How will the remediation of the Oslo fjord and the disposal of sediments at the Malmøykalven affect the use of the fjord (bathing / swimming)?

How will the remediation of the Oslo fjord and the disposal of sediments at the Malmøykalven affect the use of the fjord (bathing / swimming)?					
I never bath / swim in the fjord	I will bath /swim more than before	I will bath /swim as before	I will not bath / swim in the fjord anymore	Non-response	**Total**
4	5	70	2	12	**93**

Both questions show that there is again variability in the answers. Almost 80% of the respondents point out that they would swim in Oslo fjord. Only 2 of the 77 respondents indicate that they would never swim in Oslo fjord again. Concerning the consumption of fish/shellfish from Oslo fjord the effect of avoid-ability is a bit more clear. Nine of 55 respondents (16%) point out that they will not eat fish/shellfish from the Oslo fjord anymore. Based on this outcome it is however not possible to state with certainty that the reducibility is a factor of significance. Most of the respondents keep their faith in Oslo fjord as swimming water and as harvest grounds for shellfish.

4.7 Conclusions of the results

Based on the findings of the interviews and the internet survey the following conclusions can be drawn:

Participation

- Early involvement of a diverse group of stakeholders is important in order to empower their ability to influence the choice for a solution. : The results of the internet survey indicate that the perception of the respondents that were involved earlier were more convinced that they could have influence on the choice for a solution. Furthermore in the internet the statement “inform the local stakeholders as soon as possible before a decision is taken” is not disagreed with by any of the respondents;
- Taking time to achieve insight in the agreement/disagreement on values and knowledge is important in order to establish the level and strategy of stakeholder participation. In paragraph 2.1 we described the Oslo harbour project as a moderately structured problems based on the theory by Hisschemöller (1993). If we assume that this is the case taking time to establish what the underlying values and knowledge of the stakeholders would be justifiable. The reason for this is that this type of problems can be solved in principle by negotiation. For example in attempting to solve an unstructured problem taking more time would not increase the chance of reaching agreement as values differ too much.

Communication of Information and Knowledge

The overall conclusion about the communication of information and knowledge in the Oslo harbour project drawn from the interviews and internet survey is predominantly positive. Respondents tend to favour the way in which information and knowledge was communicated to them. However they point out some relevant flaws in the communication efforts. It was perceived that:

- The efforts were not always accurately targeted to the different groups of participants;
- The preferred availability of (new) information and knowledge for the general public tends to be ‘as soon as possible’, although a large group thinks that is not to preferable. Perhaps their perception connects to the conclusion that communication efforts were not always targeted (enough);
- Timely and targeted communication of information and knowledge in the developing project is perceived as important for the respondents;
- Estimating a separate budget for communication of information and knowledge and allocating it in time is perceived to be important for keeping various groups of participants up to date with (the progress of) the project.

Risk perception

- Communication of information and knowledge can influence risk perception. Both in the interviews and in the internet survey a part of the respondents pointed out that they changed their opinion on contaminated sediments during the project. Most often this was that they perceived contaminated sediments as having more risk than in the start of the project. In the majority of these cases scientific information an personal experience served as a source for this change in risk perception;
- The factor described by Plattner (2005) as endangerment does have an influence on risk perception in the Oslo fjord case. The site at Malmøykalven is considered to be less easy to control than the Langøya site according to the internet survey respondents. However a majority of the respondents considers it to be possible to control the Malmøykalven site. This could mean that the factor control is of importance when it comes to the selection of sediment management options.

5 Confronting theoretical framework and research findings

In this final chapter we will answer the research questions that were posed earlier in paragraph 3.1. This will be done by confronting the theoretical framework and the research findings.

The main research question is:

What can be learned from the Oslo harbour contaminated sediment remediation project concerning the design of the public decision-making and implementation processes of projects dealing with contaminated sediment remediation?

This main research question will be answered by an outlook at the end of this chapter.

Based on this research question we distinguished three sub-questions. These questions are answered below.

Question 1: In what way was the involvement of stakeholders organised in the Oslo harbour contaminated sediment remediation project, and how was it perceived by the different stakeholders?

Based on the empirical data the Oslo harbour project set out as a formal process in which governmental organisations with decision making power and expert organisations were involved. Next to this formal process an informal process was organized that was aimed at stakeholder involvement. The stakeholders could give their input by means of a hearing. If we reflect on this informal process, we can describe this process as 'stakeholder consultation' based on the degrees of influence according to the scale by Gerrits and Edelenbos (2004), as shown in Table 3. This means that stakeholders act as interlocutors, and decision makers determine the policy and open the process to input by stakeholders, but are not formally obliged to adopt their recommendations. With this form of involvement stakeholders only have limited influence on the outcome of the decision making process. In the interviews the formal decision-making process was considered of sufficient quality, however some of the respondents pointed out that the involvement of stakeholders could have received more attention at the start of the process, either through earlier involvement or more resources for communication. The strategy of involving stakeholders at an early stage of a decision-making process and taking time to communicate with them were considered to be desirable actions, according to the respondents of the internet survey (see paragraph 4.4.2).

When considering the actual strategy that would be suitable for a project such as the Oslo harbour project we can consider the results from the internet survey as described in chapter 4. In this chapter we concluded that the answers on the survey could indicate that there is consensus on the two prevailing values. The first value is achieving the lowest human risk in the Oslo fjord. The second value is achieving the lowest risk for the marine environment in the Oslo fjord. If we combine this with the constant disagreement on the available knowledge and information, with as an important event in this discussion the extra-ordinary hearing held in 2007, we can characterise the Oslo fjord sediment remediation project as a moderately

structured project. According to Hisschemöller (1993) the strategy to deal with this type of policy problems is 'negotiation'. These policy problems are mainly focussed on a discussion about the means or the solution to reach a certain goal. Very often the division of costs and benefits is at heart of the discussion. The character of a 'negotiation' might sound as an 'open' stakeholder involvement process with a lot of influence for the stakeholders. However this is often not the case in large infrastructural/spatial planning projects, as we can also describe the Oslo fjord project. The reason for this is that in these cases the goal of a project has already been decided on, and the only opportunity for negotiation is about resources, instruments or solutions to reach this goal (Drogendijk & Duijn, 1999).

Slob et al. (2008) describe several pitfalls to processes of stakeholder involvement that aim for more comprehensive approaches than 'mere consultation'. The most important pitfalls are:

- *Asymmetry* in stakeholder involvement exists when some parties have an advantage over other parties. With asymmetry, there is a risk that the stakeholder who does not share a certain advantage may be overruled. At the same time, all parties usually have some kind of advantage but not in the same area. Therefore, the challenge is to design the process in such a way that the different advantages are mixed and a mutual advantage will rise. This is something different than the rash conclusion that all actors should be equal in the process, as the process wouldn't benefit from it[11]. The existing asymmetries are an important factor for the design of the process (as they could be an important driving force), and therefore should be known when designing the process. Asymmetries in stakeholder involvement does not only include existing advantages, but also lack of representation of stakeholders, knowledge gap as not all stakeholders have the same level of knowledge, different interests and the lack of communication (Gerrits & Edelenbos, 2004). Lack of representation means that stakeholders are not representing the target group. In some cases this leads to 'extreme views' that are not representative for the opinion of the target group. The full range of perspectives and interests are not taken into account. Another pitfall that comes under the heading of 'asymmetry' are the different interests and needs of participants. Stakeholders all have different agendas and a pitfall is ignoring some of them or assuming that everyone is aiming at the same goal. This does not only apply to individuals but also to countries. Western Europe might be concerned about the environmental impact of polluted sediments, developing countries are more concerned about earning money;
- *Clashing expectations* exist often as participants have different expectations and consequently expect different outcomes. "For example, a governing body of a river can invite people living near a dredged material dumpsite to come up with new ideas about how to address the dumping of contaminated sediments. They are consulted, asked to give a recommendation. However, should this not be properly communicated, the invitees might expect that they are expected to take part in the decision-making. The result will be that their expectations rise too high, thus cannot be met, resulting in distrust, downright pessimism and obstruction of the process" (Gerrits and Edelenbos 2004);
- *Stakeholder involvement as "windowdressing":* often exists in the formal decision making process. Unfortunately, a sharp separation is made between the stakeholder process and the actual decision-making. The process of stakeholder

[11] Some research on negotiation even points out that asymmetry is vital for the progress of the process. Perfect symmetry would result in a deadlock (Zartman & Rubin, 2003).

involvement is then regarded as a way to pacify the opposition, where the actual decision mainly serves the interests of the formal decision maker. It is therefore important for the quality of a stakeholder involvement process that decision makers should commit themselves to the process, whatever the outcomes.

Question 2: How has the communication of data, information and opinions been perceived by the stakeholders of the Oslo harbour contaminated sediment remediation project?
Based on the interviews there are a number of aspects in the communication of data, information and opinions that were identified by the different stakeholders. When it comes to the accessibility of information this has, in general, been perceived positively by the majority of the respondents. The 'Ren Oslofjord' website was for most of the respondents an important source of information. Furthermore, the partners in the project were also available for asking questions, either by phone or by e-mail. For the respondents that filed out the survey, the media was an important source of information. The information of the stakeholders early in the decision-making process was ranked as important in the internet survey. This points out that timely and targeted communication of information and knowledge in the developing project is perceived as important for the respondents.

Some of the local interest groups also pointed out that in their opinion the level of transparency of the information provided was not always optimal: for example the availability of the 'raw' monitoring data and the 'echo sounding pictures' that were taken by Secora. If a lack of transparency is felt by the majority of the stakeholders this could indicate the existence of a so-called 'knowledge gap' or information asymmetry. This knowledge gap follows from the observation that not all stakeholders are equally equipped to deal with information and data and therefore possess different types and sources of knowledge. Similar to other complex, controversial policy problems, bridging the knowledge gap is of particular concern for the issue of sediment management. Sediment management is a highly specific topic, which requires sophisticated knowledge to understand. Even among experts there is still considerable debate concerning the understanding of, say, morphology. At the same time, experts may lack knowledge as well. This is not a disqualification; it just follows from the fact that no participant is equal. Too often however the knowledge gap is regarded as the lack of knowledge at laymen. This perception results in an anticipated need for a flow of information from exprts and scientists to the other participants, as well as the desired development of a shared knowledge base. But at the same time, laymen have other knowledge (i.e. practical insights or information about the local situation) at their disposal. This is as valuable as scientific knowledge and should not be ignored (Slob et al., 2008).

The challenge is to overcome the knowledge gap in a way to create a shared knowledge base. Next to bridging the knowledge gap, the process of creating a shared knowledge base can increase the level of trust that stakeholders have in the information and knowledge available. As described earlier in paragraph 2.4 one of the strategies to do so is Joint fact-finding, which is a strategy for resolving factual disputes. While joint fact-finding is not always a viable or appropriate option, a strong case can be made for it being the preferred method for settling a factual dispute. Often, in carrying out a joint fact-finding endeavour, the benefits go beyond reaching consensus on the facts. (Schultz, 2003 and Susskind, 1999). An important factor to keep in mind is that apply joint fact-finding it is important to

have an experienced and independent process facilitator that is accepted by the different stakeholders at the table (Susskind, 1999).

Another strategy that could be a viable option, especially when the effects of a project or solution are not yet clear is designing and updating a collaboratively managed monitoring system. The process of constructing a joint monitoring system could be accomplished collaboratively and none of the stakeholders would have to feel left out, which again could increase the level of trust in the data/results coming out of the monitoring system. As an example we refer to the website of the San Francisco Estuary institute were a regional monitoring plan for the whole estuary has been collaboratively constructed: see http://www.sfei.org/rmp/
Another strategy that could be a viable option, especially when the effects of a project or solution are not yet clear is designing, updating and assessing a collaborative monitoring system. The process of constructing a monitoring system could be accomplished collaboratively and none of the stakeholders would have to feel left out, which again could increase the level of trust in the data/results coming out of the monitoring system. As an example we would like to refer to the site of the San Francisco Estuary institute were a regional monitoring plan for the whole estuary has been collaboratively constructed: see http://www.sfei.org/rmp/

Question 3: How do stakeholders approach risks and what is their perception of the risk of sediments in the case of the Oslo harbour contaminated sediment remediation project?
The results from the internet survey and the interviews show that most of the people in the survey see risk as 'something that I can accept as long as it is regulated'. The conclusion based on this result could be that risk perception is not actually an issue, because risks are perceived as something which can be explained rationally. However based on the cultural theory, and also on the remainder of the results from the survey, there is a strong indication that there other perceptions of risk do exist, which may strongly influence the course of events in the decision-making process. When dealing with risk in a sediment remediation project some of the following aspects should be kept in mind according to Ellen et al. (2008):

- In sediment management issues, it is essential to respect the risk perception of all stakeholders, even when this does not comply with the scientifically estimated risk;
- Different stakeholders have different perspectives, meaning that they also have different views on risks. The different perspectives also have different vocabularies and blind spots, which should always be addressed in communication with these groups. Plurality in communication, which means communicating using the language of the different perspectives, is therefore very important;
- A diversity of communication tools that use different approaches, images and media that respect the language and blind spots of these different perspectives will help to reach the different stakeholders and to integrate them into the decision-making process, increasing support for decisions taken.

Outlook
In the beginning of this chapter we referred to the main research question:

What can be learned from the Oslo harbour contaminated sediment remediation project concerning the design of public decision-making and implementation of projects dealing with contaminated sediment remediation?

The answers to the three sub-questions provide an answer to this main research question. However we would like to frame the three answers through the concept of adaptive management (Lee, 1993) as a future approach to projects such as the Oslo harbour sediment remediation project. The reason for this approach is that projects such as the Oslo harbour sediment remediation project can be considered complex, meaning that are of a non-linear character in which interaction plays a crucial role and which will eventually adapt to a certain structure (Hommes, 2008, Gerrits, 2008). This complexity is constituted by two interdependent systems: the bio-physical and the social system. In the case of the Oslo harbour, the bio-physical system – both biotic and a-biotic – is composed of the fjord area. The social system includes the people and institutions functioning around Oslo fjord.
Adaptive management can be described as “an inductive approach, relying on comparative studies that blend ecological theories with observation and with the design of planned interventions in nature and with the understanding of human response processes" (Gunderson, Holling & Light, 1995: 491).

Lee (1993) uses the metaphor of compass and gyroscope to emphasize the process of scientific analysis and civic participation in adaptive management. Compass and gyroscope integrate science and democracy, in which science, "linked to human purpose is a compass, a way to gauge directions when sailing beyond the maps;" and democracy, "a way to maintain our bearing through turbulent seas," is the gyroscope (Lee 1993:6). The compass, grounded in the scientific method, warns when the direction is off course, while the bounded conflict of the democratic process lends stability when humans encounter turbulence in their relations with nature.

The reason why adaptive management could be a new guiding principle to sediment remediation is because it:
- acknowledges the complexity of both bio-physical and social systems;
- emphasizes the importance stakeholder involvement;
- builds upon monitoring, evaluating and learning as guiding principles for the management of complex projects in comprehensive bio-physical and social systems.

Adaptive management could help to frame sediment remediation projects in a wider assignment, such as a fjord management plan. This is analogous to the US estuary management plans for example:
- The Casco Bay: were the Casco Bay Estuary Partnership consisting of a variety of stakeholders is managing the estuary. For more information see: http://www.cascobay.usm.maine.edu/partners.html;
- The Chesapeake Bay: were the Chesapeake Bay program is in place also consists of a large variety of stakeholders which are responsible for the restoration of the Chesapeake Bay. For more information see: http://www.chesapeakebay.net/.

These types of plans serve as strategies along which the development of the entire areas are guided and informed. Applying such a strategy and pulling complex projects such as the Oslo harbour sediment remediation project away from fault finding to good housekeeping and stewardship can provide an adaptive approach to future pressures on both the bio-physical system and on society. By deliberately broadening the spatial and societal scope of a sediment remediation project, governing agencies may open up the decision making process to cooperate with them constructively on the future development of the designated area.

