The Role of Environmental Education in Promoting Short-Sea Shipping

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Abstract
The environmental and social benefit of short-sea shipping gives it the advantage over other transport modes. Such advantage is translated into lower transport-related externalities such as air pollution and greenhouse gases, traffic congestion, noise, accidents, infrastructure repair and maintenance cost. Shipping enjoys an important position in the EC sustainable mobility strategy, but must still fully embrace a number of quality standards. Croatia has the sea, well-indented coast with numerous islands, long high-quality shipbuilding tradition, prestigious maritime training institutions and the need to protect its environment. Therefore the role of education in promoting regular sustainable transport services for passengers and cargo not only within the context of prospective international short-shipping routes, but primarily the domestic services between coastal communities of the mainland and the islands. Author is of the opinion that prevailing methods of promoting short-sea shipping may not yield critical level of necessary awareness of using maritime transport routes locally without maritime education and training at all levels.

Key words: environment, short-sea shipping, externalization of costs, coastal communities, passenger and cargo transport
1. Introduction

This paper is the attempt to make initial environmental feasibility analysis of introducing and intensifying the year-long maritime liner services along the coast of Croatian mainland and the islands as well as to and fro the mainland and island centres and ports. Such services were in operation until some 50 years ago when they ceded their way to road transport on the far from perfect road infrastructure and ferries which were to carry vehicles across channels interrupting such roads, preferably pending the construction of road bridges.

Ever since that time, Croatia unfortunately ceased to develop or substantially upgrade its maritime (and rail) services and, as already mentioned, abandoned most of its short-sea or cabotage or so to say “local” maritime transport services of passengers and goods. That point of our history can also be looked upon as a demographic blow for small communities along the coasts of the mainland and the islands. Old people who were on board or in ports on the last day of operation of said services will never forget the emotions experienced. The grounds for abolishing maritime services were their low profitability (high subsidies). In author’s opinion no externalities whatsoever were considered on the occasion. Another, more tangible reason was in many cases bad connection between the port quay and town or village situated high above the port along our very often steep coast, that situation becoming even worse in bad weather conditions when the ship could not call at a destination port, but the neighbouring better sheltered one.

That is certainly not a specific feature for Croatia only. Namely, with the advent of the automobile and truck leading to the development of national highway systems in many countries since the 1950s, coastal shipping entered a new phase, that of decline. The combination of governmental subsidies and reduced transit time for road transport had shifted cargo movement from water transport. Recently, increased road congestion; recognition of the extraordinary road construction and maintenance expenses; and technological advances of containerization and cargo handling have lead many to view coastal shipping, in its new incarnation as short sea shipping, an attractive complement to road and rail transport (Lombardo 2004).

2. Short-sea shipping – the concept

A concise and unambiguous definition of short-sea shipping (hereinafter SSS) does not exist. The European Commission defines it as maritime transport of goods over relatively short distances, as opposed to the intercontinental cross-ocean deep sea shipping (EC Eurostat 2011). US MARAD defines is as a form of commercial waterborne transportation that does not transit an ocean and utilizes inland and coastal waterways to move commercial freight (Goodman et al. 2010). The concept is thus defined in various different ways. There are only scant references to the islands, and in any case only in the perspective of territorial continuity with the State to which the given island belongs (Foschi et al. 2005). Both MARAD and the European Commission are trying to revive SSS as a new, alternative, and sustainable mode of freight transportation ¹.

On the other hand, sustainable transportation system is one that allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations, that is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy, and that limits emissions ad waste within the planet’s ability to absorb them, minimizes consumption of non-renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise (CEE ASHTO 2009).

¹ In Europe, the EC has actively supported SSS through funding of short sea projects, since 1992, under its common transport policy. SSS has become a major component of the Marco Polo programs and a part of the Trans-European Networks (TEN-T). In U.S., MARDA leads its way in promoting the idea of SSS with its Marine Highway Initiative (Denisis 2009).
3. Short-sea shipping vs. Land transport

SSS offers many advantages over the land-based transportation modes (Denisis 2009, Foschi et al. 2005). It is more energy efficient (see Table 1), in certain respect is and could be even more environmentally-friendly, shows better safety record than other types of transport, and requires less public expenditures on infrastructure, it is the way of mitigating highway congestion and reducing highway noise. Additional advantages of SSS are expansion of the transportation network capacity, port productivity improvement, revival of maritime sector, intermodal integration, door-to-door, just-in-time practices, modern logistics and it allows better integration of the islands. SSS can generate public and environmental benefits.

