

The Economic Cost of Somali Piracy 2011

Working Paper
One Earth Future Foundation



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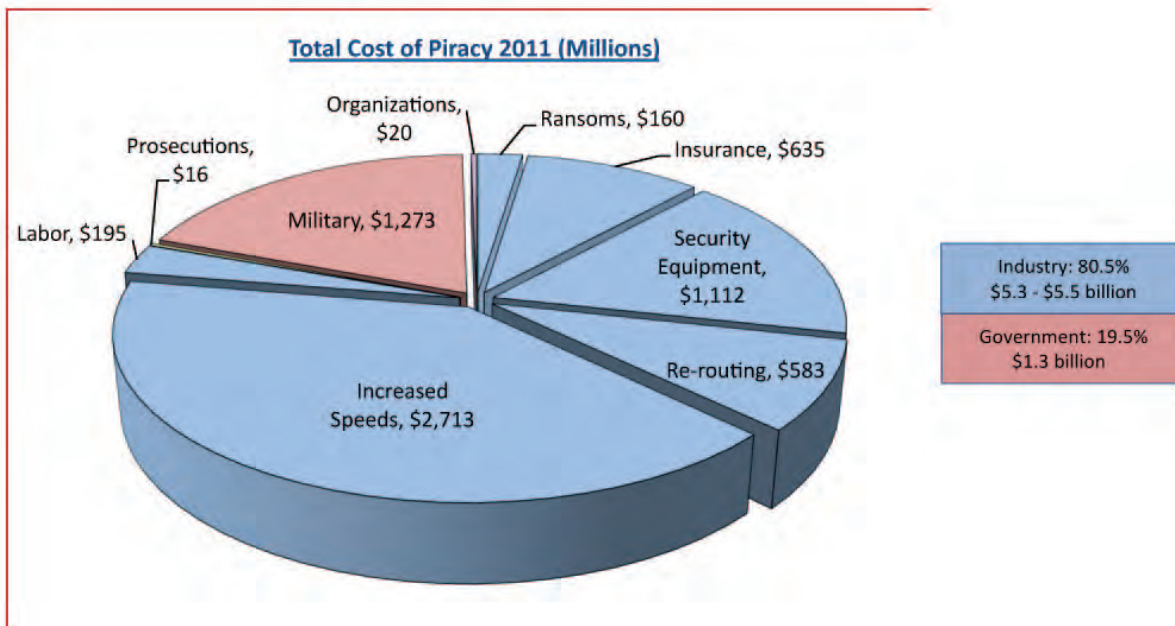
Executive Summary

This report is One Earth Future Foundation’s (OEF) second assessment of the Economic Cost of Piracy. It estimates that Somali piracy cost between \$6.6 and \$6.9 billion in 2011. Our previous report on the Economic Cost of Piracy in 2010, estimated that piracy cost the world \$7 - \$12 billion. That initial report generated a significant amount of dialogue and feedback on the cost of piracy. This report is the result of extensive research conducted by OEF with the collaborative participation of multiple different stakeholders, and includes significant contributions made by commentators, experts, and others impacted by piracy. It assesses nine different direct cost factors, and is focused specifically on the economic impact of Somali piracy.

While the report assesses the cost of piracy for the year of 2011, there were significant changes and developments in piracy throughout that year, and in many ways 2011 was the ‘tale of two years’:

- Overall, 2011 saw an increase in attacks by Somali pirates. This was driven by a rapid escalation in the number of hostages and hijackings in the first quarter of 2011. As expected, hijackings declined during the monsoon period. But in the last quarter of the year, the anticipated resurgence of piracy following the monsoon period did not eventuate.
- A number of factors may explain this pattern, including an extended period of monsoonal rough weather off the coast of Somalia, and the use of deterrence mechanisms such as private armed security. Other developing trends throughout the year included an altered re-routing model where ships transited close to the western Indian coastline (rather than around the Cape of Good Hope); and pirates’ changing use of mother ships from large vessels to smaller fishing boats. Further, 2011 saw a more aggressive response from military forces conducting counter-piracy missions in the region.