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7 Signature

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1 Timeline of the Oslo fjord sediment remediation project

The first part of this appendix covering the period prior to 1992 and up to 2001/2002 is based on the time line described by HAV (HAV, 2001 b). Other sources are used to present the activity in the succeeding years and up to 2008.

Prior to 1992:
The first recognition of contaminated sediments in the Oslo harbour was made during PhD-work in the period 1966-67.
This detection of contaminated sediments became a greater issue in 1991 when questions were raised by *Havneoppsynet*[12] (the Port Authorities) on the practise of dumping snow from the streets of Oslo into the harbour area. Concerns arose because of:
1. decrease in visual quality caused by the old, dirty snow often including garbage;
2. potential of pollution from contaminants contained in the snow;
3. decrease in water depth at the quayside and in deeper waters resulting from the shallowing up by accumulating sand sized particles.

The aim of the Port Authorities as the head administrator of the harbour, was first of all to put an end to the practise of snow dumping. Together with the Norwegian Road Administration, which was responsible for the streets of Oslo, it was decided that analysis of the sediments had to be made in order to get an overview of the conditions.
Analyses were conducted by NIVA (The Norwegian Institute for Water Research). The results showed high concentrations of pollutants, and the state of the contaminated sediments was formally announced in the autumn of 1991.
The sampling- and analysis that followed revealed high concentrations of pollutants in the sediments. According to the classification system established by SFT (rev. SFT, 2007) the sediments were defined as heavily- to very heavily polluted reaching depths of 0,5-1,0 meters.
An application for dredging for filling purposes in the sea at Kongshavn was disapproved 19 December 1991 by the (the County Governor of Oslo- and Akershus).
The Port Authorities treated this decision as a general prohibit to all dredging in the harbour knowing also the great extent of pollution. This understanding was supported by the second disapproval to dredge*[2].

[12] *Havneoppsynet* is integrated in the Oslo Port Authorities [2].

1992

The practice of dumping snow from the streets and highways of Oslo into the Oslo harbour was prohibited from the winter of 1992. This recognition initiated a process of extensive investigations of the pollution state and the work for finding good solutions for disposing the contaminated sediments.

The work for developing solutions on how to assess the need for remediation started in January. Meetings related to this involved SFT, , Oslo Municipality and Oslo Port Authorities, resulting in an agreement that a solution should be found as soon as possible in order to ensure maintained port activities and a good fjord environment.

On 20 January the first project meeting was arranged. Participants were the Pollution Authorities represented by SFT- and , the research institutes NIVA and NGI,and the applier HAV. The role of both NIVA and NGI was to function as HAV's scientific- and technical consultants.

Disposal in Bispevika was considered the best solution for the contaminated sediments at that time:

1. future plans for the Bispevika matched well with the disposal plans;
2. possible to combine with the disposal of rocks from Ekebergtunnelen.

At this stage the project goals were to remediate with the intention that harbour activity could proceed, and to gain land area by means of dredging and filling.

SFT was interested in including more extensive investigations of the Oslo fjord into this project.

The solution involving the establishment of a waterside disposal was on a meeting on the 5th of March announced as a pioneer project. Application for exemptions to regulation according to the Planning- and Building Act § 7 was sent. The project was subject to hearing 1 July, mainly involving the technical issues of the case.

*[2] A new application for permit to dredge in the Ormsund area was disapproved by FMOA 19 May based on the given pollution state in the harbour. In reality, this meant that no dredging operations would be certified in the harbour.

Oslo Municipality/HAV and SFT/ constructed a strategy plan and program for further investigations.

The City Government of the Oslo Municipality represented by the department of Environment –and Transport engaged the consulting company Asplan Østlandet. The conclusion of their work was that future plans for the development in this area also had to be taken into consideration, and the plan for developing the area for harbour purposes was eliminated.

1993

From 1993-1996 extensive investigations and studies were made to get a more comprehensive overview of the pollution state. Different suggestions for dredging-, treatment- and disposal were assessed during this time period, and in 1996 this resulted in a comprehensive action plan.

1994

From negotiations with the SFT, the Oslo Municipality states in a letter of 5 January that the Oslo Port Authorities (HAV) is the responsible part for dealing with all costs for environmental analysis of the pollution state in the Oslo fjord area. In addition, mapping of the extent of pollution-, sources- and methods to deal with the problem, was required.

The waterside disposal was transferred to Lohavn (Grønlibukta). During 1994 the area was subject to investigations of technical aspects by a consultant group.

1995
Studies were carried out aiming at finding alternative localities for a disposal in the Inner Oslo fjord. Solutions involving disposal of the contaminated sediments in deep water areas in the inner parts of the fjord were considered too simple at this stage.
The work of 1994 and 1995 was summarised in an *Evaluation of actions of 25 September* by HAV. The evaluation was sent to SFT and FMOA. The purpose of this was to:
annul the dredging prohibit;
establish waterside disposals in Lohavn in relation to the plan for quay expansion at Filipstad;
dispose the masses in a deep water disposal with subsequent capping in the Bekkelaget basin, while decisions on the regulation of the water side disposals were in process.

The answer from FMOA was that the work load at the time was heavy, and they did not expect to be able to assess the case sooner than February 1996.

1996
The FMOA replied to *the Evaluation of Actions* sent by HAV in a letter of 25 September 1995. Requirements involved:
a comprehensive evaluation at municipality level;
a complete process in line with the Planning- and Building Act;
methods for dredging and disposal had to be considered for each case.

In a meeting arranged 19 April HAV wanted to make clear who was the responsible pollution authority for giving approvals; SFT or FM.
FMOA//SFT required that *the Evaluation of Actions of 25 September 1995* was submitted as *a Remediation Plan*. Additionally, this plan had to include a description of methods, environmental requirements, monitoring program and a plan for how to progress. An application to conduct actions based on this plan was also required.
A *Comprehensive Remediation Plan* was official 3 September 1996. On the basis of the information and documents at this stage (action plan/application) the following duration of the process was predicted:
Hearing: 6 weeks
Evaluation by SFT: 3-4 weeks. Decision made 3-4 months after application is forwarded.
Approval according to the Pollution Control Act, Planning- and Building Act and the harbour Act.
The Comprehensive Remediation Plan of 3 September (NGI, 1996) and the application was sent 7 October by HAV to FMOA for permit to dredge, treat and dispose 500.000 m^3. The FMOA subsequently sent the documentation to SFT. The case was subject to hearing from 8 November-20 December. SFT was the initiator of the hearing.

1997
HAV calls for a decision by SFT 14 February 1997. SFT informs HAV in a letter of 11 March the same year that they have started the assessment.
The Coastal Administration demanded in a letter of 20 May the Port Council's (Havnestyret) evaluation of the case, but the council had already done an assessment of the case before it was sent.
SFT arranged a meeting 9 June and suggested a limited permit. A permit in line with the Pollution Control Act to dredge- and establish seven waterside disposals was acquired 30 June, expiring 15 May 2002.
In a letter of 11 July the Cultural Heritage Management Office in Oslo demanded that the permit or regulation plan for the disposals was annulled. SFT had based the permit on the Pollution Control Act only, and answered in a letter of 1 August that a deep water disposal facility was acceptable if the disposal site itself was extensively contaminated.

The regulation in line with the Planning- and Building Act, including environmental impact analysis and regulation plan, was not considered successful. This was due to concerns for future plans for development - and cultural heritage. The establishment of water side disposals had modest support from the societal hold and was considered less realistic as a disposal solution by HAV at that time.

1998
An alternative solution concerning the possibility for establishing a deep water disposal at Malmøykalven was discussed in a meeting with 14 October.
HAV started the work on a plan for the establishment of disposal of the contaminated sediments at Malmøykalven in the Inner Oslo fjord. The arguments for this disposal site:
water depths down to c. 70 meters;
anoxic conditions at the seabed;
no benthic fauna registered;
water current velocity is low;
sills defines natural thresholds;
the area is already heavily contaminated.

1998/1999
Extensive mapping and investigations of contaminated sediments in the Oslo harbour area were conducted.
The establishment of an aquatic disposal site in the area of Malmøykalven was found the best solution for disposal of the contaminated sediments considering both the technical- and feasible aspects.

1999

In June the MD ordered an *Environmental Impact Analysis (EIA)* on the basis of the establishment of the aquatic disposal site. This was required according to § 33-2 of the Planning- and Building Act (Ref. 3.2). HAV was subsequently recognised as the applier- and SFT the responsible authority. It was HAV's responsibility to announce the requirements, and to complete the environmental impact analysis.

HAV subsequently announced that an EIA had been required for conducting suggested actions, including the suggested program for the EIA (Oslo havnevesen, 1999). This program was developed during the autumn by HAV and consultants from Interconsult AS, NGI and NIVA. (HAV, 2001a)

The suggested program was circulated for public comments in the period 16 November- 31 January 2000. 61 entitled bodies were included, including 16 in the Oslo Municipality. SFT received 29 statements with remarks before the deadline.

In order to establish an aquatic disposal site, a regulation of the Malmøykalven area was needed. This regulation plan acquired an approval by the Oslo- and Nesodden Municipalities, considering the area is located on the boarder between these two municipalities.

2000

The deadline for statements on the suggested program for the EIA expired 31 January 2000. A total of 61 entitled bodies were included, some 16 in the Oslo Municipality.

SFT received 29 statements with remarks before the deadline.

A meeting concerning the EIA was held 8 June. Present were SFT, the Coastal Administration, FMOA and HAV.

SFT approved the suggested program for the EIA 28 August.

The EIA was developed by HAV with assistance from NGI and NIVA.

2001

On 15 October the EIA was completed. The final edition was completed by HAV, which subsequently sent the EIA to SFT 6 November

The EIA of 15 October was open for public comments from 4 December- 20 February 2002. In relation to this hearing an open informational meeting was held by SFT in January 2002.

2002

An official informational meeting was held by SFT 15 January 2002. It was expected at that time that SFT would give their answer on whether the EIA was complete or not.

Hearing of the EIA was completed 15 February 2002

Statements from the hearing of the EIA of 15 October in the period 4 December-20 February 2002 [D]:

The Coastal Administration, 1. District, harbour- and fairway department and Transport planning-, plan- and elucidation department (Kystverket, Havne – og farvannsavdelingen , og Transportplanlegging-, planlegging- og utrednings avdelingen), letter of 13.12.01 and 16.01.02:

Positive to improved sailing depth and the effects this will have on the safety at sea.
Agrees on the use of barges/ships and submersed pipelines for transporting and disposing the masses. Will not approve any transport that can conflict the traffic at sea- or anchor areas, e.g. Ormøysanden.
The location of an aquatic disposal site at Malmøykalven is ratified, but wishes for a process that can result in alternatives for future disposals in the Inner Oslo fjord
The risk analysis of the different transport alternatives are considered random and should therefore not be the basis for an evaluation of consequences.
It is of concern that HAV has the total economic responsibility in this case; concerned that the shipping will be charged for something they are not responsible for.

Directorate of Fisheries (Fiskeridirektoratet), letter of 28.12.01
Refers to the *Directorate of Fisheries, region Skagerrakkysten,* and their role of evaluating the fishing- and fish farming issues in this case.

The Norwegian Maritime Museum (Norsk Sjøfartsmuseum), letter of 14.01.02
Informs that they have to treat the dredging in the given area as a new case for land use including investigations for consequences related to conservation of cultural monuments.
Considers that the choice of method for dredging will have influence on the ability to detect and preserve cultural monuments.

Directorate for Civil Protection and Emergency Planning (Direktoratet for Samfunnssikkerhet og Beredskap), letter of 14.01.02
Consider their interests on protection- and emergency has been taken care of as long as support is given in every phase throughout the process.

Directorate for Cultural Heritage (Riksantikvaren), letter of 11.01.02
No statements, but refers to the Oslo Municipality and The Cultural Heritage Management Office in Oslo for any statements.

The Norwegian Road Administration (Statens Vegvesen), letter of 21.01.02
Statement is given together with the Oslo department.
Satisfied with the outcome of the EIA. Remarks the positive effects of an aquatic disposal site on the environmental- and economical aspects.
States that 50.000 m^3 contaminated masses have to be disposed in the aquatic disposal site from the tunnel-project at Bjørvika, which is included in the total amount of masses estimated by HAV.

Malmøya Welfare Society (Malmøya Vel), letter of 30.01.02
Negative to the establishment of an aquatic disposal site: the action is irreversible; will cause spreading of contaminants; means that emission of pollution will be extensive the first year; emissions to the fjord used by the largest number of people in the country.
This solution has never been tested, and would never have been proposed if the masses were situated on land. The solution also conflicts the principle of "better safe than sorry".
Considers the disposal at Langøya the best solution.
Questions whether that an artificial threshold could lead to seepage of contaminants and influence the sea currents.
Are missing a comparison of different localities for an aquatic disposal site.
The estimated costs involve great uncertainties, and remarks that some of the costs involved in the actions suggested are not taken into account.

Asker Municipality (Asker kommune), letter of 01.02.02
Recognises that consequences of receiving masses other than those included in the needs of the applicant, has not been considered. Regards that SFT has to require the aquatic disposal site to be available for masses from a joint remediation of the Inner Oslo fjord.

SINTEF, letter of 11.02.02
Considers the EIA to be thorough. Still remarks are given concerning the reference list, which could have been more complete, and the lack of numeric values.
The greatest problem with an aquatic disposal site is the uncertainly linked to any future leakage form the system.

Bekkelaget Welfare Society (Bekkelaget Vel), letter of 15.02.02
Not interested in Malmøykalven to be used as an area for aquatic disposal site, because the area is already influenced by the harbour traffic.
NOAH Langøya is considered the best option, because the risks are relatively small.

Ulvøy Welfare Society (Ulvøy Vel), letter of 17.02.02
The welfare society will only accept the two following options: 1) Disposal of the masses at Langøya, 2) Leave the masses in the harbour and establish a deep water quay in Grenland or Østfold County.
They agree with Nesodden Welfare Society (letter of 15.02.02). States it is a paradox that toxic masses from an already affected harbour area should be stored in an area of settlements, and is used for recreation purposes. Also claims the costs to prevent spreading of contaminants during operations will be far more expensive than suggested.

Norwegian Confederation of Trade Unions/Landsorganisasjonen i Norge LO, letter of 19.02.02
1. remarks that the State should bear the costs in cases where the responsible part can not be defined;
2. claims there is a need for an extensive investigation of the contaminated sediments in the whole of Inner Oslo fjord- and a consideration of actions that can reduce and remove sources on land.

Bærum Municipality (Bærum kommune), letter of 19.02.02

1. The Municipality has a need for disposing 35.000 m^3 contaminated masses;
2. Consider the case is not clarified concerning the ability to expand the aquatic disposal site for disposing additional masses from Asker- and Bærum Municipalities.

Institute of Marine Research (Havforskningsinstiuttet), letter of 20.02.02
Emphasises a review of the principal criteria for disposing contaminated deposits.
Considers there is a need for calculating the deep water shift/circulation, and the transport- and shift of masses from the aquatic disposal site.

Bellona, letter of 20.02.02
Sceptical to the aquatic disposal site at Malmøykalven based on the technical aspects of spreading and transport of contaminants, and also the" experimentation with the non-reversible…"
Other solutions should be considered. NOAH Langøya is mentioned as an option.
Regards the disposal operations as a critical phase.
Notes that the EIA does not give estimates for the amount of contaminants that will leak during actions.
Calls for better information on of water currents and effect on conducting remedial actions.

Nesodden Coastal Association (Nesodden Kystlag), statement of 20.02.02
Concerned about the potential for spreading during the needed operations.
States the need for treating the water that has been in contact with the sediments before releasing it.
Remarks that methods for treatment of the masses are not considered.

