2004 Berlin Conference on the Human Dimensions of Global Environmental Change
" Greening of Policies – Interlinkages and Policy Integration "

Sustainability in the Life-cycle of Renewable Primary Products
Case report: Governing the Maritime Transport of Liquids

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SUMMARY

Coast and birds blackened by mineral oil are an icon for the risks involved in the transport of mineral oils. Rules have been developed since the end of the 19th century. In the 1970s, international environmental protection standards were introduced through Annex I of the International Convention for the Prevention of Pollution by Ships (MARPOL) for mineral ("black") oil tankers. Regulation of the maritime transport of other bulk liquids, such as chemicals, in special tankships (chemical tanker) has also been developed at that time (as Annex II to MARPOL) leaving the transport of vegetable oils more or less unregulated. Today, about a third of the tankship capacity non-licensed for mineral oils is used for vegetable ("white") oils. Figures are rising. Marine environmental protection became an issue when floating vegetable oils coated birds and European coastline in the early 1990s. As this damage to birds was caused by operational discharge and not by accident, no press pictures of oiled animals were alarming the public. The revision of the environmental regulation was advocated by experts in maritime affairs and pollution prevention only. It took the maritime community several years to accept that white oils show similar hazards than black oils and need stricter regulation.

A story will be told: It starts with the identification of impacts on the coastal environment and the critique on the scientific principles of hazard evaluation. It will end up with the finally approved new regulatory system. The actors and stakeholders, the instruments and successful strategies involved will be identified. The case study will show the complexity of policy instruments, the social and economical interests and the technical maritime standards even when amending one specific piece of international treaty. This case report documents and discusses the integration of environmental policy into maritime shipping policy.

This paper is a case study on revision of an international instrument to cope with the risks involved in the transport of renewable primary products. The presentation will demonstrate how comparatively strong rules for environmental protection have been introduced for a fully globalised business under the involvement of several United Nations bodies.

1 INTRODUCTION

Maritime Policy

The existing global maritime regulative network including marine environmental protection under the United Nations Convention on the Law of the Sea (UNCLOS) might be classified as "global regime". Our study presents a case study on a fundamental revision and strengthening of an existing convention. As to our knowledge, the basic regulatory framework on tankships is one of the few regulations that even in detail are managed on a global scale by the United Nations´ International Maritime Organization (IMO). It is therefore, that the political processes for strengthening the rules and enhancing environmental protection is of great interest and scientific studies are relatively rare (see Höfer & Mez 2003, Campe 2004).

Sustainability

Renewable raw materials are one key to conserving our planet's limited resources and avoiding ecological problems. Helped by the sun's energy, plants will grow again and again. When they are processed, they release only the same amount of carbon dioxide as they withdrew from the atmosphere while growing. Thus vegetable oils represent renewable energy raw materials to reduce the greenhouse gas effect. The International Conference for Renewable Energies in June 2004 acknowledged that renewable energies combined with enhanced energy efficiency, can significantly contribute to sustainable development (ICRE 2004): The use of renewable fuels based on vegetable oils or biomass will let us become less dependent on fossil fuels whose supply is finite by nature. Several studies have been conducted to examine the environmental impacts of biofuels for transportation and to estimate their costs showing both advantages and disadvantages to fossil fuels (e.g. Quirin 2004). However, the transport chain from agriculture to consumption, as far as we have identified, had not been studied in respect to its environmental risks or impacts.

Policy integration

This presentation is a report on practical challenges and interactions when amending an international treaty including technical guidelines for the sustainable usage of renewable primary products: oil of vegetable origin. The aim is also to bring to the attention some of the insights gained from fundamentally amending a maritime convention by integrating environmental policy. Of particular interest in policy research is the discussion of the roles of the international secretariats, the network of stakeholder representatives within the governing bodies of the international institutions and the integration of environmental policy into this policy setting.

2 THE CASE

2.1 The Transport of Renewables

Regulating Maritime Transport of Bulk Liquids

The maritime regulation on the transport of liquid bulk cargos is one of the clear examples for comprehensive global governance. Not only the policy level for decisions but also technical approvals as well as time-limited authorisations by member countries are handled through an UN administration with yearly hazard evaluations of cargoes (e.g. IMO 2003), circular letters listing all cargoes licensed to be carried in special tankships (IMO 1993b) and additives allowed to be used as tank cleaning agents (IMO

1994a, IMO 1999b). The basic technical standards for ships are set by the International Convention for the Safety of Life at Sea (SOLAS).

The instrument governing the carriage of bulk liquids is part of the International Convention for the Prevention of Pollution from Ships, MARPOL, from 1973/1978. Annex II to the main body of the treaty contains Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (IMO 2002d). This annex was more or less a by-product of the prevention of oil pollution by tankships (for the history of MARPOL: Mitchell 1994, Höfer & Mez 2003). In 1970, during the preparation for the International Conference on Marine Pollution, maritime experts realized that not only oil tankers but also other tankships could pose a risk to environment and health. As the United Nations Environment Programme (UNEP) did not exist at that time and the World Health Organization (WHO) had no specific expertise in this respect, the IMO turned to GESAMP (Höfer 1999b). GESAMP, the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, is an interagency expert group created during the preparation of the first International Conference for the Environment in Stockholm to advice and co-ordinate in marine environmental pollution matters within the UN system. With the finalization of MARPOL´s Annex I on oil pollution, a second annex on chemical pollution hazards was created to regulate shipments of non-mineral oil liquids in tankships. However, when defining the hazards to the marine environment, GESAMP scientists did not start with the well-known hazards of oil slicks but asked experts in the field of aquatic toxicity to write down hazard criteria (IMO 1989). They concentrated on effects of soluble chemicals ignoring the hazard of floating oils which they thought would be regulated by Annex I to the planned Convention. Resulting from this specialization in two hands, the oily properties of vegetable and animal fats were not realized as such, rating such products as non-hazardous. With that classification most of these products could be carried in each and every tankship allowing a discharge of diluted oils in more or less unlimited volume (see Picture 1).

