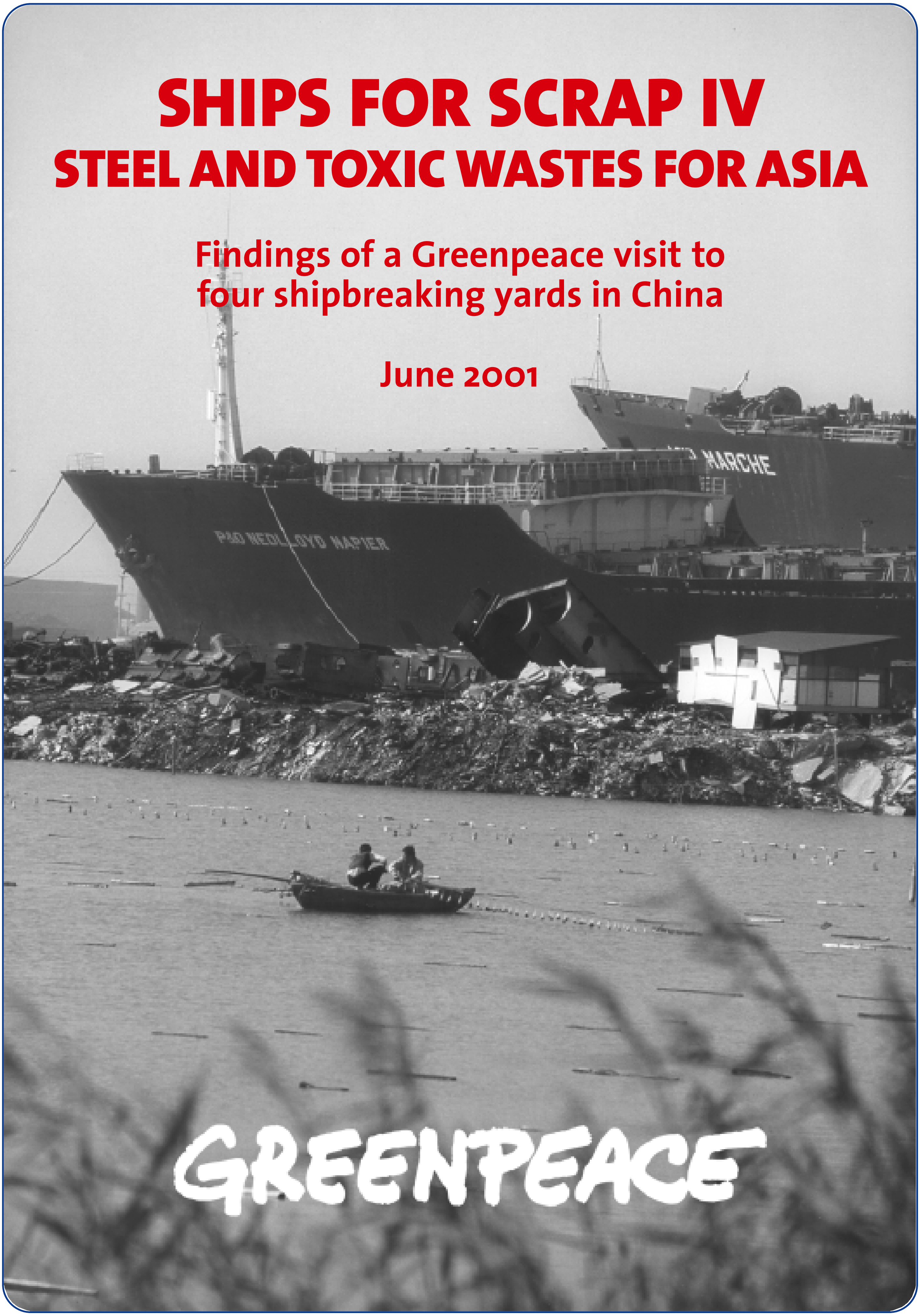
SHIPS FOR SCRAP IV
STEEL AND TOXIC WASTES FOR ASIA

Findings of a Greenpeace visit to four shipbreaking yards in China

June 2001



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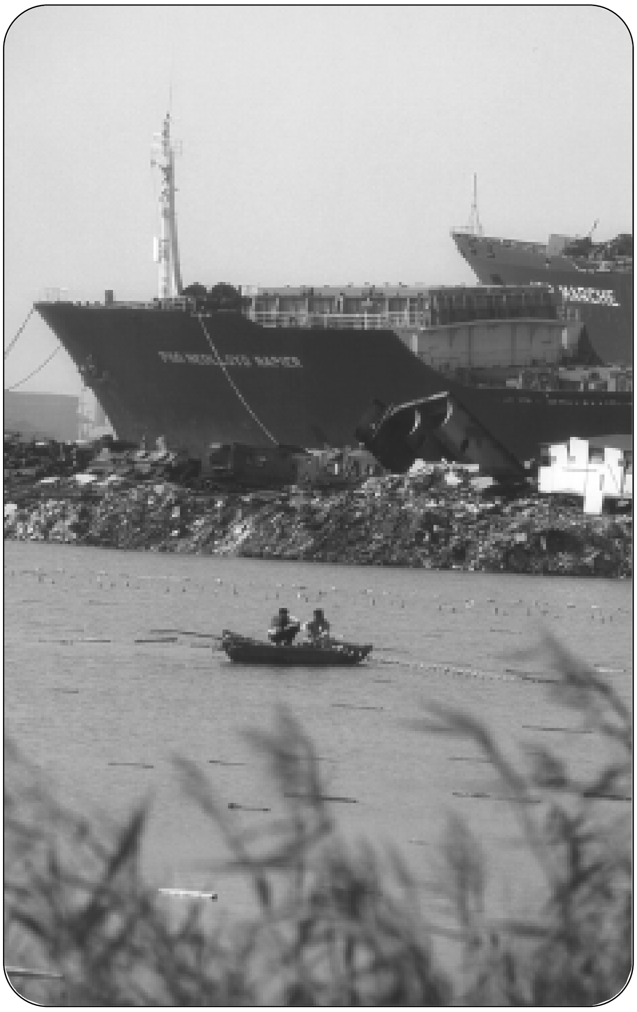

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Summary

Western companies are using Asia, including China, as a dumping ground for ships whose working lives have expired. Greenpeace decided to investigate the conditions at the Chinese shipbreaking yards. Greenpeace's investigations covered four yards – two located on the Yangtze River and two on the Pearl River delta.

1. Chang Jiang Shipbreaking Yard,operated by the China National Shipbreaking Corporation in Jiang Yin,on the Yangtze river, China
2. Zhangjiagang Yuanwang Iron & Steel Co. Ltd,Deji, on the Yangtze river, China
3. Gujing Shipbreaking Company, Xinhui City. Guangdong Province (Joint venture by Xinhui City and China State Shipbreaking Company), on the Pearl river delta, China
4. Shuangshui Shipbreaking Company, Xinhui City. Guangdong Province,on the Pearl river delta, China

Greenpeace's investigations focused on the environmental and working conditions at the shipbreaking yards, paying particular attention to the handling of hazardous substances. The study also involved sampling and analyses of sediments from the vicinity of the yards to indicate the extent of contamination due to shipbreaking activity. The objective of the study was to get an impression of working and environmental conditions on Chinese yards and a first indication on the levels of contamination caused by breaking ships.

The study finds that workers' health and the environment at the Chinese yards are constantly put at risk by toxic substances from the ships and the unsafe working conditions on the premises. Generally, insufficient protection is provided for workers and no real measures are in place to prevent environmental contamination. Compared with OECD standards, the working and environmental conditions in Chinese yards are unacceptable.

Western ships that arrive at the Chinese yards still contain toxic substances on board the vessel, inherent in their structure and as an integral part of their machinery and equipment. That they are released during the shipbreaking process is reflected in the analyses of the samples taken. The reference samples indicate that the sediments in the Pearl and Yangtze rivers contain little or none of the pollutants investigated. The samples taken from the vicinity of the yards indicate that the breaking up of ships has polluted the sediments of the local environment of the Yangtze river and Pearl river delta with mineral oil, heavy metals, PAHs, PCBs and organotin compounds. The levels of many of the pollutants found in the river environment from shipbreaking are high enough to warrant clean-up action as per Dutch standards. Dumping of western ships will inevitably contribute to contamination in Asia.

Based on these findings, Greenpeace once again stresses the need to stop dumping hazardous waste in Asia. Old ships should be decontaminated before being sent to Asia. This case also shows that handling and disposing and disposing of hazardous waste are not carried out in a way that meets existing standards in OECD countries. Even if western companies send protective gear, train local workers and try to guide the breaking operations, they fail to meet even minimum standards. It should be concluded that saving money by sending hazardous waste to Asia can not be accepted as a responsible practice.