Oslo Municipality (Oslo kommune), HAV, letter of 20.02.02
Oslo Port Council reviewed the EIA 14.02.02 in line with the harbour Act. No remarks resulted from this.

Friends of the Earth Norway (Norges Naturvernforbund), letter of 24.02.02
Positive to the tests involving deep water disposals, but consider that the applicant should do more calculations on fluxes related to e.g., seepage and transport.
Sceptical to the aquatic disposal site at Malmøykalven, because of interactions with the water and currents.
Consider the EIA is too poor and that it is not satisfactory according to the initial program for the EIA. Requires that a list with suggestions for further investigations of specific problems is sent for public circulation.
They can only approve an EIA, which level of ambitions is at least according to the "comprehensive plan for remediation".

Inner Oslo fjord Fishing Organisation (Indre Oslofjord Fiskerlag), letter of 25.02.02
Presents information on the state- and diversity of fish in the harbour area, and states that there are interests for fishing in this area.
States that it is difficult to estimate to what extent the water quality in the harbour basin and surrounding areas will be affected during the dredging phase. Comments that the interests of the fishing industry are not satisfactory considered.
Requires a thorough monitoring of conditions in the water column and bottom waters during and after dredging.
Very critical to the disposal of heavily contaminated masses in a marine environment.
Remarks the lack of calculations concerning the amounts of seepage during the process.
Emphasises the need for calculations on water current velocities in relation to the disposal site.
NOAH Langøya is proposed as a better solution for a disposal.

Statsbygg, letter of 27.02.02
Their focus has been on the construction of the opera in Bjørvika, and related development of the area. This has been based on the "comprehensive remediation" (Ref. St.mld. 12). It is considered valuable that the process of remediation is coordinated with the progress of the construction projects.
Documentation is needed on the ground conditions and stability before any actions can be made.
Remarks that the EIA is insufficient with respect to considerations of the state of readiness-, preventive actions- and reversibility.

Oslo fjord Outdoor Council (Oslofjordens Friluftsråd), letter of 27.02.02
Consider the consequences for the aspects of nature and outdoor activities well covered.
States that the quality of the bathing water has to be preserved. Otherwise satisfied with the proposed technical solution.

Nesodden Municipality (Nesodden kommune), letter of 06.03.02
Requires an additional impact analysis, which considers the NOAH Langøya facility, as well as one that covers additional risk analysis, state of readiness and preventive actions.
Calls for a comparison of projects with the aquatic disposal site at Malmøykalven, and also for investigations on water current velocity, spreading of pollutants with pore water, together with a clarifying estimate of costs for each alternative.
If Malmøykalven in decided used for disposal, it is required that a clause have to be defined. The clause has to state that HAV is responsible for readiness, monitoring and compensations related to leakage or other accidents.

The County Governor of Oslo- and Akershus (), letter of 08.03.02
Approves the EIA.
Only minor comments related to considerations and conclusions that were made, and to the monitoring of the aquatic disposal site and surrounding areas.
A regulation plan has to consider the possibilities for dumping clean masses. Suggests an extended area should be regulated, which would include the deep water trough of the Bekkelaget Basin.
Should strengthen the base of evaluations for calculations of spreading under and after disposal. Needs a better documentation of the pollution state of the sediments.
Remarks that the dredging-, transport- and disposal methods is crucial for problems related to spreading. The chosen method has to be fulfilled according to requirements.
Biological investigations should be conducted after capping of the disposal.
The "0-alternative" is no alternative

The Ministry of Fisheries- and Coastal Affairs (Fiskeridepartementet), letter of 12.03.02
Remarks to financial aspects and the conduction of actions.
Financial contributions from the State should be considered an option, and refers to St.mld. nr. 46 (1999-2000). The pollution cannot be traced directly to the harbour as a source, and dredging and disposal of these masses will lead to increased costs.
Support statements by the Coastal Administration, letter of 16.01.02

Fagrådet for vann- og avløpsteknisk samarbeid i indre Oslofjord ("Council for Water- and Discharge technical cooperation in Inner Oslofjord"), letter of 22.03.02
Points out the importance of an efficient sedimentation if salt or chemicals enhancing precipitation are added in the process. They also mention the importance of performing controls, monitoring and support during remedial actions e.g., monitor current conditions.
Remedial actions may affect the results of *Fagrådets* program that involves surveying the fjord. Therefore they require getting access to the process and being able to contribute to the planning.
Biological investigations should be conducted in the surrounding areas after capping of the disposal.

Oslo Municipality (Oslo kommune), letter of 04.04.02
For the EIA to be approved, an additional impact analysis is required to see if the disposal at Langøya is suitable for receiving the masses. Considerations of other methods for treating the contaminated sediments also have to be included.
Required that the dredging method is cleared with the Norwegian Maritime Museum in line with the Cultural Heritage Act.
Consider that removal of the masses from the Oslo harbour necessary.
Greater uncertainties related to the disposal exist, than what is stated in the EIA. A need for deciding who is responsible for repairing the aquatic disposal site, if necessary. Establishing an aquatic disposal site cannot be done unless this is justifiable on a longer time-scale.

Additional studies were required both as a consequence of the hearings (above) and the response of SFT. The studies aimed at addressing specific issues of concern. SFT stated in a letter of 28 June that an additional analysis had to be made on the spreading of pollution, alternative disposals, and costs [Q].

On both a national- and local level important decisions were made that had influence on the process:
Parliamentary decree of 2002: "Pristine and Abundant sea".
The decree involves the development of comprehensive plans on a county level as a tool in the remedial work to avoid the spreading of contaminants from contaminated sediments to unaffected areas. The decree also states that the Oslo harbour district is an area of priority (Oslo kommune, 2005 b).

Ecological Program for the City of Oslo, 2002-2014.
The visions and goals of this program constitute the base for the work of the city of Oslo in the process of developing a comprehensive action plan.

2003
The additional studies required by the public hearings and SFT were completed 2 January. HAV finished the additional analysis 20 January, which was subject to hearing from 20 February-1 April [D].

The following stakeholders gave statements during the hearing of the additional EIA of 2 January in the period 20 February-1 April [D]:

Norwegian Maritime Museum (Norsk Sjøfartsmuseum), letter of 20.03.03
The museum remarks that there is a potential for detecting monuments of interest in the area included in the dredging operations. The obligation to conduct investigations must be followed. The museum wants to make clear that the applicant understands that there archaeological investigations are required, and that it might be required excavate also in a later stage of the process. The Directorate for Cultural Heritage gives grants in cases involving ship wrecks.

The Norwegian Road Administration (Statens Vegvesen), letter of 21.03.03
The Road Administration has only minor comments to their original statement from 21.01.01; the department emphasises that the difference in costs should be of great importance. The alternative with the deep water aquatic disposal site will result in lower costs in relation with construction of Bjørvika tunnel, and a consequence will be lower costs for the society. The deep water aquatic disposal site is considered to provide the greatest environmental profits by means of contributing to a more complete remediation.

Directorate for Civil Protection and Emergency Planning (Direktoratet for samfunnssikkerhet og beredskap), letter of 24.03.03
The directorate does not recognise any aspects of this document that will cause changes to the statements given in the letter of 14.01.02. In the further process of planning the directorate finds it best that FMOA is consulted for stand points.

Malmøya Welfare Society (Malmøya Vel), letter of 26.03.03
It is found unacceptable that a disposal is established in the Oslo fjord that will pollute an already polluted area. The uncertainties linked to the effects of disposing the masses in a deep water aquatic disposal site are also pointed out. The disposal at Langøya is suggested the best solution for this. The welfare society claims that HAV puts to much load into the aspect of profit instead of considering the economic aspect at a societal level in this document. It is also called an independent part in that can evaluate the case before SFT approves the EIA.

Institute of Marine Research (Havforskningsinstiuttet), letter of 28.03.03
Refer to their statements in a letter of 20.02.02. The institute demands that a principle evaluation is made on the dumping of contaminated masses in relation to the final consideration of this case. They find that there are no principal differences connected to whether the masses are derived from a land disposal- or the sea as long as it is contaminated. When considering the deep water shift in the basin, the institute finds it best if the solution with the disposal being open for one year is reconsidered.

Bekkelaget Welfare Society (Bekkelaget Vel), letter of 20.03.03
The welfare society cannot see that the additional EIA can provide better documentation on safety on a long- or short time scale for disposal in a deep water aquatic disposal site. Considers that calls for better references and documentation on deep water disposal have not been answered (statement 15.02.02). The welfare society cannot accept such a disposal at Malmøykalven.

Directorate of Fisheries, region Skagerrakkysten (Fiskeridirektoratet, region Skagerrakkysten), letter of 31.03.03
The directorate points out that unneccessary removal of masses and disposal at sea will cause great problems for the marine environment in the area. Instead, capping of sediments can be done where needed and in combination with transport to NOAH Langøya. This will gain the environment. The directorate also states that the area of Malmøkalven in this way still can be utilised as dumping place for dredged masses in the Inner Oslo fjord.

Oslo fjord Outdoor Council (Oslofjordens Friluftsråd), letter of 31.03.03
The council is against any operation that violates the nature and outdoor life. Instead of dumping the dredged material at sea it is suggested to dipose on land. In this case the disposal at NOAH Langøya will provide the best alternative and effects on the nature and outdoor interests. It is also remarked that any action that is chosen has to be monitored continuously.

Inner Oslo fjord Fishing Organisation (Indre Oslofjord Fiskerlag), letter of 01.04.03
Still, it is considered that to many uncertainties are linked to the sedimentation- and stabilisation of masses in a deeep water aquatic disposal site. The additional EIA has not changed the standpoints of the organisation towards this type of facility. NOAH Langøya is considered the best alternative. The organisation refers to statements in the letter of 25.02.02.

The County Governor of Oslo- and Akershus (), letter of 01.04.03
With respect to the documentation presented, the county governor states that the deep water aquatic disposal site at Malmøykalven is a good solution. Points out the importance of considering the pollution state in the Oslo fjord as one problem when considering possible actions.

The Ministry of Fisheries- and Coastal Affairs (Fiskeridepartementet), letter of 02.04.03
Refer to statements in the letter of 12.03.02.

Bellona, letter of 02.04.03
Bellona finds that this document confirms once more that NOAH Langøya is the best solution. This is based on uncertainties related to technical issues.

The Coastal Administration, Region Southeast, (Kystverket Sørøst) letter of 03.04.03
The Coastal Administration remarks that actions related to anchoring and manoeuvring in areas subject to capping might lead to mobilising the masses. Any restriction towards larger ships concerning these aspects has to be considered for each specific area.

Nesodden Municipality (Nesodden kommune), letter of 11.04.03
The municipality does not consider the document to fully cover the requirements (letter of 28.06.02) from SFT. The municipality calls for additional investigations related to pollution from a deep water shift. Errors related to calculations and limitation restriciting methods for collecting data, should be presented. In this way, environmental budgets for alternative solutions can be reviewed and compared.

Oslo Municipality (Oslo kommune), letter of 16.05.03
The municipality considers the need for assessments (EIA) completed. The municipality does not accept capping of parts of the harbour and is strongly against the establishment of a deep water aquatic disposal site at Malmøykalven. The disposal at Langøya is considered the best alternative, and the State is found the economically responsible part for disposing at Langøya.

SFT concluded in a closure document of 23 June that the EIA was completed according to requirements, but still investigations were required [D].
Political will to ratify the aquatic disposal site was lacking and the issue remained quite and no action was made. (Oen, 2006)

2004

Several issues emphasised the need for dredging in the harbour:
1. maintenance and improvement of navigational depth;
2. secure ongoing construction activities; key-stakeholders were slipping away, e.g. the Norwegian Road Administration that was planning to build a submersed tunnel, E-18 (Oen, 2006).

Effect of important decisions made in 2002:
fjords and contaminated sediments had become a national focus through the *Parliamentary decree of 2002 ("Pristine and Abundant sea")*
The local focus was complied with the Ecological Program for the City of Oslo, 2002-2014.
As a response to these two issues, *a Comprehensive Plan for Remediation* of contaminated sediments was developed for the Oslo harbour. Involved in the work group for this plan were a group from the municipality including different units- and consultants (Oen, 2006).

2005
An open meeting was arranged by the municipal group lead by HAV 21 January. The information was concerning the comprehensive plan for remediation, orientation on the work, problems and an invitation to contribute with comments.

Present: Committee of Welfare Societies in Ekeberg; Malmøya-, Bleikøya- (Selskapet til) Bekkelaget-, (Selskapet for) Bygdø-, Skarpsno-, Tøyen-Nedre Kampen- and Oslo City's Neighbourhood Organisations; Ruseløkka/Skillebekk-, Gamlebyen- and Grønland-Nedre Tøyen Welfare Societies; Committee for Bekkelaget Waterside (Utvalget for Bekkelaget Sjøside); the Committee of Welfare Societies; ; SFT; the central administration of the Coastal Administration; Planning- and Building dept. (incl. the fjord City Office/fjordbykontoret); the City Government departments of Environment- and transport_and Business- and Culture; the Chief District Medical Officers of Nordstrand, Gamle Oslo and Frogner; the Health Care Unit; the Transport Unit; Water- and Discharge Unit; the Outdoor Unit; The Cultural Heritage Management Office in Oslo; Friends of the Earth Norway; Bellona; Entrepreneurs: Bjørvika Utvikling AS and Tjuvholmen, HAV, Oslo fjord Outdoor Council, Fishing Org.; "Småbåtforeningen". [A].

A second open meeting was held by the same group in April. The topic of this meeting was to orient on what decisions had been made after the meeting in January.

Present: Inner Oslo fjord Fishing Organisation; Oslo fjord Fishing Organisation; Oslo fjord Outdoor Council; the Chief of Fisheries, region Skagerrakkysten; Kontaktutvalget for Velforeninger; Fellesutvalget for vel i bydel Nordstrand; Malmøya-, Bleikøya-, (Selskapet for) Bygdø-, (Selskapet til) Bekkelaget-, Skarpsno Neighbourhood Organisations ; Committee for Bekkelaget Waterside (Utvalget for Bekkelaget Sjøside); ; Akershus County Municipality; SFT, Nesodden Municipality; the Norwegian Road Administration, region East; Planning- and Building Dept.; the City Government departments of Environment- and Transport and Business- and Development; the Chief District Medical Officers of Nordstrand, Gamle Oslo, Frogner and Nordstrand South; Health- and Welfare Dept.; Water- and Discharge Unit; the Outdoor Unit; the Norwegian Maritime Museum; The Cultural Heritage Management Office in Oslo; Entrepreneurs: Bjørvika Utvikling AS and Tjuvholmen; "Småbåtforeningen"; Friends of the Earth Norway; Bellona; HAV [A].

Under a press conference in April the first information about the *regulation plan* of the Malmøykalven area was released. This new "definition" would allow new land use with the definition "a special area for a deep water aquatic disposal site".

Journalists from national- and local newspapers were present at the conference. It was also announced in the news papers *Aftenposten*, *Dagbladet* and *VG* 18 April. Affected welfare societies, nature- and outdoor organisations and authorities received the notice in a letter the same day. The most involved authorities and organisations were invited to an orientation meeting 3 May (below) in relation to *the Comprehensive Plan for Remediation* [D]. Otherwise this was discussed internally in the Oslo City Council (Oen, 2006).

Statements in relation to the announced regulation plan 18 April 2005 [E]:

City region, Nordstrand (Bydel Nordstrand), 13.05.05
They did not receive the letter in relation to the announcement of the regulation plan, but the deadline was extended. Considers NOAH Langøya the best solution- and emphasise that the focus should be on the solution involving disposal on land.

Cultural Heritage Management Office in Oslo (Byantikvaren), 25.04.05
The Cultural Heritage Management Office in Oslo remarks that the seabed in relation to Malmøykalven is relatively undisturbed. The chance that cultural monuments, e.g. ship wrecks, of interest are preserved here might result in automatic protection. The case was sent to the Norwegian Maritime Museum.

