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ORIGINAL PAPER

The business case for telemedicine

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ABSTRACT

Background and aim: *Following the coming into force of the International Labour Organisation Maritime Labour Convention (ILO/MLC) and International Maritime Organisation Standards for Training, Certification and Watchkeeping, Manila 2010 (IMO/STCW) amendments, the objective of this article is to provide the shipping community with an initial assessment of the economic reasons and business case, in support of both publicly financed and private telemedicine being implemented on board commercial vessels.*

Materials and methods: *It provides the global scale of the requirement, the number of Telemedicine Assistance Services (TMAS) calls handled by participating TMAS, the average direct and indirect costs incurred by both TMAS and ship operators, responding to medical emergencies, and also provides a calculation of the market size of about 760 million Euro/year. It estimates a return on investment per ship, of implementing telemedicine on board to meet the MLC and STCW requirements at less than 1 year.*

Results and conclusions: *1. There are both financial and soft benefits, such as crew retention and being perceived as a quality employer offering a telemedicine service on board. 2. It is quite possible to obtain a 20% savings to the industry of perhaps 152 million Euro/year from the deployment of telemedicine on board. 3. The deployment of a telemedical service on ships is an opportunity to encourage further cooperation between TMAS and also with the private TMAS sector. 4. There is clearly a great need, on a global basis, for more cooperation, particularly in standardisation of pre-boarding medical files available, the equipment required on board at a minimum, and level of service quality provided. 5. A collection of a common TMAS annual set of normalised statistics from the stakeholders in the maritime industry is needed. Should someone not be tasked with collecting this? 6. Open registries and countries where the private sector only provides telemedicine, should be encouraged to work with the global public TMAS system and contribute to its costs?*

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Key words: telemedicine, business case for maritime

INTRODUCTION

With the recent coming into force of the International Labour Organisation Maritime Labour Convention (ILO/MLC) and International Maritime Organisation Standards for Training, Certification and Watchkeeping (IMO/STCW) 2006 convention with Manila Amendments 2010, as from January 1st, 2012, the shipping community and flag states are required to *'(...) provide seafarers with medical care as nearly as possible equivalent to the care they would receive ashore.'* [1], and to *'(...) ensure by a prearranged system that medical advice by radio or satellite communication to ships at sea is available at any hour of the day or night'* [2], and thus provide an appropriate harmonised level of healthcare for seafarers on board ships.

There will no doubt be significant differences in how the application of these requirements will be implemented, but it is believed that the availability of an industry-accepted business case for doing this will improve understanding and facilitate the allocation of adequate budgets to support both publicly and privately funded initiatives.

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This paper is an initial attempt to provide such a business case for the provision of Telemedicine Assistance Services (TMAS) to seafarers. It addresses the business justification for remote medical assistance during a medical event, or emergency on board only. This will subsequently be followed by a second paper that addresses the business case for medical monitoring and general primary health care on board. It should be remembered that while many flags do provide a TMAS for their own seafarers, many others either:

— do not provide services to third country nationals, or
— rely on the countries that do provide TMAS services to all, or
— assume the private sector will provide for the emergency response and remote medical assistance at sea.

It is therefore believed that the proper business case will help the latter 2 categories to see their own interest to either establish their own TMAS, or come to financial arrangements with those countries that already have them.

MATERIALS AND METHODS

The financial numbers in this paper have been developed by a consensus of participants at the International Maritime Health Association (IMHA) conference held in Malta in February 2013, based on the actual cost incurred. Sources of information are in the public domain.

Where there was a significant divergence in costs between different countries, a range of costs has been provided. As there are a great number of different types of vessels operating in a wide range of activities, with crews as small as 18 and as large as several hundred, for convenience, and to be able to provide a picture within the constraints of the article, it was agreed to look at the costs of 3 typical types of vessels, which are deemed representative of the majority of merchant vessels operating around the world and which constitute about 1/3 of vessels. These are (Table 1):

1. **dry transport** which includes dry-bulk and container vessels;
2. **liquid transport** which includes everything from fruit-juice, to chemical and oil and also gas tankers;
3. **offshore support vessels**.

Total of deep sea merchant vessels in operation is between 55,000 and 65,000, depending on which source is used — Lloyd's or Fairplay, who use slightly different criteria. The sample selected represents 23,299 merchant vessels. These vessels have an average of 18 crew members per vessel which means they represent 23,299 × 18 or approximately 420,000 in operation crew on board.