Table 1. Energy use in freight transportation (Denisis 2009).

<table>
<thead>
<tr>
<th>Mode of transport</th>
<th>Energy use in MJ/ton-m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>1.8 – 4.5</td>
</tr>
<tr>
<td>Rail</td>
<td>0.4 – 1</td>
</tr>
<tr>
<td>Maritime /SSS</td>
<td>0.1 – 0.4</td>
</tr>
<tr>
<td>Inland navigation</td>
<td>0.42 – 0.56</td>
</tr>
</tbody>
</table>

SSS is unfortunately associated with a greater quantity of negative externalities as compared to long-range maritime transport (DSS – Deep Sea Shipping) on account of the need to use a greater number of small ships and the greater number of ports called at. But even in this case SSS is less polluting than terrestrial and air transport. Namely, positing 100 as total cost of air transport, which is the highest, the following percentages apply for the other modes: 0, 89 for the cost of road transport, 0, 34 for the cost of rail transport, 0, 25 for the cost of SSS as against the average cost of maritime transport, which is 0.06 (Foschi et al. 2005).

Therefore, social and environmental costs of using water transport are not as high as those incurred from using road transport (e.g. cost of building new roads, splitting communities, congestion, accidents, etc). However, the creation of a ‘level playing field’ between the modes has not been achieved over the last 10 years (Rowlinson et al 2002).

4. Environmental impact of shipping

The share of SSS in environmental impact is through atmospheric pollution, noise emissions, and through routine or accidental water pollution. This may come from six major sources: routine discharges of oily bilge and ballast water from marine shipping, dumping of non-biodegradable

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2 The capital costs needed for the short sea terminal infrastructure are significantly lower than the infrastructure expenditures for the expansion and maintenance of highways. It also uses so to say a no-cost infrastructure, the sea. Investment in this mode being less substantial, maritime transport can adjust more easily to fluctuations in traffic. Maritime transport and ports take up less unspoiled land (ECMT 2000).

3 Internal/direct costs of all road solutions are 11-17% higher than those of the corresponding intermodal solutions. As for external costs, all road solutions are 45-80% higher compared to the corresponding intermodal solution. The coverage of external costs shows that, on average, the all road solutions have higher cost coverage by taxes and charges than intermodal solutions. At the same time the all road solution is responsible for higher external costs than the intermodal solutions (Recordit D6 2001).

4 Accidents are translated into external costs, to the extent that total accident costs are not reflected in insurance premiums (Denisis 2009).

5 When drawing on a more recent estimate, in 2002, the UNEP’s Global Programme of action for the Protection of the Marine Environment from Land-Based Activities, some 80 per cent of the pollution in the world’s ocean originates from land-based activities, with the marine sector representing just 10 per cent of human sources of marine pollution (IMO 2009).
solid waste into the ocean, accidental spills of oil, toxics or other cargo or fuel at ports and while underway, air emissions from the vessels’ power supplies, port and inland channel construction and management, and ecological harm due to the introduction of exotic species transported by vessels. However, the majority of water pollution attributed to coastal short sea vessels is in form of accidental spills and not recurring event (Denisis 2009).

Historically, large vessels such as container ships, tankers, bulk carriers, and cruise ships have operated virtually unregulated, with few or modest standards to regulate their emissions, and very little oversight even of those. This may be the last genuine Wild West industry on the planet (FoE and Clean Air Task Force 2008). Today, shipping accounts for about a quarter of the world’s nitrogen oxide emissions, which causes smog, and shipping emissions are growing significantly as marine transportation increases.

Therefore, for shipping to fulfil its “green” potential the industry must fully embrace a number of quality standards. As well as the technical condition of the vessel, the human relations’ issues of recruitment, training standards and employment conditions need to be considered. Fatigue and stress are particularly pertinent to the coastal and short sea trades. The examination of shipping’s green potential, therefore, needs to focus on quality benchmarks and what needs to be done to ensure that all operators attain these standards. Transport policy needs to be acutely sensitive to the balance between economic and environmental performance (Rowlinson et al 2002).

