ECOBUREAUCRATIC POWER HAMPERING MARITIME INFRASTRUCTURE PROJECTS

by

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MOTS-CLEFS

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1. INTRODUCTION

During the past 15 years executing port and fairway projects has become increasingly difficult in Finland. Rounds of permitting and appeals may take a decade. Authorities may require extensive environmental studies with ecological evaluations, cultural heritage mapping and soil sampling. Seasonal restrictions are routinely placed on dredging projects. Schedules are ruined and expensive equipment lay unused most of the year. Finally costly solutions are often imposed on projects in order to deal with environmental details.

For example the new Helsinki Port of Vuosaari first required several zoning decisions. Then about 30 environmental permits were needed. Many went through appeal rounds all the way to the highest administrative court of Finland. Even the European Commission and the European Parliament got at one stage involved into the permitting of this project which touches just a few square kilometers of Finland.

Much of the difficulties in Finland have been related to tributyltin (TBT) found in sediments. TBT has originated from ship hulls where it has been used in antifouling paints. Bureaucratic interpretations of marine protection treaties and sediment quality standards has led to a decade long court battle over a dredging permit that destroyed the city Naantali's plans for their port area development. Environmental authorities have also blocked a dredging project necessary to float out world class luxury cruisers worth billions of euros from a shipyard in Turku thus threatening thousands jobs.

In fact the new difficulty in executing maritime infrastructure projects is not limited to Finland or the European Union. From North-America to Russia a variety of ecological arguments, cultural heritage issues and theoretical interpretations of environmental legislation are used to power maritime infrastructure development to a degree that puts into question the viability of these projects and the economic activities they are supposed to serve. Is there a rational basis for this?

2. ENVIRONMENTAL IMPACTS OF DREDGING PROJECTS

Finland's environmental administration and public discourse have extensively dealt with harmful substance levels in dredged sediments. Attention typically focuses on outlier samples that exceed limit levels, even if they are not representative of the larger sample batch. The outlier figure is then compared against some guideline recommendation for the harmful substance.

Indeed, no matter what the human activity in the area, some harmful substance content of surface sediments will always exceed background levels. In certain spots, sub-samples taken from surface sediment can show significantly higher values than in the sediment slightly deeper. Moreover, limit values may ignore natural variations in substance content.

A broader perspective notes that dredging in the Baltic Sea area is predominantly earth removal from one place in the marine environment to another, which is generally a nearby sedimentation area.

When a layer about one-meter thick is scooped off the bottom and dumped on a barge, the mass mixes so that differences in harmful substance concentrations are equalized. The mass is then dumped back into the sea at the dumping site, further eliminating concentration differences. The outcome is a nearly pristine bottom at both the dredging and dumping sites (Figure 1).

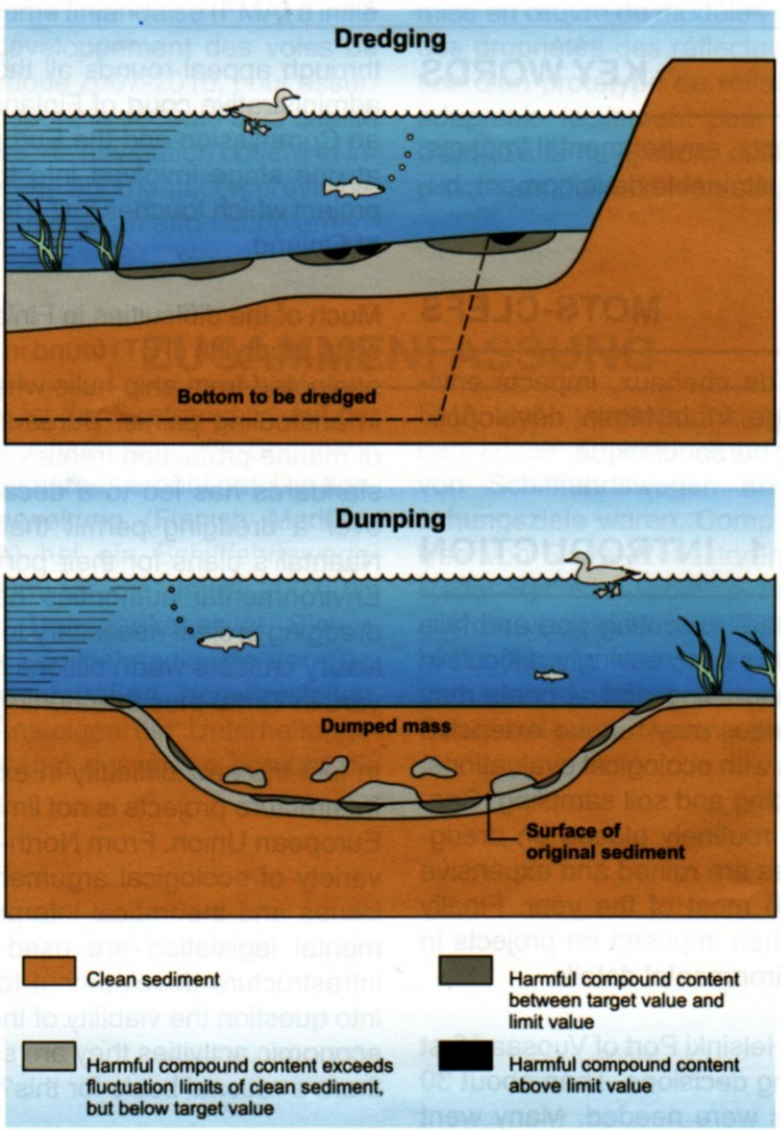


Fig 1: Impacts of dredging on the harmful substance of the biologically active surface layer at the dredging site and the dumping site

There is always some suspension connected to dredging projects. If we dredge with a bucket and dump from a barge, the total amount of suspension is in the range of 1 – 10 % of the mass of solids depending on the type of dredging. The visible suspension effects typically (but not always) disappear at a distance of 200 – 400 meters from the site. This suspension also contains harmful substances.