SCALE OF THE PROBLEM

According to Fairplay and Lloyd's, there are between 55,000 and 65,000 deep sea merchant marine vessels operating worldwide at any given time and employing somewhere between 1.2 and 1.5 million seafarers operating in rotations — some 6 weeks on, as in the case of oil service vessels, or some up to 8 months on, and then 4–8 months off as in the case of global trading tankers of box ships.

Table 1. Addressable segment of Transport Market source is Lloydes List and Fairplay databases 2011 (not a published document)

Type	Count [3]
Bulkers and box ships (container) combined	15475
Liquid transport/tankers including oil chemical and gas	7554
Offshore support vessels	270

Table 2. Estimate for 2011 of cases handled by study participating TMAS public and private, and number of medevacs

TMAS	Estimated number of patients assisted	Estimated number of medevacs
Capita	2218	473
Denmark	1264	60
France	1908	230
Germany	730	37
Italy	3270	65
Norway	2054	103
MedAire	1425	43
Spain	1069	262
Sweden	581	87
The Netherlands	794	40
United Kingdom	178	149
TOTAL	15491	1548
Percent of cases medevaced		
Private TMAS		10%
Public TMAS		10%

Note 1. Total of calls to all segments handled by TMAS closer to an estimated 21,000 calls, if one includes non participating TMAS such as Brazil, AMSA, USCG and others such as private TMAS. These figures do not include non- participating private TMAS in Asia, Latin America and Africa. We assume these will also have requirements.

Note 2. In all cases seafarers are required to undertake pre-boarding physical exams in order to procure certificate of fitness to work. These certificates vary in their content, detail and degree of personal medical information provided or required. Standardisation constitutes a problem.

Note 3. Appendix 1 at the end of the article details participants and top 20 maritime flag states and also top 20 owner nations concerned by TMAS.

COSTS CONSIDERED

Included in our calculations are both direct and indirect costs, such as the cost of provision of the publicly financed TMAS, communications cost born by the ship which includes TMAS, a part of which is also used for other ships operations, which might be considered by the ship operators as CAPEX costs, such as the costs of pre-boarding physicals, and OPEX costs incurred when a medical emergency hap-