Supported by this new evidence Greenpeace demands are:

1. Shipowners/operators must present a complete inventory of all hazardous material on board the vessel, making a register of the pollutants and analysis of the dangers from the ships;
2. The Polluter (Shipowner/operators) must decontaminate the ships-for-scrap prior to export;
3. Shipbreaking should be conducted without risk to workers health or to the environment;
4. Tankers must be made gas-free for hot works prior to export for breaking;
5. Shipowners/operators must disclose the selected shipbreaking facility and the assessment done to ascertain good working conditions and environmental record;
6. Shipowners and shipbreakers must carry out extensive consultations on the breaking plan and put in place expert monitoring;
7. Shipbreaking facilities should be freely accessible by citizen groups, environmental NGOs and trade union activists;
8. Shipbreaking should be subject to a global regulatory regime, rather than being a matter of unilateral measures.

Looking ahead,Greenpeace demands that:

1. Existing ships should be made progressively cleaner, by systematically removing, and replacing toxic and hazardous substances during maintenance, repair, refitting and rebuilding programmes;

2. The 'next generation' of ships should be 'clean ships,' i.e. ships that are designed and constructed with a view to eliminating their environmental, health and safety implications upon decommissioning.

As it is evident from the above demands, Greenpeace is not opposed to either the shipping or the shipbreaking industry. Greenpeace will,however, actively oppose the export of ships that are not decontaminated, and we will continue to stand up against unsound breaking practices that threaten workers' health and the environment.

1. Introduction

Since 1998 Greenpeace has drawn attention to the poor conditions under which ocean-going ships are scrapped. Ships are broken up primarily in Asian countries, such as India, Bangladesh, Pakistan and China. Ships are broken with practically no measures taken to protect the environment and workers.In India and Bangladesh ships are beached at high tide and broken on the spot with oxyacetylene or oxygen-LPG torches. Hazardous substances contained within the structure of the ships end up in the sea or on the beach. Workers are constanty threatened by accidents, not to mention the exposure to hazardous substances such as asbestos and heavy materials (see Greenpeace reports on India, 1999 and 2001 and ILO report, 2001).

Going by first impressions, conditions in Chinese shipbreaking yards may seem to be better. Vessels are broken up along quays and parts that are removed from the ships are hoisted to land with cranes.However, earlier visits by Greenpeace to Chinese shipbreaking yards discovered that the environmental and worker safety conditions at these yards were poor (see Greenpeace report on China, 1999). The visits found that hazardous wastes from the Chinese yards were indiscriminately dumped and ended up in the aquatic environment. The workers were ill-protected and not equiped to deal with hazardous substances.

Following critcism from Greenpeace,some shipping companies in Western Europe decided to send their ships to China to be broken up (Hamburg Sud and P&O Nedlloyd).Greenpeace does not see this as a solution. In fact, Greenpeace considers this merely an attempt to hide the problem. Ship owners should decontaminate their ships of hazardous substances prior to their export to Asian shipbreaking yards. The shipping industry, the shipbreakers and the shipbreaking country governments must jointly improve the conditions at the shipbreaking yards. Most importantly, shipbuilders and international regulators must ensure that the next generation of ships are designed for easy and safe scrapping and built using minimal or no hazardous substances.

In early 2000, the Anglo-Dutch shipping company P&O Nedlloyd (PON) announced that it had concluded an agreement to cooperate with a Chinese shipbreaker, in Jiang Yin. In a meeting with PON regarding this collaboration, Greenpeace expressed its appreciation of PON's implicit acknowledgement of the problems with the scrapping of ships, and of its efforts to improve conditions in the Chinese breaker's yard. Greenpeace asked the company to remove hazardous substances from the ships prior to their export to China for scrapping. PON refused to do this. In the fall of 2000, when it was found that PON was actually sending ships to China to be scrapped, Greenpeace decided to investigate the conditions at the Chinese shipbreaking yards to which western companies send their old ships, particularly PON's partner yard.

PON refused to cooperate with the investigation of the yard. In November 2000, a Sino-Dutch team of Greenpeace investigators visited four yards in China. This report describes the results of this mission.

Shipbreaking yards in China

In China, shipbreaking is concentrated around the two large rivers, the Pearl and the Yangtze. Several shipbreaking yards dot these rivers. They are usually situated on small plots of land with a number of quays and cranes. The number of active yards depends on the economic situation. In 1993, China had 45.9 % (1.72 million draught tons) of the world ship scrapping business and was the leading ship-breaking nation. The introduction of new taxes made the economic conditions far less attractive for shipbreaking in China. As a result, there was a significant slump in shipbreaking activity and China became a minor receiver of vessels (varying between 2-7%).(DNV, 1999)

Greenpeace found that many yards were closed and the yards that were operating were functioning below capacity.

Greenpeace's investigations covered four yards - two located on the Yangtze and two on the Pearl River.

1. Chang Jiang Shipbreaking Yard, operated by the China National Shipbreaking Corporation in Jiang Yin,along Yangtze river, China.Has a partnership agreement with P&O Nedlloyd.
2. Zhangjiagang Yuanwang Iron & Steel Co. Ltd,Deji, along Yangtze river, China
3. Gujing Shipbreaking Company, Xinhui City. Guangdong Province (Joint venture by Xinhui City and China State Shipbreaking Company),along Pearl river, China
4. Shuangshui Shipbreaking Company, Xinhui City. Guangdong Province, along Pearl river, China

Greenpeace's investigations focused on the environmental and working conditions at the shipbreaking yards, paying particular attention to the handling of hazardous substances. The study involved sampling and analyses of sediments from the vicinity of the yards to determine the extent of contamination due to shipbreaking activity. The objective of the study was not to get a complete picture of the yards but to get an impression of working and environmental conditions on Chinese yards and a first indication on the levels of contamination caused by breaking ships.

2. Visual inspection report

In this section, the situation in which Dutch and other OECD ships are scrapped in China is compared with the conditions in the Netherlands, an OECD country. Athough large marine vessels are not broken in the Netherlands, the yards that break the inland waterway vessels and small sea-going vessels can be used as a comparison with Chinese shipbreaking yards.

Chang Jiang Shipbreaking yard operated by the China National Shipbreaking Corporation in Jiang Yin, China

The Chang Jiang shipbreaking yard lies roughly 220 km from the sea on the Yangtze river near Jiang Yin. The yard is on a 1500 metre-long canal off the river. A small tributary flows into this canal. On both sides of the canal there are quays with cranes for removing pieces of steel cut from ships. Roughly four ships can be broken simultaneously. The yards are a few kilometres from densely populated residential areas. No other industrial activity is evident in the neighborhood. Rice is cultivated directly next to the yards. The yard,which began operations in 1997, has scrapped ships belonging to Hamburg Sud and now has a partnership agreement with P&O Nedlloyd. In 2000 P&O Nedlloyd started a pilot project with this yard for breaking of the containervessel 'Texas'that included training of workers, providing protective gear for asbestos removal and cleaning of fuel tanks. (P& O Nedlloyd, 2000).
The yard's 'safety and environment manager' agreed to give the Greenpeace delegation a guided tour, but P&O Nedlloyd refused to give permission (see also Greenpeace report, 2001).

Practices observed in the field of environmental protection and labour safety:
Scrap material is sorted and sold.

- Ships are broken up in the water. No oil screens were being used at the time of the visit by Greenpeace.
- Most,but not all, of the employees wear helmets and gloves.
- Materials containing asbestos are handled and disposed of separately. Some workers wear protective clothing against asbestos and dust masks (unsuitable for preventing inhalation). But Greenpeace also came across unprotected workers who said they were collecting asbestos.
- The workers do not wear masks when using oxyacetylene torches.
- There are open fires on the site. Fires were also seen on the vessels being broken up.

Zhangjiagang Yuanwang Iron & Steel Co. Ltd, Deji, China

The shipbreaker's yard in Deji is closer to the sea than the Chang Jiang site, roughly 180 km from the sea. Here also, ships are broken up in the water in a short side canal. There is space for one large ocean-going vessel. The yard only opened recently. Rice is cultivated directly next to the yard. The first ship was scrapped during the visit by Greenpeace.

Practices observed in the field of environmental protection and labour safety:

- Scrap materials are sorted and sold.
- Materials containing asbestos are stored in a separate building and sold.
- Ships are broken up in the water. An oil screen in the water is used.
- Only some of the workers wear helmets and gloves.
- Workers do not wear protective clothing while using oxyacetylene torches and they have no breathing masks.

- Waste is incinerated in open fires in the yard.
- A lot of dust was in evidence during the Greenpeace visit. The presence of asbestos in the dust is very likely.

Gujing Shipbreaking Company, Xinhui City. Guangdong Province (Joint venture by Xinhui City and China State Shipbreaking Company),China

The Gujing yard lies on the Pearl river roughly 30 km from the sea. Ships are broken along the bank of the river and partly along a quay. A number of ships can be broken simultaneously. Pieces of the ships are hoisted to land with cranes. The ship's parts are sometimes dragged through the mud before they reach the ground. The land in the immediate vicinity of the yard is used for agriculture.