Health- and Welfare Unit (Helse– og Velferdsetaten), 03.05.05
Positive to the comprehensive remediation plan, but suggest that user interests in the area have to be considered, e.g. fishing and other outdoor activities. The effects of the suggested actions on the water quality should be accounted for.

Property- and City Reform Unit (Eiendoms – og Byfornyelsesetaten), 10.05.05
The unit asks for a decision on who is the responsible part for future service of the aquatic disposal site.

The Norwegian Road Administration (Statens Vegvesen), 02.05.05
In general positive to the suggestion, and gives an estimate of the contaminated masses to be removed for the construction of the submersed tunnel. Considers the establishment of the aquatic disposal site the best solution for a disposing these masses. The disposal has to be regulated and ready for receiving the masses by latest 1 November 2005.

The Norwegian Maritime Museum (Norsk Sjøfartsmuseum), 09.05.05
Remarks that registrations of cultural monuments have to be conducted in accord with the Cultural Heritage Act.

Committee of Welfare Societies in City Region Nordstrand/Fellesutvalget for vel i bydel Nordstrand, 07.05.05
The safest solution is disposal on land after the sediments has been treated, and the difference in costs for different disposal solutions is small. Points out that this part of the city has experienced a lot of environmental strain and the aim should therefore be to reduce these effects. Happy that remediation is an issue, but thinks the proposed plan for establishing a deep water disposal in their neighbourhood should be disapproved.

Malmøyveien 19a, Arne Løvås/Nina Bjurbeck, 07.05.05
States it is meaningless to dispose contaminated sediments in the Inner Oslo fjord; disposal on land is considered best.

476 electronic letters of 12.05.05. (eight letters before the deadline. Several additional anonymous letters.)
These letters were a protest to the disposal of poisonous- and noxious sediments in Bunnefjorden. In the letters it is considered that the project is a high risk-project threatening the environment in the Inner Oslo fjord-, the disposal is a permanent health threat for the affected parties, e.g. settlements in the surrounding area- and despite the ensuring statements from the expertise; this is not a permanent insurance for future

leakage. It is stated that this is a permanent threat for future generations, and that Oslo- and Nesodden Municipalities, HAV and the State have to take responsibility for the environment through the use of disposal on land.

On the informational meeting of 3 May, HAV informed about *the comprehensive plan* and *the regulation plan* for the Malmøykalven area. The deadline for commenting on the comprehensive plan for remediation was announced the 20 May. Modifications of the plan would then be made and subsequently forwarded to the City Government dept. for Environment-, Transport- and Communication (Byrådsavdelingen for Miljø- og samferdsel) by 1 June. The chosen alternative would depend on the political process, and the actions conducted depending on the will and interests of different stakeholders [L].

Present to inform about the comprehensive plan for remediation was:
Guttorm Grundt, Oslo Municipality, Environmental Protection Leader, on comprehensive plans; Kristin Espeseth, , concerning plans at county level; Torild Jørgensen, HAV, leader of the work group and presenting the suggested plan; Audun Hauge, NGI, and Jens Skei, NIVA, for reviewing the plan; and Ingvild Marthinsen, SFT, to state the need for such a plan [L].

Orientation- and status on/of the *regulation plan* was given by Petter Christensen and Hjalmar Tenold (Asplan Viak AS)
The work group: Trygve Abry og Terje Wold, Oslo Municipality, Vann- og avløpsetaten; Ann-Mari Nylund, Oslo Municipality, Friluftsetaten; Gina Mikarlsen, Oslo Municipality, Helse- og velferdsetaten, Nina Fjeldheim Oslo Municipality, Plan- og bygningsetaten; Torild Jørgensen, Oslo Havn KF; Kristin Espeseth, Observatør fra Fylkesmannens miljøvernavdeling; consulting group represented by Audun Hauge, NGI and Jens Skei, NIVA [L].

A proposal for *the Comprehensive Plan for Remediation* was announced in June (Oslo kommune, 2005 a).
Application for establishment of the deep water aquatic disposal site and to dispose the contaminated masses of 30 June was sent to SFT by HAV [J]. A copy was sent to: the Norwegian Maritime Museum, the Norwegian Road Administration and SFT required in a letter of 6 July statements from the Oslo –and Nesodden Municipalities- and that the application was made available to the public. It was emphasised that information regarding local conditions, e.g. health care issues and other interests, are considered in this case. Deadlines for the Oslo –and Nesodden Municipalities were 8 and 7 weeks, respectively. A copy was sent to HAV, and both the letter and application was sent to responsible departments within the Oslo Municipality (8) [O].

In a letter of 8 July SFT sends the application together with a request for statements in relation to the application to be in within 7 weeks [N]. Recipients: ; Fellesutvalget for vel i bydel Nordstrand; Malmøya-, (Selskapet for) Bygdøy-, Skarpsno-, Bleikøya- and (Selskapet til) Bekkelaget Neighbourhood Organisations; Norwegian Maritime Museum; Oslo fjord Outdoor Council; Inner Oslo fjord Fishing Organisation; Coastal Administration Southeast; Oslo fjord Fishing Organisation; Bellona; Friends of the Earth Norway; Utvalget for Bekkelagets Sjøside; Kontaktutvalget for Velforeninger.

SFT approved the application of 30 June the 20 September, based on the law against pollution and waste of 13 March 1981 nr. 6, § 11, jfr. §16 and regulation of 1 July 2004 dealing with limitation of pollution (Ref. 3.2). The permission was given with the understanding that necessary decisions in relation to regulation was made in line with the Planning- and Building Act in both municipalities [H].
A copy of this permission together with instructions for objections were sent to: FMOA; Oslo Municipality(6); Nesodden Municipality; the Coastal Administration Southeast; the Norwegian Road Administration Region East; Bellona; Friends of Earth Norway; the Oslo fjord Fishing Organisation; Inner Oslo fjord Fishing Organisation; The Norwegian Maritime Museum, (Selskapet for) Bygdøy-, Malmøya –and Skarpsno Neighbourhood Organisations; Fellesutvalget for Vel i bydel Nordstrand; Natur og Ungdom; Kontaktutvalget for Velforeninger i Oslo; Reef Systems; Simensbråten Ekeberg arbeidersamfunn.

It was possible to make objections within 3 weeks to the MD or other authorities responsible for evaluating complaints.

The application was circulated for comments. This round resulted in the following statements [H]:

Oslo Municipality, Health- and Welfare Unit (Oslo kommune, Helse- og Velferdsetaten)
In general, the unit is positive to the remedial work in the Inner Oslo fjord. The establishment of the aquatic disposal site is considered good solution for health reasons. The unit gives suggestions for additional actions to increase environmental profits. Points out the effect on the surrounding areas making them less attractive during actions, but this is considered an incidentally reaction. The long term positive effects on the health- and recreational aspects will easily wipe out any short term local disadvantages. It is also remarked that the solution with the deep water aquatic disposal site is the best alternative if the aim is to conduct a comprehensive remediation.

Oslo Municipality, City Region Nordstrand (Oslo kommune v/ bydel Nordstrand)
Considers the best- and safest solution is to dispose the masses in the already approved land disposal facility at NOAH Langøya.

Nesodden Municipality (Nesodden kommune)
The municipality is positive to the remediation in the inner Oslo fjord according to the content of the Comprehensive Plan for Remediation. They consider the action plan, application to dispose together with the analysis of risk- and vulnerability answers good enough to remove the initial uncertainty that existed at the stage of the evaluation of the EIA related to the deep water aquatic disposal site. Still, NOAH Langøya is considered the best solution for disposal and states that environmental requirement should be more relevant than economic issues in the decision-making. Also finds that the State should take much of the economic responsibility for the remediation in the Oslo fjord.

The Coastal Administration (Kystverket)
States on the phone they have no comments to the application.

Friends of the Earth Norway (Norges Naturvernforbund)
The organisation is positive to the establishment of the deep water aquatic disposal site, and recommends that SFT gives approval according to some requirements. Points out that previous uncertainty related to current condition and methods of disposing, now is clarified. Consider that the deep water aquatic disposal site will result in great improvements for the environment in the Inner Oslo fjord, and that the expected leakage during the needed operations is not dramatic. It is also asked for that some additional aspects of technical character is included in the permission.

Nature and Youth (Natur og Ungdom)
States that the remedial work in harbours and fjords are positive actions. It is considered highly needed to prevent the spreading of contaminants in the Inner Oslo fjord. Nature and Youth finds it important that local solutions are developed in order to include as many areas as possible, and therefore the deep water aquatic disposal site at Malmøykalven is found to be the best option. It is made clear the importance of following up and controlling the facility during disposal of the masses and when the work is completed.

Bellona
Bellona finds that the deep water aquatic disposal site is not a good solution, but is still positive to a comprehensive remediation. This is based on uncertainties related to spreading of contaminants during disposal of the masses, and claims that only a slight increase in current velocity will be able to transport particles under suspension. Points out the need for deciding who takes responsibility for the facility when actions are completed. Claims that there are oxidising conditions in the area of the deep water aquatic disposal site, and considers it critical that the facility is open and that the time span from completion to capping is not clear. Based on these statements the land disposal at Langøya is preferred, and it is also pointed out that the difference in costs is insignificant.

The Oslo fjord Outdoor Council (Oslofjordens friluftsråd)
The council finds the remedial actions positive for the pollution state in the Inner Oslo fjord, but would prefer it the masses were disposed on land. The establishment of a deep water aquatic disposal site cannot be accepted a solution for this problem. This statement is based on the uncertainties linked to technical aspects, and considers the principle of "better safe than sorry" should prevail in this case.

Bygdø Welfare Society (Bygdø Vel)
Very positive to a comprehensive remediation of the seabed in the Oslofjord when it comes to dredging of contaminated sediments. Alternatives exists for disposal exists that can provide safer solution than the suggested deep water aquatic disposal site. The aspects of uncertainty are so significant when it comes to spreading of contaminant when masses are disposed, leakage because of the open system and after capping. Do not accept the deep water aquatic disposal site.

Skarpsno Welfare Society (Skarpsno Vel)
Supports the establishment of the deep water aquatic disposal site, but expresses their concerns related to spreading during dredging and transport of the masses to the facility.

Committee of welfare societies in Oslo (Kontaktutvalget for Velforeninger i Oslo)
The union is very pleased that remedial actions are conducted. Still, they cannot accept the solution with the dep water aquatic disposal site based on problem during operations and after completion of the project. Remarks that possibilities to dispose on land exists.

Committee of welfare societies in City Region Nordstrand (Kontaktutvalget for Velforeningene, Bydel Nordstrand)
The union is positive to the remediation of the seabed in Oslo, but is against removal of the contaminated sediments to the disposal facility at Malmøykalven. They worry about negative effects on both a short and long time scale, and remark the need for identifying a responsible part for the facility and problems after completion of actions. Since so many resources have been used to clean the fjord, the committee considers it a mistake to conduct suggested actions in case of problems related to the deep water aquatic disposal site.

Malmøya Welfare Society (Malmøya Vel)
The welfare society states that the application is incorrect when claiming that the establishment of a deep water aquatic disposal site will gain the environment. They also claim that from an environmental point of view it is not possible to argument for a facility that includes disposal of contaminants in one of Norway's most popular

recreational areas. States there is a much better alternative for disposal and suggests the facility at Langøya is the only option.

Simensbråten og Ekeberg arbeidersamfunn
Questions the application; claim it is only formalism and that SFT already has decided to approve the deep water aquatic disposal site. This is based on the fact that the application was announced at that stage. Also question whether the deep water aquatic disposal site really is a safer and better solution compared to the facility at Langøya.

Reef Systems
Remarks that removal of masses might affect the established biota on both the locations of dredging and disposal. Therefore it was suggested that in order to increase the marine biological development, a habitat should be placed at the disposal site.

Objections to Malmøykalven-regulation plan were voiced in June (Below).

Statements in relation to the regulation plan in the period 23 May – 22 June 2005 [F]:

City region, Nordstrand (Bydel Nordstrand)
The disposal at Langøya was decided the best solution; the resolution was unison. They stated that the suggested regulation plan was in disharmony with *the Ecological Program (2002-2004)*; a vision that were meant to secure the next generation with a clean seabed- and a marine ecosystem. Arguments for not establishing the deep water aquatic disposal site points towards the lack of experience for such a facility; no guarantees for any leakage and consequent environmental effects; the area is an important resource for the inhabitants and future generations and any leak would potentially destroy both the ecosystem and the specific qualities of the area.

Bydel Nordstrand-barnas representant
Statements are in the same line as the above mentioned.

Water- and Discharge Unit (Vann– og avløpsetaten)
Points out that at present they do not have any installations in the area, and sees no obvious conflict regarding their activities and the regulation in the area.

The Outdoor Unit (Friluftsetaten)
Emphasise the need for investigations of the environmental state in the area before approval of the regulation.

Health- and Social Affairs Unit (Helse– og velferdsetaten)
Positive to the remediation plans, and considers it important to choose a healthy- and environmentally good disposal solution. The unit states the importance of informing different parties to avoid unnecessary fears.

Property- and City Reform Unit (Eiendoms- og byfornyelsesetaten)
The unit required that the responsible part for any future service of the facility was decided upon before the plan was politically approved.

Cultural Heritage Management Office in Oslo (Byantikvaren)
The Cultural Heritage Management Office in Oslo forwarded the case to the Norwegian Maritime Museum, which would require registration of cultural monuments at sea.

Hafslund Nett
Hafslund Nett was planning to run a cable at the same location as the existing one, and they asked if this could be taken into account in the future planning. Remarks that the purpose with the regulation plan is to enable deposition of the contaminated sediments. The action will, in addition to the regulation plan required by the Planning- and Building Act, require permission in line with the Pollution Control Act. The consideration of environment- and pollution issues will be secured through ongoing processes in the case consistent with the Pollution Control Act.

The Norwegian Maritime Museum (Norsk Sjøfartsmuseum)
The museum refers to two letters (26.2.05, 14.06.05) and states there is a need for investigations. Contact has been established with HAV and the Norwegian Road Administration to allow investigations; statements concerning cultural monuments will be presented after the examination.

The Norwegian Road Administration, region East (Statens vegvesen, Region øst)
No remarks to the plan, but reminds that it is important that the regulation is completed by 1 November 2005 if they are going to use the disposal.

The Coastal Administration, region Southeast (Kystverket Sørøst)
The Coastal Administration brought the harbour Act and related regulations to attention for approving dumping operations.

Nesodden Municipality (Nesodden kommune)
The municipality decided in a meeting of 2 June to arrange a hearing on the suggested plan. Expressed a need for agreements related to drifting the facility after disposal is completed, accidents involving acute pollution, requirements for removing the disposal and claims from compensation. Aspects of economy, responsibility and resources including preparedness were also asked for. SFT and the FM should be responsible for certifying good quality of the agreement.

Oppegård Municipality (Oppegård kommune)
Oppegård Municipality delivers an objection to the plan. This is based on the great risk of increased pollution in Bunnefjorden when a project of such a scale is conducted; there are no previous experiences and knowledge linked to this, which can handle the complexity of conditions in the fjord, e.g. currents and weather. The municipality recommends that *Fagrådet for Inner Oslo fjord ("Council for Water- and Discharge technical cooperation in Inner Oslo fjord")* is involved to supervise in the operation period and when making an evaluation of the actions. They also ask for information on the decision of the location of disposal, and what the consequences will be for Bunnefjorden.

Malmøya Welfare Society (Malmøya Vel)
The organisation cannot understand what can support a decision involving the dumping of pollutants in the fjord, and how this possibly can be in line with the Planning- and Building Act. Any risk that the Oslo fjord will be destroyed is considered unacceptable. They state that the only argument for the deep water aquatic disposal site is that it involves lower costs; the budgets of HAV should not be decisive when approval to dump pollutants in Oslo's recreational areas is given.