4.1 Greenhouse gas emissions

International aviation and shipping are the only greenhouse gas emitting sectors which are not covered by the Kyoto Protocol, reportedly due to lack of reliable emission data and lack of an agreed approach for defining responsibility by country. In 2009, a report on the greenhouse emissions of the shipping industry which was commissioned by the IMO stated that mid-range emissions scenarios show that by 2050 in the absence of policies ship emissions may grow by 150 to 250%, compared to the emissions in 2007, as a result of the growth in shipping. The report found that a range of technical and operational measures could increase efficiency and reduce emissions rate by 25% to 75% below the current levels, see table 2. It also recommended the introduction of a mandatory limit on the EEDP for new ships in a cost-effective solution that can provide an incentive to improve the design efficiency of new ships (SourceWatch 2009).

Report by Friends of the Earth also discusses other key environmental issues raised by short sea shipping, besides air emissions – underwater noise and collisions with marine mammals (Kaltenstein 2010). Short sea shipping should be compatible with marine spatial planning efforts (Runko Luttenberger 2009).

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6 The Kyoto Protocol which was negotiated in 1997 stated in Article 2, section 2 that “The parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the ICAO and the IMO, respectively”. The IPCC reported that “the vast majority of marine propulsion and auxiliary plants onboard ocean-going ships are diesel engines”, which typically have service lives of 30 years or more. Thus, the IPCC concluded, it will be a “long time before technical measures can be implemented in the fleet on any significant scale”.

7 In its annual report, Carnival Cruise Lines admitted that its operations pump out 401 grams of CO2 per passenger. This is 36 more than the per-passenger emissions of Eurostar, and more than three times that of a passenger on a Boeing 747 (Shreeve 2008), also see (Conlin 2009).

8 Energy Efficiency Design Index constitutes a part of provisional and voluntary technical and operational measures for reducing GHG, together with SSEMP (Ship Energy Efficiency Management Plan) and EEOI Energy Efficiency Operational Index (EEOI).
Table 2. Components of potential solutions for reducing CO₂ emissions from shipping by using known technology and practices ((SourceWatch 2009).

<table>
<thead>
<tr>
<th>Design (new ships)</th>
<th>Saving of CO₂/tonne-mile</th>
<th>Combined</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept, speed &amp; capability</td>
<td>2 to 50%+</td>
<td>10 – 50%+</td>
<td>25-75%+</td>
</tr>
<tr>
<td>Hull and superstructure</td>
<td>2-20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power and propulsion systems</td>
<td>5-15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-carbon fuels</td>
<td>5-15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renewable energy</td>
<td>1-10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust gas CO₂ reduction</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation (all ships)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet management, logistics &amp; incentives</td>
<td>5-50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voyage optimization</td>
<td>1-10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy management</td>
<td>1-10%</td>
<td></td>
<td></td>
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</tbody>
</table>

+Reductions at this level would require reductions of operational speed

* CO₂ equivalent, based on the use of LNG

4.2 Bunker fuel

One fairly simply way is to reduce fuel consumption by initiating a system of best practices regarding vessel maintenance and performance (Kaltenstein 2010).

As mentioned above, the transport of goods by vessel, including SSS, is generally more fuel efficient on a per ton-mile basis than trucks and comparable to rail. Nevertheless, fuel efficiency per ton-mile of cargo does not guarantee that the emissions from shipping will be less harmful than landside transport (Kaltenstein 2010). In fact, since many years heavy duty road transport is engaged in an ongoing improvement of air emissions performances, while maritime transport is very late and slow in this change (Malocchi 2005).

Ships use one of the dirties fuels on the planet – heavy fuel oil, or bunker fuel – which can, by international accord, include fuel with a sulphur content⁹ of up to 15, 000 ppm. That level of sulphur content is thousands of times higher than that which is allowed for US truck transport (15 ppm). Moreover, ship engine standards are not as robust as landside transportation standards. Thus, while relative carbon dioxide production from SSS as compared to trucking and even rail may be less because of economies of scale, air emissions of particulate matter and sulphur and nitrogen oxides may be greater, depending on key inputs like fuel type, route, speed of the vessel, the amount of drayage trucking involved post shipping, and ancillary emissions (Kaltenstein 2010).