Practices observed in the field of environmental protection and labour safety:

- (Valuable) scrap materials are sorted and some are further processed. Steel, for example, is cut into small strips. A lot of waste is left behind on the site.
- Ships are broken up in the water. No oil screens are used.
- Materials containing asbestos did not appear to be collected separately. According to workers, materials were not separated on the basis of whether they contained asbestos or not. There is no protection against inhaling asbestos and asbestos is dumped as normal waste.
- Workers are not protected against inhaling hazardous fumes that are released while using oxyacetylene torches.
- Workers wear helmets or straw hats.The storage of gas canisters for oxyacetylene torches is very chaotic.
- Large quantities of waste oil were found on the broken ships, and no precautions were in evidence to prevent fires or explosions.

Shuangshui Shipbreaking Company, Xinhui City, Guangdong Province,China

The Shuangshui yard lies around 50 km from the sea on the Pearl river. The yard is part of a steel plant. Ships are broken in the river. At the time of the Greenpeace visit, at least five ships were lined up along the river to be broken up simultaneously. The number of ships and the size of the yard has increased substantially since Greenpeace's last visit to the yard in 1999. The scrap materials are transported to land from the scrapped vessels in small boats. The steel is processed on-site by the company. The land in the immediate vicinity of the yard is used for agriculture.

Practices observed in the field of environmental protection and labour safety:

- Ships are broken up in the water. There are no oil screens.
- Insulating materials are collected separately. During this work, workers wear masks that do not protect against asbestos.The Greenpeace delegation could not determine whether any other measures were taken against exposure to asbestos in the ships.
- A large open fire was burning on one of the ships releasing a lot of smoke.
- A pool close to the yard was severely contaminated with oil.

The situation in an OECD country (Netherlands)

Asbestos removal

In the Netherlands the removal of asbestos from scrapped ships is subject to strict regulations.The removal of asbestos takes place under the rules of the Asbestos Removal Decree (NL- Ministry of Environmental Affairs, 1998), according to the general, applicable prescriptions of the Conditions at Places of Work Act, the Conditions at Places of Work Decree and the Policy Rules on Conditions at Places of Work Legislation (NL- Ministry of Social Affairs, 1997).The essence of these regulations is that exposure of workers to asbestos fibre is prevented through numerous technical, organizational and medical measures as the inhalation of asbestos fibres may result in incurable and fatal diseases. A ship intended for scrapping must first be inventoried by a company specially certified to inventory asbestos. A company with a special certification for asbestos removal must then remove the asbestos, after which the asbestos waste is checked and disposed of in a controlled facility. There are also strict regulations governing the removal of asbestos, such as the use of specific breathing equipment and that the work must be carried out under so-called containment. Finally, a suitably accredited laboratory must issue an asbestos-free certificate. Before the asbestos-free certificate is issued,the asbestos areas are inspected visually and the air is sampled for asbestos fibre. The ship is only considered to be safe for scrapping after the asbestos-free certificate has been issued. (Locher, K., 2001) Thus, in the Netherlands, asbestos removal and disposal are strictly controlled with regard to sequence and the companies that do the work.

Netherlands: asbestos removal from a ship using protective gear.

Oil pollution

When ships are being broken up there is a very great risk of oil pollution.In the Netherlands these risks are minimised by the regulations accompanying an environmental protection licence. The regulations deal, for example, with the scrapping of ships on impermeable slopes, the installation of oil drains as well as water-oil separators and provisions for the controlled disposal of oil. In fact, using a dry dock is the best way to prevent oil pollution when scrapping a ship.

Netherlands:oil drain below scrap slope prevents oil pollution.

Netherlands: scrapping a ship (110 m) in dry dock prevents the pollution of ground and surface water with oil.

Threat of fires and explosions

Fuel residues left in ships' tanks can lead to dangerous situations during torch-cutting operations. In the Netherlands, fires and explosions are minimized because ships are decontaminated of all fuel and residues prior to scrapping. Before a ship can be scrapped,it has to obtain a gas-free certificate from a company specializing in such certification.

Cables

Burning plastic (PVC)-insulated cables can result in the release of highly poisonous chemicals such as dioxins and furans. Dioxines and furans are two of the most toxic products known because the dose that can cause disease is lower than that for many other man-made chemical. They are linked to cancer and birth defects. (DNV, 1999 and US Office of Technology Assessment, 1989) PCBs are found in solid (waxy) and liquid (oily) forms in equipment and materials on ships being scrapped. Cable insulation may contain PCBs in concentrations of at least 50 parts per million (ppm). PCBs are toxic and persistent and have been shown to cause a variety of adverse health effects. Chemicals produced when PCBs are heated in fire-related incidents include polychlorinated dibenzofurans and polychlorinated dibenzo-p-dioxins, both of which are believed to be much more toxic than PCBs themselves.(US-EPA, 2000)

The use of hydraulic cutters, rather than open flames for scrapping greatly reduces the likelihood of dioxin generation. The environmental protection licence for ship breakers includes provisions for the disposal of cables. Cables are gathered after removal in special containers and must be transported to special processing companies. In the Netherlands, copper is recovered from insulated cables by a mechanical process and not by burning them.The waste products are subsequently disposed of or further processed by licensed processing companies.The processing and transportation of paper-insulated ground cables is also regulated. The cables are processed by the processing companies through four fractions after which possible PCB-containing fractions, such as paper, jute and bitumen fractions are transported to controlled disposal sites. (Bohmann,R.O., 2001)

Origin of toxic gases from paints and coatings
The paints and coatings on a ship may be flammable or may contain toxic compounds such as ploychlorinated biphenyls (PCB's),heavy metals (such as lead, cadmium,chromium,zinc and copper) and pesticides such as tributyl tin (TBT). (US-EPA, 2000) Torch cutting generates smoke,fumes and particulates that may have toxic effects. (ILO, 2001) If ships are scrapped,as is often the case in the Netherlands, using other methods (with hydraulic cutters),this problem does not occur. In addition, workers are protected because they are relatively far away from the surface being cut.

Netherlands: during scrapping with hydraulic cutters no toxic substances are released from the paints and coatings.

Waste disposal

The Dutch breaking yards must have water-proof floors to prevent contamination of ground water. The waste that is produced must be sorted. Important categories are hazardous waste, waste containing oil and ordinary waste. This waste must be delivered to appropriate processing companies.

Comparison

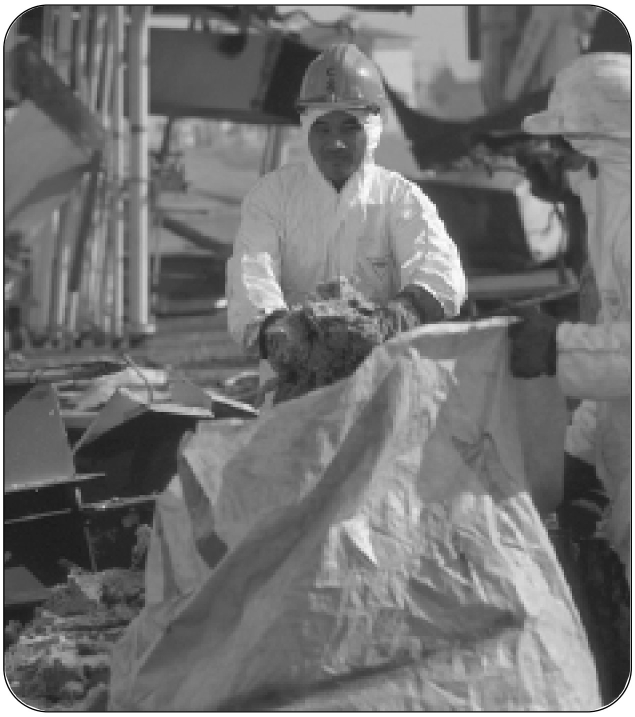
Workers'health and the environment at the Chinese yards are constantly put at risk by toxic substances from the ships and the unsafe working conditions on the premises.Generally, insufficient protection is provided for workers and no real measures are in place to prevent environmental contamination. Compared with OECD standards, the working and environmental conditions in Chinese yards are unacceptable. The main issues are:

Asbestos

In China,asbestos is removed at the time that the ship is broken and by the same company. In all yards, insulating material that may contain asbestos is disposed of by the workers while the ship is being scrapped.

Most of the workers wear inadequate protective clothing and breathing equipment. Only the Jiang Yin yard has a special procedure for the removal of asbestos. (P&O Nedlloyd, 2000) During the visit by the Greenpeace delegation to this yard,however, workers without breathing equipment were disposing of insulating material that could have contained asbestos. P&O Nedlloyd itself states that unprotected workers were found in screened-off asbestos areas.
At none of the four yards visited are the ships declared free of asbestos (after removal of the asbestos and air measurement) as is the case in the Netherlands.
At the yards large separated sections of the ships were worked on in the open air, on the quay, even though some of these large sections still contained asbestos, for instance in insulating materials around pipes. At one of the yards, ships are dismantled in the water and insulating materials are taken out while the ships are still in the river. Only dust masks were seen during dismantling of the ship. These masks are not adequate to protect from the risks of breathing in asbestos fibres.