Picture 1: Discharge of white oils form tankship in the North Sea - legal at that time (photograph from surveillance plan kindly provided by the Netherlands´ Ministerie van Verkeer en Waterstraat, Directorate-Generaal Goederenvervoer, Den Hague)

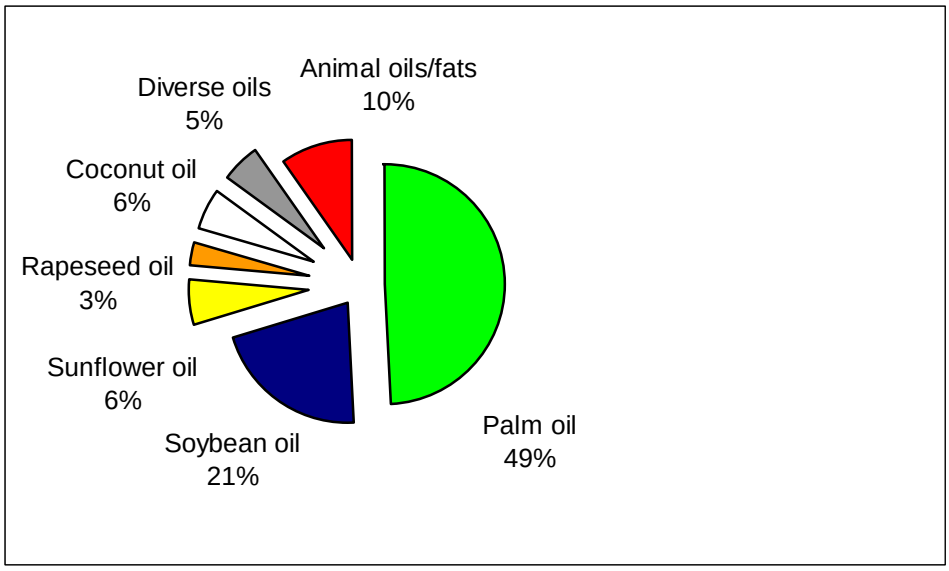
About Renewable "Environmentally Friendly" Oils

With the rise of the environmentally friendly products and the agricultural industry needing feed for the ever increasing numbers of farm animals, increasing volumes of vegetable were produced and carried in

sea-going tankships. Whereas chemicals were carried under strict regulations for chemical tankships in relatively small ship tanks of several hundred tons each, the vegetable oils were carried in bottom tanks of cargo vessels and single-hull tankships carrying 10.000 to 40.000 tonnes in a few separated tanks only. The simple pumping technique, the relatively low value of cargo (compared to chemicals) and a lack of technical discharge requirements in general posed a clear risk to the environment by significant discharge, but was not identified by regulators during the 1970´s and 1980´s. Vegetable oils were not transported under IMO´s International Code for the Contruction and Equipment of Ships Carrying Dangerous Chemicals in Bulk that was defining the minimum carriage requirements for bulk liquids to protect the marine environment.

Sources of vegetable raw materials include soybeans, rapeseed and sunflowers; vast plantations in the Philippines and Malaysia supply coconut and palm oils (see Figure 1). Oils are used for direct use in the food industry (for animals as well as for human consumption). However, ever increasing volumes are used for further chemical treatment resulting in biodegradable surfactants (household cleaning liquid) and fuel for engines (eco-diesel). Producing countries expect a strong increase in demand based on upcoming EU legislation on the addition of renewable oils to common gasoil for use in car engines. Such vegetable oils represent about a third of all non-mineral oil cargo in sea-going tankships. About 40 million tonnes of vegetable and animal oils and fats are shipped by sea, palm oil representing about 50% (IMO 2002b, USDA 2004). There is an increase in production and transport volume every year.

Figure 1: World movements of vegetable and animal oils (IMO 2002b)



2.2 The Issues for Environmental Policy

Environmental effects: Contaminated Marine Birds Died

In the winter of 1988-1989, a significant number of oiled sea birds were washed onto Dutch and German beaches. Although that had happened on a regular basis before, it was now realized that these animals were not coated with black oils but with some other slicky material. After chemical analysis it became clear that chemicals were involved. Further research revealed the origin of the substances involved: For tank washing purpose strongly acting surfactants were used to clean the large tanks off residues after deloading of edible fats in the ports of Rotterdam and Hamburg. Biologists assumed that the sea-birds

were poisoned by these cleaning agents or their degradation products, which are known to be even more toxic, strongly irritating and interacting with the hormonal system. Reports submitted to the Marine Environmental Protection Committee of the International Maritime Organization were alarming (IMO 1990).

Within a few years, a new regulation and approval procedure of cleaning additives was developed and implemented by the IMO (IMO 1994a). However, in 1991, the Netherlands introduced a report to IMO (IMO 1991): Further studies carried out in the Netherlands indicated that not the cleaning agents, but the layers of oily substances were fatal to birds. More and more reports came in as beach cleaners and police in Germany, Danemark and the Netherlands started to have a detailed look on the oiled birds that had been thrown into the bin before while blaming the mineral oil industry for this marine pollution (see Picture 2). Every two weeks groups of dead birds were collected on the beaches of the islands Amrum, Sylt, Helgoland and the coast of the North Sea and sent to further examination at competent laboratories. Studies confirmed the coating effect leading to death even without the involvement of cleaning agents. During the years, reports showed that similar effects on birds were also observed at the North American coast (Smith 1989) and the vegetable oils did not biodegrade at the beach but transformed into a gum-like material (Mudge 1997, Gloria Pereira 2002).