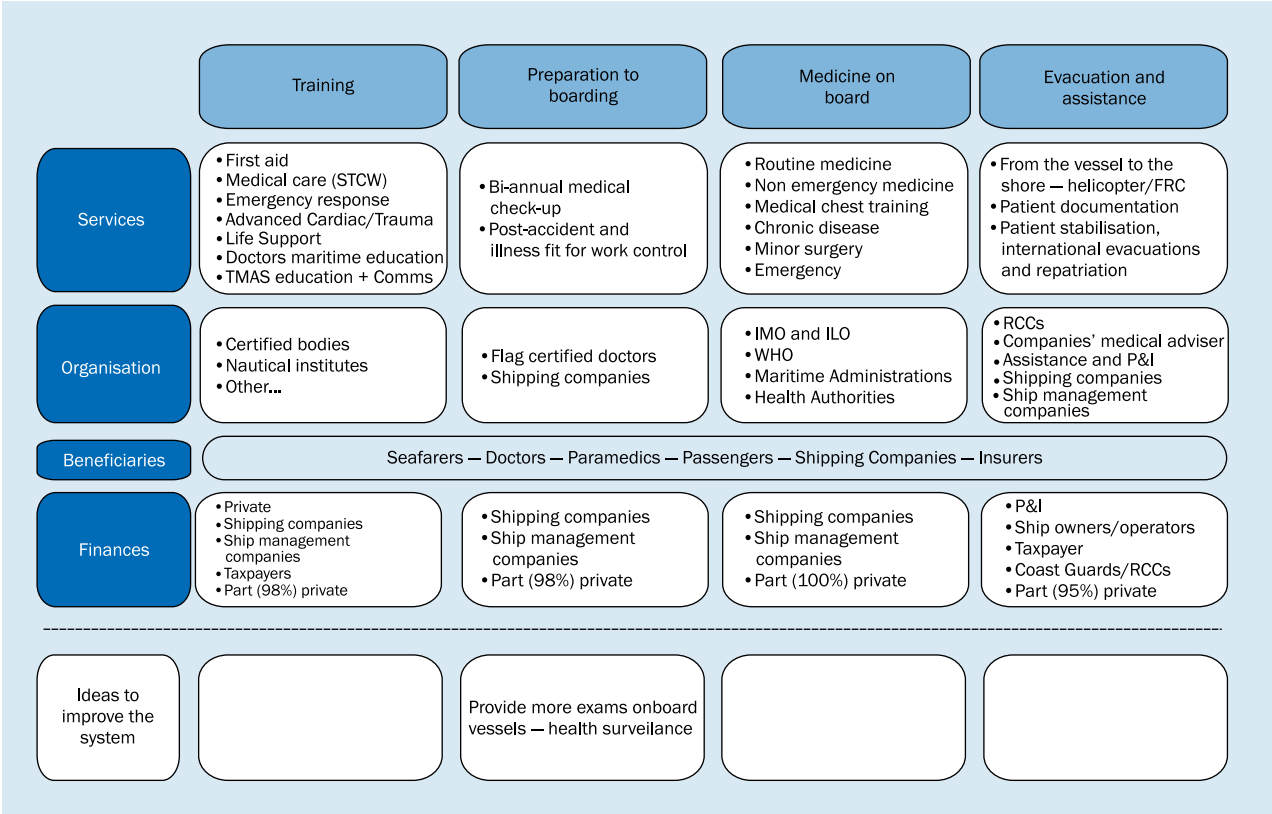

Figure 1. Health chain management in the maritime sector

pens for diversions of ships, costs for medical evacuations (helicopters), and the indirect costs for replacing medically evacuated seafarers, for medical follow up and rehabilitation, and also for returning seafarers to service.

DIRECT COSTS

Based on the numbers obtained from the IMHA conference, our knowledge of the industry, and using our sample of ships as the core data, we have made a rough calculation as follows.

TMAS cost

- There are 9 publicly funded and 2 private TMAS which we are aware of and which provided statistics for this study (Table 2).
- The cost of operating a TMAS with a team of 5–7 doctors on call in 2012 was between Euro 500,000 and Euro 635,000. This is expected to rise in 2013.
- Several global publicly funded TMAS have reported receiving between 2,000 and 2,500 calls in 2012, resulting in 50–75 deviations/medevacs.
- Several TMAS have reported that their cost to handle 1 call is between Euro 200 and Euro 260. It should, however, be mentioned that this includes not only personnel cost but also investment expenses (Fig. 1).
- Based on figures reported by TMAS above, about 10% of calls result in either an evacuation or a rerouting for disembarkation.

To get a feel for the type of cases involved, we reviewed data published in the media from 2 studies — one undertaken at Yale University [4] in 2012 and the other made by Dr Antonio Abaya of Health Metrics, presented at the 13th Annual Asia-Pacific Manning & Training Conference in November 2012 in Manila [5].

The Yale University study in association with Future Care have analysed over 4 years some 6,724 marine medical cases and was 'based on a number of variables, including age, rank, nationality and type of illness/injury. Average costs per case and type of medical incident were presented along with statistics on resource utilisation and type of medical care rendered. Among the findings presented, the following are of particular interest:

- Illness and dental claims comprised 66.7% of the total.
- Illness claims alone, as distinguished from injury claims, accounted for almost half of all medical events (49.8%) with an associated direct cost of $18.5 million, 56.4% of the total direct costs of $32.8 million.
- Cardiovascular disease, while accounting for only 4.1% of claims, had an associated direct cost of $5.7 million (17.3% of total direct costs).

— With regard to point of service, hospital admissions accounted for only 2.4% of all medical encounters, but 56.8% of all medical expenses.'

The Health Metrics study from the Philippines was performed between 2009 and 2012 and covered Philippine seafarers (who in 2010 deployed 82,000 officers and 125,000 ratings or between 15% and 17% of seafarers worldwide). Dr Abaya found that about 1.62% of medical cases result in an evacuation or medical repatriation. It should be noted that many Philippine seafarers also work in the cruise business, which typically have doctors on board, thus would require perhaps less frequent evacuations than cargo vessels.

From these 2 studies we can extract some data and apply it to our sample.