At the yards on the Yangtze river insulating material was collected.The re-use of asbestos is forbidden in China. However, the Greenpeace delegation was informed by the managers of one of the yards that all types of asbestos were sold to industries producing heating systems.



China: removal of insulating material suspected to contain asbestos without proper protection.

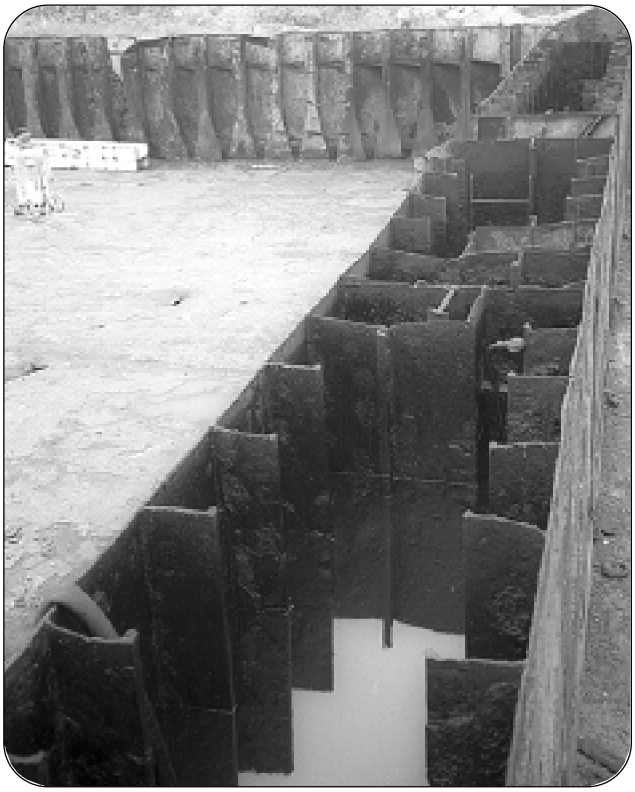
Oil pollution

At the Chinese yards, ships are broken up in the water. This means that oil pollution is virtually impossible to prevent. At the Jiang Yin and Deli yard, oil screens are said to be used.But installation of an oil-slick screen does not mitigate oil pollution. Oil-slick screens can help in preventing immediate oil pollution in emergency cases but can not serve as a permanent protection measure against oil pollution. At Jiang Yin, Greenpeace found no oil-slick screen in use when the P&O Nedloyd ship, Napier, was being scrapped. At the yards on the Pearl river ships are scrapped in the river stream and not in a canal which makes prevention of oil pollution completely impossible. The Greenpeace team did not find any protection against oil pollution at these yards.

China:scrapping ships in water leads to oil pollution

Threat of explosions and fires

The threat of explosions and fires can be minimised when ships are delivered free of any fuel and fuel residue and when (tank) compartments are tested for oxygen before entry. The conditions are dangerous at the Chinese yards. Most yards lack the equipment to detect and prevent explosions or fires. Where the equipment is available, as in the Jiang Yin yard, workers make no use of it. (P&O Nedlloyd, 2000) In some yards, Greenpeace witnessed open storage of oil,oil residues in broken ships and even severe oil-pollution in the environment. The likelihood of fires and explosions is high at the Chinese yards, and the conditions here make a case for the need for decontamination of fuel and fuel-residues prior to breaking.



China: Oil in broken ship

Toxic fumes

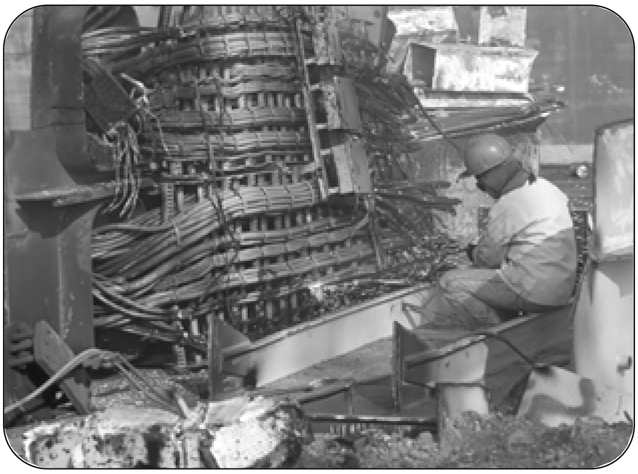
The paints and coatings on a ship may be flammable or may contain toxic compounds such as ploychlorinated biphenyls (PCBs), heavy metals (such as lead, cadmium,chromium,zinc and copper) and pesticides such as tributyl tin (TBT). Toxic fumes are released during torch cutting and after torch cutting when the paints continue to smoulder. At the Chinese yards, workers using the cutting torches are routinely inhale the toxic fumes from the steel coated with toxic paints. Workers may also inhale toxic smoke potentially carrying dioxins, furans and polycyclic aromatic hydrocarbons (PAHs) from waste that is burnt in the open.

China: emission of possibly toxic substances by burning waste materials.

China: open fires at ships being scrapped.

Cables

When burning cables dangerous substances may be released, such as highly toxic dioxins.Greenpeace noticed during its visit to the Chinese yards that cables were not thoroughly removed from ships even when they were broken up using oxyacetylene torches.Because of this, workers may be exposed to toxic gases such as dioxins when cutting these cables. According to information from Chinese shipbreakers cables which had been removed are put on the market. A major objection to this is that processing of these cables then takes place outside the control of the yards and ship owners, and that environmentally responsible processing or disposal of waste fractions cannot be guaranteed.



China:during scrapping with oxyacetylene torches toxic gases from cables, paints and coatings may be released (ILO 2001, US-EPA 2000)

Waste disposal

At the Chinese yards, waste is disposed on the yard's premises and in the surrounding areas. No measures are taken to prevent soil pollution by oil or hazardous substances or the spread of contaminants by air. Oil and wastes from oxyacetylene torches (see picture) for example were visibly dumped on the bare ground in the yard. Oil residues are not separated at the yard and nor are they disposed at special facilities. The Greenpeace mission did not find any separation of hazardous waste (see above for asbestos).

China: waste from oxyacetylene torches.

3. Investigation of sediment at the four yards

Samples

At the four yards, the sediment was investigated for hazardous substances that were used in the ships. To establish whether the potential pollution originated from the breaker's yards, samples were also taken of the sediment upstream from the yards. The substances investigated were:

- ***mineral oil***
- ***heavy metals***
- ***polyaromatic hydrocarbons (PAHs)***
- ***PCBs***
- ***organotin compounds***

Contamination with mineral oil can occur through the leakage of oil from the scrapped ships. Of the heavy metals, particularly copper, lead and zinc from the ship's paint can cause pollution. PAHs come mainly from combustion processes and from leaking oil. PCBs are found in solid (waxy) and liquid (oily) forms in equipment and materials on ships being scrapped (US_EPA, 2000). These equiment and materials which may contain PCBs in concentrations of at least 50 parts per miliion (ppm) include cable insulation, transformers, capacitors and electronic equipment with transformers and capacitors inside, oil-based paint, anchor windlasses, hydraulic systems.
Organotins, mainly tributyltin (TBT), are released from antifouling paint that is used on ships beneath the waterline to discourage the growth of marine life on the ship's surface.
The results are presented in two tables, one for the yards along the Yangtze river and one for the yards along the Pearl river (see page 15 - 16).

Information in substances

Oil

Oils and fuel exhibit toxic characteristics.Main exposure routes are inhalation and consumption of contaminated fish and water. Oil spills threatens birds, mammals and water organisms.

Heavy metals

Toxic heavy metals associated with shipbreaking include lead,mercury and cadmium. Metals can be found in many products onboard a vessel in varying quantities. Paints and coatings might contain metals such as zinc,lead and copper. Both zinc (typically in topcoats) and copper are still present in considerable amounts in modern paints.Heavy metals compounds are also present in anodes, insulation,batteries and electrical compounds. Heavy metals can cause harm to human health and environmental systems. Mercury for example is a toxic heavy metal and a persistent, bioaccumulative pollutant that affects the nervous system.The effects of lead upon human health have been known for a long time. Young children are most vulnerable to its toxic effects. Long-term exposure to even low levels can cause irreversible learning difficulties, mental retardation and delayed neurological and physical development.

PAHs

Approximately 250 different polycyclic aromatic hydrocarbons (PAHs) are known.Some 30 PAH compounds and several hundreds of derivatives are classed as carcinogenic. The health hazard from PAHs comes from directly inhaling fumes, which are released primarily during torchcutting, after torchcutting when paints continue to smoulder, or when wastes are deliberately burned. PAHs accumulate in dust and sediment,and tissues of lifeforms. As a result they are available for uptake either through inhalation,dermal contact or via the foodchain.
PAHs cause malignant tumours by interfering with enzymatic breakdown, affecting the lungs, stomach, intestines and skin. The potential of substance mixtures containing high PAHs levels to cause skin cancer is known since 1775.