Black carbon is a component of particulate matter and is produced by ships through the incomplete combustion of diesel fuel. The substance is especially pernicious because it is responsible for severe public health¹⁰ and climate change impacts. Black carbon contributes to global warming by absorbing solar energy not only when suspended in the atmosphere but also when deposited on

⁹ Currently IMO is drafting new rules to limit sulphur emissions from ship exhausts and is generally trying to get shipping firms to burn cleaner fuels (Shreeve 2008)

¹⁰ There is evidence showing that emissions from shipping are worse than previously thought. Large cargo ships, for example, emit more than twice as much black carbon (otherwise known as soot, which is thought to be the second largest contributor to global warming, after CO₂) than was estimated in earlier studies. It is estimated that commercial shipping releases around 130, 000 metric tons of black carbon a year, or 1.7 per cent of the global total – with much of it pumped out near highly populated coastlines (Shreeve 2008). Bunker fuel threatens human health (Corbett et al. 2007). It is more than 1, 000 times dirtier than the highway diesel used by trucks and buses (FoE Nov 2997).
snow and ice, which leads to accelerated melting. It is estimated that over 80% percent of the warming caused by black carbon deposited on snow comes from black carbon emitted by the burning of fossil fuels. A recent study found that medium speed marine engines, such as those used in tugboats, produce black carbon at more than twice the rate of slow speed engines (apart from container ships) and high speed engines (Kaltenstein 2010).

Shippers could further improve their environmental performance by lowering ship emissions while at port, where most of their external costs occur (Goodman et al. 2010). All types of vessels engaged in short sea shipping should use shore power (cold ironing) at berth (Kaltenstein 2010). Ports also play a key role on the environmental friendliness of the transport system. Being the interface between sea and land they are central to ecosystems and consequently must meet the environmental challenges to achieve sustainability (de Oliveira 2009). Ports authorities are at the forefront of the race to make shipping cleaner (Shreeve 2008). Ports should comply with all applicable environmental review requirements, and ensure that this documentation is made easily available to the public (Kaltenstein 2010).

5. Integrated approach

Halting and revising global warming will require innovations across every sector of the global economy. It’s time for regulating11. The time for voluntary measures has passed. The steps that the shipping industry must take are clear: slower speeds, cleaner fuels, better ships (FoE Oct 2007). Protecting the marine environment from polluting by shipping however asks for more than a set of regulations. What the world’s oceans really need is a genuine integrated approach, with a combination of technological development, regulation, education and financial instruments. And because the process is so time-consuming standards for the future should be set today (Leemans 2005).

6. How croatia approaches SSS

The priorities in written and non-written development strategies in the Republic of Croatia are either associated with integrations into international organizations and thereby the projects of international and fully economic interest or with the development of tourism which is not always subject to proper regulation and control. Croatia rarely defends its sustainability and environmental interests within the framework of global development projects that we are to participate in.

The interest of our citizens, our precious natural resources, or so to say general public interest is given neither due attention nor priority12. Likewise, the Pre-accession Maritime Strategy of the

11 Environmental organizations have been urging IMO to require the reduction of smog-forming NO\textsubscript{x} emissions, reduction of SO\textsubscript{2} emissions, reduced sulphur content in bunker fuels at sea and even less in coastal zones and ports, international mandatory quality standards for marine fuel, international standardization for electrification of ships and ports so vessels can turn off engines and plug into shoreside power when docked, to prohibit on-board incineration in coastal waters and to adopt a Port Community Bill of Rights to protect public health as ports and shipping trade expand (FoE 2006).

12 Similarly, at EU level, the interest in expanding SSS was heralded at first as promising an improvement in inter-island links. It now appears that this is unlikely to occur in the near future. The islands are only briefly mentioned in no more than a very few definitions of SSS, and they are given no attention at all in sea motorway (SM) designs, despite the fact that many of the proposed SM pass just a few miles from important Mediterranean islands. With a minimum variation in routes and timetables, and with some additional costs, the liner shipping companies could include the islands in their legs, if necessary making use of public financial support. This would be justified by the fact that delivering a transport service should not be based exclusively on economic criteria: certainly, it must be profitable from the economic point of view but it should also be acceptable in an ecological perspective and socially fair. It must reconcile the development strategy devised for a given area with overall economic development, lasting growth and a quality public service for the entire population (Foschi et al. 2005).
Republic of Croatia has identified SSS as one of the key measures of shipbuilding development (Skočibušić et al. 2010). On the other side, we are extinguishing our shipbuilding industry and thus centuries-old tradition of this region.

In 2005 a Short Sea Shipping Promotion Centre was established in Croatia, the official task of which is placing an emphasis on the advantages that the short-sea shipping may provide at Trans European and Pan European level and in facilitating integration processes in logistics chaining of intermodal transport by providing support to members of the Association in finding and preparing concrete projects. Major aims are modernisation of the port of Rijeka in order to accommodate transit traffic, especially container and ro-ro, constructing summer berth in the Port of Split for passenger ships and passenger terminal in Šibenik for cruise ships (MMTPR 2005). Therefore, apart from international transit and tourism, there is no mention of projects intended for transporting passengers and goods locally.

