

CALL FOR PAPERS



Implementation of the polluter pays principle – example of planning for decommissioning

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Third International Conference on Environmental Economics and Investment Assessment
Environmental Economics 2010
 3 - 5 May 2010, Cyprus

ORGANIZED BY: Wessex Institute of Technology, UK
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Swedish Radiation Safety Authority

The Swedish Radiation Safety Authority

- Finance
 - Research
 - Cost – benefit analyses
 - Review of plans & cost calculations for decommissioning of nuclear facilities
 - Review of plans and cost calculation for management and disposal of nuclear waste including spent nuclear fuel
 - Analyses of level of fee required & proposal of fee to Government
 - Disbursement
- RD&D programme review
- Radioactive waste management and disposal
- Radiation protection
- Nuclear facility operational safety
- Non-proliferation

Nuclear legacy - negative value

Worldwide maybe on the order of	1 T€
Sweden total on the order of (including incurred costs)	10 G€
Decommissioning Swedish nuclear power plants	1,6 G€
Decommissioning facilities built before 1970*	0,2 G€

* Not designed for decommissioning, costs difficult to assess

New ordinance in Sweden on November 1st, 2008

Ordinance on financial action for the management of residues from nuclear technology activities.

(Förordning om finansiella åtgärder för hanteringen av restprodukter från kärnteknisk verksamhet, in Swedish). SFS 2008:715

New feature:
Covers the entire area of nuclear
technology

- concerns also small facilities and sites and
- all sizes of enterprises including small businesses

Responsible Competent Authority:
***The Swedish Radiation Safety Authority -
SSM***

The new ordinance contains authorization
from the Government to the Swedish
Radiation Safety Authority to issue
regulation as warranted and appropriate
for the implementation

This has prompted the
Swedish Radiation Safety Authority
to compile the knowledge base
required for such a regulation

- Environmental liabilities in different areas
- Legislation in various areas
- Prerequisites specific to nuclear decommissioning (Env. Econ. II, Cadiz)

The structure of this presentation

1. Definitions
2. Legacy legislation prerequisites
3. Purpose and scope
4. Environmental liabilities in some areas
5. Legislation in some areas
6. Example of small nuclear facilities
7. Some final comments

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The Swedish legal system

	Law	Ordinance	Regulation
People of Sweden	Authorisation		
Parliament	Issuing	Authorisation	
Government	Compliance	Issuing	Authorisation
Competent Authority	Compliance	Compliance	Issuing
Everyone	Compliance	Compliance	Compliance

What is required of a legislation / regulation?

The Swedish constitution states the following:

- A regulation must contain
 - a reasonable balance between different interests, and
 - the benefits must be reasonable in comparison with the costs for compliance
- All must be dealt with in an equal manner.
- There must not be any contradictions with any other legislation
- There has to be
 - a follow-up of the outcome,
 - and adjustments made as appropriate from any lessons learned
- A regulation must be simple and clear

Not legally binding documents

	Competent Authority	Branch organisations e t c
General advice	Clarify legislation + examples	
Recommendations & guidance documents	Describe good practice and best knowledge	
Standards	Seldom	Often by special institutions

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Legislation during the last few decades

- Protection of health and the environment
- Sustainable development and recycling
- Remediation
- Use of Best Available Technology (BAT)
- Equity between the generations
- Polluter Pays Principle (PPP)
 - Extended Polluter Responsibility (EPR)

Varying success rate

Staffan Westerlund professor of environmental law at the University of Uppsala:

"It is well known that environmental laws seldom function well and that environmental goals are usually not achieved. We have also become accustomed to an almost total inefficiency of regulations intended to alter environmentally inappropriate behaviour. It does not come as a surprise that concrete rules ... still 25 years after having come into force have not been implemented and enforced. Over the years, there have been so many incidences of malfunctioning of the environmental legal system that we who teach law must make a quite clear distinction between on one hand the law as it is written,... and on the other hand how it actually functions (or actually does not function)".

"Easy and straightforward" cases

- The potential polluter and its activities can be clearly identified
- The impact on health and environment can readily be measured and assessed
- The potential polluter needs a permit
- The potential polluter is rational in the selection of the best available technology

Difficult cases

- The link between the polluter and the potential impact is difficult to establish
- Remediation is to be done *long* after the activity has been terminated
- Planning is difficult to carry out *long* before the restoration is to take place

Difficult cases, in other words

- Simultaneous implementation of
 - The polluter pays principle
 - and
 - The principle of equity between generations

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Purpose of the present paper

- To illustrate how *the polluter pays principle* and *the principle of solidarity between generations* can be implemented simultaneously even in cases where the planning is difficult

Scope of the present paper is to summarize the following

- Examples of implementation of these principles
- Relevant legislation
- Prerequisites for financial planning for decommissioning of nuclear facilities