PCBs

Polychlorinated organic compounds (PCBs) are found in solid (waxy) and liquid (oily) forms in equipment and materials on ships being scrapped.
These equiment and materials which may contain PCBs in concentrations of at least 50 parts per million (ppm) include cable insulation, transformers, capacitors and electronic equipment with transformers and capacitors inside, oil-based paint, anchor windlasses, in electrical systems in equipment for cargo handling (such as crane and pump arrangements), in sealing materials and glues used in windows in vessels built up to mid 1980's, in electrical components in powering systems and in electric lighting including fittings and heat exposed electrical components (condensators). Since PCB was phased out as a compound in ship paintings in the mid 70's, it is likely that most of the exposed paint structure does not contain this.

However, some paint surfaces such as in engine-, pump and boiler rooms and also ground coatings in accommodation areas are most likely of original specifications. PCBs are highly toxic and persistent pollutants and they bioaccumulate in the environment. Exposure to PCBs has been associated with a variety of adverse health problems. PCBs have been linked to cancer, liver damage, reproductive impairments, immune system damage and behavioural and neurological damage.

Organotins

Tributyltin (TBT) is an aggressive biocode (kills living organisms) that has been used in anti-fouling paints since the 1970s. TBT is considered as one of the most toxic compounds in the aquatic ecosystems; its impact on marine organisms range from the subtle to the lethal. TBT is responsible for the disruption of the endocrine system of marine shellfish leading to the development of male characteristics in female marine snails. TBT also impairs the immune system of organisms. Shellfish are reported to have developed shell malformation after exposure to extremely low levels of TBT in the seawater.

As organotins compounds can damage human health even in small doses, in industrialised nations, legal regulations are in place to protect workers from exposure to antifouling paints containing TBT. Skin, eye and lung protection are mandatory for any contact work with TBT-containing paints.

References: DNV1999, Greenpeace reports 1999 and 2001, ILO 2001 and US-EPA 2000

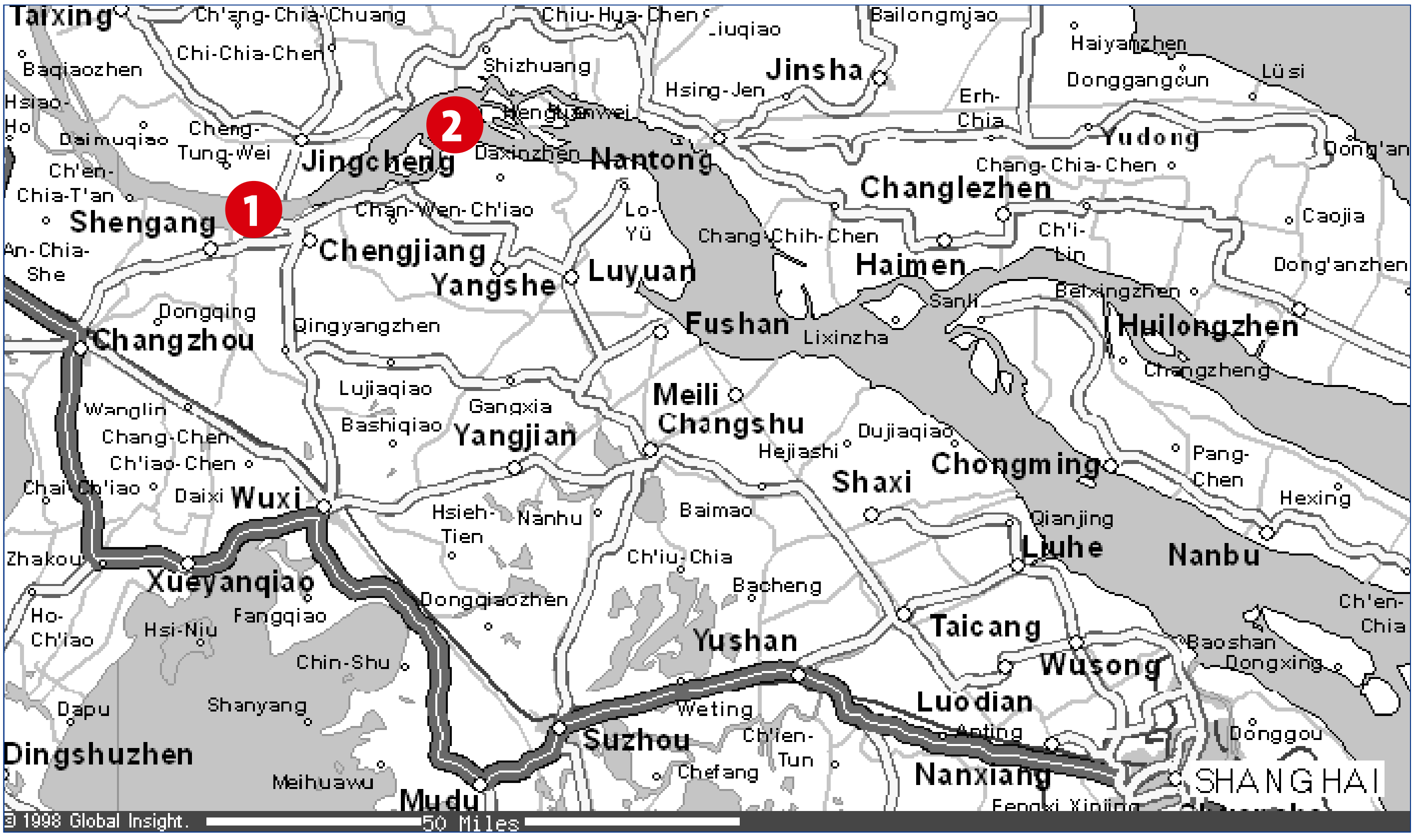
SAMPLE DETAILS

Yangtze river

Along the Yangtze, reference samples could for logistic reasons not be taken from the sediment in the middle of the stream (what would be ideal). The first sample has been taken from a dike that was built with sediments from the river (R1) at less than 1 km distance from yard 1 and of sediment upstream Yangtze near a side canal (R2) at around 2 km distance from yard 1. Many small fishing boats use this canal. In the Jiang Yin yard,a sample was taken of the sediment at the end of the canal in which the ships are broken (yard 1).The area where the sample was taken from was (visually) severely polluted with oil.The sample at the yard in Deji was also taken at the end of the side canal (yard 2).

Table 1 Sample details at and around yards along Yangtze river

Sample No.	Sample referred to as:	Date of sampling	Location of sampling
1	R(eference) 1	2/11/00	material from dike near yard 1
2	R(eference) 2	2/11/00	sediment upstream Yangtze river
4	Yard 1 (Chang Jiang in Jiang Yin)	2/11/00	end of side canal in which breaking up takes place
5	Yard 2 (Zhangjiagang in Deji)	2/11/00	end of side canal in which breaking up takes place