Picture 2: Sea-bird oiled by white oil

For sea-birds any substance affecting the plumage means a serious health risk. The plumage acts as an isolating coating between the bird´s body and the environment for thermal isolation, flying ability, etc. It is essential that the natural water repellency of the feathers will not be diminished. Substances that make a film on the water surface are therefore, although edible and non-toxic in nature, fatal to many marine animals. Edible oils are thus producing the same effects as mineral oils on marine birds.

Inadequat Marine Environmental Protection Standards

As early as 1994, the IMO circulated to all member states guidance and warning concerning the transport of vegetable oils and their effect on birds after discharge (IMO 1994b). The organization urged governments and port state administrations to bring the information to the attention to all ship operators to reduce the discharge of such substances inspite of missing specific regulation.

The Netherlands proposed to include "lipophilic" properties in evaluation and classification of the pollution hazards of cargoes. IMO experts developed preliminary regulative drafts. This resulted in an outcry of the agricultural industry involved, when realizing the effect on the transport requirements for vegetable oils, switching these cargoes from non-standardized simple tankships to double hull spezial tankers. In 1993, the industry explained that the ocean carriage of vegetable oils is safe (IMO 1993a): The edible oils were shipped especially to feed animals, some were even for human consumption, generally recognised as safe, never as hazardous. Any strict regulation by IMO against these environmentally friendly products would not be in the interest of the international community and the developing nations in particular, the producing countries in Asia and Latin-America argued.

It was realized that not only renewable vegetable raw materials but also lipophilic chemicals (oily substances) created floating liquids. Investigations were started e.g. by the European chemical industry (ECETOC 1990). In contrary to the situation surrounding oil tankers, large volumes of mineral oil products like lube oil additives were transported in chemical tankships without any appropriate evaluation of the hazards created by these liquids when floating after accidental or operational discharge. However, these products because of their health hazards were transported under strict technical requirements, whereas vegetable oils could be transported by nearly any kind of ship tank system.

United Nations Conference on Environment: Sound Management of Chemicals

In 1992, the United Nations Conference on Environment and Development in Rio de Janeiro discussed issues connected to the maritime transport (UN 1992). This conference had direct implications on the just started discussion on the revision of the tankship regulations. Whereas the discussion under Chapter 17 on the protection of the oceans touched on-going issues and projects of the International Maritime Organization only, Chapter 19 on chemicals presented new challenges for the IMO. When discussing the sound management of toxic chemicals (Chapter 19 of the conference), the conference noted that a world-wide valid hazard classification and labelling system was not available to promote the safe global management of chemicals. The conference decided to develop a globally harmonized hazard classification and compatible labelling system, including material data sheets, the so-called GHS.

With that decision, the classification systems in general were on the international political agenda. Any revision of cargo related regulation by IMO could not ignore these developments. In 1993/94, proponents of new stricter rules for the transport of bulk liquids refered to the ongoing work in this respect. They furthermore argued, that a revision would be necessary not only but inter alia because of the outcome of Chapter 19 in 1992. It was then that all hazard classification criteria were put on the touchstone. Aspects of floating oil hazards became one of the issues only. They were hidden by a large number of further re-classification issues.

The Globally Harmonized System: Implementation without Ratification

Within the following eight years, a Harmonized Integrated Hazard Classification System for Chemical Substances and Mixtures was developed under the co-ordination of the Organisation for Economic Co-Operation and Development OECD (OECD 2001) for health and environmental protection issues. Once completed, in 1999 all work was transmitted to a newly established United Nations Committee on the Globally Harmonized System of Classification. Some years later the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) was publised by the UN (UN 2003). Although the model system did not become part of any international convention and therefore lacked ratification, the organizations involved with the help of their secretariats pushed the project and urged member states of organisations concerned to follow the principles. The same happened within the IMO and influenced the revision process. IMO´s bodies were forced to allign their proposals with the cirtieria prepared for this global exercise. Arguments to re-wright the regulations for special tankships were strengthened. From 1993 to 2003, IMO´s experts involved had to allign with OECD´s and UN´s expert meetings on the

development of the GHS. During this time, in a flexible approach, scientists collected all safety data for bulk liquids listed or derogated in the IMO regulation, developed specific criteria for hazard classification in line with the ongoing discussions at OECD and UN level. They re-evaluated about 800 chemicals. The work was done by the interagency expert group GESAMP (IMO 2002c) finanzed by IMO and those member that were strongly involved in the revision of the Annex to MARPOL: the Netherlands, Norway, the USA and the United Kingdom. The hazard evaluation of vegetable oils became a side-issue for some years.

2.3 Reaction and Strategy at the Policy Broker

Policy Learning through Technical Discussion

The bodies of the IMO as the policy broker involved reacted according to their rules of procedure by bringing the issue as one topic besides others on the agenda of the competent Marine Environmental Protection Committee. Without any time consuming discussion, a technical safety-orientated sub-committee was asked to look into the matter. The terms of reference decided (IMO 1993c) were clearly written in a technical style to refrain from any early controversial debate that might block progress because of impacts on the shipping industry. The terms of reference sounded clearly maritime:

- Simplification of present requirements and editorial amendments,
- Adaption to technical progress,
- Inconsistencies with mineral oil tanker requirements,
- Categorization of noxious liquid substances.

The proponents for marine environmental protection used these technical maritime terms to integrate marine environmental policy:

- Simplification through a reduction of classification categories covering all bulk liquids under the regulations,
- Introduction of improved cargo tank emptying technologies for all bulk liquids and better enforcement procedures,
- Assimilation of discharge standards for oil-like substances in all tankships based on strict mineral oil tanker regulation,
- Principal change of existing criteria for the categorization of liquid cargoes.