Equipment costs

Equipment costs vary considerably. From the simple on board kits costing around Euro 20,000 to more complex devices like echography machines and additional sensors up to Euro 70,000, depending on what a particular company wishes to have on board, and the remoteness and hostility of the environment they operate in. For the purposes of this study we will assume that the companies will supply just a bit more than the minimum which would be about Euro 25,000. A kit would be written off in 3 years, so the cost would be 8,333 Euro per year.

Training costs

By way of example, medical training for 2 people per vessel (the captain and the first officer for example) would cost an average of Euro 1,744/person/year. The cost per vessel in training is estimated at Euro 3,488.

Reaction/response to an event — variable/ /unscheduled costs

From the sample of selected ships we can infer that out of the 420,000 seafarers some 3,230 or 7% will be evacuated per year. One can multiply by 3 times as many to get a scale for the whole industry (or about 9,690).

The average vessel uses about 100 tons of fuel per day at a cost of about Euro 525 per ton. The average rerouting time is 1.5 days. Thus average rerouting costs per year per ship are as follows: 100 tons of fuel × Euro 525 × 1.5 days = Euro 78,750/year. In addition, there is a cost and danger of evacuation by helicopter. From the experience of the attendees at the IMHA conference, the average helicopter evacuation costs Euro 25,000.

Apart from that, the attendee companies reported that one needs to allow an additional 30% indirect costs or Euro 60,000 for the crew replacement and other on shore costs on average.

Taken together the cost of a medevac for a shipping company, whether paid by the insurance or as a direct cost is (Fig. 2):

— Euro 78,750 for fuel +
— Euro 25,000 for the helicopter +
— Euro 60,000 indirect cost
— For a total cost of = Euro 163,750 on average per ship per year.

It is estimated by several shipping companies that 1 in 5 ships will be forced to divert course for medical reasons per year. Thus, the average statistical annual cost per vessel to the ship owners would be 163,750/5 = Euro 32,750 per diversion per ship.

From our sample of 23,299 vessels, this represents Euro 163,750 × 1,550 diversions for a cost of 253 million Euro to the industry, for our 1/3 of the industry sample.

For the entire industry this cost will be closer to 3 × 253 million Euro or about 760 million Euro.

There is some debate about what should be the minimum demands for the ship owners to meet new MLC and STCW requirements for better medical provision for the crew. In placing on board the equipment which costs approximately Euro 25,000 with a 3 years depreciation = 8,333 Euro/year and providing annual training to use it on board, with training costing Euro 3,488 per vessel, it would cost the ship owner a total of about 11,821 Euro/year plus a subscription cost for access to the telemedical access services, over and above the SOLAS minimum free Telex and Voice GMDSS services.

The ROI per vessel from investing in equipment and training would therefore statistically pay for itself in less than 1 year.

Of course this also raises the question as to whether or not an additional investment in prevention and expanded training might result in even lower costs to all.

Prevention — fixed costs

In our model, the cost to the industry of pre-boarding exams to the sample 420,000 crew = average Euro 150–500/exam = 63 million Euro × 3 for the entire industry = 189 million Euro + the cost of getting the seafarer to the medical exam. The benefit of the availability of the standard pre-boarding physical exam set of data, if available to the doctor during an event, would considerably reduce the time to deal with and event and, according to the IMHA participants, significantly reduce the number of misdiagnoses.

By reducing medevacs (in particular not absolutely necessary ones) through better on board diagnostics and with the use of telemedicine, we can thus expect to impact on the unscheduled costs, although not on the fixed ones.

The costs of the seafarer medical (pre-boarding exams) include the cost of the medical only. They do not include the logistics costs of getting the seafarer to and from the