Let us take a look at the big picture (Figure 2 A). Typical amounts of suspension in the Baltic coastal areas on a nice day range from 2 – 4 mg/l. Thus there is at least about 2 million tons of suspended

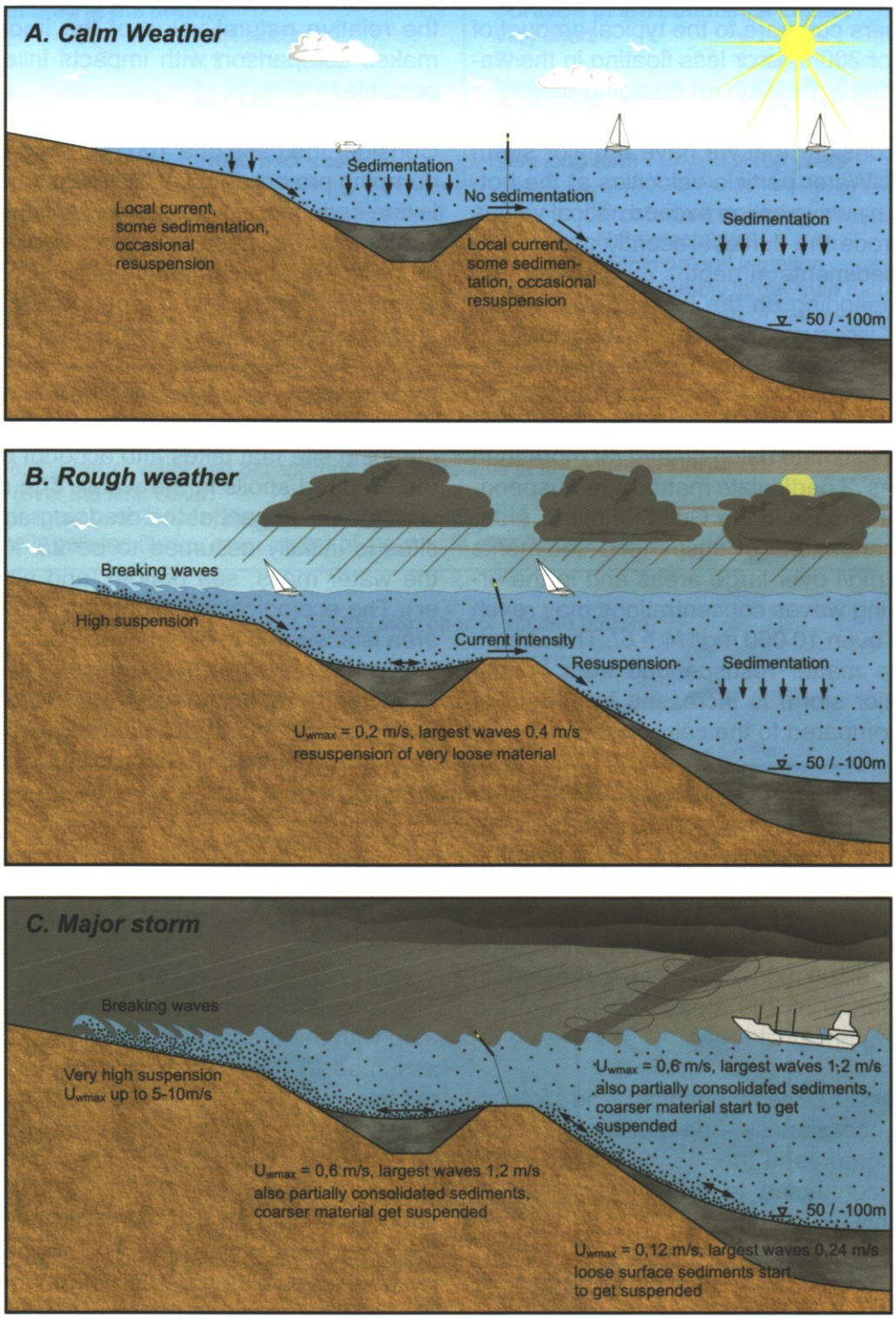


Fig. 2: Sedimentation and re-suspension patterns in the Gulf of Finland in different weather conditions

particulate matter floating in the water mass of the Gulf of Finland. This suspended matter has a similar chemical composition as surface sediments in the bottom. With a typical current velocity of 0.05 m/s and water depth of 30 meters, for example, the stream of suspended matter is of the order of 400 tons/(km x day).

These numbers compare to the typical amount of suspension of 200 tons or less floating in the water mass during a 1 million m^3 dredging project.

Now let us consider that we have a major storm (Figure 2 C). Water particle velocities at the bottom induced by wave action exceed critical values starting to erode the fluffiest recently accumulated surface sediments at depths ranging from 50 to 100 m depending on the location at the Gulf of Finland. Also currents intensify. At shallower water depths also coarser material starts to re-suspend.

Based on an estimate using /2/ and /3/ more than 10 million tons of particulate matter is re-suspended to the water mass in the Gulf of Finland. Near bottom concentrations of suspended sediments exceed 100 mg/l over large areas and in the areas of breaking waves concentrations may reach 1000 mg/l or even 10 000 mg/l /4,5,6/. The stream of particulate matter resuspended from bottom during a major storm is increased by orders of magnitude compared to the calm situation.

High concentrations of suspended solids (up to about 100 mg/l) are also observed over large areas in Baltic river estuaries especially during the peak of spring runoff.

In comparison concentration of suspended solids seldom exceed 100 mg/l even close to the bottom outside the range of 200 meters away from the dredging or dumping site.

Thus suspension, sedimentation and re-suspension in occasionally heavy concentrations are integral features in the marine environment. Suspension connected to dredging projects is marginal in this big picture.

3. SCALE ISSUES

Maritime infrastructure projects have a wide range of magnitudes (Figure 3 on the next page). However, even the biggest of them cover quite small areas compared to other human activities like forestry and farming.

One way to measure environmental impact is to multiply the relative intensity, scope, and duration of the impact. Use of a weighting factor for the relative natural value of the impacted area makes comparison with impacts in other areas possible.

Consider the case of a 100 000 m^3 dredging and dumping project. Most of the mass to be dredged is fine sediment. The average harmful substance content in the mass is less or similar to levels found in surface sediments at the dredging and dumping sites and in suspended solids in the area.