This strategy included a competent development of technical regulation, often with two alternatives explaining the pros and cons, and presenting practicable technical regulations based on best quality science and technology. The strategy for integrating environmental issues proved successful in the end as it enabled responsible tankship owners to get a feeling for upcoming environmental protection standards for ships and invest in new shipping technology accordingly. The political decision at the end got a clear majority whereas in the beginning the opposition was stronger.

Showing the Feasability of the Policy Project

The simplification of the maritime regulation and the new criteria led to a re-classification of all 700 listed cargoes and the more than 1000 liquids regulated specifically by IMO circular guidelines. To show benefits and problems associated with proposed amendments a computer-based classification of cargo could be managed. According to IMO records, about 6 versions of different classification systems covering the base set of 700 chemicals were prepared between 1998 and 2004. Five product types, which include 33 code entries accounting for about 80% of the word´s seaborne trade in chemicals and vegetable oils, an estimated 75 Million tonnes of cargo per year were to be re-categorized in particular.

This was essential to identify the implications for the industry and the feasibility, as many chemical tankships are specialized regarding route, size and cargo type, any newbuilding needs significant investment and takes many years. The result was: About 25% of all liquid cargo volume, former non-regulated cargo was to be covered under strict carriage requirements and had to be shifted into classified (licensed) chemical tankers. During the two years of political debate at IMO it was often discussed, whether this surplus could be soaked up within the predicted surplus of existing abundance and "to-be-build" ship tonnage.

Getting the Majority for the Policy Project

This strategy in convincing the maritime community at IMO was well adjusted to the style of co-operation within the network of maritime stakeholders gathered at the meetings. It let to a final political debate at the end with only weak opposition organized by the leading exporter of palm oil: Malaysia. The long process of integrating environmental issues allowed for identification of regional and technical problems as well as the tailorized solutions for e.g. the small pacific islands´ trade of vegetable oils. In autumn 2004, all important stakeholders including the European Union states, the USA, Japan, India and the open registers presenting delegations of Panama and Liberia, voted for stricter rules on the transport of bulk liquid cargo (2004c).

3 ANALAYSIS

3.1 The Stakeholders: Political and Economical Interests

European Nations

According to IMO meeting reports of 1993-1997, the work was driven in particular by experts from the Netherlands who were then nominated as chairmen for the regulatory as well as the scientific work within IMO working groups. Most European nations were not actively involved nor intervening pro or con the guidance presented by the Netherlands (representing the world's largest largest port for unloading vegetable oils and being effected by contaminated beaches). Specific submissions to IMO on the issue in the 1990s were restricted to Greece (e.g. IMO 1996a; representing a large tanker fleet ownership), Norway (e.g. IMO 1994c; representing a large modern chemical tanker fleet ownership) and Germany (e.g. IMO 1996b; representing the world's largest producer of naturalsource oleochemical basestocks and being effected by contaminated beaches).

The lack of activity by most European delegations has to be connected to a lack of European regulations on floating substances like vegetable oil. Still, in the European directive on chemicals (EU COM 1976) as well as in regulations for the transport of dangerous goods on inland waterways criteria on hazards of floating liquids are missing. Even principally strict national regulations (like regulations based on the German Wasserhaushaltsgesetz) or the proposal for a new EU chemicals policy "REACH" (EU COM 2004) are still ignoring the risk. Thus, it is not astonishing that national environmental politics did not support the position of the European delegations at IMO meetings. However, European countries had an interest to include parts of their legislative approaches into the chemical tanker regulation, eg. the criteria connected to biodegradability of chemicals (IMO 1996b).

The USA

The USA is one of the important players in the trade of vegetable oils (see Figure 2). The delegation from the USA observed the progress carefully without interfering against but looking for a thorough evaluation of the potential consequences of stricter environmental regulation for shipping. It was not before the late 1990s, that this delegation realized the impact of the national Oil Pollution Act, as the US Environmental

Protection Agency published a regulatory rule-making statement (USEPA 1997). The report included a list of edible oil spillages (see Figure 3) that resulted in heavy environmental effects like fouling of beaches, destruction of recreational areas as well as breeding grounds and killing birds. The agency concluded, that the environmental effects of such "white" oils are as devastating as those produced by mineral "black" oils. They should be treated the same way in respect to environmental protection law. It was then during the late 1990s that the USA backed the introduction of stricter rules for the transport of vegetable oils. Based on their national policy (defined by the Oil Pollution Act OPA) they opted for double hull tankship technology.

Figure 2: List of Edible Oil Spillages reported by the US EPA (USEPA 1997)

Real-world Spills	**Reported Effects of Spills**
More than 4000 tonnes of soybean oil discharged from storage facility in Minnesota (1962/63).	Killed thousands of ducks and other water-birds and formed rubbery masses with slick, as well as hard crusts of soybean oil with sand.
Animal fat and vegetable oil pollution in New York State waters in the late 1960s (reported 1967) from a variety of sources.	Shore-line grease balls floating; material killed waterfowl, coated boats and tainted fish.
Cargo ship with coconut oil, palm oil and other edible liquids ran aground at Fanning Atoll (1975).	Killed fish, crustaceans, mollusks; effects on marine community continued for 11 months.
Releases from fish factories at St. Helena By in South Africa (1973).	Reported killing of 10,000 lobsters and about 100,000 other smaller crustaceans (like clams).
Three rapeseed oil spills of about 5.5 tonnes in total (1974-1978).	Killed 500 birds.
Spill of fish oil mixtures near Bird Island, South Africa (1974).	Killed about 6000 animals including penguins and cormorans.
Discharges from tankship in front of Netherlands and German coastline 1988-1989) as reported to IMO	Washed thousands of oiled sea-birds ashore.
Discharge of sunflower oil from ship at the North Wales coast (1991).	Oil polymerized and covered bottom. Remains still detected six years later as concrete-like aggregates of oil and sand on the beach.
Soybean oil spill in Lake Lanier, Georgia, USA (1996).	Rancid oil weathered, adhered to boats and docks; rapid response prevented significant damage.