Bellona
Positive to the comprehensive remediation of the contaminated sediments in the Oslo harbour, but is sceptical to the deep water aquatic disposal site concerning environmental-, economic- and judicial responsibility after completion. Argues that the disposal at Langøya is used instead, for both technical- and judicial (responsibility) reasons.

The Oslo fjord Outdoor Council (Oslofjordens friluftsråd)
In general positive to actions leading to improvement of the pollution state, but is against actions having a negative influence on nature and animals; therefore the masses should be disposed on land. Mentions that the economic aspect probably is very influential in this case, also when stating arguments for a deep water aquatic disposal site with scientific reasons. Points to: the pressure on the area-, population density -, the great interests concerning outdoor activities- and the *fjordbruk plan* aiming at providing

better water quality. The risk for slides when disposing the masses is also evident, and is considered poorly investigated.

Cathrine Conradi (Citizen)
Conradi finds the idea of disposing contaminated masses at Malmøykalven shocking. She mentions the importance of the area for recreational purposes; to conduct the project because of lower costs in found unthinkable. She also asks for the proposal for protection of Malmøya, and states she is against the solution and hopes the politicians will act with reason in the following process.

The Norwegian Maritime Museum conducted archaeological investigations in Bekkelaget basin in the period 23 August to 7 September. This was done to reveal if cultural monuments protected in line with the Cultural Heritage Act could conflict the actions described in the Comprehensive Plan for Remediation. These investigations were instructed by HAV. The museum recommended that the locality in the inner Oslo harbour should stay untouched (Norsk Sjøfartsmuseum, 2005).

HAV sent the application for dredging to SFT 28 September**.** It was also announced in the news papers *Aftenposten, Dagsavisen* and *Norsk Lysingsblad* [K].

The Comprehensive Plan for Remediation was ratified in the Oslo City Council 26 October [M].

The Nesodden Municipality Council reviewed the *regulation plan*, and decided not to consider the objection from Oppegård Municipality. This was decided 1 November [M].

The deep water disposal and *regulation plan* was ratified in the Oslo City Council 16 November in line with the Planning –and Building Act, § 28-1 nr. 1, jf. § 27-2 nr.1 [F]. In accord with this decision made in the Oslo City Council, the regulation plan was sent the MD for a final conclusion [M].

The Oslo City Government represented by the department of Environment-, Transport- and Communication claims HAV as responsible part the 17 November. [M]

The 24 November HAV decided to take the role as applicant [M].

A hearing was arranged by the MD 1 December as a response to the objection by Oppegård municipality concerning the regulation plan. Present were all affected municipalities, the , SFT, HAV, NGI, Bellona, Friends of the Earth Norway, politician (Oslo, Ap) and involved welfare societies [16].

MD ratified the *regulation plan* 6 December based on the Planning –and Building Act § 27-2 nr. 2. The regulation plan then had support from the Nesodden Municipality Council- and the Oslo City Council as well as the MD. The latter had no further comments [G].

Subsequently in December the *regulation plan* was ratified by Nesodden Municipality (Oen, 2006).

Permission to dredge was given by SFT 8 December based on the law against pollution and waste of 13 March 1981 nr. 6, § 11, jfr. §16 and regulation of 1 July 2004 dealing

with limitation of pollution (Ref. 3.2) [I]. A copy of this permission together with instructions for objections were sent to: FMOA, Oslo Municipality (6), Nesodden Municipality, the Coastal Administration Southeast, Statsbygg, The Norwegian Road Administration Region East, Bellona, Friends of Earth Norway, the Oslo fjord Outdoor Council, Inner Oslo fjord Fishing Organisation, The Norwegian Maritime Museum, Bygdø-, Malmøya –and Skarpsno Neighbourhood Organisations, Fellesutvalget for Vel I bydel Nordstrand, Natur og Ungdom, Kontaktutvalget for Velforeninger I Oslo.

It was possible to make objections within 3 weeks to the MD or other authorities responsible for evaluating complaints.

Statements in relation to the application of 28 September for permission to dredge [I]:

Oslo Municipality, The City Government department for Environment-, Transport- and Communication. (Byrådsavdeling for miljø og samferdsel)
The department refers to the City Government case 246/05 and the City Council evaluation of 26 October 2005 when it was decided to remove contaminated sediments in relation to Comprehensive Remediation Plans for the Oslo harbour district. Asks SFT to consider the statements from the departments of Frogner and Water-and Discharge Unit.

Oslo Municipality, City Region Nordstrand (Oslo kommune v/ bydel Nordstrand)
Positive to the work with the Comprehensive Plan for Remediation and has several standpoints on the solution for disposal, but none concerning the permission to dredge.

Oslo Municipality, City Region Frogner (Oslo kommune v/ bydel Frogner)
Positive to the remediation plan of contaminated sediments and that action is put into effect. The city region of Frogner points out the importance of avoiding conflict between users interests in the area Huk/Bygdøy and dredging operations.

Oslo Municipality, Health- and Welfare Unit (Oslo kommune v/ Helse- og Velferdsetaten)
Positive to the work with a comprehensive remediation of contaminated sediments; this will have great value for recreation and surroundings. Recognises a conflicting problem between user interests and dredging operations in the summer, and requires therefore a detailed plan for the progress.

Oslo Municipality, Water- and Discharge Unit (Oslo kommune v/ Vann- og Avløpsetaten)
The unit is positive to HAV's wish to initiate remedial actions, with the assumptions that the technical solutions are sufficiently tested and functions satisfactory. The work should not cause inconveniences for the migration of fish to any watercourses in the area. To avoid that installations operated by the unit are affected, the unit wishes to be integrated in the planning of the work in such a way that monitoring and operations are properly attended. On the basis of this, the unit wants to review the solution for dredging and capping before any work is initiated.

The Norwegian Road Administration, Region East (Statens Vegvesen Region øst)
The Norwegian Road Administration entirely supports the comprehensive remediation in the Oslo harbour district.

The Norwegian Maritime Museum
The Maritime Museum has a dialog with HAV dealing with capping and dredging. Several investigations have been made, including the use of a ROV. This resulted in a map displaying the areas subject to dredging and capping, together with restrictions from the Maritime Museum. Only one area was defined as restricted, but several others were labelled as areas obliging to submit reports if objects of interest were detected and with requirements to monitor. Actions in the minor harbours require partial monitoring.

Bellona invited politicians and experts to a meeting 5 September to discuss the planned establishment of the deep water aquatic disposal site at Malmøykalven. Present were (c.

20) representatives from the Oslo City Council-, HAV- and the pollution authorities. Bellona presented their arguments and informed the participant about their hearing statement on the application for establishing the deep water disposal, stating that their view of the case was the same. Some of the persons present were politicians Rune Gerhardsen (Ap), Ola Elvestuen (Ap), Erling Folkvord (RV), Andreas Behring (SV), Aud Kvalbein (KrF). Also HAV's Bernt Stilluf Karlsen and the harbour Administrator (Havnedirektøren) Anne Sigrid Hamran. Rune Gerhardsen was critical to "the experiment" in the vicinity of Norway's biggest city. Bellona concluded that despite disagreements, the meeting was constructive [16].

29 November Bellona sent a letter to the minister of the Ministry of the Environment with requirement not to treat the case with the disposal as a simple regulation plan, but also consider the consequences for environmental politics.
Later, in a news article of 7 December Bellona expresses their concern that the minister has not taken their statements in the letter of 29 November into account. They also questioned that the decision with the regulation plan only took a few days, interpreting this as an indicative that some decisions and/or agreements between some parties already were made [16].

2006
The Oslo Municipality ratifies *the regulation plan* in February, ant the project operations starts 16 February (Oen, 2006).
2 March the board of HAV concludes that no snow should be dumped in the harbour area taking into account that the remediation project is about to start [1].
SFT conducted audits at HAV in the period 6-13 March. Subsequent meetings with HAV were arranged. Some deviations related to salinity were found and described in the revision report of 13 March [1].
5 September SFT made an inspection of HAV revealing one deviation presented in a report of 8 September [1].
HAV announced 10 January that they had chosen the entrepreneur Secora for conducting dredging and disposal operations. In addition to Secora two other entrepreneurs were evaluated. The selection of Secora as entrepreneur was based on progress, cost, method for dredging, method for disposal, organisation and CV's [1].
As a result of statements from several politicians, representing the political parties KrF, Ap and RV, in *Nordstrand Blad* 5 February in relation to the potential of leakage from the aquatic disposal site, HAV decided to engage DNV for making volume calculations. HAV on the other hand considered the monitoring program to be very good and also well documented by NIVA and others. This was done as a consequence of questions asked concerning the monitoring and actual masses that were disposed. This became a great subject also for the public resulting in the actions by HAV mentioned above [1].
The project operations started 16 February with the financial contributors: Oslo Municipality, HAV, SFT, the Norwegian Road Administration and constructors in the inner harbour areas. In the same news article by HAV concerning the start of operations, Tore Killingland in Friends of the Earth Norway gives his support to the project [1].
27 February Nature and Youth expresses their support to the comprehensive remediation, and also that the deep water aquatic disposal site is a good-and safe environmental solution for Oslo [1].
28 March the Norwegian Road Administration and Skanska Norge AS were reported by the Green Warriors of Norway for uncontrolled spreading of contaminants during dredging of the submersed tunnel. HAV and Secora were also reported based on

accusations related to uncontrolled spreading during deposition of "poisonous mud" in the sea at Malmøykalven, and then violating the permit [W].
The organisation informed the police that the equipment had been secured and locked away in Bjørvika in order to prevent illegal pollution, this in accord with the content of the Criminal Law. It was required that the police initiated investigations to secure evidence and to stop future actions in line with the Pollution Control Act. The attached material to document this: pictures, video tapes, SFT's revision report from the start of the disposal, permissions to dredge and dispose together with data from other similar operations in the country involving dredging [W].
HAV stated that the accusation was meaningless and did not bring about justness. HAV represented by Bernt Stilluf Karlsen interpreted this action as part of a greater game where some persons or organisations tried to stop a democratic and legal action, as well as trying to stop an important environmental project [1].
On a press conference 5 April HAV, Oslo Municipality and the Norwegian Road Administration informed that future actions to stop any operations would be reported to the police. Any new participants to these actions, private persons or organisations would be subject to requirements for compensations. It was also stated that so far respect for the freedom of speech had been an important aspect, but from now on this would change as a response to the use of more aggressive methods that was announced by the activists [1].
The organisation Nature and Youth represented by the (former) leader Bård Lahn said that the remediation project could provide very useful knowledge for the conduction of other projects of its kind concerning costs and safety. He also mentioned that the comprehensive planning and the use of resources from a local project (the construction of the submersed tunnel) were very positive aspects [1].
5 May *VG Nett* (web page administrated by the news paper *VG*) presented a photo of what might look like a particle cloud close to the water surface in the disposal area. Secora reports they have not detected any concentration of particles of that kind. Measurement made by NGI of the turbidity the same day gave low values indicating that this observation could not be caused by particles [1].
The Norwegian Maritime Museum by Jostein Gundersen reported 12 May that ship wrecks had been found in relation to dredging. The dredging goes on while an archaeologist is on board the dredging vessel to observe. Objects of interest are sent to Bjørvika for further investigations and registration [1].
HAV informed 24 May that in some media it is claimed that the assumptions of the project "Ren Oslofjord" is violated because particles are spreading with the water currents. No documentation existed to support these statements, and NGI could confirm that no spreading- or violation of assumptions had occurred [1].
Dagbladet (internet) stated in an article 21 June claiming that "a poisonous cloud of particles" could be found in the Oslo fjord. The article included a video tape made by Bellona in March displaying a particle cloud at some 30 meters water depth outside the deep water disposal. HAV referred to their own investigations and measurements in this period, stating that no "clouds" of this kind had been detected [1].
In a press release of 22 June, a united Norwegian environmental movement criticise the actions of the Green Warriors of Norway who stated in the media that they would take actions towards the barges the same day [1].
14 September HAV called for assistance from the police to remove a demonstration group; Safety rules had been violated and the situation was very stressing for the workers on the construction. One of the activists were identified; Frank-Hugo Storelv from the organisation Neptun. Other participants were present, but not identified [X].

In a letter to the police of 20 September HAV reports the actions of the activists of 13 and 14 September at Malmøykalven. HAV required that the responsible persons were prosecuted and judged [Y].
Kurt Oddekalv, leader of Green Warriors of Norway, presented "new" mud samples in relation to the disposal work at Malmøykalven 28 September. Both in *TV2* and *AMTA (Akershus Amtstidene)* these samples were highlighted as new and sensational. According to the web page of this group the sediment samples from Bispevika/Bjørvika were taken from one of the barges. The result was displayed 27 September on their web page. NGI could confirm that the result was only manifesting the results as far back as 1995, which also represents the base for the conduction of remedial actions.
HAV responded by saying that these actions only contributed to the spreading of incorrect information and that some media were responsible for this by not applying criticism to their journalism. HAV also said that the saying "Always check a good story" had turned into a scenario more like: "Never check a good story". This was of great concern considering the state of the case [1].

2007
5 September SFT made an inspection of HAV revealing one deviation presented in a report of 8 September. SFT conducted audits of HAV in the period 15-19 October, and detected only some lack in routines related to the measurements of turbidity. Negative environmental effects were considered very low [1].
On 26 October SFT made an unannounced control of HAV in relation to tips concerning leakage of contaminants in the surface waters in vicinity of the deep water aquatic disposal site. The control did not reveal any deviations [1].
The Norwegian Maritime Museum reports after investigations of possible conflicts between cultural monuments in Paddehavet and Pipervika in Oslo harbour and capping operations, that they have no requirements or restrictions for conduction of the suggested capping. The investigations were done on instructions from the Oslo municipality and HAV ([1]; Norsk Sjøfartsmuseum, 2006).
City Government minister Peter N. Myhre reports the status of the "Ren Oslofjord" project, with focus on the action plan, progress of the project and the budget concerning the remaining actions, to the department of Environment-, transport- and communication. He said that he was confident that the action plan- and SFT's permit were being followed ([1]: News article of 13.02.07).
On a press conference in March a Swedish scientist, Per-Anders Bergquist (ExposMeter AB), engaged by Neptun released a report presenting data from the sea water. Measurements were made from October to December. It was claimed that there were elevated levels of PCB outside the deep water aquatic disposal site and that the aquatic disposal site was leaking.

As a consequence of the scientific report, all sides of the project were presented in front of the Oslo City Council in March. This was an extra ordinary hearing that included scientific research organisations and institutes, NGO's, authorities, Oslo- and Nesodden Municipalities.
The Oslo City Council was convinced in the end by scientific knowledge, and it was decided that dredging and disposal operations should continue as planned. (Oen, 2006; [1])
One of the members of the NGO Neptun was judged 18 May, for illegally entering one of the barges- and chaining himself to a crane 13 September, to pay a fine of NOK 4000 and got a seven day's sentence. The decision of the court members was unison. [Z]

Aften, a large Norwegian newspaper, claimed 5 June that a new problem had come up concerning dumping of "poisonous masses". In this article local politicians from Nesodden and Oslo, pointed out that they doubted that conditions of the remediation were being followed [1].
29 August it was declared in *Dagbladet* that information related to the "Ren Oslofjord" project was kept secret from the public. HAV strongly rejected this by referring to all the information that is accessible on their web page www.renoslofjord.no. Some of the more critical local interest groups wanted access to data from echo sounding done by Secora. This information was sent the SFT, which subsequently sent this to the local interest groups [1].
HAV reacted strongly towards elements presented in what they call "the so-called environmental newspaper" which was printed by Neptun (News archive: 04.09.07). The reactions of HAV were mainly focused on showing what was claimed to be traces of poisonous mud whirling up during dredging and transport to Malmøykalven. The Norwegian Road Administration, Region East, "Ren Oslofjord" and HAV stated this was not the fact, and presented a explanation covering the different aspects shown in the photo.
5 September HAV announced they had just been notified that Secora had dumped illegal septic masses into the fjord. HAV required that the contractor reviewed their routines, also stating that their experience with Secora had been positive so far and that they still trusted Secora as the operator of dredging and disposal.
12 September HAV arranged a meeting with Secora after *VG* presented that the entrepreneur had illegally dumped mud in the Malmøykalven area. HAV took this accusation very seriously and demanded that Secora stated the facts concerning this case. The meeting ended the same day with the conclusion that external investigations had to be made in order to highlight all relevant facts.
External investigations were conducted by DNV on the initiative of Secora. A final consideration of the case would be due after DNV's investigatons.
On a press conference 19 December DNV presented the results from their report on the illegal dumping by Secora that involved several episodes of irregular dumping. Because the dumping involved clean rocks, the environmental consequences of these actions were considered small [1].