The project's footprint effect is assumed to cover the 6-hectare dredging site and a 10-hectare dumping site that takes into account dispersal of the dredged spoils in the water. The relative environmental impact at the dredging and dumping sites is initially assumed to be 25 % (we have the water mass, sea bottom, and air to consider). The ecological weighting factor for the water area is assumed to be 1.5, used here for shallow waters. The ecological condition of the bottom is expected to recover linearly over two years (initial recovery is fast, but full recovery takes longer). The footprint effect from the dredging and dumping would be:

$$I = -(0.06 + 0.10)\ km^2 \times 0.25 \times 1.5 \times 0.5 \times 2\ years$$
$$= -0.06\ km^2\ eq. \times year$$

The added cloudiness and disturbance associated with the dredging and dumping operation is assumed to have an environmental impact extending over 15 hectares around the dredging site and 30 hectares around the dumping site. The relative environmental impact is conservatively assumed to be 30 %. This includes the effect of driving off fish, which simply increases their numbers elsewhere. The weighting factor is again1.5 and the duration of the impact is essentially the same as the length of the dredging operation, i.e. three months.

Size of Investment	
Tiny	< 0,1 million euros
Very small	0,1 - 1 million euros
Small	1 - 10 million euros
Medium size	10 - 100 million euros
Large	100 - 1000 million euros
Very large	> 1000 million euros

Mass quantity	
Tiny	<1 000 m³
Very small	1 000 - 10 000 m³
Small	10 000 - 100 000 m³
Medium size	100 000 - 1 000 000m³
Large	1 000 000 - 10 000 000 m³
Very large	>10 000 000 m³

Fill or cut area in the bottom	
Tiny	< 0,1 hectares
Very small	0,1 - 1 hectares
Small	1 - 10 hectares
Medium size	10 - 100 hectares
Large	100 - 1000 hectares
Very large	>1000 hectares

Duration of environmental impact	
Very short	< 1 day
Short	1 day - 1 month
Medium	1 month - 1 year
Quite long	1 year - 10 years
Long term	10 years - 100 years
Very long term	>100 years

Suspension, sedimentation
Not detectable
In common range
10 x normal
100 x normal
1000 x normal

Current speed
Very weak, < 0,2 m/s
Weak, 0,2 - 0,5 m/s
Moderate, 0,5 - 1,0 m/s
Strong, 1,0 - 3,0 m/s
Very strong, over 3,0 m/s

Erosion on dumping sites
Not detectable
Within natural variation
Considerably larger than natural
Significant part of mass will erode
Major portion of mass will erode

Average amount of harmful compounds in dredged and dumped mass
Minor (under the target value or the background level at the dumping site)
Within the background variation at the dumping site
Dirty (over the target value and background concentrations at the dumping site)
Polluted (over the limit value)
Heavily polluted (one order of magnitude over the limit value)
Very heavily polluted (two or more orders of magnitude over the limit value)

Character of the ecosystem
Insignificant (bottom or harbor area, dumping site, poor or spoiled bottom)
Ordinary
Notable (spawning area, wandering route of the fish)
Quite important (protection area)
Very important (key area for biodiversity or ecosystem)

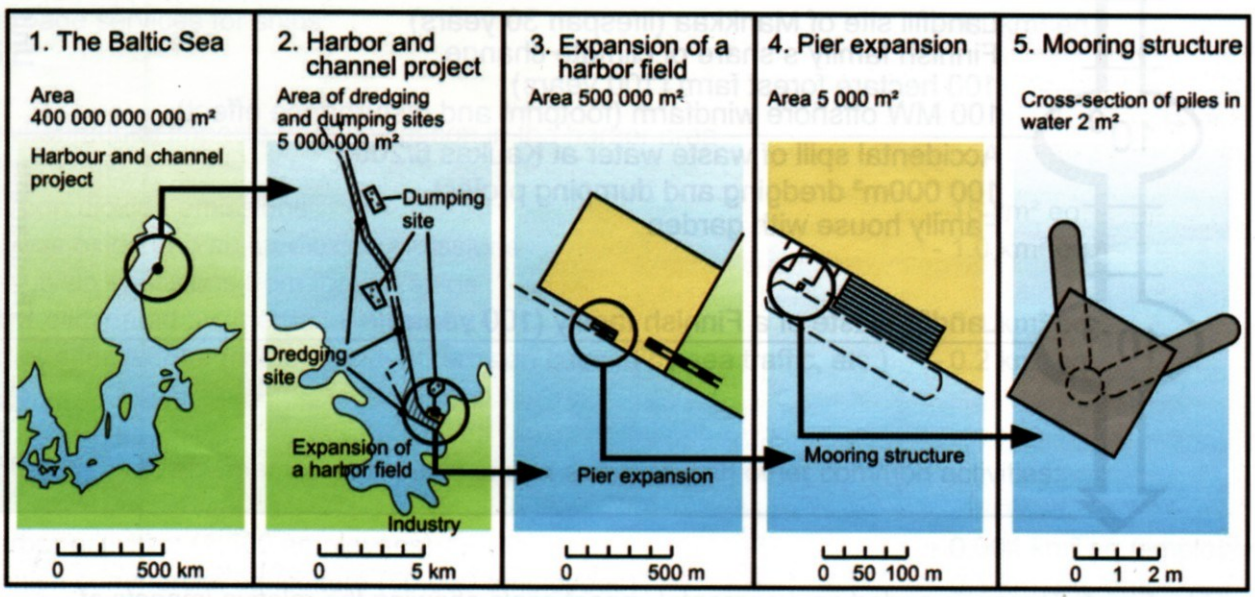


Fig. 3: Scales of magnitude considered in harbour and channel construction projects