Shipowners and Flag-of-convenience States

The tankship owners represented by organizations like Intertanko and the International Parcel Tanker Association IPTA as well as by important flag states like Panama and Liberia observed the developments carefully during the first years and switched to positive backing in the late 1990s. At that time, the impacts on the fleet and the business as well as the time schedule for enforcement of new regulations became clear (e.g. IMO 1999a, IMO 2002b, IMO 2004a). There was also a window of opportunity for new regulations as there had been a boom to chemical tanker building in the early 1980s. Being older than 20 years in 2005 – 2010, these ships were now at the end of the lifetime for good quality management. Shipowners engaged in IMO meetings had started finanzing new fleet capacity based on the proposed future ship standards, in particular modern double hull special tankers.

Some of the largest ship operators are based in Norway. Large vessels of this kind are priced at about 40 Million US Dollars each (HCB 2004). The large volume of vegetable oils, representing more than a third of all non-mineral oil bulk liquids carried in ships, would have to be transported in such ships. Relevant shipowners wanted to have appropriate cargo space available when the proposed regulations were enforced. New ship yard and company data on building contracts clearly indicate that industry responded very well to the regulatory developments by ordering new tanker tonnage to enable contracts for the transport of about 25-40% more cargo per year in chemical tankships.

Stakeholders in Vegetable Oil Business

During the debate at IMO, important exporters and importers of vegetable oils were identified (Figure 3). It was in particular an Asian and Latin America dominated coalition. It was Malaysia on behalf of some other vegetable oil producing countries, who did still at the end question the hazards of floating oils for some products (like palm oil) arguing that these liquids could solidify and thus not harm marine life. Furthermore, Malaysia identified a shortage of suitable tanker tonnage, thus leading to a shortage of renewable oils after 2006 (IMO 2004b). Between the lines of the papers submitted during the years it was made clear by the producing agricultural industry that stricter transport regulations might influence the competitive position of these renewable raw products in a negative way and might have impacts on developing countries in the south.

However, important members in the Asian advocacy group broke away as the full economical impact of stricter rules became clear: Forcing single hull tankships, a significant chare of the fleet, out of business would ask for ship breaking. This ship recycling industry including the wreckage on beaches and steel-works is dominated by India, Bangladesh and China. South Korea is home of some of the largest ship yards of the world. These countries stopped opposing the revision of the regulations after accepting the environmental risks of vegetable oils - but also in light of their potential ship recycling interests.

Figure 3: Major stakeholders vegetable oils business (IMO 2002b)

No.	Type of Oil	Exporters	Importers
1	Palm oil	Malaysia and Indonesia (89%)	China (12%), EU (17%), India (20%)
2	Soybean oil	Argentina and Brazil (60%), EU (16%)	India, Bangladesh and China (28%)
3	Sunflower oil	Argentina (55%)	India (23%)
4	Rapeseed oil	Canada (46%), EU (25%)	USA and China (54%)
5	Coconut oil	Philippines and Indonesia (87%)	EU (40%)

Regulatory Interests

During more than two decades of experience with controlling marine pollution by ships, it became clear that regulations based on procedural requirements are not effective because enforcement of compliance on sea is nearly unpossible. With some weak maritime administrations, in particular those of open registers and flags of convenience, history showed that under these circumstances port state control is the best way to keep standards and fight against negligent behavior onboard ships. Furthermore, expected penalty costs can be increased by retaining ships with deficiencies in port, as actual penalty costs based on national laws do not deter but ship´s daily leasing rates are significant. Therefore, the arguments brought forward by strong port state control administrations (like the Netherlands and the United Kingdom) during the discussions were important and in general convinced the coastal state

delegations. With financial contributions from the USA and the United Kingdom, the Netherlands (all three with well established port state control regimes) performed a study on the perspectives, benefits and challenges connected with any revision of the regulatory system for bulk liquids including the database on properties of several hundreds of cargoes to investigate the implications of amended classification of cargoes (IMO 1995).

3.2 The Policy Process

Phased Process

The political process from the identification of the environmental risk up to the implementation of regulation can be structured into destinctive periods.

Before any political or regulatory debate, scientists already wrote reports about the risks to the environment (as discussed in para. 2.2) in the 1970s and 1980s. However, it were the reports from coast guard and beach control agents in 1989 that induced political activity at national levels. The process at IMO level could be separated into three periods representing different processes with different advocacy groups (see Figure 5): start of debate, development of proposals, finalization of convention text. The policy process is shown in Figure 4.

Figure 4: Five Phases of the policy process

1a	1978-1989	First articles on the biological effects of floating vegetable oils published in scientific literature, noted by the scientific community only.
1b	1989-1990	Competent authorities´s reports on environmental effects reached the policy level in the Netherlands, Germany and Danemark
2a	1991-1993	Policy disput on choice of action on the IMO policy level; policy decisions on sound management of chemicals by UN Rio de Janeiro Conference influenced policy.
2b	1993-2003	Development of technical regulation in international working groups; impact by US EPA report concverning legal national background changed policy position of the USA; integration of policy development into shipowner investment concepts changed attitude of this stakeholder group.
2c	2003-2004	Finalisation of debate at international level and approval procedur.
	2005-2007	Global implementation and entry into force.

In contrast to common thinking, the time consuming part concerned the transfer of scientific knowledge to policy makers. It should also be noted, that the writing of technical regulation itself was limited by the number of regular meeting sessions. One per year is common.

