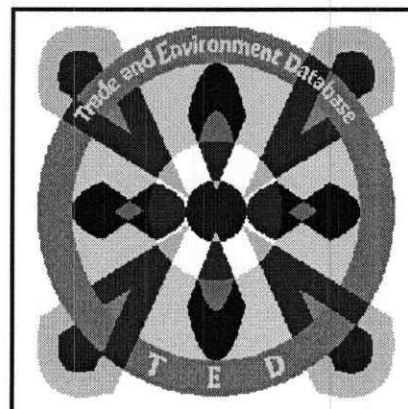


TED Case Studies

Bolivia Gold Mining

[● Go to All TED Cases](#)



CASE NUMBER: 267
CASE MNEMONIC: KOMSO
CASE NAME: Komsomolets Radiation Disaster

A. IDENTIFICATION

1. The [ssue

On 7 April, 1989, after thirty-nine days at sea, the Soviet nuclear sub Komsomolets sank in the Barents Sea off the coast of Norway. Forty-two officers in the Soviet navy perished, while most of the officers who did survive escaped with serious injuries. The Komsomolets was unique among submarines in the Soviet navy. It was a 6400 ton forerunner of a new class of nuclear submarines. The Komsomolets also had capabilities beyond those of American submarines. It was able to dive deeper than its predecessors and the advanced nuclear reactor propelled it to speeds faster than any other submarine. It was made of titanium, a stronger metal than conventional materials, but also more expensive. On 7 April, however, none of the supposedly superior aspects of the submarine prevented it from disaster. When fire broke out in the stern of the ship, it quickly spread to other compartments. After surfacing, the intense pressure from the fire was too much for the titanium hull as high pressured oxygen ruptured the hull. The ship sank to the bottom of the sea bed, 1700 meters below the surface. In the ensuing months, specialists initially concluded that the wreck posed little threat to the surrounding ecosystem. But as the years passed evidence of potential environmental damage mounted, pushing officials to announce structural deficiencies in the wreck, and the possibility of plutonium leakage into the sea by 1995. The potential damage to the local ecosystem is enormous and irrevocable. It is one of the richest fishing areas in the world; trade in fisheries, valued at billions of dollars annually, is in jeopardy

2. Description

The Komsomolets is not the only nuclear submarine to experience such a major accident. Four other Soviet nuclear subs and two American vessels are supposedly resting at the bottom of the sea. While the other accidents have been mostly forgotten by the press and public, the Komosolets still demands public scrutiny because of its location and potential environmental damage. It is feared that leaks from the nuclear reactor and torpedoes could imperil rich arctic fisheries, causing massive losses in revenue for several nations.

It was only in the last couple of years that the potential damage from the ship was recognized. As late as April of 1993, Russian officials were still claiming (not without warrant) that leaks were "insignificant" and posed no threat to the surrounding

environment. It was around this time, however, that environmental repercussions from the accident were first being realized. In an interview on Russian television, Tengiz Nikolayevich Borisov, Chairman of the Specialized Underwater Work of the Russian Federation Government and a primary scientist tasked with examining the accident, discussed the problems with the wreck. After several underwater submersible missions to the site, it became apparent that sea water was eroding the casings of the warheads and the hull of the submarine. This erosion was perpetuated by rapidly shifting currents, which hastened the corrosive process. Borisov frankly admitted there was a real danger of leakage, originally not predicted (if at all) for many years. The reason, ironically, lies in the construction of the submarine itself. Steel components and alloys based on magnesium and aluminum corrode at enormous speeds in the presence of titanium; thus plutonium is predicted to enter the sea at some point in 1995.

Borisov predicted that in the summer of 1994, scientists might be able to "buy some time," because a massive operation to either raise the submarine or somehow remove the weapons would take years to plan. Previous expeditions which examined the possible extrication of the sub, concluded this would likely not be possible because of structural decay and corrosion. If the ship breaks up in the process, it might exacerbate any environmental damage. Therefore a mission was planned to seal some of the cracks during the summer of 1994 and forestall the predicted seepage in 1995. This precluded some damage and gave scientists more time to plan another scheme to eradicate the problem.

When the expedition reached the wreck during the summer of 1994, scientists were surprised to discover some plutonium leakage. One of the sub's two torpedoes equipped with nuclear warheads appeared to have broke, releasing twenty-two pounds of plutonium into direct contact with the ocean. The expedition was successful in closing some of the holes in the hull of the sub. However, although radioactive levels were low last summer, expedition scientists warn that the rest of the sub must be sealed soon, or else plutonium may show up in the food chain.

Norwegian authorities, who have vested trade interests in the region, and scientists concur with this point. It was previously argued that the severe depth of the submarine would preclude detrimental effects to organisms. But scientists have since articulated a plausible scenario illustrating the damaging effects. They are most concerned with the alternating cold and warm ocean currents that can transport contaminated plankton from the depths around the wreck toward the surface where the organisms can be eaten by fish. They are also worried about sea water flowing between the inner titanium and outer steel shells of the material. Additionally, the torpedo casings are especially vulnerable and dangerous. The plutonium released can likely attach to titanium flakes and spread throughout the sea.