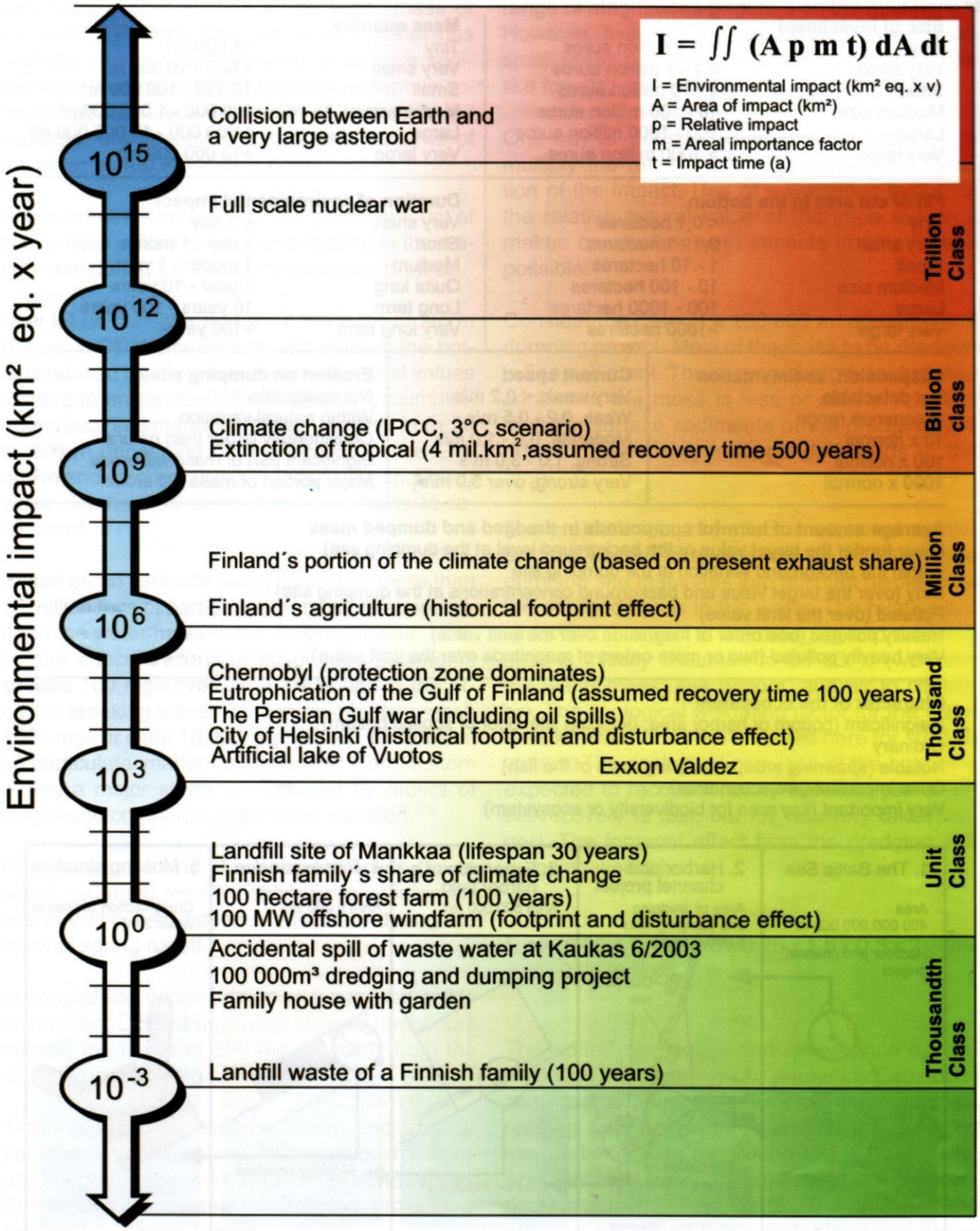


Fig. 4: The open-ended environmental impact scale showing the relative impacts of various natural and man-made events and activities

The clouding and disturbance effect is:

I = - (0.15 + 0.30) km² x 0.3 x 1.5 x 0.25 years
= - 0.05 km² eq. x year

The operation's local environmental impact value would thus be - 0.11 km² eq. x year. Harmful substances in the dredging mass are a minor factor here since the environment has adjusted to their presence.

Similar environmental impact estimates have been calculated for other phenomena, actions and activities in /1/. The results are shown in the open ended environmental impact scale in Figure 3. Here it has been assumed that the IPPC 3 degree scenario for climate change is correct. It can be readily seen that the environmental impacts of dredging projects are small compared to other human activities like energy use with the present production profile or forestry.

The annual environmental impacts of port activities and sea transportation in the port area can be estimated in a similar manner and compared to other human activities. The annual environmental impacts of a port in Southwestern Finland have been estimated as follows (see table below).

On the basis of this analysis, the best and most cost-effective way to reduce environmental impacts of port operations is to improve the efficiency of service for scheduled line vessels. If line vessels can balance traffic delays by more efficient cargo handling and service in port, fuel consumption will be reduced (a large ship uses 50 % more fuel per nautical mile at full speed than at its optimum speed). Carbon dioxide emissions are reduced as well as sulfur and nitrogen oxide emissions.

Port activities	
Carbon dioxide emissions from energy use	- 3.6 km² eq.
Harbor fields and channel areas, footprint effect	- 2.0 km² eq.
Dredging and dumping activities	- 0.1 km² eq.
General impacts of sea traffic and port activities	
Water supply and management waste water from ships	- 0.2 km² eq.
Garbage services for ships	- 0.1 km² eq.
Environmental impacts from navigation in the harbor area	
Carbon dioxide emissions	- 18 km² eq.
Nitrous oxide and sulfur dioxide emissions	- 1.0 km² eq.
Tributyltin emissions from foreign ships (now eliminated by international treaty)	- 0.1 km² eq.
Other effects, total (risk of accident, erosion caused by sea traffic, etc.)	- 0.2 km² eq.
Comparison of environmental impacts of port activities with other common activities:	
Harbor activities (1,500 employees)	- 0.004 km² eq./employee
Finnish commercial agriculture (50,000 employees)	- 0.1 km² eq./employee
Finnish forest farming (50,000 employees)	- 0.25 km² eq./employee

4. HARMFUL SUBSTANCES

Harmful substances have been among the issues that have caused serious problems to maritime infrastructure projects. In Finland environmental administration and the nationwide media have for years focused on the horrors of tributyltin (TBT). As a result of this interaction the Finnish ministry of environment issued an unofficial guideline for dredging and dumping sediments with limit values of harmful substances /7/. The lower limit value for TBT supposed to correspond to a harmless level was set at 0.003 mg/kg dry matter and the upper one supposed to correspond to polluted levels at 0.2 mg/kg dry matter.

Internationally the upper limit value generally corresponds to the so-called Maximum Acceptable Risk (MAR) concentration. If the whole bottom of a lake is covered with sediment with harmful substance concentration at MAR-level, impact on the lake ecosystem is 5 %.

Based on Dutch studies /8, 9/ a typical TBT release from a traditional ocean liner has been 0.2 kg/day. Jan-Erik Enestam, Finnish former minister of environment, has estimated in front of the parliament that the TBT-release to Finnish waters has been of the order of 20 000 kg in the 1970's and 80's and the emissions had halved by 2004 /10/. No signs of environmental impacts had been reported at that time.