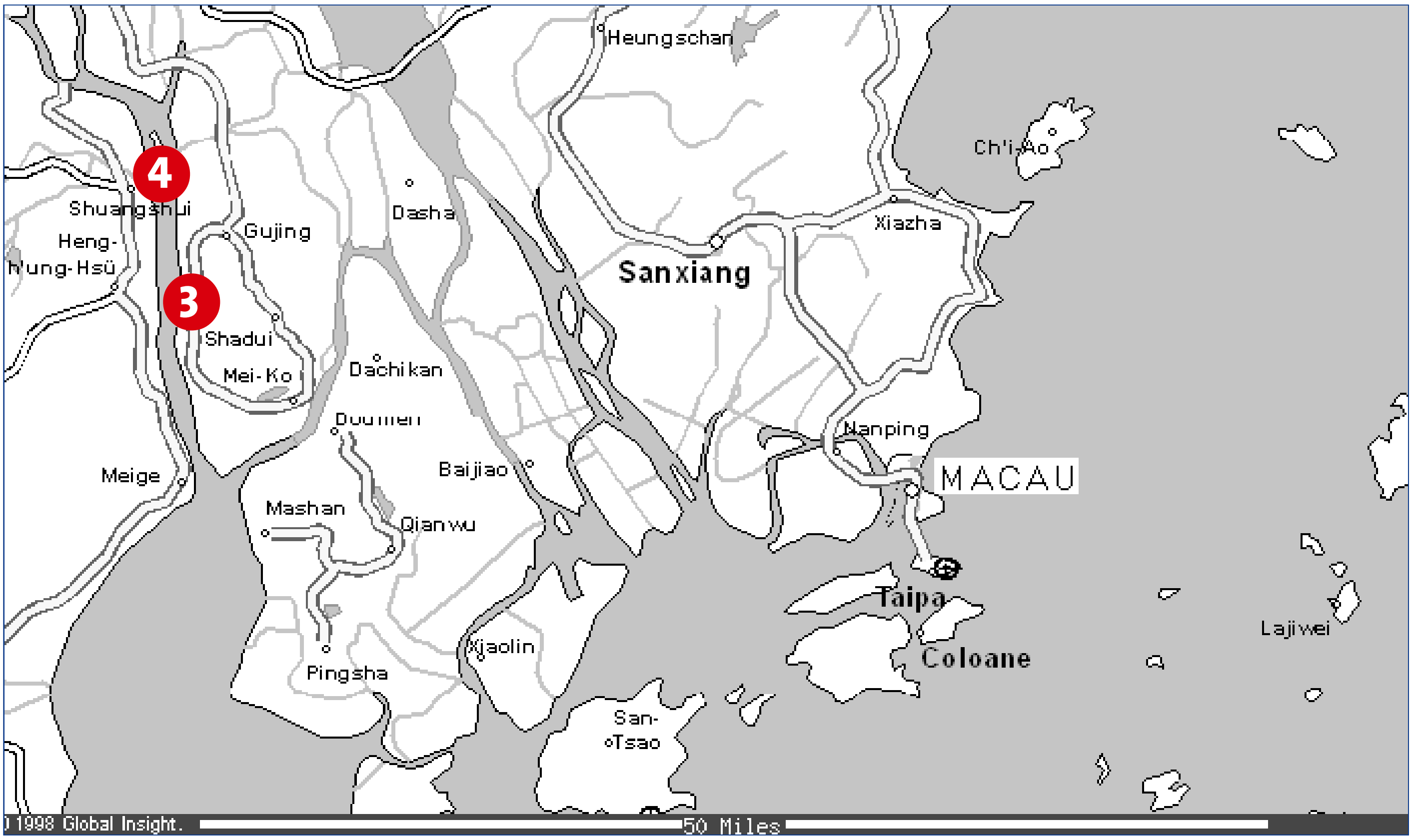


Pearl river delta

Samples from Pear River Delta are taken at five places. One sediment sample (R7) is taken from the river near the bridge leading to Xinhui, around 15 km upstream from yard 4. A second reference sample (R10) is also taken upstream from the yards near some fishingboats in a side channel, at around 15 km distance from yard 4. The last reference sample (R9) was taken up a side channel which then flows through yard 4. The sample at yard 3 was taken between a ship currently scrapped and the quay with cranes.These cranes tow pieces of ships on shore. The sediment sample from yard 4 comes from the riverbed at the location where ships are anchored for scrapping. The distance between ship and shore is approximately between 50 and 100 meters.

Table 2. Sample details at and around yards along Pearl river delta

Sample No.	Sample referred to as:	Date of sampling	Location of sampling
7	R(eference) 7	6/11/00	upstream river near bridge
9	R(eference) 9	6/11/00	upstream side channel passing through yard 4
10	R(eference) 10	6/11/00	upstream Pearl river delta near fisherboats
6	Yard 3 (Gujing in Xinhui City)	6/11/00	sediment between quay and scapped ship
8	Yard 4 (Shuangshui in Xinhui City)	6/11/00	sediment Pearl river delta near ships for scrap



The number of samples taken in and around the yards is rather small and can therefore not give a certain and complete picture on the contamination caused by the four shipbreaking yards investigated. It can also not been excluded that other sources between the location of the reference samples and the samples taken at the yards at the Pearl river delta cause pollution of the sediments. However, based on visual observation of the area and the specific contamination caused by shipbreaking, this seems not be very likely. The analyses can be used as an indication of levels of contamination caused by the scrapping of toxic ships in China compared to the sediments of the local environment of the Yangtze river and Pearl river delta.

Comparison

In tables 4 and 5 the levels of toxic or hazardous substances found in the samples are compared with:

1. parameters for assessing the quality of sediment for fresh water systems in the Netherlands (NL-Council of Ministries, 2000) :

Table 3. Dutch parameters for the assessment of the quality of sediment

criteria	description:quality of sediment
equal and below “target” value	not contaminated
Exceeding “target” value	lightly contaminated
Exceeding “limit” value	moderately contaminated
Exceeding ”test” value	seriously contaminated,sediment must be cleaned up
Exceeding “intervention” value	very seriously contaminated,sediment must be cleaned up

2. the ecotoxicological assessment criteria (EAC) agreed by the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic (OSPAR, 1997):

- Provisional criteria for metals, for arsenic (1-10 mg/kg), for cadmium (0.1-1 mg/kg), for chromium (10-100 mg/kg), for copper, lead and nickel (5-50 mg/kg), for mercury (0.05-0.5 mg/kg) and for zinc (50-500 mg/kg);
- Eleven individual PAHs are listed. Of these, firm criteria are given for three PAHs (0.05-0.5 mg/kg for naphthalene and anthracene, 0.1-1.0 mg/kg for phenanthrene). Provisional criteria are given for a further 5 PAHs, ranging from 0.05-0.5 mg/kg for pyrene to 0.5-5 mg/kg for fluoranthene. For the remaining three, there were considered to be insufficient data available on which to agree criteria.;
- A provisional criterium for the sum of PCB of 0.001-0.01 mg/kg;and
- A provisional criterium 0.000005 to 0.00005 mg/kg for TBT (tributyltin) in marine sediment.

Note that OSPAR criteria are designed for application to marine environments. Therefore it only provides a tentative basis for comparison with freshwater/estuarine systems. The OSPAR criteria are also not limits for remedial action but criteria which may be used “to identify potential areas of concern”.

Table 4. Results samples yards 1 and 2 along Yangtze river

Substances	R1	R2	Yard 1	Yard 2	target value	limit value	test value	interven-tion value	OSPAR EAC
	mg/kg ds	mg/kg ds	mg/kg ds	mg/kg ds	mg/kg ds	mg/kg ds	mg/kg ds	mg/kg ds	mg/kg ds
Mineral oil	<50	**57**	**37000**	**1500**	50	1000	3000	5000	------
Metals									
Arsenic	*11*	*16*	*9.6*	10	29	55	55	55	1-10 (p)
Cadmium	*0.4*	*0.8*	***2.4***	0.5	0.8	2	7.5	12	0.1-1 (p)
Chromium	44	45	91	27	100	380	380	380	10-100 (p)
Copper	25	***63***	***230***	30	36	36	90	190	5-50 (p)
Mercury	0.04	0.16	0.46	0.12	0.3*	0.5	1.6	10	0.05-0.5 (p)
Lead	13	47	42	21	85	530	530	530	5-50 (p)
Nickle	31	**40**	***62***	28	35	35	45	210	5-50 (p)
Zinc	67	140	**420**	76	140	480	720	720	50-500 (p)
PAHs									
sum 10 PAHs	<0.07	0.9	**22**	0.4	------	1	10	40	------
Naphthalene	<0.05	<0.05	***7.4***	<0.05	0.001	0.015	------	------	0,05-0,5 (f)
Phenanthrene	<0.01	**0.05**	***11***	**0.08**	0.005	0.05	------	------	0,1-1 (f)
Anthracene	<0.01	***0.63***	<2.58	0.01	0.001	0.05	------	------	0,05-0,5 (f)
Fluoranthene	<0.01	**0.08**	<0.01	0.12	0.03	0.3	------	------	0,5-5 (p)
Pyrene	<0.01	**0.07**	1,3	0.13	------	------	------	------	0,05-0,5 (p)
Benz(a)anthracene	<0.01	**0.05**	<2.50	<0.01	0.003	0.05	------	------	0,1-1 (p)
Chrysene	<0.01	**0.06**	***1.8***	**0.09**	0.1	0.05	------	------	0,1-1 (p)
benzo(k)fluoranthene	<0.01	0.02	**0.11**	0.03	0.02	0.2	------	------	n.d.
benzo(a)pyrene	<0.01	<0.01	<0.40	<0.01	0.003	0.05	------	------	0,1-1 (p)
benzo(ghi)perylene	<0.01	<0.01	**1.4**	0.03	0.08	0.05	------	------	n.d.
Indenopyrene	<0.01	0.0	**0.22**	0.04	0.06	0.05	------	------	n.d.
PCBs									
no 28	<0.001	<0.001	<0.005	<0.001	0.001	0.004	0.03	------	------
no 52	<0.001	<0.001	**0.018**	<0.001	0.001	0.004	0.03	------	------
no 101	<0.001	<0.001	**0.034**	<0.001	0.004	0.004	0.03	------	------
no 118	<0.001	<0.001	**0.010**	<0.001	0.004	0.004	0.03	------	------
no 138	<0.001	<0.001	**0.032**	<0.001	0.004	0.004	0.03	-----	------
no 153	<0.001	<0.001	**0.049**	<0.001	0.004	0.004	0.03	------	------
no 180	<0.001	<0.001	**0.030**		0.004	0.004	0.03	------	------
sum 7-PCBs	<0.003	<0.003	0.170	<0.003	------	------	0.2	1	0.001-0.01 (p)
Organotins									
Tributyltin	n.d.	<0.02	***0.74***	<0,02	0.0001	------	------	------	0.000005-
									0,00005 (p)
Triphenyltin	n.d.	<0.02	<0.5	<0,02	0.00006	------	------	------	------
Dibutyltin	n.d.	<0.02	<0.5	<0,02	-----	------	------	------	------
Dicyclohexyltin	n.d.	<0.02	<0.5	<0,02	-----	------	------	------	------
Diphenyltin	n.d.	<0.02	<0.5	<0,02	------	------	------	------	------
Tricyclohexyltin	n.d.	<0.02	<0.5	<0,02	------	------	------	------	------