Advocacy Coalitions Changing

When the discussion at international level started, the coalition advocating the revision of rules was small. According to submissions and reports brought forward by the Netherlands, confirmed by Germany, arguments were taken by Norway only. However, as Norway is the home of important special tanker operators, this position was important and noted by other maritime delegations at IMO. Most delegations including the large vegetable oil exporters and importers (see Figure 2) accepted a compromise, opting for some editorial work on the existing convention only. Arguments from classification societies and some

port state control experts backed that perspective (see Para. 2.3). Figure 5 shows an overview of the advocacy coalitions through the political process.

Figure 5: Advocacy Coalition (structure acc. to Sabatier & Jenkins-Smith 1999) under the policy broker "IMO´s bodies"

Policy Learning Phases	Advocacy Coalition (pro new regulation)	Advocacy Coalition (contra new regulation)
I (starting to early 1990s)	The Netherlands * ***	Japan **
	Germany * **	Malaysia, Indonesia **
	Norway **	Panama **
	Classification Societies ***	Liberia **
		Greece **
		USA **
		China **
		India **
		Ship Owner Ass. **
II (mid and late 1990s)	The Netherlands * ***	Japan **
	Panama **	Malaysia, Indonesia **
	Germany * **	Liberia **
	Norway **	China **
	USA *	India **
	Classification Societies ***	
	Ship Owner Ass. **	
III (2000s and finalization)	The Netherlands * ***	Malaysia, Indonesia **
	Panama **	
	Germany * **	
	Norway **	
	USA *	
	India **	
	China **	
	Classification Societies ***	
	Ship Owner Ass. **	
Points of interest	* environmental protection policy ** economic policy / interest *** regulatory aspects	

Policy Learning Process

During the deliberations at IMO the coalition pro revision grew:

- The regulatory statement published by the US Environmental Protection Agency in 1997 changed the position of the USA during the process. From a national policy standpoint, white oils are to be treated similar to black oils during transport. As the existing international maritime regulations did not correspond to this requirement, the US delegates joined the coalition pro new rules.
- The shipowner associations as well as the flag-of-convenience states were heavily influenced by important ship operators running tank vessels. Depending whether these companies represented low quality or high quality ship tonnage, the positions of these actors were different. At least, high quality operators sent their representatives in a regular mode and were represented more strongly at meetings. These shipowners were interested in getting the large volume of un-regulated vegetable oils onboard their highly sophisticated ships away from cheap-running ships with simple technology. It

were the companies represented at the meetings that invested in new additional tonnage to cover future needs based on stricter regulation. Their representatives from owner associations as well as flag states lobbied for new regulation to secure the amortisation of investment.

- During the last sessions, the Asian coalition of vegetable oil stakeholders broke up. Important influence had a side-effect of stricter regulation. Many low-quality tankships would have to be scrapped because they would not comply with the carriage requirements for vegetable oils. As the beaches of India, Bangladesh and China are the home of the world´s largest ship recycling sites, specific economic interests were identified.

Figure 6: Beliefs and common understandings in actors´ scene regarding the policy process

	Core beliefs	**Policy phases**		
		2a	**2b**	**2c**
1	Shipowners have to follow flag state regulations only	+	+	+
2	Ship management standards should global	+	+	+
3	Environmental standards should be global	+/-	+/-	+
4	Edible oils are not environmentally hazardous	+	-	-

The policy learning is associated with the policy process phases (see Figure 6). There is a firm belief in the maritime arena, this is the concept "Freedom of the Seas" introduced about four hundred years ago by Hugo Grotius with the notion "Mare Liberum" (Russ 2003). Resulting from this, two core beliefs had been developed in running ships and let to the establishment of the United Nation´s International Maritime Organization: Ship operators have to follow flag state regulations only and ship management standards should be global. This concept is introduced into the Law of the Sea (UNCLOS) Convention that offers the legal background for any use of the sea. However, regarding standards on marine environmental protection, the areas of the sea are not treated the same way. Some regions are understood as more sensitive than others, with so-called Particularily Sensitive Sea Areas on top of the scale. Resulting from these differences, the maritime translation has been, that discharge limits and pollutions standards for noxious liquids should differ in these regions. However, when the understanding of the environmental hazards of edible oils was established and strong limits were set, this tiered approach to pollution and discharge standards showed its clearly tactical face: The maritime community decided to go for one global environmental standard for chemical tankships.

3.3 Institutional Setting

Institutional Capacity

Any revision of the MARPOL Convention is embedded in the agenda of IMO´s Marine Environmental Protection Committee (MEPC) that can amend the convention at any time based on IMO´s tacid acceptance procedure (for "tacid acceptance procedure" relevance see paragraph 4.1). As the rules for chemical tankships are detailed and deeply embedded into IMO´s treaties, the identification of the hazard to marine birds acted as a kick-off for further deliberations:

The scientific hazard identification procedure had been developed in the late 1960s, early 1970s. Meanwhile, a number of additional biological and toxicological aspects had been identified and tests had been development. The discussions on the GHS had an additional effect (as already discussed).

Greenpeace strongly critized the use of acute toxicity data by ignoring the criteria assessing the chronic toxicity to the marine environment (IMO 1994d). This lead IMO to introduce tests and detailed criteria on chronic aquatic toxicity before a respective discussion was started within the development of the GHS.

Once a basic revision of a regulatory instrument was induced, technical experts from industry and flag states offering modern technology were coming forward with ideas of further improvement of technical requirements offering better environmental protection. This is typical for open fora with regulatory organisations and happened also in IMO in the 1990´s. The pumping efficiacy standards from the 1970´s could clearly be improved. Tankships built before 1986 left about 1000-3000 litres of non-regulated bulk liquid in each tank and had to discharge this volume as waste. The technical standards by IMO required a reduction of this volume to 900 litres, but modern ships could easily get down to 100 litres. It was then decided that any revision of the regulation should aim at a value below 100 litres to reduce operational discharges into the sea or reception facilities in ports.