When the construction of the Port of Vuosaari started, TBT was found in surface sediments. Concentrations exceeded the upper limit value in sub-samples of surface sediments over a large area. At the site of a floating repair dock the highest concentration found in a sub-sample exceeded the new upper limit value by two orders of magnitude. Dredging works were stopped until the permit issues were settled. Then the supposedly contaminated sediments were dredged behind a silt screen and an earth embankment, stored onshore and finally stabilized and placed under the harbor field. The additional cost of this operation was reportedly 10 million euros.

However, the total amount of TBT in Vuosaari sediments was 100 kg. Had the dredging operation been continued as planned, 10 kg of TBT would have re-suspended. This equals to two months release from a traditional ocean liner, legal at the time of the dredging.

When the port development of Naantali was blocked and the jobs in the Turku shipyard were threatened, the amount of TBT at issue was less than a days release from a traditional ocean liner.

According to the law one should apply best available technology, when the issue is polluting the environment. The proportionality principle states that measures should be proportional to the chosen level of protection. How could this go so horribly wrong?

5. POWER THEORY

Jan-Erik Enestam, the Finnish minister of environment said in a press release on the administrative guideline for dredging activities: "From the environmental standpoint, the guideline looks to sustainable methods, because we have no other options."

The minister was taking the view that sustainable development was somehow threatened by TBT that is no longer used and is disappearing from the environment through break-down. For some reason, the threat is acute in the specific case when a negligible amount of TBT is in the dredged mass being moved from one point in the sea to another. What could be behind this apparent insanity?

German sociologist and political thinker Max Weber defined power as the possibility of imposing one's will upon the behavior of other people /11/. Under the Weberian view, mankind is caught up in an eternal struggle for power.

Mao Zedung observed that power grows out of the barrel of a gun.

The economist John Kenneth Galbraith /12/ has pointed out that a modern state bureaucracy has a tendency to make the state an instrument of its own purposes. Power of a government organization can be increased through the use of e.g. the media, the legislative drafting process, and alliances.

When guideline interpretation ignores the actual scale of an environmental impact and the limit

values are to some degree exceeded everywhere within human touch, the environmental administration generates power capital. The minister can then use this capital in struggles over important party issues by deciding which industrial jobs have priority. The environmental administration and its research institutes can use such capital to subdue other organizations and to force them to finance environmental research and other activities.

Classic power theory says that power should be directed at the opponent's most vulnerable spot. A fifth of Finland's foreign trade will pass through the Vuosaari harbor. Helsinki submitted to the unreasonable sediment handling rules, because the environmental administration had the power to sink the project into legal disputes through never-ending permitting rounds. The environmental administration's power position was further strengthened by the fact that by killing the project it would also have sunk the City of Helsinki's plans to renew the city layout.

The roles of state research institutes and Helsingin Sanomat, the powerful nationwide newspaper is quite interesting in the TBT case (Figure 5). Since the impact of TBT in the dredging mass was not a big issue, both focused on the environmental impacts of TBT in the ecosystem instead. Research efforts were chosen to show impact and results were changed. The scale of the Vuosaari TBT problem finally emerged to the common man from a nationwide television program five years after it was told to the environmental authorities and Helsingin Sanomat. After that Helsingin Sanomat published another face saving horror story of TBT in its Science & Nature section beefed up with a forged chart as shown in Figure 5 (page 46).

This is not in any way exceptional. The history of environmental science is littered with scientific certainties that have supported the existing power structure but proved eventually to be false /13/. Falsehood, distortion and manipulation are common in modern media. Fabricating and recycling sensational stories is a way of life in an industry that is supposed to tell the truth /14/.

Danish sociologist Bengt Flyvberg gives propositions of the relationship of power and rationality /15/. The four central ones are:

- Power defines reality;
- Rationality is context-dependent; the context of rationality is power; and power blurs the dividing line between rationality and rationalization;
- Rationalization presented as rationality is a principal strategy in the exercise of power;
- The greater the power, the less the rationality.

The propositions are quite appropriate in the case of European environmental policy generally and in the Finnish TBT case specifically. When public expert institutes rationalize political objectives and administrative decisions, they are not just pursuing their own interests. They become propaganda departments for the state bureaucracy.

6. COGNITIVE DISSONANCE

Cognitive dissonance is a state of tension that occurs whenever a person holds two cognitions (ideas, attitudes, beliefs, opinions) that are psychologically inconsistent. Dissonance produces mental discomfort that may be unbearable. It is in the process of reducing dissonance that the self-justification accelerator steps in /16/.

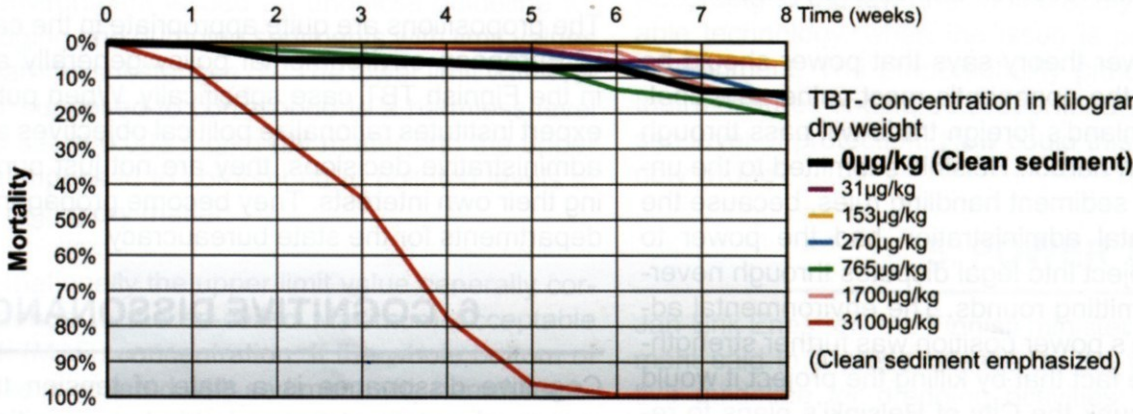
Consider the pyramid of power shown in Figure 6. (page 47). Earlier Finland had three layers of administration and the approach to governance was practical. Now there are five layers of governance and the approach is theoretical and even ideological. First the political, administrative and institutional elites push politically correct phrases, strategies and targets to the highest levels of legislation isolated in an illusion of their own excellence in world betterment. Then at the lower levels matters are exaggerated, obfuscated and conveniently reframed in a new context. Bureaucratic power has increased ten-fold by the recently built jungle of legislation, guidelines and interpretations.