* this standard applies for both inorganic mercury and methyl mercury

n.d. = not determined

values **bold** — sediment is lightly or moderately contaminated (according to the assessment of quality of sediment in the Netherlands)

values **bold** & underlined — sediment is seriously or very seriously contaminated (according to the assessment of quality of sediment in The Netherlands), need for cleaning up

italic — exceeds the ecotoxicological assessment criteria (EAC) agreed by the OSPAR Commission

Table 5. Results samples yard 3 and 4 along Pearl river delta

Substances	**R7**	**R9**	**R10**	**Yard 3**	**Yard 2**	**target value**	**limit value**	**test value**	**interven-tion value**	**OSPAR EAC**
	mg/kg ds	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**	**mg/kg ds**
Mineral oil	**56**	**71**	**210**	**<u>13000</u>**	**740**	50	1000	3000	5000	------
Metals										
Arsenic	6.8	16	18	20	29	29	55	55	55	1-10 (p)
Cadmium	0.4	0.7	***1.7***	***3.6***	***2.5***	0.8	2	7.5	12	0.1-1 (p)
Chromium	7	40	42	94	63	100	380	380	380	10-100 (p)
Copper	9	**37**	***52***	***<u>620</u>***	***88***	36	36	90	190	5-50 (p)
Mercury	<0.04	0.13	0.17	***1***	0.30	0.3 *	0.5	1.6	10	0.05-0.5 (p)
Lead	19	36	47	***230***	65	85	530	530	530	5-50 (p)
Nickel	7	32	31	***<u>65</u>***	**<u>48</u>**	35	35	45	210	5-50 (p)
Zinc	49	110	**170**	**<u>2200</u>**	**280**	140	480	720	720	50-500 (p)
PAHs										
sum 10 PAHs	<0.07	<0.07	0.02	**<u>31</u>**	0.4	------	1	10	40	------
Naphthalene	<0.05	<0.05	<0.05	**0.36**	<0.05	0.001	0.015	------	------	0,05-0,5 (f)
Phenanthrene	<0.01	<0.01	<0.01	***8.2***	0.06	0.005	0.05	------	------	0,1-1 (f)
Anthracene	<0.01	<0.01	<0.01	***1.3***	0.02	0.001	0.05	------	------	0,05-0,5 (f)
Fluoranthene	<0.01	<0.01	0.02	***8***	0.05	0.03	0.3	------	------	0,5-5 (p)
Pyrene	0.01	<0.01	0.03	***7.3***	0.07	------	------	------	------	0,05-0,5 (p)
benz(a)anthracene	<0.01	<0.01	<0.01	***3***	0.02	0.003	0.05	------	------	0,1-1 (p)
Chrysene	<0.01	<0.01	<0.04	***2.8***	0.05	0.1	0.05	------	------	0,1-1 (p)
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	**1.1**	0.02	0.02	0.2	------	------	n.d.
Benzo(a)pyrene	<0.01	<0.01	<0.01	***2.4***	0.05	0.003	0.05	------	------	0,1-1 (p)
Benzo(ghi)perylene	<0.01	<0.01	<0.02	**2.4**	**0.08**	0.08	0.05	------	------	n.d.
Indenopyrene	<0.01	<0.01	<0.02	**1**	**0.09**	0.06	0.05	------	------	n.d.
PCBs										
no 28	<0.001	<0.001	<0.001	**0.005**	<0.001	0.001	0.004	0.03	------	------
no 52	<0.001	<0.001	<0.001	**0.012**	<0.001	0.001	0.004	0.03	------	------
no 101	<0.001	<0.001	<0.001	**0.022**	<0.001	0.004	0.004	0.03	------	------
no 118	<0.001	<0.001	<0.001	**0.018**	<0.001	0.004	0.004	0.03	------	------
no 138	<0.001	<0.001	<0.001	**0.014**	<0.001	0.004	0.004	0.03	------	------
no 153	<0.001	<0.001	<0.001	**0.029**	<0.001	0.004	0.004	0.03	------	------
no 180	<0.001	<0.001	<0.001	**0.024**	<0.001	0.004	0.004	0.03	------	------
sum 7-PCBs	<0.003	<0.003	<0.003	*0.120*	<0.003	------	------	0.2	1	0.001-0.01 (p)
Organotins										
Tributyltin	n.d.	<0.02	<0.02	***8.5***	***0.26***	0.0001	------	------	------	0.000005-
										0,00005 (p)
Triphenyltin	n.d.	<0.02	<0.02	**1.6**	**0.06**	0.00006	------	------	------	------
Dibutyltin	n.d.	<0.02	<0.02	<0.02	<0.03	-----	------	------	------	------
Dicyclohexyltin	n.d.	<0.02	<0.02	0.03	<0.02	-----	------	------	------	------
Diphenyltin	n.d.	<0.02	<0.02	0.03	<0.02	------	------	------	------	------
Tricyclohexyltin	n.d.	<0.02	<0.02	0.28	<0.02	------	------	------	------	------

* this standard applies for both inorganic mercury and methyl mercury

n.d.= not determined	
values **bold**	sediment is lightly or moderately contaminated (according to the assessment of quality of sediment in the Netherlands)
values **bold** & <u>underlined</u>	sediment is seriously or very seriously contaminated (according to the assessment of quality of sediment in The Netherlands), need for cleaning up
italic	exceeds the ecotoxicological assessment criteria (EAC) agreed by the OSPAR Commission

Explanation of results

Yangtze river

The first striking feature is that the reference samples indicate that the sediments in the Yangtze river contain little or none of the pollutants investigated. In one sample (R1) there is no demonstrable pollution with mineral oil and PAHs, and in the other (R2) it is slightly to moderately increased. A possible explanation for this increase is the presence of a large number of small fishing boats with very basic (and highly polluting) combustion engines. The concentrations of heavy metals are low (below the Dutch target value, with the exception of copper and nickel). PAHs and organotin compounds are not present in measurable quantities and there seems to be no question of contamination.

The sample at the first yard (the Yin Jiang yard) presents an entirely different picture. All categories of substances are significantly higher than the reference samples and exceed the Dutch standards for sediment.

- The sediment is very heavily contaminated with oil (3.7 % of weight) and is well above the Netherlands' standard requiring clean-up of the river bed.
- The concentrations of five heavy metals (of the eight studied) are higher and for nickel and copper the Dutch standards for river beds are seriously exceeded, clean-up is needed.
- The concentrations of various PAH compounds are also higher than the reference sample and the sediment would be described as slightly to moderately contaminated by Dutch standards.The levels of some individual PAHs are also higher than the ecotoxicological assessment criteria agreed by OSPAR.
- The total PAH concentration (sum of 10 PAHs) is above the maximum acceptable concentration in the Netherlands and qualifies for clean-up.
- The highly toxic PCB compounds that were not found in reference samples are found in the Jiang Yin yard,and in high concentrations. Various PCB are well above the Netherlands'standard requiring clean-up of the river bed
- The sum of 7-PCBs level found here is also approximately between 17 and 170 times higher than provisional ecotoxicological assessment criteria for the sum of 7-PCBs in marine sediment agreed by OSPAR.
- The seriously harmful TBT that was not found in the reference sample is found in the Jiang Yin yard, and in a very high concentration,more than 7000 times higher than the Dutch value for not contaminated. The TBT level found here is also approximately between 15,000 and 150,000 times higher than provisional ecotoxicological assessment criteria for TBT in marine sediment agreed by OSPAR.

In less than four years of shipbreaking, the yard's operations seem to have severely contaminated the sediment comparing to almost not polluted sediments upstream the Yangtze with mineral oil,heavy metals, PAHs, PCBs and organotin compounds.The concentrations of mineral oil, copper, nickel,the total PAH concentration (sum of 10 PAHs) and various PCBs, in fact, are above levels prescribed for clean-up action in the Netherlands.

The sample at the second yard (the Chang Jiang yard in Deji) is far less contaminated. Here only a distinct increase in the concentration of mineral oil and two individual PAHs was found. An explanation for the fact that other compounds are not higher or were not found is that this yard only opened recently and only one ship has been broken here.

Pearl river delta

Practically no contamination was found in the reference samples that were taken in sediment of the Pearl river upstream of the yards. But the values for mineral oil were slightly higher in the reference samples, especially in reference sample (10) taken in an area frequented by small fishing boats, with very basic (and highly polluting) combustion engines. Some heavy metal concentrations (cadmium, copper and zinc) were also slightly elevated. With the exception of copper (in reference sample 10),the reference samples fall in the category 'slightly contaminated" according to the Dutch sediment standards. Copper concentrations are just above target/limit value. PCBs, PAHs and organotin compounds were not found in measurable quantities.

At the third yard (the Gujing yard in Xinhui City),the sample was taken between the area where the ship was being broken and the quay on which the crane stood.The results clearly show that the activities seriously pollute the sediment. Levels of all categories of substances were significantly higher than the reference samples.