Regulators, in particular those that did port state control, contributed many experiences with control and practical deficiencies with implementation. They asked to stream-line the text and harmonize the regulations between mineral oil tanker and chemical tanker as both ship types carry liquids with similar hazards. An editorial improvement of all 150 pages resulted.

Institutional Structure

It must be realized that the institutional setting and structure of the institutions involved has a strong influence on the early detection of risks for health and environment not covered by existing regulations. In this case the transfer of information within the maritime and coastal adminstrations, the network of experts within IMO worked fairly well. The reports on oiled birds resulted in first regulatory responses within 1-2 years. The criticism by Greenpeace (1994d) confirmed by GESAMP scientists, resulted in deciding on criteria that were not even finalized under the GHS (on chronic aquatic toxicity) or not even envisaged by the EU legislators (on hazards of floating liquids).

However, there was a lack of transfer from developments in science to regulatory practice. Although discussed in scientific journals in the late 1970s (McKelvey 1980, Russel 1978), the effects of vegetable oil on sea birds were only realized in 1989 by regulatory experts (see Figure 4). At that time additional effects of accidental spillages on the coastal environment were published (Smith 1989, Mudge 1992). A direct involvement of scientific work within regulatory agencies was lacking, as GESAMP is separated from IMO. A similar critical development takes place in Europe by installing scientific risk assessment including scientific early detection in organisations separated from those agencies that are responsible for risk/hazard management and regulatory affairs. Devided national responsibilities for environmental pollution and public health in some European states created further problems in evaluating maritime risks. Regulators at IMO were really surprised to hear that flaoting properties of bulk liquids were not classified for chemical tankships´ cargoes whilst the hazards were well known, even in public, as far as mineral oils were carried. The EU regulators did not realize this hazard before and there is no EU regulation existing today.

When studying the functions and the effectiveness of international organisations from a political science perspective the practical limits and capacities of such institutions are mostly not evaluated. However, as the effectiveness of international conventions are strongly dependent of their institutional setting, the ignorence can be misleading. In the case presented here, the total amount of work done for the revision of the chemical tanker regulations has been estimated based on interviews and the reports available. There have been about 12 sessions of working groups (ca. 15 delegations; agenda item for 1-3 days), 12 sub-committees (ca. 90 delegations; agenda item for 1-2 days) and committees (ca. 180 delegations; agenda item for ½ day) representing max. 45 working days in total on the revision process, discussions and the development of amendments and new paragraphs. The extensive part of the revision process

was the re-evaluation of environmental, health and safety hazards of about 800 bulk liquid chemicals based on new criteria and the filing of thousands of new testing data including confidential reports in IMO offices. The scientific work has been done by a GESAMP expert group of 12 scientists meeting once or twice a year for 5 days each from 1996 to 2004. Comparing this situation with national or European legislation processes on similarily complex issues shows a highly efficient process at the IMO level, limited by the meeting capacity of the organisation that allowed 1-2 meetings a year each, resulting in a consultation process that took several years.

4 DISCUSSION

4.1 Global Governance for Sustainability

The open-ended discussion in an existing competent international committee including non-governmental organisations managed by an UN secretariat led to the integration of all existing programs and projects. It was clear from the beginning that once kicked off, any amendment procedure could be developed by majority votes within the committee, limited only by the tacit acceptance procedure. This motivated all stakeholders to get involved in the process. Thus, the organisational setting enhanced the regime effectivess.

The amendment procedures contained in the first conventions to be developed under the auspices of IMO were so slow that some amendments adopted have never entered into force. This changed with the introduction of the tacit acceptance procedure, also known as the "passive" acceptance procedure. This means that the competent IMO body which adopts an amendment fixes a time period within which contracting parties will have the opportunity to notify either their acceptance or their rejection, or to remain silent on the subject. In case of silence, the amendment is considered to have been accepted by that party. Amendments enter into force unless more than one third of contracting parties notify IMO of their objection. Tacit acceptance is now incorporated into most of IMO's technical conventions. It facilitates the quick and simple modification of conventions to keep pace with the rapidly evolving technology and science. Without tacit acceptance, it would have proved impossible to keep conventions up to date and the IMO's role as the international forum for technical issues involving shipping would have been placed in jeopardy.

Although the speed of reaction and development of new treaty paragraphs seems to be low, the involvement and the interests of pioneers for environmentally friendly technology, in this case the shipowners investing in ship tonnage with most modern technology, led to a strong interest by this industry for the revision of rules after some years of developments. The continous involvement of experts as envoys for important ship owners during the discussions enabled the companies to invest into the apprpriate (right) ship typs based on the upcoming legislation. During the years, it was no more the question of "what" but on "when". Having the appropriate ships available or on order at ship yards, these ship owners and their associations were more than interested to take over business from competitors running older ships.

Based on the open structure of global networks that are in detail often stronger than local ties, scientists are strongly "globalised" actors in environmental protection issues. Martin Jänicke pointed out at the last Berlin Conference: "Under real global environmental governance, science may hold the key". Although news coverage of global environmental protection in media mostly show politicians in front, often the international scientific network behind the scene is the driving force not looking for personal media coverage but aiming at problem coverage. There is a need, as also shown by this case study, to enhance the speed of bringing scientific studies to the attention of regulatory scientists without involvement of

politically or economical motivated resistance by governmental stakeholders, like specific risk management agencies or ministries which are interested in positive coverage of their work.