After the environmental administration and the media had already destroyed projects and forced administrative subordinates to disproportional solutions, seasonal restrictions and monitoring programmes, new overwhelming evidence emerged showing that things have gone horribly wrong. Acts in the exercise of public power have been in conflict with common sense, international practise and the law.

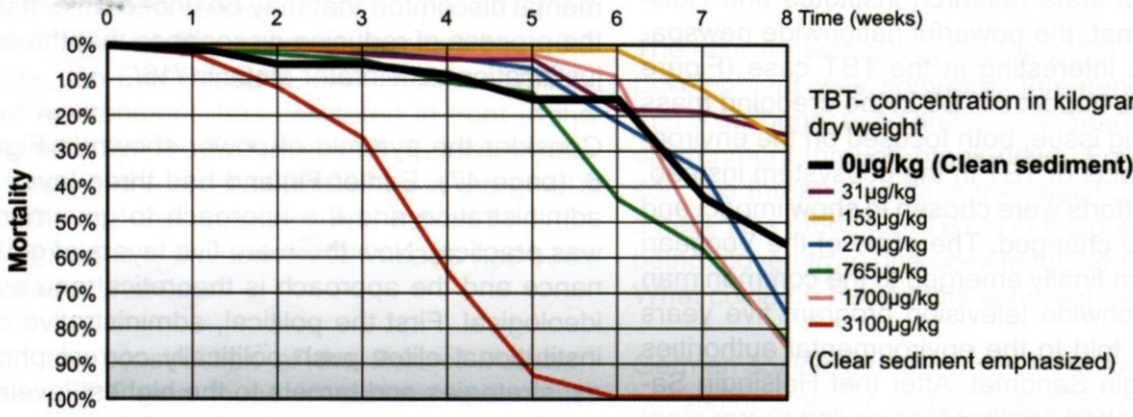
1. **Sleight of hand trick:** Change of perspective from impacts of dredging to impacts of tributyltin (TBT).

2. **Tendency:** Choice of sensitive mussel as research object, procurement of research from a reliable source and choice of method known to exaggerate the impact.

3. **Original results:** Finnish journal for professionals in the water sector 4/2006, TBT has no impact on mussel mortality at concentrations found in Finnish surface sediments.



4. **Changed results:** Chart sent to Helsingin Sanomat. Mortality increased but TBT in dredging mass has no particular effect on mussel mortality.



5. **Scientific forgery:** Chart published by Helsingin Sanomat, mortality curve in clean sediment has been removed. TBT appears to increase mortality even at low concentrations.

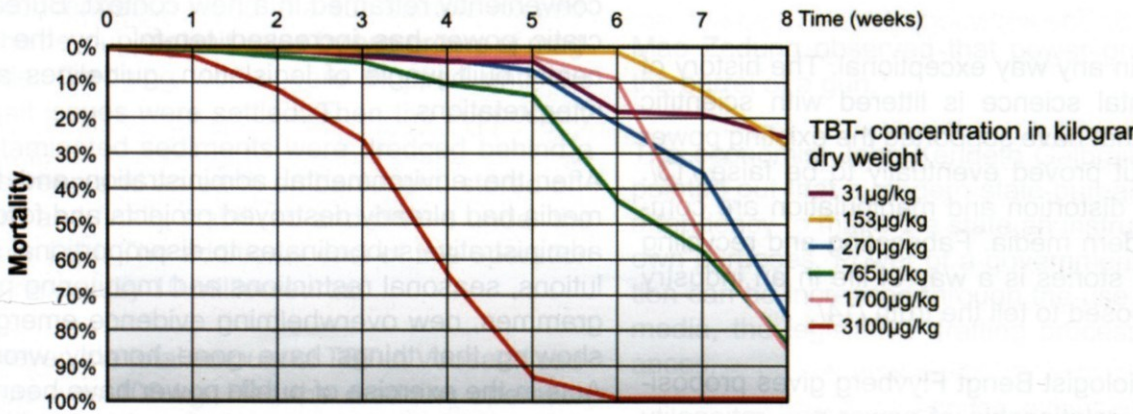


Fig. 5: Steps of manipulation aimed at restoring the credibility of the environmental administration and Helsingin Sanomat in their handling of dredging projects with a TBT-issue