In the Republic of Croatia there is also the Agency for Coastal Liner Maritime Traffic established in pursuance of Decision of the Government of the Republic of Croatia of 2006. Its web portal lists ship service schedules. If one would search for Rijeka, for instance, there are only three services available to and from Rijeka, one of which is seasonal only (AOLPP 2011).

EU is financing the Adriatic 3S project of developing the SSS in the Adriatic. The project is managed by one of national faculties for transport and traffic sciences which is neither on the coast or educates seafarers.

With regard to SSS and its inherent intermodality, the situation in South-East Europe and East Mediterranean is not as developed as other regions. The infrastructure for freight management and equipment that supports efficiently, rapidly and at low cost the modal shifting procedures is underdeveloped (Beškovnik 2006). Given the indentness of northern part of the Adriatic in European mainland, it is and will remain the object of interest for various forms of maritime transport (Runko Luttenberger 2009). Investment will be required to improve the hinterland connections. However, the range offers a potential or international trade within the Mediterranean basis but also, with the Far-Eastern markets. For the “round the world” – Suez trade routes, an efficient North Adriatic gateway may represent important savings both time and money wise (de Oliveira 2009).

The existing transport system of the Republic of Croatia is not fully adapted to the SSS utilization. Difficulties occur in the following: administrative, organisational, technical, technological and infrastructure shortcomings as well as inappropriately trained staff (Skočibušić et al 2010). Here is the role of education and training.

There is a low level of collaboration of specialized universities which should be a generator of developmental strategies. The absence of IT systems which would promote and stimulate the usage of intermodal routes and logistically explain their administration serves road carriers which have a simple and traditional, but ecologically more unacceptable, way of goods transport (Jugović et al. 2010).

Ortmanns points out that there is a long and frustrating tradition of European support for infrastructure projects built in ecologically sensitive areas. In particular in the New EU Member States and Accession Countries, many plans to expand ports have a negative impact on areas, protected under NATURA2000, the Fauna-Flora-Habitat Directive or RAMSAR. In addition to port developments and hinterland transport, unsafe and high-emitting ships are another potential problem that undermines the credibility of Motorways of the Sea. No other transport mode offers such a variety of vessels, from ageing rust buckets to hyper-modern, clean vessels. No other transport mode has so little incentives to use available solutions and so big incentives for non-compliance with the existing legislation. While some quality ships go beyond legal requirements, a substantial part of the vessels operating in EU waters enjoy the economic benefits of illegal practices, like saving cost for port reception facilities by pollution offences at sea. If European taxpayers’ money is used to support a well-off industry, these subsidies should only be used for
safe and environmental friendly service providers. Subsidising the status-quo, without an environmental conditionality will undermine the credibility of the Motorways of the Sea idea. Labelling a project under the EU Motorways of the Sea and providing financial support is not acceptable unless environmental quality is a key criterion, and the project goes significantly beyond the standards common in the current competition between ports and service providers (Ortmanns 2005).

Furthermore, it is essential for island maritime transport to provide services both for passengers and freight. If these two aspects are considered separately, neither of the two sources of demand appears to be large enough to support a satisfactory maritime transport service. But if they are considered jointly, they can give rise to a more substantial volume of traffic, which thus becomes more attractive from an economic point of view (Foschi et al 2005).

MARPOL Annex VI among other things defines more stringent emission and fuel quality requirements applicable to ships in Emission Control Areas (ECA). An Emission Control Area can be designated for SO\textsubscript{2} and PM, or NO\textsubscript{x}, or all three types of emissions from ships, subject to a proposal from a Party to Annex VI. Existing Emission Control Areas include Baltic Sea (SO\textsubscript{2}, adopted 1997 / entered into force 2005), North Sea (SO\textsubscript{2}, 2005/2006) and North American ECA, including most of US and Canadian coast (NO\textsubscript{x} & SO\textsubscript{2}, 2010/2012). (DieselNet 2011). Italy was pursuing the idea of a Med SECA\textsuperscript{13} limited to the Adriatic Sea which should be the object of our interest, which was dropped for the foreseeable future according to Italian Environmental Ministry (Johnsen 2006).

7. Employment

Short sea shipping can be used as vehicle and driving force for creating more jobs in the transport. As Europe faces the “ghost” of unemployment throughout the Member States, especially in young and productive ages, short sea shipping can be an “expensive” investment by a promising sector, expanding and growing in such a way as to create more employment too in the hands of policy makers of the unified Europe (Papadimitriou 2001).