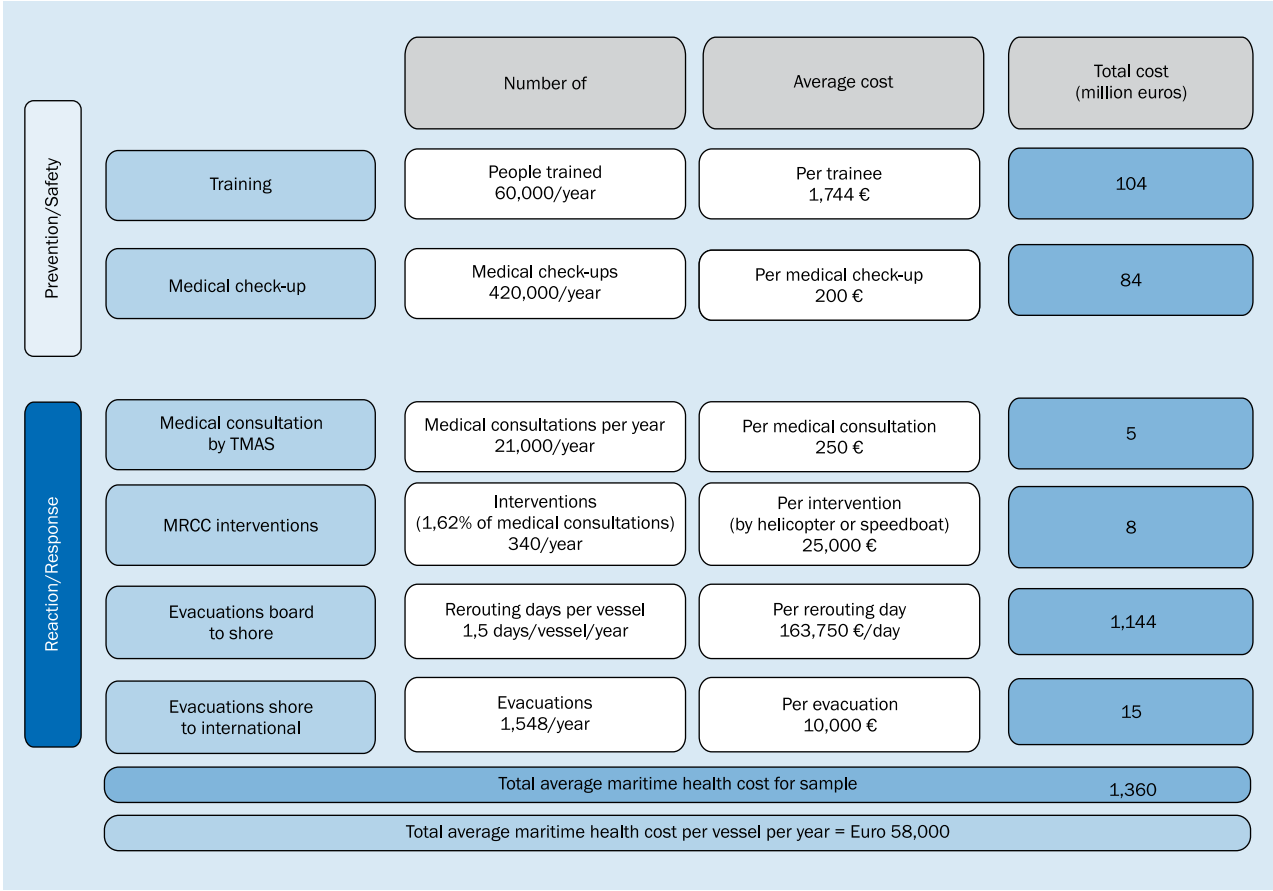

Figure 2. Can investments in more prevention help save money?

medical facility, which can be significantly more than the medical cost itself. If the medical procedure can be performed on board using telemedicine, there are these logistic costs that will also be 'avoided/saved'.

It should be noted that the availability of pre-boarding medical records for a treating physician would in all probability also improve the diagnostic capability to determine if a vessel needed to be re-routed and likely also reduce the number of medical evacuations required.

In addition, one needs to factor in the cost of non-emergency medical consultations to the TMAS.

From the data obtained from 9 public TMAS and 2 private responders, about 15,000 medical assistance calls are made each year, not including Asia, Africa and Latin America.

One third of medical consultations (our sample) are estimated by the group to the cost: 5000 calls × 50 Euro/ /consultation = Euro 250,000 × 3 = Euro 750,000 per year for the total market.

Also keep in mind, that many vessels will have larger crew complements, that crews are rotated out, and that some segments, like fishing, have a significantly higher incident of injuries and emergencies. Thus this model is probably an underestimate of the real total need.

WHO PAYS?

It is clear that improved medical prevention, diagnostics and treatment enabled by telemedicine is something that would benefit the entire industry.

The real questions then become who pays for what and under what kind of arrangement?

Typically the P&I club pays for re-routing costs due to medical emergency, depending on the contract type, usually with a small deductible of about Euro 5,000.