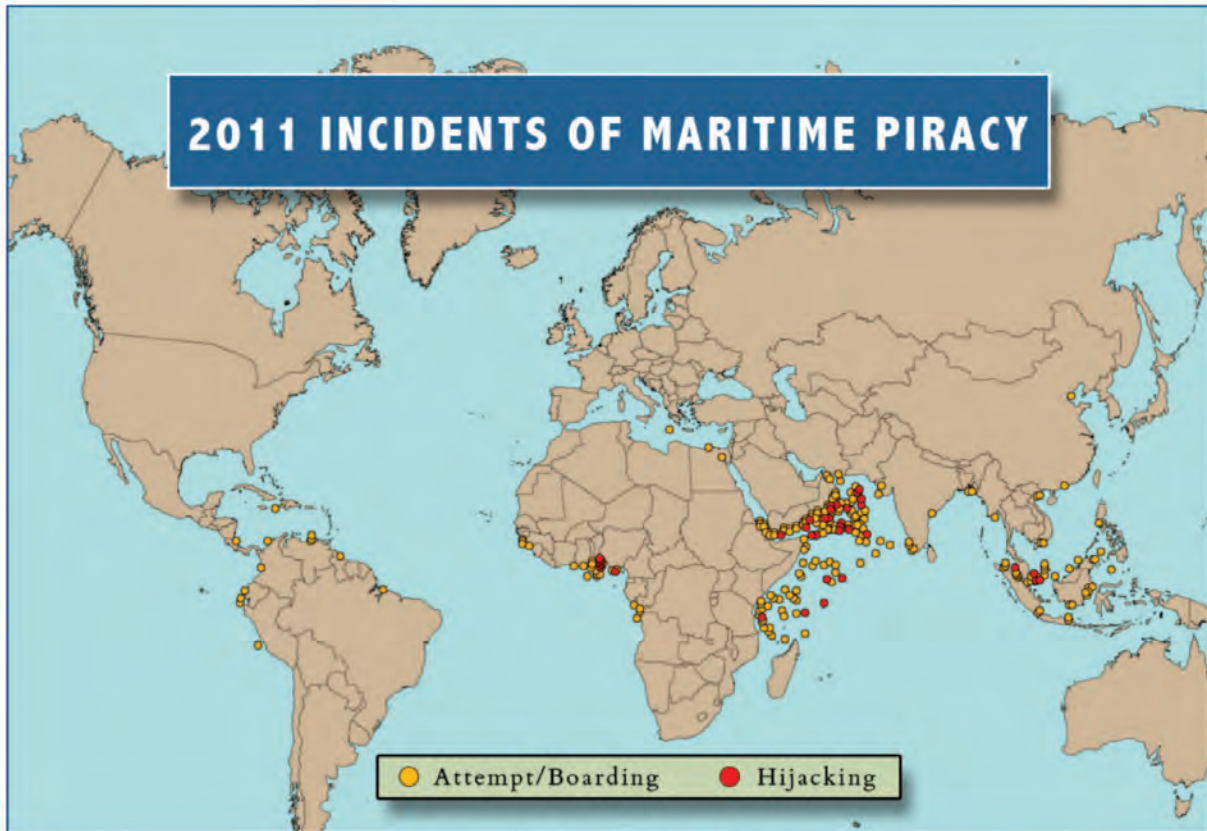
The project finds that of the total costs of Somali piracy in 2011, the shipping industry bore over 80% of these costs, or between \$5.3 and \$5.5 billion.



THE ECONOMIC COST OF SOMALI PIRACY, 2011

Factors contributing to the overall cost:

- **Ransoms:** In 2011, 31 ransoms were paid to Somali pirates, totaling around \$160 million. The average ransom was approximately \$5 million, up from around \$4 million in 2010. While 2011 saw a lower success rate for Somali pirates, the increased price of ransoms meant that pirates received greater revenue for fewer hijackings.
- **Insurance:** The two major forms of piracy-related insurance are war risk and kidnap and ransom (K&R). This insurance market has evolved throughout 2011 to reflect continued developments in piracy. The 'war risk' region was expanded to include the larger Indian Ocean at the beginning of the year, and many shipping companies have received premium reductions for having private armed security on board ships. The total cost of war risk and K&R insurance was approximately \$635 million.
- **Security Equipment and Guards:** A notable trend in 2011 was the rapid escalation in the use of private armed security. The total cost of both security equipment and armed guards in 2011 was between \$1.06 and \$1.16 billion.
- **Re-routing:** In 2011, some ships opted to avoid the piracy high risk area (HRA) by hugging the western Indian coastline. This report assessed the cost of that re-routing for bulk carriers and tankers, and estimated the cost was around \$486 - \$680 million in 2011.
- **Increased speed:** To date, no ship has been successfully hijacked that was traveling at 18 knots or faster. Therefore, many ships will 'speed up' when transiting the HRA. Since more fuel is burned by ships transiting at faster speeds, these increased speeds are a large added cost. This project finds that the extra costs of increased speeds for containerships alone is around \$2.7 billion.
- **Labor:** In 2011, 1,118 seafarers were held hostage, and 24 died. Due to this grave risk, many seafarers are entitled to double compensation when they transit the HRA and/or for the duration they are held hostage by pirates. This study estimates that the total cost of this additional compensation was \$195 million.
- **Prosecutions and Imprisonment:** 20 countries have arrested, detained or tried Somali pirate suspects. The total cost of prosecutions and imprisonment was around \$16.4 million in 2011.
- **Military Operations:** Over 30 countries contributed military forces, equipment, and vessels to counter-piracy activities in 2011. This report estimates the total cost of administrative and headquarter operations, military vessels, aircraft, and unmanned aerial vehicles to be \$1.27 billion in 2011.
- **Counter-Piracy Organizations:** A number of new civil society and multilateral initiatives were launched in 2011 with a mission of reducing piracy, and its impact. This report calculates the total cost of funding and operational budgets for these organizations to be approximately \$21.3 million.