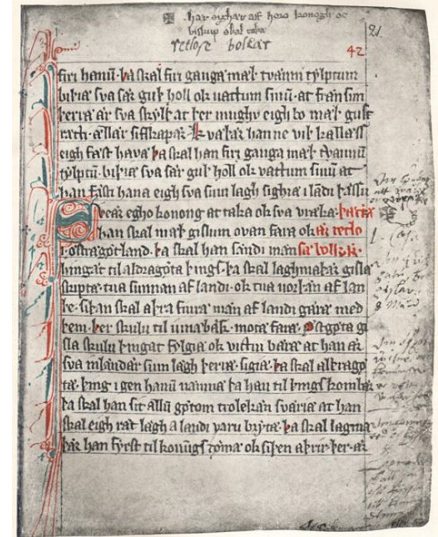
This presentation

1. Definitions
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3. Purpose and scope
4. Environmental liabilities in some areas
 1. Forestry
 2. Mining, beneficiation and contaminated soil
 3. Offshore
 4. Nuclear technology
5. Legislation in some areas
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The older Westgothia law

- Oldest written law in Sweden
- From around 1220
- Based on tradition of recitation of entire law annually at the court

Contains statements on protection of certain trees and forests



In the year 1639, our Queen Kristina banned burn-beating by the penalty of banishment



Förbud om Swedjande uti Bergslagen

gene: samt om thezas belöning, som sådant tillkänna gifwa. Dar. Hwbro then 19 Martii 1639.

MA Christina ic. Gode witterligt, at efter som Wi hafwe fattat och nu wtilgen af trycket latit utgå och publicera et Placat, ther med Wi althwar och strengeligen huide alle Wåre Underfåtare, som boendes äro i Bergslagen, efter thessa dag at hålla inne med alt Swedjande och stadeligt skogsbruk, efter som Wåre Bergebruk ther af i längden för mangel på skog och wed, her och märkelig skada tagandes warda; omfödt Wi wåre Landshöfdingar och Befalningsmän hafwa befallat, här öfwer noga infående hafwa, och tillbedeligen låta straffa them, som the bestäma at fördrifva sig emot Wårt Mandat at handla och bryta: lihwil på ther at Wår althwarlige wijse theste flitigare må blifwa efterkommen, wese Wi uti thetta Wårt dyne bref alle Wåre trogne Underfåtare uti kemälte Bergslagen förmanne hafwa, at ther the förnimma någon emot Wårt Förbud at handla, the så sådant Wåre Landshöfdingar, Befalningsmän och Vänsmän tillkänna gifwa. Och wese Wi nådijst unna och efterlåta honom, som någon ther med beslar och ther updræter, at han then tredje denning af the böder ther falla kunna, skal bekomma. Här alle och hwar och en i sonnerhet hafwe sig fulkomligt at efterlåta. Til hytternera wijso ic. Datum ut supra.

(L. S.)

Gabriel Oxenstierna, Clas Horn, Carl Gyldenhielm,
 Eustaff / S. B. Drogter, i R. Mart, sällr. S. B. Amiral,
 Axel Oxenstierna, Gabriel Oxenstierna,
 S. B. Kamler, S. B. Statthållare.

Early Swedish environmental legislation

Ban on burn-beating by the penalty of banishment.

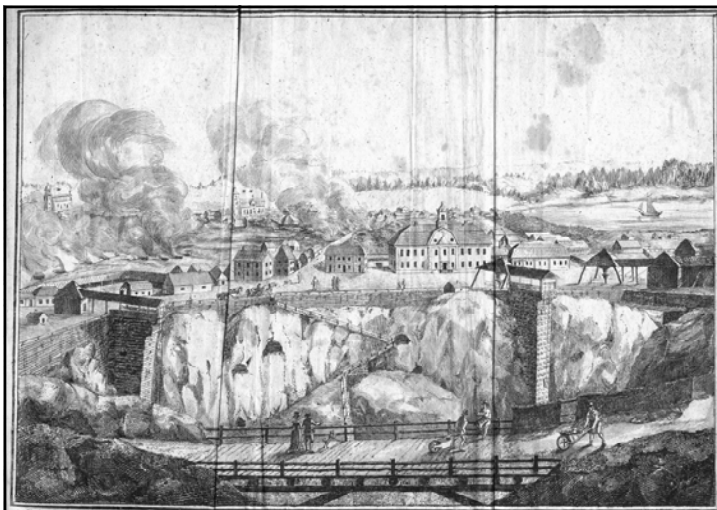
Queen Kristina, March 18th 1639.