Global governance needs competent personell to keep international organizations prepared for the development of technical regulations. Decades of experience with national federal administrations in Germany showed that agencies with a large and competent workforce are needed to govern environmental and health protection, to develop new policy and identify environmental and health risks by preparing proposals for policy levels. The local authorities are smaller each, but not less important for organizing the enforcement and the identification of local environmental status or impact. Both are essential. However, in global maritime governance, this is not the case. A relatively large workforce exists on the national level, whereas the global level is the smallest entity in the system. E.g. of several hundred persons for translation and administration of meetings, IMO employs only about 60 nautical, technical and scientific experts. Without effective institutions global governance will not succeed based on strong national institutions only.

There is no alternative to global governance when confronted with global environmental impacts produced by a global industry. There has been critique on the adequacy of the existing organisational framework for global governance for marine environmental protection (for global ocean governance see: Payoyo 1994).There is controversy whether a centralized international institution or decentralized global treaty developments are more effective in environmental protection (e.g. Biermann 2000, Juma 2000). While some authors call for far-reaching reforms to create a world environmental protection organisation others argue against major changes.

4.2 Integration of Environmental Policy into Shipping Policy

The International Maritime Organization is proud in explaining that environmental policy is integrated into the main body of the work which is on technical standards for vessels, floating units and the maritime industry products as well as the maritime business including safety and rescue. This UN organisation is dedicated to maritime safety and pollution prevention under its slogan: "Safer Shipping = Cleaner Oceans". The structure of the organisation is based on four main committees. A greater number of sub-committees with specialized working groups are preparing the technical and editorial work (see www.imo.org).

1. The *Marine Environmental Protection Committee* based on the MARPOL Convention for integrating environmental policy into IMO´s work;
2. The *Maritime Safety Committee* based on the SOLAS Convention for integrating safety aspects concerning ship and crew into IMO´s work;
3. The *Legal Committee* on integrating the legal instruments developed with IMO into maritime global governance based on the United Nations Convention on the Law of the Sea (UNCLOS);
4. The *Technical Co-operation Committee* to enhance and optimize national implementation of IMO´s treaties and standards.

Environmental policy integration is often understood as an element of a process of ecological modernisation of policy. Such policy will continue to face important barriers because it runs counter to prevailing economical interests. Policy integration strategies need to be understood as learning processes, with a focus on developing institutional capabilities (Hertin & Berhout 2001/2003). As shown in our case study, based on institutional structures, environmental policy could be integrated into maritime regulations. It shows a good example on how to integrate environmental objectives into sectoral policy. The revised Chemical Tanker Code (based on the SOLAS Convention on safe management of ships) and the revised Annex II to MARPOL are global instruments acting together in a harmonized way to define technical minimum requirements for the carriage of bulk liquids in tankships.

As policy integration processes are slower than non-integrated projects, latter are often taken to gain faster results. However, as policy integration aims at win-win solutions (integrating social, economical and environmental benefits) and conflict minimisation (whilst not ignoring disputs as some conflicts will undoubtedly remain), the resulting solutions *by theory* are more sustainable than the alternatives. Practical experience, comparing the reported case with other non-integrated regulative maritime projects introducing marine environmental protection, suggests that the entry-into-force date, the implementation by industry and the enforcement by national regulations comes faster after adoptions of integrated policy. The traditional response on how to integrate an emerging issue in the policy debate has been to create new institutions and treaties (OECD 2002). The same pattern is evident within the IMO. The new treaties need specialized secretariats and separate legal implementation (internationally as well as nationally). Developments of technical frame-work and standards tend to operate according to closed decision-making processes, leading to independent and fragmentated solutions complicating the implementation by industry and the policy for global sustainability. These solutions are labor-intensive for global institutions in the long-run. However, it has to be acknowledged that due to limiations in the meeting schedules of international gatherings, policy integration within complex issues can slow down the speed of green policy significantly.

5 PERSPECTIVES

It is a well-known experience that the interaction of policy projects and regulations in the field of environmental protection can be very complex creating challenges in respect to process management and expert networks. The establishment of global scientific knowledge network is a challenge but could be managed with the help of internet and communication technology as well as scientific conferences. The interaction and timing of amendments or the new introduction of global regulations can be even more challenging. Amendments of existing interrelated treaties, regulations and programs that have to be ratified by member countries to allow global implementation at the same time, tends to create time schedules that elongate revision processes considerably. There is real risk created by fragmented international environmental policy performed by uncoordinated agencies or treaties. There is a lack of studies evaluating the effects of new specialized treaties in contrast to amendment (enlargement) of existing ones in respect to over-all international effectiveness and needs for man-power at national (delegations) and international (UN secretariats) level.

From a historical standpoint, the international ship operation is the first fully globalised business on earth. The regulation of this part of the maritime industry in respect to marine environmental protection should be looked at in more detail as it represents the oldest example of a global enviroment protection regime for a globalised industry. The Law of the Sea (UNCLOS) defines the legal background of all aspects for ocean governance including national, regional and international level. UNCLOS strictly refers to UN marine and maritime regulations that can even limit national legal competence. The most important rules in this respect are created under the roof of the IMO for maritime activities. However, there is only a limited number of studies on environmental protection within maritime policy.

6 ACRONYMS USED

UNCLOS	United Nations Convention on the Law of the Sea
IMO	International Maritime Organization
SOLAS	International Convention for the Safety of Life at Sea

MARPOL	International Convention for the Prevention of Pollution from Ships
GESAMP	IMO / FAO / UNESCO-IOC / WMO / WHO / IAEA / UN / UNEP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
WHO	World Helath Organization
UNEP	United Nations Environment Programme
UN	United Nations
OECD	Organisation for Economic Co-Operation and Development
GHS	Globally Harmonized System of Classification and Labelling of Chemicals

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