Source: IMB Piracy Reporting Center

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Acronyms

BIMCO	The Baltic and International Maritime Council
BMP	Best Management Practices
CGPCS	Contact Group on Piracy off the Coast of Somalia
DWT	Dead Weight Tonnage
EUNAVFOR	European Union Naval Force
GCC	Gulf Cooperation Council
HRA	High Risk Area
IMB	International Maritime Bureau
IMO	International Maritime Organization
ITF	International Transport Workers' Federation
K&R	Kidnap and Ransom (Insurance)
LMA	Lloyd's Market Association
MSC HOA	Maritime Security Center, Horn of Africa
NATO	North Atlantic Treaty Organization
OBP	Oceans Beyond Piracy
OEF	One Earth Future Foundation
Trust Fund	The Trust Fund to Support the Initiatives of States to Counter Piracy off the Coast of Somalia
UAV	Unmanned Aerial Vehicle
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNODC	United Nations Office of Drugs and Crime
UNSCR	United Nations Security Council Resolution
VLCC	Very Large Crude Carrier
WFP	World Food Program

Introduction and Overview of Piracy Trends in 2011

In 2011, Somali pirates attacked 237 ships, and successfully hijacked 28¹. Piracy impacts multiple stakeholders, none more so than the seafarers attacked, held hostage, or killed. This report specifically analyzes the economic impact of Somali piracy. It estimates that the total cost of piracy in 2011 was between \$6.6 and \$6.9 billion.

This report is second assessment of *'The Economic Cost of Piracy'*, with One Earth Future Foundation (OEF) previously analyzing the cost of piracy for 2010. Given interest in the initial report, including feedback from many stakeholders who claimed it was a useful tool for analysis, as well as ongoing developments in piracy, OEF decided to re-issue the study to assess the costs of piracy for 2011. Note that the present report focuses solely on Somali piracy, and excludes piracy in other regions.

In assessing the economic cost of piracy over the course of 2011 we have witnessed a number of concerning developments and trends that warrant attention from the outset:

a) *Expanding Countries and Regions Affected by Piracy*

Over the past four years, the location of successful pirate hijackings has ballooned out from a relatively concentrated area in the Gulf of Aden and off the coast of Somalia, into the larger Indian Ocean. In 2011, we saw a larger number of hijackings occurring to the northeast of Somalia and the Gulf of Aden. The evolving distribution of Somali piracy attacks for 2008 - 2011, is shown at right.²