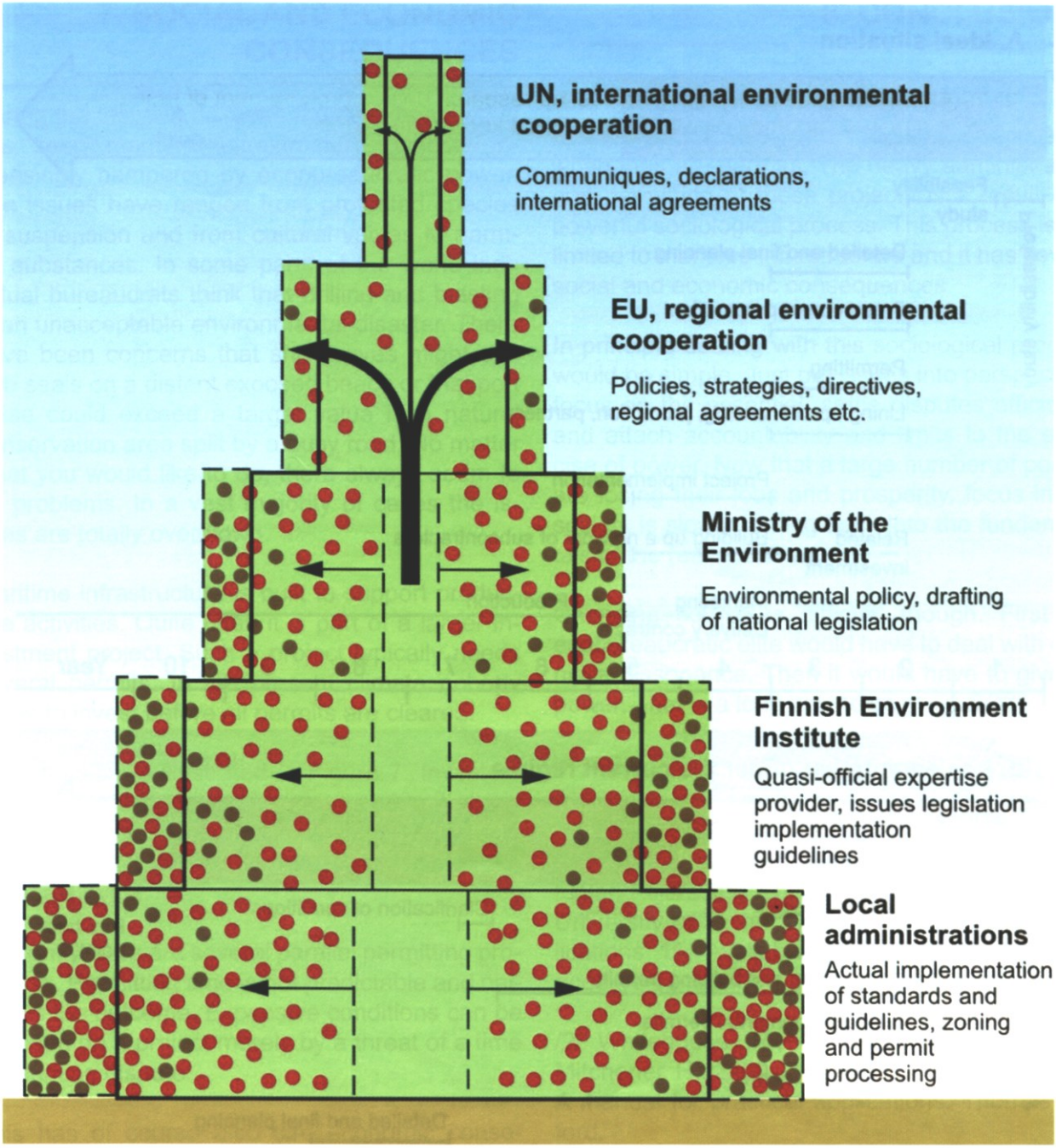


Fig. 6: The widening pyramid of power. Administrative subordinates of the environmental bureaucracy are increasingly showered with acts of power and arbitrariness.

Cognitive dissonance came into the picture here. The ecobureaucratic elite could not face its own mistakes. Neither could the power media or the institutional environmental science community. Instead of admitting errors and changing course they turned to self-justification.

First an unofficial guideline was issued to justify past administrative actions as the mass media focused in making a sensation of the Port of Vuosaari TBT issue and permitting struggle. Then narrative was changed. There was an attempt to manufacture theoretical justification by using the REACH-approach (by picking up a suitable safety factor and forgetting that the environment has already adjusted to its own chemical content) and the aquarium test (bioactivity of TBT is lower when attached to a tiny sediment particle than when mixed directly with sediment). When this is not enough, results were manipulated.

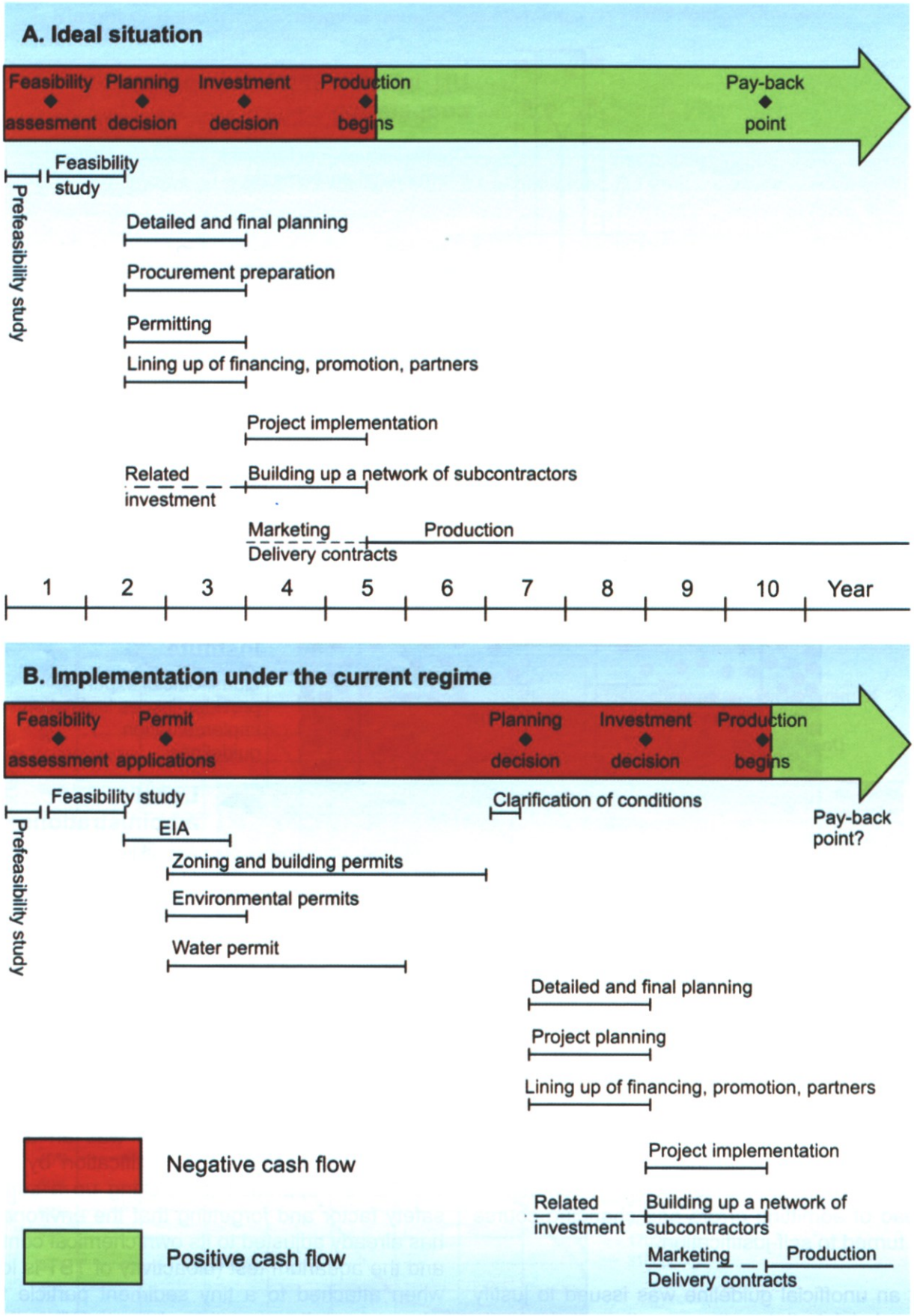


Fig. 7: The effects of the permitting process on the implementation schedule of an industrial project including maritime infrastructure – ideal and current scenario's