The Swedish Forestry Act

- First issued in 1903
(at which time our forests were converted from old-forests to actively managed ones)
- Requirements on replanting
- Includes buyers
- Includes securities

The Falun copper mine

- In operation already in 1288, now closed
- Beneficiation in two steps (simplified)
 - 1) Roasting:
copper sulphide + air =>
sulphur dioxide + copper oxide
 - 2) Reduction:
copper oxide + charcoal => copper
- Roasting away from mine to avoid health problems for miners, see next view



The Falun copper mine at around the year 1780

Releases

- Health problem for miners and others
- Detrimental to the crops
- + Plague never reached the area

- Heated environmental debate from the 17th century and onwards
- Eventually a court decision prohibited roasting during the growing season

Today

- Large volumes of tailings "everywhere" in and outside the town of Falun
- Surprisingly little influence on the environment of today
- Chemistry of incorporation of heavy elements in tailings and sediments not so well understood

Cyprus - copper

- Dominating source of copper in the ancient world
- A total of about 250 000 tonnes were beneficiated from dawn of history to end of Roman era
- 2 million tonnes of slag were generated in the process
- 150 000 km² of forest was used for the reduction
- Ecological disaster



Oil-shale and shale ash

- 50 hectares, 100 meters high, around 40 Mm³
- Residues from oil production during 1940 – 1965
- Various stages of pyrolysis and combustion
- Still burning
- Hazardous waste(?) according to EU hazardous waste directive
- Essentially un-investigated
- Sulfides may oxidize with time to form acid that dissolves heavy elements

There are many old mine tailings that need remediation

- Most of the remediations of old sites require public financing
- Annual public spending is for somewhat above M€ 50
- According to the Swedish Environmental Protection Agency:
this is insufficient even to remediate those with the highest risks before the year 2050

Offshore - huge structures



Offshore – huge structures

also under water



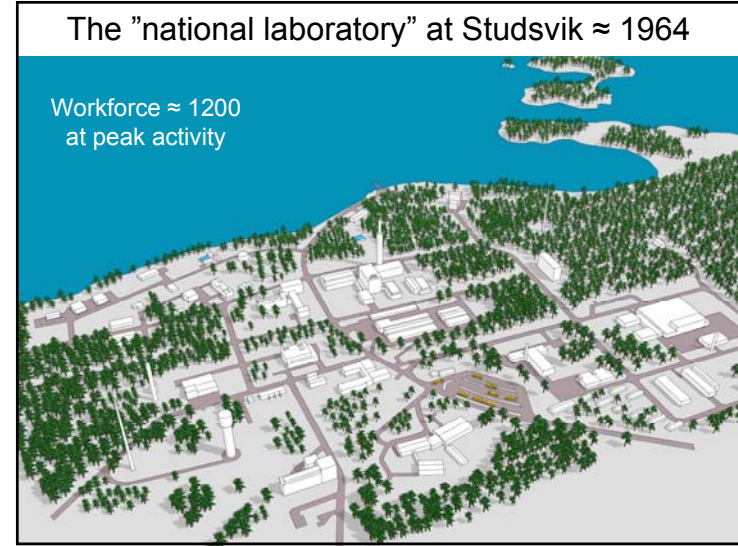
Offshore

- There are no offshore rigs for oil production in Swedish waters
- Internationally – major area of environmental liability
- All structures are to be removed except sub-seabed installations
- Cost raisers include hazardous waste
- It has been estimated that UK liability alone is on the order of 35 G€
- Dealt with by consortia



The Ågesta nuclear power plant in operation 1963-1973

Sweden one of six countries to build first nuclear power reactors



The "national laboratory" at Studsvik ≈ 1964

Workforce ≈ 1200 at peak activity

3D drawing - reconstruction

- Based on
 - plan from the book "The architect in the nuclear age" published in 1964
 - Contemporary areal photos (especially for heights of buildings)

The architect in the nuclear age

- Compilation of best contemporary (1964) knowledge on nuclear facility design
- Makes no mentioning of contamination, decommissioning or waste
- Subsequently, these areas have constituted substantial technical and financial challenges
- Why?

Some general observations - or lessons learned - from all the areas

- Future costs are often underestimated
- The uncertainty is often high
- Specific cost raisers important
- Early calculations essential for financial reasons
- More difficult when facilities are closed and there are no revenues
- Culture important, e.g. forestry
- Safeguarding by securities

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 2. The Swedish environmental code
 3. Financial reporting legislation
 4. Criminal law
6. Example of small nuclear facilities
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Nuclear technology legislation

- The Radiation Protection Act
- Act on Nuclear Activities
- Nuclear Liability Act
 - with securities and segregated funds to cover the following
 - 1) the anticipated costs for decommissioning and waste management etc, and
 - 2) a risk fee intended to cover the risk that the Government takes in its management of the fund system