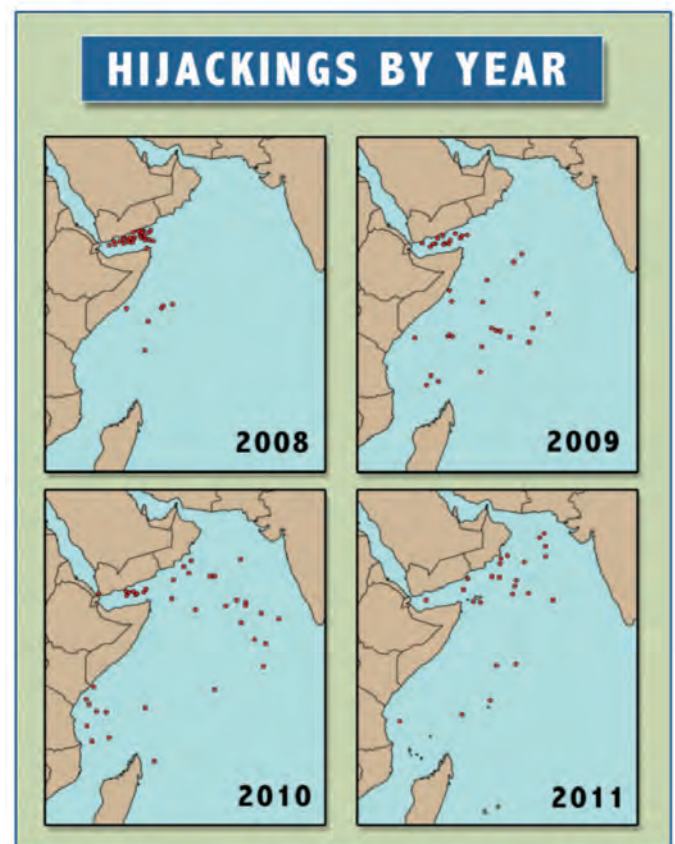
The changing geographical spread of piracy attacks also alters the countries, industries, and trade routes most impacted by piracy. For example in 2011, piracy has increasingly impacted India, Pakistan, and the Gulf countries. This transformation in the location of piracy attacks also indicates that there may be an escalating impact on the oil-supplying industries and nations within that region, as discussed later in this report.

b) *Developments in Ship Hardening and Private Armed Security*

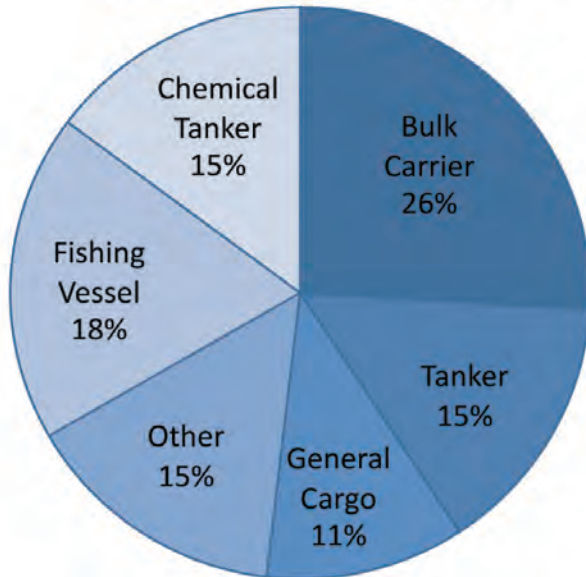
In 2011, we witnessed a significant growth in the use of private armed security to protect against piracy attacks, as discussed in Section 3. We also saw the increasing use of citadels

(safe rooms) where crews can seek shelter in the event of a piracy attack. These self-defense methods, particularly private armed security, have generally been considered successful in deterring piracy attacks.

One of the persistent questions related to private armed security is whether they will continue to be used in the long-term, or even permanently. In either case, their continued use will be a significant 'cost of piracy' to the shipping industry.³



Types of Vessels Hijacked, 2011



c) Developments in Re-Routing Volumes and Trends

Our previous report in 2010 estimated that the largest economic cost of piracy resulted from ships re-routing to avoid the entire high risk area (HRA) affected by Somali pirates. At that point, we understood that a small proportion of ships were even redirecting their voyages around the Cape of Good Hope to avoid pirate-prone regions. In 2011, as a result of a number of factors discussed in Section 4, this report no longer calculates the cost of re-routing around the Cape of Good Hope, and instead focuses on ships re-routing by hugging the western Indian coastline. We have calculated that this version of re-routing adds only one extra day to the average voyage (for a journey from East Asia to the Gulf of Aden), thereby reducing the aggregate cost of re-routing for 2011.

Methodological Challenges

When we launched our study on the *Economic Cost of Piracy in 2010*, we noted the significant difficulties we faced in accurately assessing piracy's impact. Many of the 2010 calculations were rough estimations, which were intended to initiate an informed dialogue on the cost of piracy. The report instigated a large amount of both positive and critical feedback, all of which was very useful. Importantly, this feedback allowed us to collaborate with multiple stakeholders from industry, government, and civil society, in order to improve the assumptions and calculations in this model.