2008
SFT conducted audits at HAV in the period 5-7 May and a subsequent meeting with HAV was held 14 May. The revision resulted in the detection of insufficient monitoring routines of turbidity during dredging operations. SFT considered the effect on the environment to be very small [1].
SFT announced 28 February that they had reported HAV and Secora for having dumped contaminated masses at Malmøykalven. This was in relation to facts presented on the press conference 19 December 2007. SFT took these deliberate- and repeated actions very seriously. This case was highlighted when employers at Secora in September last year stated that masses had been dumped from the sea surface at the disposal, violating the frames of the permit. SFT immediately required HAV to investigate the case, and DNV was involved. NIVA was also consulted to calculate effects on the environment from the results of DNV's investigation. NGI was involved to review the capability of the monitoring equipment to detect any illegal dumping activity. The results from DNV's investigations were presented to SFT [1].
A mechanical failure in one of Secora's barges resulted in a leak of contaminated masses. This incident was reported by HAV to SFT [1].

Investigations and measurements made by NGU including echo sounding and seismic imaging led to the conclusion that the disposed masses at Malmøykalven were located within the thresholds of the deep water aquatic disposal site. This result showed that the actions had been in line with what was permitted by SFT. ([1] News archive: 26.06.08).

April 2008 until April 2009
The dreding and disposal of sediments continued until April 2009. During this period of time there were no events that had a large impact on the project implementation. The site was capped in April 2009. However this does not finalise the project, as the monitoring of the aquatic disposal site will continue, and official approval/closure of the project has still to be granted by SFT.

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Revidering av klassifisering av metaller og organiske miljøgifter i vann og sedimenter.
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Ref.	Date	Web page	Topic	Key-word(s)
1	25.06.08	www.renoslofjord.no/cgi-bin/ohv/imaker?id=26505&visdybde=1&aktiv=26505 (Documents) www.renoslofjord.no/cgi-bin/ohv/imaker?id=26504&visdybde=1&aktiv=26504 (News archive) www.renoslofjord.no/cgi-bin/ohv/imaker?id=26507&visdybde=1&aktiv=26507 (Press releases)	Project "Ren Oslofjord"	Oslo fjord, Oslo harbour, documents; EIA, action plan; news articles/press release. News archive. Press releases.
2	19.06.08	www.lovdata.no www.lovdata.no/info/lawdata.html	Law data, Norwegian laws- and regulations	Pollution control, building- and planning, administration, pollution, waste, land fill, pilotage, EU-directives, maritime, cultural heritage, laws, regulations
3	30.06.08	www.regjeringen.no www.government.no	The Government	Government, ministries, responsibilities, work, authority
(4)	01.07.08	http://www.riksrevisjonen.no	The Office of the Auditor General of Norway	Riksrevisjonen. (Not used.)
5	30.06.08	www.norge.no	"Your gateway to the public sector of Norway"	Administration, state powers, legal framework, responsibilities
(6)	01.07.08	www.sivilombudsmannen.no	The Parliamentary Ombudsmann	Ombudsmann. (Not used.)
7	01.07.08	www.stortinget.no	The Parliament	Parliament
8	25.06.08	www.regjeringen.no/en/dep.html?id=933 www.regjeringen.no/nb/dep.html?id=933	The Ministries	Ministry of the Environment, ministries and responsibilities, decision-making and formal process in the Oslo harbour case
9	02.07.08	www.oslo.kommune.no	Oslo Municipality	Government, responsibilities
10	03.07.08	www.akershus.no/index.php?page_id=201	Akershus County Municipality	County municipality, responsibilities
11	03.07.08	www.fylkesmannen.no/hovedEnkel.aspx?m=9216	Aust-Agder County Governor	County governor, responsibilities
(12)	28.07.08	www.sft.no		Documents, legal framework, guidelines for dealing with contaminated sediments. (See SFT, 2004; 2007)
13	21.07.08	http://www.gulesider.no/kart/	Gulesider	Map, Oslo fjord
(14)	23.07.08	www.stopp-giftdumpingen.org/	Neptun	Articles, news archive. (Not used.)
(15)	28.07.08	www.vegvesen.no/cs/Satellite?c=Page&cid=1152522319885&f=true&pagename=VPBjorvika%2FPage%2FVPside	Statens Vegvesen	Tunnel, Bjørvika. (Not used.)
16	31.07.08	www.bellona.no	Bellona	Meeting with authorities and experts, comments to regulation plan (News archive)

Documents: E-mail, Letters and Presentations

Ref.	Type	Date	Name/responsible	Key-year(s)	Key-word(s)
A	E-mail	25.06.08	HAV	2005	Informational meetings, comprehensive plan for remediation
B	E-mail	26.06.08	SFT	2005	Applications, permissions, meetings, hearings
(C)	Pp-presentation	2006	BI		*"Troverdighet i formidling av vanskelige budskap"* Communication, language and culture. (Not used.)
D	Letter	23.06.03	SFT	2001-2003	*Sluttdokument.* EIA, additional analysis: Closure document with comments from hearings
E	Document	18.04.05	HAV repr. by Asplan Viak AS	2005	*Forslag til reguleringsplan med reguleringsbestemmelser for spesialområde: dypvannsdeponi mellom Malmøykalven og Langøyene Nesodden og Oslo Kommuner.* Announcement of proposal for regulation plan; statements to the regulation.
F	Document	16.11.05	Oslo City Council	2005	*Reguleringsplan (Sak: 462/05*). Regulation plan for Malmøykalven
G	Document	06.12.05	MD	2005	*Nesodden kommune og Oslo kommune – innsigelse til regulerings plan for sjøområde ved Malmøykalven*. (Nesodden Municipality- and Oslo Municipality-objections to regulation plan.)
H	Letter	20.09.05	SFT	2005	*Oversendelse av tillatelse til etablering av dypvannsdeponi ved Malmøykalven og deponering av forurensede masser.* Permission for establishing deep water aquatic disposal site and disposing contaminated masses; including statements from hearing of application.
I	Letter	08.12.05	SFT	2005	*Oversendelse av tillatelse til mudring av forurensede sediment i Oslo havnedistrikt.* Permission to dredge in the Oslo harbour district; including statements from hearing of application.
J	Document	30.06.05	HAV	2005	*Søknad om etablering av dypvannsdeponi ved Malmøykalven i Oslo- og Nesodden kommuner, samt deponering av forurensede sedimenter.* Application for establishing deep water aquatic disposal site and to dispose contaminated sediments.
K	Document	28.09.05	HAV	2005	*Søknad om mudring av forurensede sediments i Oslo havnebasseng.* Application to dredge.
L	Pp-presentation	03.05.05	HAV	2005	*Informasjonsmøte - høringsutkast til helhetlig tiltaksplan for forurensede sedimenter i Oslo*
M	Pp-presentation	03.05.06	FOAM, Oslo Municipality, HAV	2006	*Fagrådets årsmøte:"Kommunal gruppe lagde utkast til plan."* Suggestions to action plan by municipal group

N	Letter	08.07.05	SFT	2005	List of recipients: Request for statements to application for establishing deep water aquatic disposal site at Malmøykalven and disposing the masses.
O	Letter	06.07.05	SFT	2005	Request for the Oslo- and Nesodden Municipalities to provide statements and make the application available to the public.
P	Document		Oslo Municipality, HAV	2001	*Konsekvensutredning av dypvannsdeponi ved Malmøykalven i Indre Oslofjord. (KU)* EIA

Q	**Letter**	**28.06.02**	**SFT**	**2002**	***Konsekvensutredning av dypvannsdeponi ved Malmøykalven i Indre Oslofjord: Krav om tilleggsutredning.*** **Request for additional assessment (EIA)**
R	Document		Oslo kommune, HAV	2005	*Helhetlig tiltaksplan for forurensede sedimenter i Oslo havnedistrikt, Forslag/vedtatt.*
S	Document	15.03.02	MD/Stortinget	2001	Stortingsmelding nr. 12 (2001-2002) ”Rent og rikt hav”. Parliamentary decree nr. 12 (2001-2002) “Pristine and abundant sea”
T	E-mail	22.07.08	SFT	1996,1998,2005	Response to questions for information concerning meetings, hearings and waterside disposals
U	Poster, document	April 2004	Oslo City		The Decision-making and Administrative Systems
V	Document	March 2008	Sediments and Society-project, NGI	2008	*”Description of Work on the work package 1 from the project sediment & society”*
W	Document	26.03.06	Green Warriors of Norway	2006	Norges Miljøvernforbund og anmeldelse/Green Warriors of Norway and their report to the police
X	Document	14.09.06	HAV	2006	HAV og anmodning om fjerning av demonstranter, HAV requires assistance from the police to remove activists
Y	Document	20.09.06	HAV	2006	HAV reports activist actions of 13 and 14 September
Z	Document	18.05.07	Oslo tingrett/District Court	2007	Dom. Sentence

2 Legal framework and the Responsible Authorities

This review was conducted for a large part by a summer student of NTNU working at NGI. Guidance in conducting the review has been given by TNO.
The remediation process of contaminated sediments involves several steps from problem identification to implementing a site specific remediation plan with subsequent monitoring and evaluations of conducted actions. The central laws-, regulations- and directives together with the responsible authorities involved in this process, are presented in this part.

The Most Central Laws, Regulations and EU-directives

Laws:
The Pollution Control Act
The Planning- and Building Act
The harbour Act
The Pilotage Act
The Norwegian Maritime Code
The Cultural Heritage Act
The Act Relating to the Municipal Health Services
The Act Relating to the Right to Environmental Information and Participation in Decision-Making Processes Relating to the Environment: Environmental Information Act

Regulations:
Ch. 9 in Regulations Relating to the Recycling of Waste (Waste Regulations): Landfilling of Waste
Ch. 22 in Regulations Relating to Pollution Control (Pollution Regulations): Dredging and Dumping at Sea and in Waterways

EU-directives:
Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste
EU Water Framework Directive 2000/60/EC of 23 October 2000

The Pollution Control Act

The responsible pollution authority is stated in § 81. The MD has delegated the responsibility to the SFT/FM* for issues related to sediments.

The content of this act does not provide solutions on how to address specific problems dealing with a contaminated seabed, but it is still central. Important decisions for the involved parties are related to:

Responsibility to avoid contamination (§ 7)
Approval to conduct actions causing pollution (§ 11)
General conditions for permit (§ 16)
Order for investigations (§ 51)

Relevant appliance:
The act opens for instructions to be established in order to prevent pollution- and mobilisation of contaminants.

Ch. 22 in Regulations Relating to Pollution Control (Pollution Regulations): Dredging and Dumping at Sea and in Waterways

The regulation is based on the Pollution Control Act and the Norwegian Maritime Code.

By law, all dredging and dumping is forbidden. It provides a framework that explains what type of work will be permitted- or not, and also which precautions have to be considered. It also gives guidelines for the sampling- and investigations that should be conducted.

The FM* is authorised to give permit for the dumping of deposits, e.g. mud, after application has been approved. The same process is valid for dredging operations, but the application then has to include a proposal for the disposal of these masses.

When deciding upon the application, focus should be on the inconvenience of pollution resulting from the actions in comparison with the overall advantages- and disadvantages caused by the actions.

This regulation is valid for cases involving both sea- and fresh water environments. In cases where masses are to be removed from land and dumped at sea, the SFT and FM have to agree on who is the responsible the authority. SFT is engaged when the ground- and sediments are contaminated. The exception is in cases where the ground is the property of a stakeholder where the FM is already involved. In several cases the SFT has delegated authority to the FM*.

The SFT/FM is responsible for arranging a hearing concerning the application.

Ch. 9 in Regulations Relating to the Recycling of Waste (Waste Regulations): Landfilling of waste

The responsible administrator of this regulation is the FM*.

The regulation for disposing waste does not include actions at sea; In this regulation the definition of a disposal does not include disposal operations at sea.

Disposal operations at sea- and in shoreline settings therefore require permit in line with the Pollution Control Act (§ 29) in cases where this regulation is not applicable.

The Planning and Building Act

The responsible authority is the local municipalities.

The act is the framework for dealing with land use in general. It provides guidelines for issues concerning planning- and building, future building projects including plans for sea areas and permits to build.

The municipality may require specific areas to be protected as part of the area plans of the municipality plans.

Planning according to the act aims at bring together state-, county- and local business interests.

The act shall provide a base for decisions made concerning the use- and preservation of resources-, expansions- and also take into consideration the esthetical aspect.

The act aims to provide the best solutions for the involved parties and the society concerning land use and settlements.

This act cannot be applied to stop- or regulate an already established traffic with emphasise to environmental issues, or to order for actions limiting pollution by those responsible for this.

§ 23 orders for regulation plans for areas subject to extensive building operations. The purpose of the regulation and instructions can be fitted to each specific area of the sea. The regulation plan can include decisions for actions dealing with sediments.

Actions in relation to contaminated sediments require application and permit (§ 93 and § 84). These instructions are especially relevant for land filling operations and subsequent disposal into the sea, and for building projects causing extensive modifications of the seabed.

An environmental impact analysis is not obligatory according to this act, but the MD is engaged (§ 33-2) in cases when contaminated sediments have to be included in the decision-making when disposing contaminated sediments on land or in the sea.

Relevant appliance:
The act is relevant for issues related to dredging, the establishment of disposal facilities at sea-, at the seashore- and on land, land filling from land into the sea and for the development of regulation plans.

The Harbour Act

For actions dealing with sediments, the responsible authority is the Coastal Administration and the local Port Authorities (the Municipality). Dumping requires permit from the Coastal Administration.

The act is aiming at securing the best setting for planning-, building- and expansion operations in harbours, and to ensure safe sailing.

Applicable for the inner waterways of Norway and additional Norwegian territory at sea. It is also valid for all other navigational waterways and for Svalbard.

It includes paragraphs that define the framework for the decision-making.

Requires statements from hearings to be collected from the Chief of Fisheries.

The Pilotage Act

The authority involved is the Coastal Administration/the central administration of the Coastal Administration.

The purpose of the act is to secure an efficient pilotage, which can provide safe operations at sea and that in effect can preserve the environment.

The Norwegian Maritime Code

The Coastal Administration and the local port authorities (the municipality) are the administrators.

The act concerns problems related to pollution from ships, and requests a general obligation for cautious actions.

The Cultural Heritage Act

The responsible administrators are the Maritime Museum/Directorate for Cultural Heritage.

The purpose of the act is to preserve the original features and diversity of the cultural monuments- and environments as part of our cultural heritage and identity, as well as a part of the comprehensive environmental- and resource administration.

The act sketches the process for the work of mapping- and discovery of monuments.

This law also calls for investigations to avoid conflict with the conservation of monuments of relevance to cultural heritage.

The responsible parties have to contact the County Municipality and check if registrations have been made in the specific area, and to decide if investigations are needed. In relation to work in harbours and/or on seabed the responsible maritime museums must be oriented. The County Municipality coordinates the case with the responsible authorities, but to make this process more efficient the initiators can send a copy to the museum responsible.