- The mineral oil content is very high (1.3% of weight),and in the Netherlands would justify clean-up of the sediment.

- The concentration of six heavy metals (of the eight studied) were higher, and for copper, nickel and zinc, the Dutch standards for sediment are greatly exceeded, meaning that there is a need for clean-up.
- The levels of PAH compounds are also highly elevated.The concentration of the total PAH compounds (sum of 10 PAHs) exceeds the clean-up standard for sediment in the Netherlands. The levels of some individual PAHs are also higher than the ecotoxicological assessment criteria agreed by OSPAR.
- PCBs compounds which could not be found in the reference samples are found in the sediment at this yard and are slightly below the Dutch test values and qualify the sediment as moderately contaminated.
- The sum of 7-PCBs level found here is also approximately between 12 and 120 times higher than provisional ecotoxicological assessment criteria for the sum of 7-PCBs in marine sediment agreed by OSPAR.
- The seriously harmful TB, which was not found in the reference sample was found in this yard.It was present at a very high concentration,some 85,000 times higher than the Dutch standard for non- contaminated sediment. The TBT level found here is also approximately between 170,000 and 1.7 million (!) times higher than provisional ecotoxicological assessment criteria for TBT in marine sediment agreed by OSPAR. The quantity of triphenyltin is more than 25,000 times higher than the Dutch standard for non- contaminated sediment.

At the <u>fourth yard</u> (the Shuangshui yard in Xinhui City) the ships are broken up in the stream of the river. The sample was taken relatively close to the river bank.It is a fairly long distance from the place where the ships are broken up (approximately 50-100 meters away).Nevertheless, here also is a clear increase in the concentration of pollutants.

- The levels of oil,heavy metals and some PAHs are clearly higher than the reference samples and the Dutch value for non-contaminated sediment. The nickel content would justify clean-up of the sediment in the Netherlands.
- The PCB concentration is not demonstrably elevated.
- The seriously environmentally harmful TBT was not found in the reference sample but was found in this yard.The concentration was again very high, being 2600 times higher than the Dutch standard for non-contaminated sediment. The TBT level found here is also approximately between 5000 and 50,000 times higher than provisional ecotoxicological assessment criteria for TBT in marine sediment agreed by OSPAR.Although the level of TBT (0.26 mg/kg) found in the yard no. 4 is much lower than in yard no. 3 (8.5 mg/kg), port authorities and agencies regulating industrial sites in the European Union are preparing legislation that would classify such sediments as hazardous waste. For instance, Hamburg, Germany, has already made a political decision to classify spoils (dredging sludge from the river Elbe) with more than 0.25 mg/kg as hazardous waste. (Hamburg parliament, 1999) The triphenyltin concentration is 1000 times higher than the Dutch norm for not contaminated sediment.

Possible reasons for the lower concentrations here than at the third yard despite the large number of ships that are broken up are: that the pollutants are probably dispersed over a far larger area because the ships are broken up in the stream of the river; and that the sample was taken at a relatively large distance from the ships.

TBT worldwide

On the basis of peak values measured,Greenpeace identified 10 TBT hotspots in Europe in 1999/2000 (Maack, T., 2000). The levels of TBT (not taking into account its degradation products) in the sediment of one of the Chinese yards (Gujing shipbreaking yard) place this yard at par with the 8th most contaminated TBT hotspot in Europe. This is high in comparison with the European hotspots that have more than five decades of industrial and/or maritime activity. Alang – the largest scrapping yard of the world – is at 6th place among the top ten European TBT hotspots. (Greenpeace, 2001) See table 6.

Table 6: Comparison of concentrations of TBT and its degradation products in the sediment of European ports with the TBT levels found in the Gujing shipbreaking yard,China and Alang, India

PORT	LOCALITY OF SAMPLING	SOURCE	MBT, DBT, TBT mg/kg
Marseille, France	Avant Port Nord Forme 10	Greenpeace, 25-08-00	241
Hamburg, Germany	Norderweft yard	Greenpeace, 17-09-99	106
Piraeus, Greece	Kinosaura harbour	Greenpeace, 10-08-00	94
Antwerp, Belgium	Port	Greenpeace 2000	28
Barcelona,Spain	Fishing harbour	Greenpeace, 01-09-00	22
Alang-Sosiya Gujarat/India	Shipbreaking yard	Greenpeace 06-06-00	21
Odense, Denmark	Lindovaerflets	Danish Energy Ministry, 2000	14
Livorno, Italy	Docks	Greenpeace, 17-08-00	8.8
China, Xinhui City	Gujing shipbreaking yard	Greenpeace, 06-11-00	8.5 (TBT only)
Rostock, Germany	Neptunwerf, Floating dock	Greenpeace, 09-09-99	4.9
Thessaloniki, Greece	Port-Dock 24	Greenpeace, 10-08-00	1.3
Rotterdam, The Netherlands	Eemhaven Port	Dutch Ministry for Transport and waterways, 1999	1 (TBT only)

Summary on sediment samples

The reference samples indicate that the sediments in the Pearl and Yangtze rivers contain little or none of the pollutants investigated.The breaking up of ships seems to have polluted the sediment of the relatively clean local environment of the Yangtze and Pearl rivers with mineral oil,heavy metals, PAHs, PCBs and organotin compounds.The levels of many of the pollutants found in the river environment at shipbreaking yards are high enough to warrant clean-up action according to Dutch standards.

At all four of the yards, increased concentrations of oil and PAHs were found. At two yards (1 and 3), for these substances clean-up of the sediment would be required under the Dutch standards for quality of sediment. Of the heavy metals, particularly high concentrations of copper, zinc and nickel were found and at three yards (1, 3 and 4).These levels would justify clean-up under Dutch standards for sediment. Higher levels of PCBs were found in two yards; at one yard (1) clean-up would be required under the Dutch standards for sediment. Organotins were found in increased concentrations at three yards (1, 3 and 4). At the Gujing yard in Xinhui City there was even a peak concentration of TBT. Comparison of the peak concentration of TBT in the sediment of this yard with the values from European hotspots would put this Chinese yard in 8th place among the top ten European TBT hotspots.

4. Conclusion

The observations of Greenpeace make clear that toxic substances are not being handled in a safe and environmentally responsible manner in the Chinese yards. Samples investigated indicate that sediments are polluted with very toxic and persistent substances.The levels of many of the pollutants found in the river environment at and near shipbreaking yards are high enough to warrant clean-up action according to Dutch standards.

- The problems indicated are in line with the general conditions in many Asian countries:
- inadequate awareness of environmental and health problems related to hazardous substances;
- inadequate legislation and enforcement to protect the environment and the occupational health and safety situation;
- a low degree of mechanisation;
- absence of a global regime mandating removal of hazardous substances (such as asbestos) from ships prior to export for scrapping.

Based on these findings, Greenpeace once again stresses the need to stop dumping hazardous waste in non-OECD countries in Asia. Old ships should be decontaminated before being sent to Asia.This case also shows the current impossibility of handling and disposing of hazardous waste in a safe way which can meet existing standards in OECD countries. Even if western companies send protective gear, train local workers and try to guide the breaking operations, they fail to meet even minimum standards. It should be concluded that saving money by sending ships with hazardous substances to Asia can not be accepted as a responsible practice. Greenpeace welcomes the suggestion by P&O Nedlloyd in their report that they would investigate the introduction of a pre-cleaning yard to separate decontamination and breaking. This shows that P&O Nedllyd also has serious doubts whether it is possible to break toxic ships in an acceptable way at the breaking yards in Asia.

Greenpeace demands:

1. Shipowners/operators must present a complete inventory of all hazardous material on board the vessel,making a register of the pollutants and analysis of the dangers from the ships;

2. The Polluter (Shipowner/operators) must decontaminate the ships-for-scrap prior to export;

3. Shipbreaking should be conducted without risk to workers'health or to the environment;

4. Tankers must be made gas-free for hot works prior to export for breaking;

5. Shipowners/operators must disclose the selected shipbreaking facility and the assessment done to ascertain good working conditions and environmental record;

6. Shipowners and shipbreakers must carry out extensive consultations on the breaking plan and put in place expert monitoring;

7. Shipbreaking facilities should be freely accessible by citizen groups, environmental NGOs and trade union activists;

8. Shipbreaking should be subject to a global regulatory regime, rather than being a matter of unilateral measures.

Looking ahead, Greenpeace demands that:

1. Existing ships should be made progressively cleaner, by systematically removing, and replacing toxic and hazardous substances during maintenance, repair, refitting and rebuilding programmes;

2. The "next generation" of ships should be "clean ships,"i.e. ships that are designed and constructed with a view to eliminating their environmental, health and safety implications upon decommissioning.

As it is evident from the above demands, Greenpeace is not opposed to either the shipping or the shipbreaking industry. Greenpeace will, however, actively oppose the export of ships that are not decontaminated, and we will continue to stand up against unsound breaking practices that threaten workers' health and the environment.

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