While this feedback and discussion was critical in helping us shape the present report, it is important to note that many of the assertions in this report are still estimations. In 2011 (as in 2010) we faced a number of tough challenges in accessing and analyzing robust data that could be used to accurately assess piracy's impact. Some of the major difficulties we faced included:

- **Data limitations:** it remains very difficult to locate and assemble robust data on the economic cost of piracy. We have analyzed hundreds of reports, articles, and media sources to make our calculations as accurate as possible. But this information is not perfect, and there is certainly data missing. In particular, we have found it challenging to assess 'aggregate costs' for the shipping industry. That is, while we may be able to retrieve information on the average cost of insurance premiums; a team of armed guards; or even the excess cost for an individual ship re-routing its voyage to avoid the high risk area; the difficulty lies in determining precisely *how many* ships pay for these protection mechanisms.
- **Isolating the impact of piracy from other economic affects:** as we note throughout this report, it is difficult to isolate the economic impact of piracy from other macroeconomic trends and volatility. This was especially the case in 2011, as the world (and shipping industry) experienced a persistent economic downturn and excess capacity, as well as political instability in the Middle East and North Africa.
- **Redistribution of economic impact:** a recognized limitation of this study is that it does not account for how economic costs and impacts are ultimately redirected to third parties, countries, or regions.

Indeed in many instances, some countries or industries may even ‘benefit’ from the presence of piracy in another region. For instance, if tourism in Kenya reduces as a result of piracy, might it increase in other countries, like South Africa or Ghana? We regret that we were not able to calculate how economic costs have been redirected or reabsorbed by other stakeholders, or how they even ‘benefited’ some regions or industries.

In sum, while these cost estimations are as accurate as possible, they are certainly not perfect. Throughout the report, we are transparent about the methodology, data, and assumptions feeding into our calculations. With no agenda or stake in the piracy issue, we wanted to create a model which could be openly reviewed and challenged. Given the complexity of calculating the cost of piracy, we believe that adequately assessing the cost of piracy requires a collaborative approach, where industry, governments, and civil society, are able to share data and produce increasingly accurate calculations. We invite feedback and dialogue from all stakeholders interested in this issue, and especially welcome data and information from interested parties.

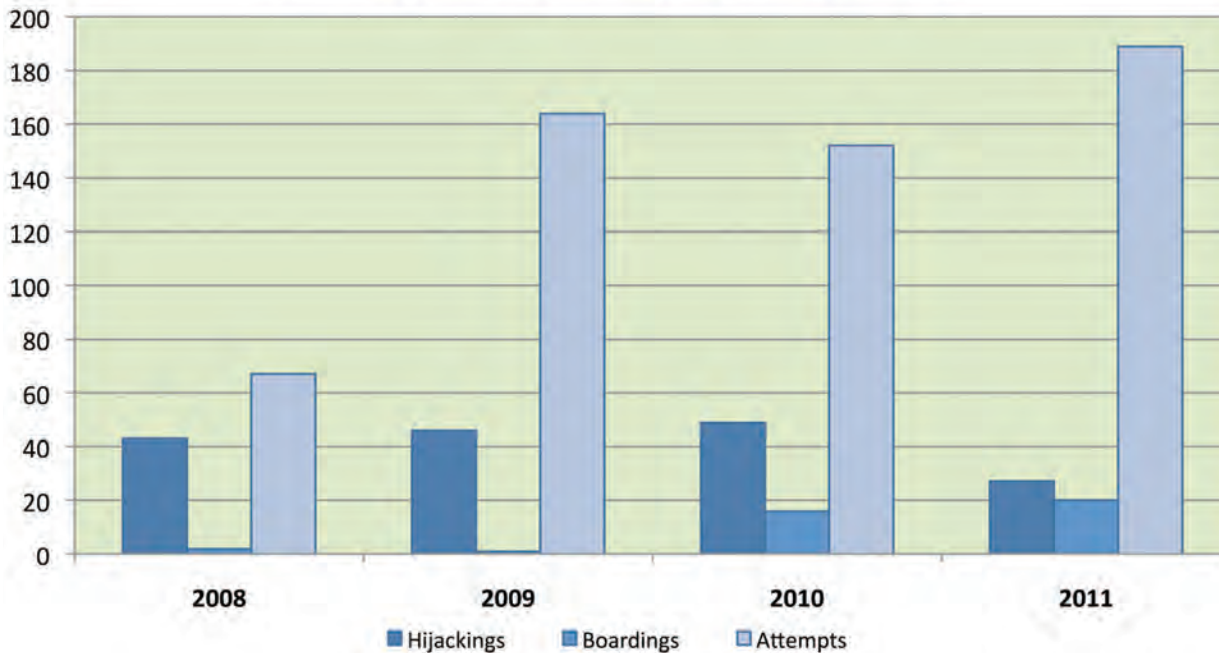
The Direct Economic Costs of Piracy

1. The Cost of Ransoms

- Average hostage situation: 6 months
- Average ransom: \$4.97 million
- Total ransoms paid: \$159.62 million