Scientists are currently considering three options to eradicate the problem. The first and most expensive proposition is to raise the sub. A Dutch firm estimates that this could cost somewhere in the range of \$1 billion dollars. But more importantly, most analysts believe this option to be the most hazardous. The submarine has corroded to a point where it is unlikely to stay intact during such an operation. This would worsen environmental problems if it were to break up on its ascent. The second option is to raise only the bow of the craft (section with the torpedoes). But this option has been set aside, since the leakage has rendered the weapons unstable. Because of corrosion, movement of the weapons could cause them to explode. The third and most likely option is to encase the submarine by hermetically sealing it with a jelly substance from crustacean shells containing one to two percent chitosan. It is postulated that this chitinous gel can bind radionuclides better than concrete, as originally

postulated A few years after this operation, the warheads could be safely removed. Scientists stress that the warheads must be removed; half-life for plutonium-239 is 24,000 years. The interim sealing process will give scientists time to devise such a plan. The sealing operation will commence in the summer of 1995.

The effects of the Komsomolets accident go beyond ecological consequences. There are trade repercussions also. Several European nations fish in the region very close to the exact location where the wreck is submerged. Ecological consequences threaten billions of dollars in revenue from sales of fish to Russia and Europe. There has already been a decrease of fishing in the area, due to minor contamination levels and the perceived threat of future, more extensive, contamination. Once the encasing operation is completed, fishing operations should return to the area in a relatively short period of time. Russia has since been heavily criticized, not so much for the accident itself (accidents of this sort do happen), but because it could have been prevented and more should have been done to rectify the situation. Nevertheless, efforts to quash the potential ecological side-effects are proceeding. It remains to be seen, however, whether or not such efforts will be successful. The aforementioned operation to seal the warheads is scheduled for this summer.

3. Related Cases:

CHERNOB case
ARCTIC case
JAPANSEA case
MURUROA case
JAPANPL case
TEMELIN case

Keyword Clusters

(1): Trade Product = FISH
 (2): Bio-geography = OCEAN
 (3): Environmental Problem = Species Loss Sea [SPLS]

4. Draft Author: Vincent P. Bonner

II Legal Filters

5. Discourse and Status: Disagreement and Incomplete

The loss of a nuclear sub is a unique event, and as such, is not covered by an international agreement. Any means of solving a subsequent problem (such as potential pollution by the Komsomolets), must be worked out on an ad hoc basis. In this example, Russia is primarily working with Norway, which has the most to lose if said pollution effects the environment as forecasted. Since there has been minor damage to the environment thus far, most analyses are only informed speculation at best. This will probably prove to be an important consideration in the future as different parties may adhere to different extremes of the exact nature of the problem.

6. Forum and Scope: Russia and Unilateral

At this point there is no deliberative body that can broker a solution. Russia and Norway are directly involved and hence will be the primary parties in discussing the future course of action. Other European nations, such as Finland, Sweden, the United Kingdom, and Iceland fish in the Barents and Norwegian Seas and therefore have a stake in the situation. The United States has a vital interest in the Komsomolets also, though not for

environmental or trade reasons. The US is interested because they to have lost nuclear subs and are intrigued by methods to salvage the operation.

7. Decision Breadth: 2 (Russia and Norway)

In addition to Norway and Russia, some other nations utilize resources from the Barents Sea area. They include, but are not limited to, European nations.

8. Legal Standing: Law

Given the capricious state of Russian affairs, one might easily envisage legislators demanding some sort of action depending on what experts predict. They could easily be swayed by nationalism or by the populace as a whole. The Russians are also concerned that a salvage operation may result in a diffusion of sensitive technology to other nations.

C. Geographic Filters

9. Geographic Locations:

- a. Domain: EUROPE
- b. Site: Northern Europe
- c. Impact: Russia

10. Sub-National Factors: No

11. Type of Habitat: COOL

D. Trade Filters

12. Type of Measure: Regulatory Standard [REGSTD]

Because the full extent of any contamination has not been determined, a precise measure of trade damage is not yet possible. Additionally, it is only in the last year, that some contamination is being reported. There has been some effect thus far on trade patterns. Norway however, has reported that some importers, such as France, have raised questions regarding the quality of its marine exports from the Barents Sea region. And, tens of thousands of workers are potentially affected by the pollution.

13. Direct versus Indirect Impact: Direct

14. Relation of Trade Measures to Resource Impact

- a. Directly related: NO
- b. Indirectly related: YES FISH
- c. Not related: NO
- d. Process related: YES Habitat Loss

15. Trade Product Identification: FISH

The discharge of plutonium-239 from the torpedoes warheads, assuming it occurs, will take place in bursts and will continue for several years. Its consequences will be catastrophic. This section of the world ocean is one of the most biologically productive. Eighty percent of the fish caught in the Barents and Norwegian Seas are caught precisely in the region where the Komsomolets went down. Since plutonium has a half-life of 24,000 years, this part of the sea may be unsuitable for fishing for 600-700 years.