Apart from the fact that SSS is a major source of employment (accounting for almost 60% of French sea-going jobs), another factor to be taken into account is its contribution to the turnover of the insurance, brokerage and freight forwarding sectors, for example. Lastly, short sea shipping develops as a logistics business; it will almost certainly require highly specialised personnel (ECMT 2000).

SSS generates work for European shipyards. In 1995, the European Commission estimated that 50 per cent of the ships built in the EU were for short sea shipping.

8. Education

Ever since their arrival on the Adriatic Sea, Croatians were oriented to navigating and exploiting the sea whereby the education of seafarers was given particular significance. As early as in 1793 Collegium Ragusinum (in present-day Dubrovnik) allows young noblemen to study navigation, and in 1849 the first maritime school was established in Bakar, to be followed in the same year by Split, and later Dubrovnik in 1852, and afterwards by two other Croatian coastal cities, Zadar and Lošinj. Presently in Croatia there are maritime faculties in Rijeka, Split and Dubrovnik and maritime high schools in Split, Lošinj, Šibenik, Zadar, Bakar, Korčula and Dubrovnik. Since 1990, a total of 7312 students graduated from maritime high schools, acquiring the seagoing professions, and during the same period there were 4626 graduates from the maritime faculties (MMTPR 2005).

\textsuperscript{13} SECA – sulphur emission control area
It is a well-known fact that the shipowners rather reluctantly choose to apply technological innovations which inventive researches persistently and permanently offer to them (Abramov 2010). Ships as a subject are the primary target of European research and they are examined intensively from the engineering, managerial and economics point of view. Although intermodality and short sea shipping chains demand the efficient interface among modes – that port terminals be integral parts of the shipping system – researchers are primarily interested in ships and as far as ports are concerned, only their managerial and logistic problems. Terminals hold pivotal positions, but do not attract the interest of researchers. (4)

Short sea shipping can provide new and wide traditional fields of research and occupation. Maritime business have always been considered to be the product of thinking involving three separate and interactive environments: First is the technical one consisting of the design, construction and interaction with classification societies and specialized international or national organisations. Second is the managerial environment, where shipowners, operators and supporting staff try to supply the vessel with money, documentation, people and cargo, and third is the operational environment, where people operate the vessel – in other words, handle someone else’s capital – the crew, pilots, shore staff, etc. So it is meaningless to focus all interest only on mechanical matters when so many other factors affect the proper operation. The application of new technology and the reduced number of crew demand more skilled and well trained personnel onboard and these serious problems deserve a scientific approach (Papadimitrionus 2001).

If current trends are confirmed, there may be, in the EU of 27 Member States, a shortage of 10,000 to 15,000 merchant marine officers. Tackling this problem implies that adequate, education and professional training as well as promotion strategies must be addressed by both the Member States and the Commission (de Oliveira 2009).

9. Conclusion

The Republic of Croatia has the sea, well-indented coast with numerous islands, long high-quality shipbuilding tradition, prestigious maritime training institutions and the need to protect its environment.

Croatian maritime transport faculties and high schools should broaden the emphasis from studying technical features of the ship and navigation skills to considering integral role of shipping in local and world economy, society and environment. They should educate people able to draft maritime strategies at the national, regional and local level that would benefit both our local needs and integrations in international flow of passengers and goods. On the other hand, all the children living in coastal communities should be taught sailing skills during their obligatory schooling, while all educational institutions, from kindergartens to PhD courses, should teach environmental protection in order to make the population aware of transport solutions that will least degrade the environment.

The existing historical ports in small coastal communities would be sufficient to accommodate smaller ships meaning that intervention in the space would just concern some environmentally-friendly communication between the port and town in cases the very port is not already a part of historical centre of such town or village. Bigger cities such as Rijeka have already built passenger terminals which, while waiting for some future cruise ships, could service small Quarner bay liners. This would also lead to better practices of ships, of similar size, which presently on one-day summer charters berth at pristine beaches and stretches of coast and pollute them by all means, mitigating any control and while on winter berths in ports keep their auxiliary engines running.

Moreover, Croatians still have enough skills to teach, learn, design and build novel small-size green ships for sailing our seas and shuttle people and goods between local coastal communities and to export them wherever the decision makers are receptive for environmentally friendly and socially and economically relevant short-sea maritime transport.
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