The new ordinance

- Those eligible must submit every third year a cost calculation comprising the following:
 - the total best estimate for the cost for decommissioning and waste management
 - the expected remaining time of operation
 - the proposed proportions between securities and assets in a segregated fund
- Duty of Swedish Radiation Safety Authority:
 - To review the material submitted
 - To decide on fee and on exemption

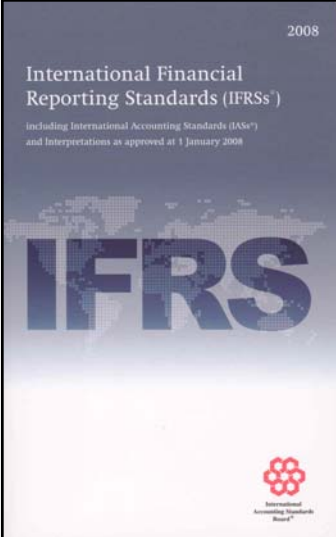
The Swedish Environmental code

“Persons who pursue or have pursued an activity or taken a measure that causes damage or detriment to the environment shall be responsible, until such time as the damage or detriment ceases, for remedying it to the extent deemed reasonable ...”.

The Code also states that permits issued under the code may be associated with requirements on securities corresponding to all future costs.

The Swedish penal code

- Anyone who declares figures that are not correct so that the books no longer present an “*essentially correct financial situation*” may be sentenced to jail for at most six years
- “*Essentially correct*” might mean $< \pm 30 \%$
- Thus:
make sure to explain uncertainty!



2008
International Financial Reporting Standards (IFRSs)
including International Accounting Standards (IASs) and Interpretations as approved at 1 January 2008

IFRS International Financial Reporting Standards
IAS International Accounting Standards

- The financial reporting must include all environmental liabilities
- Contains stringent requirements on how environmental liabilities are to be assessed and reported
- Exact cost estimates are to be conducted and reported each year
- If difficulties are encountered in estimating the costs, then scenarios should be presented and their relative probabilities declared
- ❖ Industrial standard on how this is to be carried out in practice: :
“*Standard guide for costs and liabilities for environmental matters.*”
ASTM standard E 2137-06.
Approved on November 1st, 2006.

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Example of small nuclear facilities & new ordinance

- The Government authorises the Swedish Radiation Safety Authority to issue regulation as warranted and appropriate for implementation
- Tempting to assume that limits should be based on complexity and risks associated with (previous) permits under
 - *Radiation Protection Act and*
 - *Act on Nuclear Activities*
- However, weak links to complexity and costs for decommissioning (in most cases)

Example of small nuclear facilities & new ordinance, cont

- Instead, differentiation should be based on costs for decommissioning
- Notoriously difficult to assess? Adequate planning => $\pm 15\%$, at least in favourable cases.
(Prerequisites presented at Env Econ II).
- Proportionality principle? Such planning is required already under the financial laws and the penal law.

Possible alternatives for securing financing

- *Exemption*
- Securities
 - Limited in time
 - *Unlimited in time*
- (Insurance)
- Funds
 - Internal
 - *Segregated*

Exemption

- Complications will arise if system of finance harsher than other requirements
- Small companies need not declare environmental liabilities under kSEK 25 (about k€ 2,4 and k\$ 3,4)
- A similar limit exists in the tax domain
=> liabilities below at least kSEK 25 (or similar) should be exempted

Boundary between [time unlimited] securities and [segregated] funds

- No feature was found to support any particular level of boundary
- There is a certain amount of administration associated with a fund => level not too low.
- A segregated fund is a more robust alternative than securities => level not too high
- Perhaps MSEK 1,00 (about k€ 96 and k\$ 135) is maybe a reasonable compromise
- For short term liabilities, securities should suffice (provided that the business in question is financially sound)

What to do with existing facilities?

- Ordinarily, money is collected during the useful lifetime
- For older facilities it might appear reasonable to implement liability over time
- Not compatible with financial legislation
- However, possible to start with securities and gradually collect money in segregated funds

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Final comments - 1

- Complex considerations required when the following principles are to be applied simultaneously:
 - Polluter pays principle
 - Equity between generations principle
- The timing of the planning is frequently dictated by financial considerations

Final comments - 2

- Sustainability is not really a modern innovation
- According to the Westgothia law mentioned earlier, land belonged to the clan
 - It was passed on to children when they married
 - It could be sold outside the clan only after a court ruling

Final comments - 3

- Research suggests that an individual will sacrifice consumption to benefit future generations only if there exists a guarantee that others will also do so
 - <= Modern bodies are needed for the ancient tasks of the clan and the court.
- On the whole, we have to be the "ombudsman" for the future generations
- But we do have access to the values of one future generation, namely the young generation, and this will be dealt with in another presentation at this conference