16. Economic Data

There is no precise data available as yet. Estimates vary somewhat, depending on the source. Most sources claim that the

financial damage to Norway alone will be a loss of revenue in the range of hundreds of millions of dollars annually, hopefully paid by Russia. Over a five year period, the damage to the fishing economy of the region is estimated to be around 3.5 trillion rubles (roughly \$3 billion in 1993 prices). This would be added to the \$500 million annually that will have to be disbursed to Norway to recoup sustained lost revenue.

17. Impact of Trade Restriction: LOW

The estimated loss in revenue to certain nations which fish in the effected areas is the only indication of the potential consequences that might arise.

18. Industry Sector: Fish

19. Exporter and Importer: NORWAY and MANY

Norway has the most to lose from the pollution. At stake is the rich fishing industry, and by extension, the fish processing industry in the area, which brings in at least \$500 million annually and employs thousands of workers. Other nations also fish in the area, including Russia.

E. Environment Filters

20. Environmental Problem Type: Habitat loss

Those who believe that the situation is exaggerated point to the great depth of the submarine. They rightly emphasize that few fish have their habitat at these depths. But according to environmental experts, this misses a crucial factor. Leaking plutonium will be absorbed by phtoplankton, thus instigating a possible uncontrollable spread of radioactivity. This spread is further exacerbated when fish in the Barents and Norwegian Seas feed on the plankton. Experts also reckon that levels of radioactivity would be 10,000 times more toxic than arsenic. This would render the area unsuitable for fishing operations for hundreds of years.

21. Species

Name:	MANY
Type:	MANY
Diversity:	150 higher plants per 10,000 km/sq (Russia)

22. Resource Impact: High and Product

The potential impact is high, effecting the marine environment for centuries. According to a report to Russian President Boris Yeltsin from the Atomic Energy Ministry, the area is one of the productive spawning grounds for fish in the world.

23. Urgency of Problem: High and Hundreds of Years

Some plutonium-239 has been observed leaking from the submarine already, and, when coupled with potential absorption by phtoplankton and subsequent movement through the food chain, thus presents an imminent problem. Furthermore, if the situation is not remedied soon, the potential damage can last hundreds of years.

24. Substitutes: LIKE Products

25. Culture: No

26. Human Rights: No

27. Trans-Boundary Issues: Yes

The issue affects Russia and Norway the most. The success or failure of the operation to halt potential environmental damage will have a direct effect on Norway.

28. Relevant Literature

Baiduzhy, Andrei, "Russia has only a year left to render the Komsomolets harmless," Current Digest of the Post-Soviet Press, 27 October, 1993, v. 45, n. 39, p. 24.

Boston Globe Editorial, "Nuclear Sub Corroding in Barents," 24 January 1993, p.16.

Broad, William, J. "Russians Seal Nuclear Sub on Sea Floor," New York Times, 8 September 1994, A7.

Elliott, Lawrence, "Mayday on a Nuclear Sub," Reader's Digest, November 1993, Vol. 143, No. 859, pp. 95-101.

Kurchtov, Col. A., "They Want to Behead the Komsomolets: Our Descendants are Unlikely to Forgive us For the Execution," Moscow Rossiyskaya Gazeta, 11 October 1994, p.3, translated by the Foreign Broadcast Information Service, London.

Lean, Geoffrey, "Russian Dumps 20 N-Reactors at Sea; Yeltsin Learns Full Scale of Horror," London Observer, 11 April 1993, p. 1.

Mozgovoy, Aleksander, in the Moscow Rossiyskaya Gazeta, First Edition, p. 2, 26 January, 1993, translated by the Foreign Broadcast Information Service, London.

Nenashev, Sergei, "Raising the Komsomolets," Soviet Life, November 1991, n. 11, p. 58.

Westerwoudt, Theo, "Sealing a Radioactive Grave," World Press Review, December 1994, Vol. 41, No. 12, p.44.

"Heavy Costs for Russia is Sunken Komsomolets Leaks," Moscow 2x2 Television, 16 June 1994.

"Sunken sub corroding, could release "plutonium soup," Moscow Ostankino Television First Channel, 20 November 1993.

"Program to waterproof Komsomolets to continue in 1995," Moscow Interfax, 23 July 1994, translated by the Foreign Broadcast Information Service, London.

"Expedition to Study Submarine's Warheads, Moscow Ostankino Television First Channel, and Orbita Networks, 3 August 1993.

Federal Broadcast Information Service, London, Moscow Interfax "Exclusive" Report, 4 November, 1993.

● [Go to Super Page](#)

1/11/97