7. SOCIAL AND ECONOMIC CONSEQUENCES

During the last two decades the developed world has seen maritime infrastructure projects increasingly hampered by ecobureaucratic power. The issues have ranged from protected species to suspension and from cultural values to harmful substances. In some parts of the world individual bureaucrats think that drilling and blasting is an unacceptable environmental disaster. There have been concerns that ship waves might disturb seals on a distant exposed beach or that port noise could exceed a target value in a natural conservation area split by a busy road. No matter what you would like to do, there always seem to be problems. In a vast majority of cases the issues are totally overblown.

Maritime infrastructure is built to support productive activities. Quite often it is part of a larger investment project. Such a project typically needs several permits. In the present climate nobody dares to invest before all permits are cleared.

The situation is illustrated in Figure 7. Investors are looking for investment opportunities that are moving in time. If permitting is efficient, the outcome predictable and the conditions reasonable, they can invest.

Presently there are several parallel permitting processes. Permitting time is not predictable and neither is the outcome. Expensive conditions can be imposed on a project merely by a threat of a time consuming dispute.

This has of course also dire economic consequences. Real economy investment activities can't flourish in this kind of an environment. Small and medium size businesses are hardest hit. Productive activities are pushed elsewhere and with them jobs and prosperity.

Justice delayed is justice denied. Power is sweet and known for its ability to corrupt. People and organizations have the will to power and advance their own interests. When permitting processes can be dragged on for a decade they no more serve justice but have become tools of power.

8. CONCLUSIONS

Maritime infrastructure projects seldom have very harmful environmental impacts. There are reasonable measures to deal with impacts even when they are harmful. The heavy administration and permitting of these projects is a result of a powerful sociological process. This process is not limited to maritime infrastructure and it has severe social and economic consequences.

In principle dealing with this sociological process would be simple. Just put issues into perspective, focus on the essential, settle disputes efficiently and attach accountability and limits to the exercise of power. Now that a large number of people are losing their jobs and prosperity, focus in the society is slowly turning back into the fundamentals of the real economy.

Changing course is difficult, though. First the ecobureaucratic elite would have to deal with cognitive dissonance. Then it would have to give up power. That is a long way to go.

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SUMMARY

Execution of maritime infrastructure projects has recently become difficult in Finland and all over the developed world because of environmental issues. The permitting of the projects may now take a decade and the outcome is unpredictable. Heavy conditions are routinely imposed on projects.

Analysis of the scale of the environmental impacts connected to the projects indicates modest impacts. Some typical environmental details that have been used to hamper the projects are shown to be blown out of proportions. Thus there is no real justification to the recent development.

However, power theory provides an explanation. The recently built jungle of legislation, guidelines and interpretations has increased ecobureaucratic power significantly. This power is multiplied by the opportunity of sinking a project into a lengthy permitting process using the justice system.

Power is sweet and cognitive dissonance is a further obstacle for the bureaucratic elite to change course. The social and economic consequences of this sociological process are dire.

RÉSUMÉ

La réalisation de projets d'infrastructure maritime est devenue récemment difficile en Finlande et dans l'ensemble des pays développés à cause de problématiques environnementales. Les procédures d'autorisation des projets peuvent aujourd'hui prendre une décennie et le résultat final reste incertain. Des contraintes lourdes sont continuellement imposées aux projets.

L'analyse de l'échelle des impacts environnementaux liés aux projets montre qu'il s'agit d'impacts de faible ampleur. Certains aspects environnementaux typiquement mineurs utilisés pour entraver les projets s'avèrent démesurément amplifiés. Ainsi il n'y a pas de réelle justification à cette évolution récente.

Néanmoins la théorie du pouvoir fournit une explication. La jungle de législations, de recommandations et d'interprétations récemment construite a augmenté de manière significative le pouvoir bureaucratique. Ce pouvoir a été amplifié par la possibilité de faire échouer un projet par la lenteur des procédures d'autorisation et le recours au système juridique.

Le pouvoir est agréable et la dissonance cognitive est pour l'élite bureaucratique un obstacle supplémentaire au changement. Les conséquences économiques et sociales de ce processus sociologique sont dramatiques.

ZUSAMMENFASSUNG

Die Durchführung von Projekten zur maritimen Infrastruktur ist in letzter Zeit in Finnland und überall auf der entwickelten Welt wegen der zu beachtenden Umweltaspekte schwierig geworden. Die Genehmigungsverfahren derartiger Projekte können ein Jahrzehnt dauern und der Ausgang ist nicht vorhersehbar. Den Projekten werden routinemäßig schwere Auflagen erteilt.

Die Analyse des Umfangs der projektbezogenen Umwelteinflüsse zeigt, dass die Auswirkungen gering sind. Um die Unverhältnismäßigkeit zu zeigen, werden einige ökologische Details dargestellt, die verwendet wurden um Projekte zu verhindern. Daraus ergibt sich, dass es keine echte Rechtfertigung für die aktuelle Entwicklung gibt.

Die Theorie der Machtausübung liefert jedoch eine Erklärung. Der aufgebaute Dschungel aus Gesetzgebung, Richtlinien und Auslegungen hat die öko-bürokratische Macht deutlich gestärkt. Diese Macht wird noch durch die Möglichkeit verstärkt, ein Projekt durch Gerichtsverfahren in ein langwieriges Genehmigungsverfahren zu zwingen. Macht ist süß und kognitive Dissonanz ist für die bürokratische Elite ein weiteres Hindernis, den Kurs zu verändern. Die sozialen und ökonomischen Konsequenzen dieses soziologischen Prozesses sind schrecklich.