Coverage includes such things as the rerouting fuel and operations/salary costs, and, depending on the skill of the claims adjuster, might also include any charter loss penalties or even the insurance for the days lost.

Now consider what the impact would be on P&I costs and thus premiums to shipowners of an achievable reduction of 20% in the number of cases medevaced due to better diagnosis and treatment on board.

This would generate savings to the industry and in particular to the P&I clubs of about 152 million Euro. One might ask the P&I clubs what they think of this, and how they might seek to encourage increased use of an expanded telemedical service.

Additionally, one needs to consider whether or not there is perhaps a role for private TMAS to provide services, or an

additional level of service, over and above the mandatory minimum, for those willing to pay more in the maritime industry.

This inevitably will also raise the question of who makes use of the TMAS system and who contributes.

CONCLUSIONS

It is clear that besides being able to meet new service requirements required by the MLC and STCW, the perception of being an employer offering better health services, and the general improvements in health of the crew, will make the shipping company using a telemedicine service, be perceived as a more attractive employer, able to get the best most qualified crew. The value of these soft benefits are of course more difficult to assess.

After quite some discussion, it was believed by the participants at the IMHA conference that, through the judicious use of TMAS, one could perhaps reduce by approximately 20% the number of unnecessary or required medevacs per year (treatment on board for cases deemed able to wait till next stop), providing savings to the industry of perhaps 152 million Euro/year.

This is of course justification for the existing publicly funded TMAS. Yet it might also be seen as an opportunity to encourage further cooperation between TMAS and also with the private TMAS sector.

There is clearly a great need, on a global basis, for more cooperation, particularly in standardisation of pre-boarding medical files available, the equipment required on board at a minimum, and level of service quality provided.

The entire industry would no doubt appreciate and benefit from the collection of a common TMAS annual set of normalised statistics from the stakeholders in the maritime industry. We need to ask whether someone should not be tasked with collecting this.

Lastly, in this time of economic budget contractions and austerity, should the open registries and countries where the private sector is invited to provide the service, not be encouraged to work with the global public TMAS system, and contribute to its costs?

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APPENDIX 1. Participants, top 20 maritime flag states and 20 owner nations concerned by TMAS

Operational public TMAS providing information for this business case:

Australia
Belgium
Denmark
France
Germany
Iceland
Italy
The Netherlands
Norway
Spain
Sweden
United Kingdom
4 USA MedAire and GEOS plus 2 USCG

TOP 20 Flags

Figures in brackets are in gross tones of shipping registered in the countries and territories listed (**data as of December 31st, 2010**, based on IHS Fairplay "World Fleet Statistics 2010" [6]).

1. Panama (201,264,453)
2. Liberia (106,708,344)
3. Marshall Islands (62,011,182)
4. Hong Kong, China (55,543,246)
5. Bahamas (50,369,836)
6. Singapore (44,869,918)
7. Greece (40,795,358)
8. Malta (38,737,657)
9. China (34,705,141)
10. Cyprus (20,732,488)
11. Italy (17,044,319)
12. Japan (16,857,860)
13. United Kingdom (16,477,909)
14. Germany (15,282,545)
15. Norway NIS (13,828,168)
16. Republic of Korea (12,512,549)
17. United States (11,941,087)
18. Isle of Man (11,620,778)
19. Denmark DIS (11,530,364)
20. Antigua and Barbuda (10,737,659)

TOP 20 Owners

Based on total gross tonnage controlled by parent companies located in these countries and territories (**data as of December 31st, 2010**, based on IHS Fairplay "World Fleet Statistics 2010" [6]).

1. Japan (131,955,001)
2. Greece (118,089,051)
3. Germany (85,371,604)
4. China (67,156,101)
5. United States (42,982,683)
6. United Kingdom (40,700,626)
7. Norway (33,794,824)
8. Republic of Korea (29,547,097)
9. Denmark (26,445,159)
10. Hong Kong, China (23,427,839)
11. Taiwan Province of China (20,917,259)
12. Singapore (19,977,240)
13. Italy (17,716,680)
14. Russian Federation (14,267,814)
15. Canada (13,242,100)
16. Turkey (12,438,626)
17. Malaysia (10,884,115)
18. India (10,751,903)
19. France (8,685,204)
20. Belgium (7,965,964)