Cultural monuments can be detected when working on marine sediments. If objects/monuments of interest are discovered the work must stop immediately and the Maritime Museums/Directorate for Cultural Heritage must be oriented. A period of three weeks is required to make decisions on whether the work will continue or not. If the work continues, suggestions for further actions will also be given.

Discoveries that reveal monuments more than 100 years old will automatically be preserved according to the law. Special considerations and requirements have to be decided upon prior to this.

The Act Relating to the Municipal Health Services

The administrator of the act is the Municipality represented by the Health Care Unit/the Chief District Medical Officer.

The act serves as a guide on how the municipalities have to act to improve public health-, welfare-, good social- and environmental conditions, and also on how to prevent- and treat deceases, injuries and defects.

Council Directive 1999/31/EC of 26 April 1999 on the Landfill of Waste

The aim of this directive is to reduce the volume- or degree of danger related to waste and masses. This is preferred to simplify the process of handling-, disposing the waste- or to increase recycling.

The directive requires that the composition of the given masses must be known; Characteristics of the waste have to be documented, including information of the leakage potential of contaminants.

It can function as a tool for defining aims for the environmental quality, and ambitions on how to achieve this.

Specific criterion for accept is given, and they have to be followed.

As of today, the relation between the sediments and the directive is not fully defined.
Perspectives:
This directive does not include waste masses like sewage, recycled waste used as a resource, disposal of soil or sediments, or treated waste. Still, it can be applied in cases dealing with the management of contaminated sediments in a disposal facility.

EU Water Framework Directives

The purpose of the directive is to establish a frame to protect waters, seas, estuaries, coastal waters and groundwater.

It focuses on the eco-systems involving emissions and supplies, and to sustain the biological diversity including possibilities for improvement.

The focus is on the establishment of both local- and regional aims by 2015.
Investigations have to be conducted in order to document the state of amounts- and level, ecological- and chemical setting, and also the ecological potential buy 2015.

Human activities and the influence on surface- and groundwater conditions have to be considered.

Perspectives:
This directive does not directly describe- or deal with sediments/the sea bed, and the influence on water quality. Still, sediments can be considered a source for the introduction of contaminants. The relation between the sediments' meaning and the content of the directives is not clarified. Despite this, this directive can function as a contributor to the work of putting the quality of the environment, and ambitions for how to achieve this, on the agenda.

The Act Relating to the Right to Environmental Information and Participation in Decision-Making Processes Relating to the Environment: Environmental Information Act

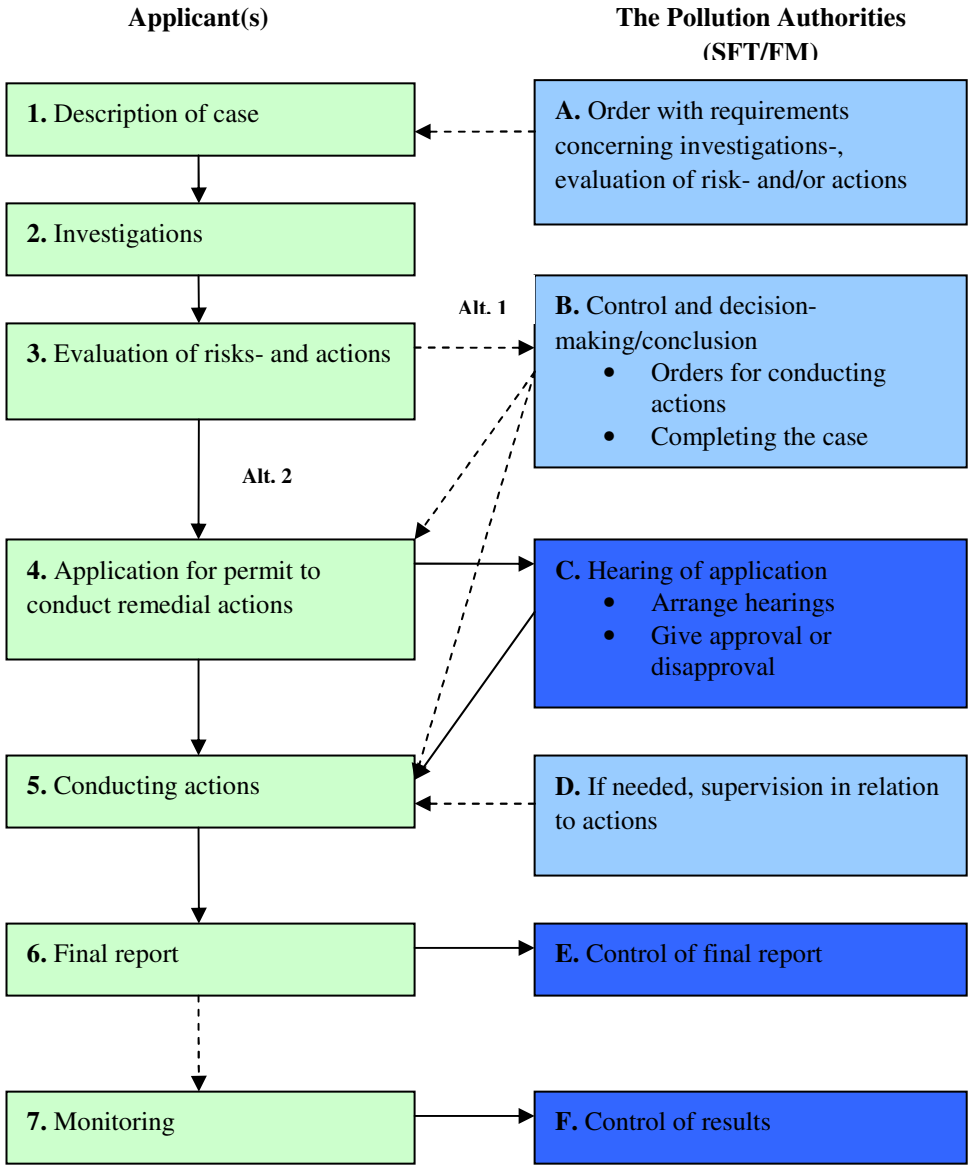
Paragraph 1 (§ 1) explains the purpose of the act:
"The purpose of this Act is to ensure public access to environmental information and thus make it easier for individuals to contribute to the protection of the environment, to

protect themselves against injury to health and environmental damage, and to influence public and private decision-makers in environmental matters. The Act is also intended to promote public participation in decision-making processes of significance relating to the environment." [2]

Box 1:
* The FM has according to regulations concerning the practise of dredging and dumping-, disposal of waste- and the Pollution Control Act the authority in land based cases. The FM is authorised to order- and approve according to the Pollution Control Act in other cases dealing with sediments on a level claiming FM as the executive authority. The SFT is the authority in all other cases that deals with contaminated sediments, but can delegate this responsibility to the FM (SFT, 2004).

The Role of the Applicant and the Pollution Authorities

This part focuses on the role of the applicant and the Pollution Authorities. The remediation process progresses in line with the laws- and regulations required by this authority. The steps to be followed by the applicant and the responsible pollution authorities (SFT/FM) are described below in accordance with the guide by SFT (2004).



The role of the applicant- and the Pollution Authorities (SFT/FM). Numbers 1-7- and letters A-F are described in more detail in the following part. The figure displays the process parallel to Figure 4 with focus on the responsibility of the applicant- and the pollution authorities. (With modifications from SFT, 2004) The scale- and nature of each case defines the problem, which will decide who is the responsible authority of the SFT or the FM. This delegation of responsibility (Box 1) is in accord with the legal framework.

The Applicant(s)

1. Description of case
The purpose of investigations or actions should be described, together with an estimate of the geographical extent- and time frame. Available and relevant information is collected to describe the problem. This information should give an overview of the current setting in the area of interest concerning the pollution state-, surrounding nature-, cultural monuments-, environmental priorities plans- and activities that might limit the plans for conducting selected actions.
Activities involving work in/on (contaminated) sediments can have an effect on a wide range of settings, e.g. harbours, waterways, nature, biologic diversity, cultural monuments and outdoor life. Sectoral authorities might therefore be involved. Relevant participants (interest groups, neighbours, activities) - and authorities should have been mapped at this stage, together with the respective legal framework required for completing the process.
Environmental goals need to be developed in accordance with plans on a national level- and other existing environmental goals. This issue has to be cleared with the local municipality or the FM. If the applicant has suggestions for defining new goals this has to be discussed with the pollution authorities at an early stage.

An environmental impact assessment (EIA) may be required.

2. Investigations
Investigations are made to acquire good descriptions of the pollution status and other factors that might influence on the evaluation- and conduction of actions. The program aimed at investigating the specific problem is developed with respect to the description of the problem, and is adjusted for consistency with superior environmental goals.

3. Evaluation of actions
A risk analysis is made with respect to the contaminated sediments in situ to estimate the need for actions. Alternative actions in relation to achieving initial aims are considered, the risk linked to different actions, the costs and the feasibility. Operations are chosen with respect to the results from investigations- and the evaluation of risks in connection with the suggested actions.
The superior environmental goal is put into action by means of achieving definite and measurable aims. This part of the process constitutes the basis for later control of the chosen actions, and for the evaluation of achievements on both a short- and long time scale. (Ref.: *6. Final report*)

4. Applying for permit to conduct remedial actions
Any work/actions in or on contaminated sediments require a specific authorisation from the Pollution Authorities. This also counts for carrying out work involving disposal solutions. The application to the pollution authorities is developed with emphasise to nr. 1-3. Alternatively, the pollution authorities can demand specific actions to be conducted by the responsible part, and state what requirements that need to be followed in order to put actions into effect.
Actions are also dependant on the requirements from the Coastal Administration and/or the municipality.

5. Conducting actions
The actions are carried out along with requirements and/or according to the permission.

6. Final report
A final report is made when actions are completed, and subsequently sent to the authority responsible for giving the permit. The report has to be sent to the pollution authorities 6 weeks after completion of actions, or other given deadline. The report should yield documentation for the accomplishments; conducted actions, measurements and results. Any deviations from the permit have to be reported together with the preventive actions used.

7. Monitoring
It is still necessary to monitor the situation when actions are carried out and completed. The aim is to evaluate the effect of the actions for a longer time scale, and to monitor (any) disposal facilities. The results of this part will decide if there is a need for continued monitoring. The collected results have to be reported to the pollution authorities (SFT/FM).

The Pollution Authorities (SFT/FM):

A/B. Requirements according to the Pollution Control Act
The Pollution Control Authorities (SFT) may initiate the process by requiring investigation, analysis and actions. Requirements are in line with the Public Administration Act (paragraphs: § 51 or § 7). The requirements from the authorities may result in extended instructions not included in the guide descriptions by SFT (2004).
Depending on the extent of the case, the SFT may delegate authority in accord with the Pollution Control Act to the FM.

C. Hearing of application and approval/disapproval
The application for permit is reviewed consistently with the Pollution Control Act and/or instructions for dredging- or dumping. In addition, the application is considered by the Coastal Administration/municipality for permit according to the harbour Act, and the local municipality in line with the Planning- and Building Act. In most cases, permit is needed from the municipality, e.g. in cases involving disposal solutions and actions conflicting plans for land use.
The municipality and SFT/FM arranges hearings. Permits with respect to new requirements- or disapprovals are issued by the Pollution Authorities (FM/SFT), the Coastal Administration and/or the municipality based on the application, hearings and evaluation of the case.

D. Supervision
The authorities can carry out audits while the work is done with respect to the permission.

E. Control of final report
The authorities examine the final report and evaluates, if needed, which steps have to be made in the following up of the project after completion.

F. Control of results
The Pollution Authorities reviews the results from the monitoring and decides whether the case needs to be followed up or not.

3 Stakeholder scoring based on the different

Stakeholders	**INFLUENCE** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**INTEREST** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**ARGUMENTATION** **Critical = 1** **Support =2**	**ROLE** **Participant =1** **Critical observer= 2** **Information supplier = 3** **Listener = 4** **Not involved = 5**	**PERCEPTION** **Individualist = 1** **Egalitarian = 2** **Hierarchists = 3**
Government Local-Regional					
Akershus County Municipality *Akershus Fylkeskommune*	4	4	2	3	3
County Governor in Oslo- and Akershus, Environmental Protection *Fylkesmannen i Oslo og Akershus, Miljøvernavdelingen*	4	4	2	1	3
Cultural Heritage Management Office in Oslo *Byantikvaren*	4	2	2	1	3
Nesodden Municipality *Nesodden commune*	4	4	1	1	3
Norwegian Road Administration, Region East *Statens Vegvesen (nå Statens vegvesen region øst)*	4	4	2	1	3
Oslo Municipality, City Goverment department of Environment-, Transport - and Communication *Oslo kommune, Byrådsavdeling for miljø og samferdsel*	4	4	2	1	3
Oslo Municipality, City Region Nordstrand	4	4	1	1	3

Stakeholders	**INFLUENCE** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**INTEREST** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**ARGUMENTATION** **Critical = 1** **Support =2**	**ROLE** **Participant =1** **Critical observer= 2** **Information supplier = 3** **Listener = 4** **Not involved = 5**	**PERCEPTION** **Individualist = 1** **Egalitarian = 2** **Hierarchists = 3**
Oslo kommune, Bydel Nordstrand					
Oslo Municipality, Health- and Welfare *Oslo kommune, Helse- og velferdsetaten*	4	4	2	1	3
Oslo Municipality, Planning- and Building fjord city development *Oslo kommune, Plan- og bygningsetaten fjordbykontoret*	4	4	2	1	3
Oslo Municipality, Water -and Discharge *Oslo kommune, Vann- og avløpsetaten*	4	4	2	1	3
Oslo Port Authorities *Oslo Havn KF (early phase)*	4	4	2	1	1
Directorate of Fisheries, Region Sør *Fiskeridirektoratet, Region South*	4	4	1	1	2
Interest groups-Local-Regional					
Bekkelaget Welfare Society/*Bekkelaget Vel*	1	3	1	1	2
Inner Oslo fjord Fishing Organisation/*Indre Oslofjord Fiskerlag*	1	3	1	2	3
"Citizen initiative at Nesodden"/ *Innebyggerinitiativet på Nesodden*	1	3	1	1	2
Nesodden Welfare Society/*Nesodden Velforbund*	3	3	1	1	2
Interestgroups-national					

Stakeholders	**INFLUENCE** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**INTEREST** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**ARGUMENTATION** **Critical = 1** **Support =2**	**ROLE** **Participant =1** **Critical observer= 2** **Information supplier = 3** **Listener = 4** **Not involved = 5**	**PERCEPTION** **Individualist = 1** **Egalitarian = 2** **Hierarchists = 3**
Green Warriors of Norway/*Norges Miljøvernforbund*	1	3	1	2	2
Bellona	3	3	1	2	2
Friends of the Earth Norway/*Norges Naturvernforbund*	3	3	2	2	2
Nature and Youth/N*atur og Ungdom*	1	3	2	2	2
Neptun	1	3	1	2	2
Government National					
Norwegian Maritime Museum/*Norsk Sjøfartsmuseum*	4	4	2	1	3
Pollution Control Authority/*SFT*	4	4	2	1	3
Citizens					
Citizen – Malmøya	1	3	1	2	2
"Public movement against dumping of pollution"/ *Folkeaksjon mot giftdumping*	3	3	1	2	2
Prominent citizen – Oslo	1	3	1	2	1
Research					
Institute of Marine Research/*Havforskningsinstituttet*	3	1	1	3	3
Norwegian Geotechnical Institute/*NGI*	3	1	2	3	3
Norwegian Institute for Water Research/*NIVA*	3	1	2	3	3

Stakeholders	**INFLUENCE** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**INTEREST** **Formal High = 4** **Informal High = 3** **Formal low = 2** **Informal low = 1**	**ARGUMENTATION** **Critical = 1** **Support =2**	**ROLE** **Participant =1** **Critical observer= 2** **Information supplier = 3** **Listener = 4** **Not involved = 5**	**PERCEPTION** **Individualist = 1** **Egalitarian = 2** **Hierarchists = 3**
Politicians local					
Politician, The Christian Democratic Party/*Kristlig Folkepartiet (KrF)*	4	4	1	4	2
Politician SV	4	4	2	4	1
Politician, "The Red Party" (RV) / *De rode*	2	4	1	4	2

4 Interview Questions for the Sediment & Society project[13]

Part 1: General information
Name:
Age:
Gender:
Highest level of education:
Function/ Organization:
Residence (municipality):

Part 2: Participation
In what way are or were you involved in the Oslo fjord Sediment Remediation project?
How would you describe your role?
When did you get involved in the Oslo fjord Sediment Remediation project? And why?
Did your opinion on the Oslo fjord Sediment Remediation project change over the duration of the project? And if so why, and how did it change?
How did you experience the decision making process in the Oslo fjord Sediment Remediation project which resulted in the selection of the deepwater disposal site as the solution?
Did you have the feeling that you could influence the choice for a certain solution in the Oslo fjord Sediment Remediation project? And if so in what way(s)?
What would you do differently if you had to do/take part in the project again?
What would be the three most important elements of an ideal decision making process, if it was up to you?

