E. PANEL DISCUSSION ON WASTE DISPOSAL IN NATURAL WATER BODIES

with

Tom Pedersen, Stella Swanson and David Chambers

E.1. Panel Discussion - Panelists

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Panelists:

Tom Pedersen is a geochemist and author of numerous research reports and scientific papers on underwater disposal, including many for MEND. At present he is a professor in Earth and Ocean Sciences at the University of British Columbia in Vancouver.

Stella Swanson is an aquatic biologist/toxicologist with Golder Associates Ltd. in Calgary. Dr. Swanson has broad experience in the effects of human activities on ecosystems, ranging from industry to municipalities to agriculture. Her work has included in-depth studies of the chemical partitioning and food chain transfer of radionuclides, metals, and chlorinated organic compounds in both aquatic and terrestrial systems. Stella has also conducted research into the health of aquatic and terrestrial ecosystems exposed to above-background levels of metals, organic compounds and radionuclides. Stella has had extensive involvement with the development and performance of Environmental Effects Monitoring (EEM) programs.

David Chambers is the president of the CENTER for SCIENCE in PUBLIC PARTICIPATION, a non-profit corporation formed to provide technical assistance on mining and water quality to public interest groups and tribal governments. Dr. Chambers has served as an advisor on the environmental effects of mining projects both nationally and internationally.

Format:
The three panelists, Tom Pedersen, Stella Swanson and Dave Chambers, were introduced. In the first round, each panelist was asked to respond to the following three questions.

Question 1.
What are the main gaps in our present understanding?

Question 2.
Based on our current understanding, under what conditions should waste disposal in natural water bodies be or not be permitted?

Question 3.
Are there any practical research projects that could be initiated that would increase our understanding and radically change the assessment of potential impacts?

In the second round, each panelist was given the opportunity to respond to questions from the other panelists. They were then asked to respond to questions from the audience.

Round 1 – Response to Questions

Tom Pedersen

Above questions were addressed by Tom Pedersen as part of his presentation. Overheads used for his presentation are given in Section D.7.

David Chambers.

An overview of the presentation highlighting environmental concerns associated with disposal of mine wastes in natural water bodies is given below. These are further explained in the attached article "A Brief Overview of the Environmental Concerns with the Subaqueous Disposal of Metal Mine Tailings in Natural Water Bodies" (Section E.1a.).

Response to Question 1.

- Technical issues and policy are entwined - need to try to distinguish between the two.
- Need to provide technical advice and identify what is technically and economically feasible. The parties in the debate have probably already established their policy positions.
- Lots of areas that need research were identified today. Other areas that need to be considered are:
  - Magnitude of metal uptake via benthic organisms through digestive process.
  - How does this affect organisms
  - Deposition of tailings changes physical and chemical environment of lake bottom
  - Exposure of bottom dwellers.
  - Modification of food-web structure in lakes due to chemical changes - species density and distribution are altered; this effects food chain - downstream effects on fish population
  - Burial of existing benthic biota - mining disposal, even for short term can have significant effect on bottom fish and crab.
  - Geochemical/Biological/Physical Reworking of Mine Wastes - concern for remobilization - changing currents, turbidity currents, underwater slides relocate mine wastes - organisms recolonize in waste and effect stability - new speciation due to modification

Response to Question 2.

- Disposal permitted?
  - Definitely Not in riverine systems.
  - Lakes possibly - if can be converted back to lake after mine closure. Need to predict if once lake has been converted to waste disposal facilities that it be later converted back - need to be honest. For purposes of mitigation planning, it should be assumed that it will not be possible to return all pre-existing aquatic functions.
  - In the Unites States - this will never be possible based on current legislation. From the public standpoint - lake disposal will never be an option, lakes are too important.

Response to Question 3.

Practical research projects

- Magnitude/modification of food web - more work for public to be comfortable
- Burial of benthic biota
- Modeling of waste dispersal is improving, still needs improvements
- More site specific data, otherwise limits accuracy

As an overall note. In the case of land disposal, one can get to the mine waste after disposal. With lake/ocean disposal, once placed can not get it back. Need to ask public "How much risk are you willing to accept to allow lake/marine disposal"?

Stella Swanson
The responses to Questions 1, 2 and 3 are outlined in the overheads in Section E.1b.

Round Two - Response to Other Panelists

Tom Pedersen

- Must employ responsible risk assessment for disposal options
- With respect to ecological impact - must consider natural lakes for responsible disposal - long-term stewardship
- With risk assessment, must also consider risk of placing waste on land. Regulators are prone to saying "Thou shalt not put tailings in water".

David Chambers.
Risk assessment should be done. Option needs more refinement in order to be acceptable to the public. The purpose of the risk assessment should clearly be to define the risks, not to provide the framework – or worse, the justification – for making a decision as to whether these risks are acceptable. Must realize that significant risk to put waste in water. Wastes move around more; so remobilization of metals is higher. Better geochemisty is needed. Risk has to be quantified; how to get to the tailings if deposited in lake/on land. There are pros and cons to both sides. Acceptance of risks for each option.

Tom Pedersen
The location must be considered as part of the assessment. Disposal site should be well-selected i.e. no racing currents. Coastal waters accumulate natural sediment at deposition rates of one to several cm per year. In some lakes the tailings are also quickly covered. Ecological risk diminishes each year as natural sediment thickness increased. The amount of biota getting into tailings declines as the depth of the overlying sediment cover increases.

Stella Swanson
For lake disposal the tailings should be moved to the deepest part of the lake. Shallow waters are more problematic. Beware of arsenic, as speciation very complex. Risk assessment - long ways to go in communicating the benefits and acceptability of this evaluating technique. The main challenge with application of risk assessment is risk communication. One approach to explaining risk that has worked for me (Stella Swanson) is to say that risk assessment answers three main questions: (1) how safe is it? (2) How sure are we? (3) Is that safe enough? These three questions help frame the explanation of the risk analysis (question 1); dealing with uncertainty (question 2), and dealing with the acceptability of risk (question 3). Questions 1 and 2 can be answered by science. Question 3 must be answered with the help of public input.