Part 3: Risk
What does the word risk mean to you?
The interviewer will show you the table with a question as displayed on the following page.

[13] 'Sediment and Society' is a research project funded by the Norwegian Research Council. The overall objective of the 'Sediment and Society' research project is to recommend an integrated management strategy for stakeholder involvement that can be implemented within the existing Norwegian national management framework for contaminated marine sediments. The project was initiated by the Norwegian Geotechnical Institute (NGI), The Norwegian Institute for Water Research (NIVA), Bioforsk and the Netherlands Institute for applied scientific research (TNO) from the Netherlands.

Question 10 – Sediment & Society

Can you please range the following items based on the risk of having a long term negative effect on people's health or causing injury. Us a scale from 1(low) to 10 (high)

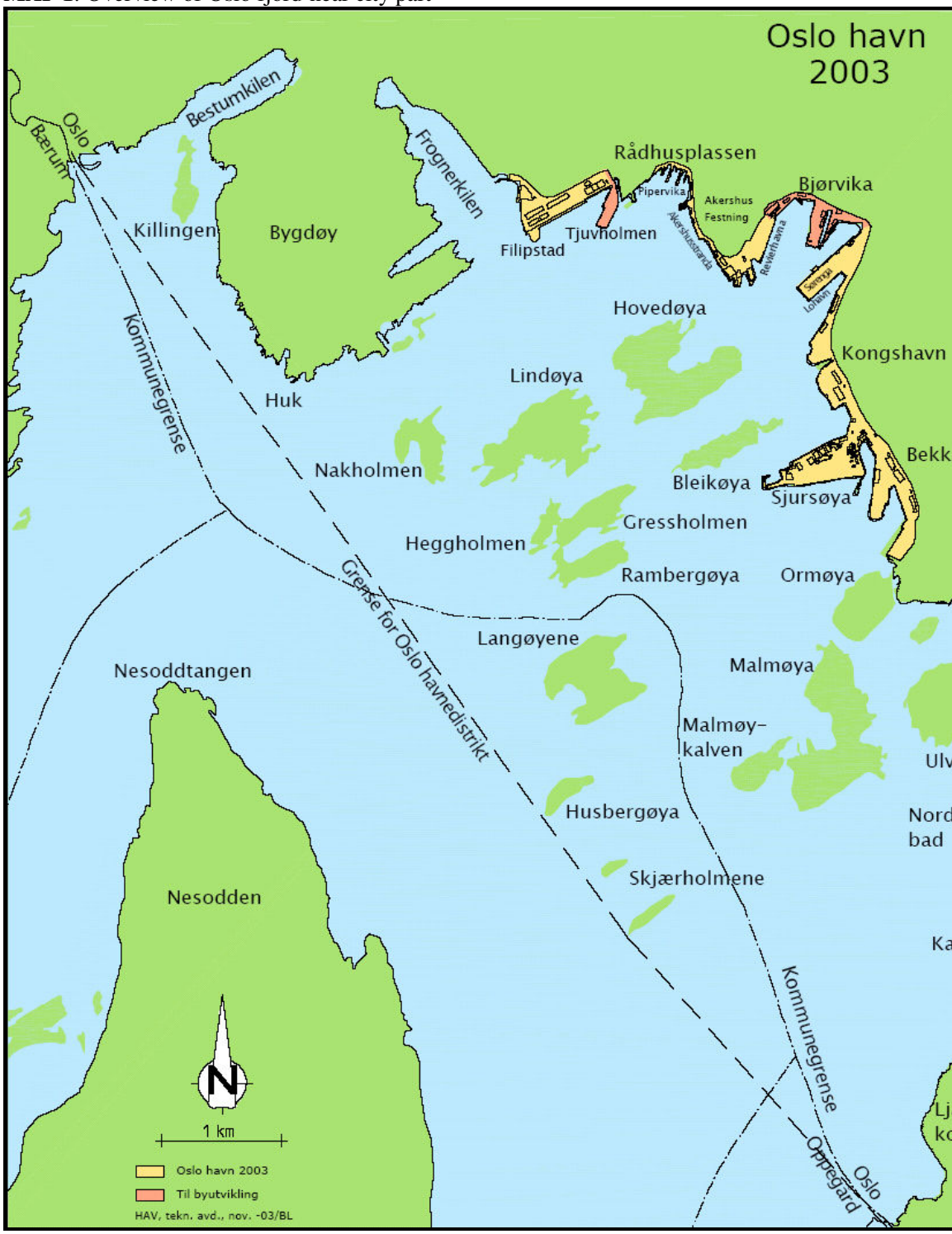
	RANKING
Driving an automobile	
The deep water disposal site at Malmøykalven	
Smoking 20 cigarettes a day	
Food additions (E-substances)	
Getting a vaccination	
Getting an X-ray taken of the chest in a good hospital	
Living 20 kilometres from a nuclear power plant	
Having a fire in your home	

Did you change your opinion about the risk of sediments after you got involved in the Oslo fjord Sediment Remediation project? If yes, can you elaborate on this: why did you change your opinion?
Which of the following solutions according to your opinion would have been the 'best' solution, and can you name three criteria that are important to you that you used to come to this decision:
deep water disposal site
land disposal at NOAH Langøya
land disposal at local site
Do you feel that the solution of deep water disposal of sediments has different risks compared to other solutions? Can you elaborate on this: why do you see it like that?

Part 4: Communication
Was the information on the Oslo fjord Sediment Remediation project you wanted easily available to you?
What are/were your main sources of information about the Oslo fjord Sediment Remediation project?
What source of information was the most reliable to you?
Was the information about the Oslo fjord Sediment Remediation project available when you needed it?
What were your most important questions concerning the Oslo fjord Sediment Remediation project? And how did you try to get answers?
Did you communicate with the Oslo fjord Sediment Remediation project? If yes how, and with whom?
If you communicated with the Oslo fjord Sediment Remediation project did you have the idea that your interests or concerns were taken seriously? If so, why or why not?

Part 5: Context
Which organization/group of individuals/individual is the main responsible for the selected solution, to your opinion? And why?
Which three organizations/group of individuals/individual, to your opinion, had most to gain from the selected solution? And why?
Which three organizations/ group of individuals/individual, to your opinion, had the most to lose from the selected solution? And why?

MAP 1: Overview of Oslo fjord-near city part



MAP 2: Overview of Oslo fjord

5 Internet survey questions for the Sediment & Society project

NR.	Question	Categories
1. General Information		
1	What is your age?	1 = 0-18 2 = 18-40 3 = 40-65 4 = older than 65
2	What is your gender?	1 = female 2 = male
3	What is your highest level of education?	1 = no formal education 2 = primary school 3 = secondary school 4 = Bachelor 5 = Master 6 = Cand. Scient. 7 = PhD
4	What is your current occupation?	1 = unemployed 2 = student 3 = retired 4 = government employed 5 = company employed 6 = other non-profit 7 = freelance/company owner
5	What is your current residence?	Postal area code
6	How did you get access to this survey	1=Direct through e-mail from TNO 2=Forwarded via e-mail
7	In what way have you participated in the debate about sediment remediation in the Oslo fjord?	1 = Not involved. I have no knowledge or an opinion about the sediment remediation of Oslo fjord. [if this answer is selected go to end] 2 =Listener. I have knowledge or an opinion about the project but, did not participate in the project or in the debate [if this answer is selected go to question 10] 3 = Knowledge supplier. I have worked with the project and gave information to others when asked or wrote these down in reports 4 = Critical observer. I have knowledge and /or an opinion about the project and participated in the debate (delivering information and views) when asked 5 = Participant. I have knowledge or an opinion about the project and participated in the debate actively (delivering information and views)

NR.	Question	Categories
In order to see how active you have been in the process and we would like you to answer the following questions		
2. Participation		
8	In what role have you participated in the debate about sediment remediation in the Oslo fjord?	1=Private person 2=Journalist 3=Non governmental organisation 4=Commercial organisation 5=Governmental organisation 6=Politician 7=Consultant / Researcher
9	When did you get/were you involved in the project or the debate concerning the sediment remediation of Oslo fjord?	1 = between 1993-2004 2 = in 2004 3 = in 2005 4 = in 2006 5 = between 2007 and the present date
10	Why did you become involved in the project or the debate concerning the sediment remediation of Oslo fjord?	1 = Because it was part of my job 2 = Because of personal interests/values; 3 = Because I represented an organisation concerned about the project
11	Where did you first hear about the project or the debate concerning the sediment remediation of Oslo fjord?	1 = in the media 2 = from a friend/neighbour 3 = from my colleagues at work 4 = within the context of my job 5 = do not remember
12	What was you opinion about the project concerning the sediment remediation of Oslo fjord when you first heard about it?	1 = solely positive 2 = partly positive 3 = either positive or negative 4 = negative 5 = solely negative
13	What is you opinion about the project concerning the sediment remediation of Oslo fjord now?	1 = solely positive 2 = partly positive 3 = either positive or negative 4 = negative 5 = solely negative
14	What was is the basis for coming to the opinion about the project? Multiple answers possible.	1 = scientific information 2 = information from media 3 = personal experience 4 = discussions with friends and neighbours 5 = other – specify in an answering field
15	Did you have the feeling that you could influence the choice of the solution for the sediment remediation of Oslo fjord?	1 = Yes 2 = To some degree 3 = No

The following statements apply to sediment remediation projects involving a lot of people, like the remediation of the Oslo fjord. We have found some items that may be important in such a process and we like to hear your opinion about them.		
3. Experience from the project		
16	On a general basis can you trust people even if they are unknown to you	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
17	Local people, organisations and companies as shoud be informed as early as possible before you take a decision about what to do.	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
18	You should according to your opinion invest resources for communication in the start of such a project (before decision is taken).	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
19	Supervision of such a project should be made by an independent governmental organisation not involved in the work	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
20	Decision on solutions should be made by governmental organizations and experts without involvement of stakeholders	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
21	Stakeholders have to be involved in the decision making process even if this means that the process will takes long time	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree

22	All information from research in such a project should be made available even if this is raw data or internal working material	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
23	Time pressure can never be a reason for politicians to take decision in such a project.	1 = Strongly agree 2 = Agree 3 = Neither agree nor disagree 4 = Disagree 5 = Strongly disagree
We like to understand more how you see the risk of sediment remediation and how you experience the risk of sediment remediation and the disposal at Malmøykalven		
4. Risk		
24	Which of the following descriptions of risk do you agree with the most?	1 = Risk is something that I want to avoid 2 = Risk is something that I can accept as long as it is regulated 3 = Risk is difficult to define because it doesn't mean anything to me 4 = Risk is a natural and could also have an upside as long as I have control
To identify how you perceive the risk of certain phenomena we would like to ask you to score the following items based on the risk of having a long term negative effect on people's health or causing injury?		
25	Driving an automobile The deep water disposal site at Malmøykalven Smoking 20 cigarettes a day Food additions (E-substances) Getting a vaccination Getting an X-ray taken of the chest in a good hospital Living 20 kilometres from a nuclear power plant Having a fire in your home	Insert a scale from 1 (low risk) to 10 (high risk). You can have many items at the same level if you see them as equal in risk
26	Did you change your opinion about the risk of unwanted accident/damage connected to contaminated sediments after you first read or heard about the sediment remediation of Oslo fjord	1 = Yes, more risky than I thought 2 = Yes, less risky than I thought 3= No change
27	In case you changed your mind what was the reason?	1 = I did not change my mind 2 = I received scientific information 4 = I received information from newspapers and television 4 = personal experience 5 = discussions with friends and neighbours 6 = other – specify in an answering field
28	To control that the sediments stay in the Malmøykalven disposal site is according to your opinion:	1 = Easy 2 = Difficult 3 = Impossible

29	If the sediments had been disposed at NOAH Langøya, how would it according to your opinion been to control that the sediments had stayed in the disposal site	1 = Easy 2 = Difficult 3 = Impossible
30	What effect do you think the disposal of sediments at Malmøykalven will have on the fjord in the future	1 = large positive effect (whole inner fjord) 2 = small positive effect (local area) 3 = none 4= small negative effect (local area) 4 = large negative effect (whole inner fjord)
31	How will the remediation of the Oslo fjord and the disposal of sediments at the Malmøykalven affect your consumption of fish/shellfish from the fjord	1 = I do not eat fish/shellfish from the fjord 2 = I will eat more fish/shellfish than before 3 = I will eat fish/shellfish as before 4 = I will not eat fish/shellfish from the fjord anymore 5 = I do not eat fish/shellfish at all
32	Will the remediation of the Oslo fjord and the disposal of sediments at the Malmøykalven affect the use of the fjord (bathing / swimming)	1 = I never bath / swim in the fjord 2 = I will bath /swim more than before 3 = I will bath /swim as before 4 = I will not bath / swim in the fjord anymore
33	Which of the following solutions would have been the best solution to deal with the contaminated sediment in Oslo fjord?	1 = deep water disposal _ Malmøykalven 2 = land disposal at NOAH Langøya 3 = local site – land reclamation 4 = another solution: specify in a box
34	How important was the following arguments for your choice of disposal solution: Facilitate a local solution Lowest risk for the marine life in Oslo fjord Lowest risk for people Low cost good conductability Avoid using a hazardous waste disposal site designed for industrial waste Local solution Added value except environmental	1 = Very Important 2 = Important 3 = Neutral 4 = Not important 5 = Absolutely not important

We would like to find how you perceive the communication in the sediment remediation project of the Oslo fjord		
5. Communication		
35	Was the information on the Oslo fjord Sediment Remediation project you wanted easily available to you?	1 = Yes 2 = No 3= Do not know
36	Was the information about the Oslo fjord Sediment Remediation project available when you needed it?	1 = Yes 2 = No
37	What are/were your main sources of information about the Oslo fjord Sediment Remediation project (multiple answers)?	1= Ren Oslo fjord web site 2= NGO web sites (Bellona, Friends of the earth Norway, Miljøvernforbundet, citizens movement, Neptun etc.) 3= Scientific reports 4= Meetings 5= Direct communication with people involved in the Ren Oslo fjord project 6= Personal experience 7= Colleagues 8= Friends and neighbors 9= Newspapers (and their websites) 10= Television 11= Other specify in box
38	What source of information was the most reliable to you?	1= Ren Oslo fjord web site 2= NGO web sites (Bellona, Friends of the earth Norway, Miljøvernforbundet, citizens movement, Neptun etc.) 3= Scientific reports 4= Meetings 5= Direct communication with people involved in the Ren Oslo fjord project 6= Personal experience 7= Colleagues 8= Friends and neighbors 9= Newspapers (and their websites) 10= Television 11= Other specify in box
39	During the communication with the people involved in the Ren Oslo fjord project, did you have the feeling that your interests and concerns were taken seriously.	1= I did not communicate with people in the project 2 = Yes 3 = No