Receiving multi-million dollar ransoms payments to release hijacked ships is perhaps the first thing that comes to mind when we think about the economic cost of piracy. Once a vessel has been hijacked, pirates usually move that ship towards Somalia where it is held hostage while shipping companies negotiate a ransom. In 2011, these ransoms become increasingly costly. According to available data, 31 ransoms were paid in 2011, amounting to a total of \$159.62 million, with the average ransom being \$4.97 million.

Somali Piracy Hijackings, Boardings, and Attempts, 2008 - 2011*



While the success rate of pirate attacks in 2011 has declined from 27% in 2010, to 13% in 2011, there has been an increase in both the number of attempted attacks (from 152 in 2010, to 189 in 2011), as well as the ransom price⁵. In other words, pirates have been securing equal or greater value for less hijacked vessels.

2011 also saw the highest ransom paid on record. In April, \$13.5 million was paid to release the *Irene SL*, a Very Large Crude Carrier (VLCC)⁶. The Greek flagged *Irene*, hijacked on February 9, 2011, was carrying two million barrels of oil valued at \$200 million (the equivalent of 20% of one day’s worth of the US’s crude imports)⁷. The hijacking occurred only three months after the former highest ransom on record had been paid to release the *Samho Dream*, a South Korean oil tanker, for \$9.5 million⁸.

It is of great concern that hijackings and ransom payments are taking longer to negotiate. According to our calculations, on average it took 178 days, or around six months for a ransom to be negotiated, and a ship released. Many vessels and their crew were held hostage off the coast of Somalia for a distressing 12 months or longer. For instance, the *Iceberg I* and its 24 crewmembers have remained in captivity since March 2010. The *Iceberg’s* crew is said to have suffered severe psychological and physical harm, and one crew member committed suicide by jumping overboard in October 2010⁹.

In 2010's *Economic Cost of Piracy* report, we made a rough estimation of the total value of ransoms paid to Somali pirates. In that study, we employed an estimation made by the General Insurance Research Organising Committee (GIRO) that the average ransom in 2010 was \$5.4 million.¹⁰ Upon further investigation of data subsequently made available, we now believe the average ransom in 2010 was lower than this figure, likely closer to \$4 million.¹¹

In 2011, we have taken a more robust approach to assessing ransoms, and have tracked and accounted for each individual ransom paid in 2011 (where data was available). The table below lists ransom payments

Table 1: Ransoms Paid in 2011¹¹

Ship Name	Date Hijacked	Date Released	Days Held	Ship Type	Ransom Amount (millions)
<i>Motivator</i>	4-Jul-2010	16-Jan-2011	196	Chemical Tanker	\$4.97
<i>Izumi</i>	10-Oct-10	28-Feb-11	141	General Cargo	\$4.50
<i>EMS River</i>	27-Dec-10	1-Mar-11	64	General Cargo	\$3.00
<i>Rak Afrikana</i>	11-Apr-10	9-Mar-11	332	General Cargo	\$1.20
<i>York</i>	23-Oct-10	9-Mar-11	137	LPG Tanker	\$4.50
<i>Hannibal II</i>	11-Nov-10	11-Mar-11	120	Chemical Tanker	\$2.00
<i>Jahan Moni</i>	5-Dec-10	14-Mar-11	99	Bulk Carrier	\$4.00
<i>Irene SL</i>	9-Feb-11	7-Apr-11	57	Oil Tanker	\$13.50
<i>Thor Nexus</i>	25-Dec-10	12-Apr-11	108	General Cargo	\$5.00
<i>Beluga Nomination</i>	22-Jan-11	13-Apr-11	81	General Cargo	\$5.00
<i>Asphalt Venture</i>	28-Sep-10	15-Apr-11	199	Bitumen Tanker	\$3.60
<i>Renuar</i>	11-Dec-10	23-Apr-11	133	Bulk Carrier	\$6.00
<i>Jih Chun Tsai No. 68</i>	30-Mar-10	1-May-11	397	Fishing Vessel	\$8.00
<i>Sinar Kudus</i>	16-Mar-11	1-May-11	46	Bulk Carrier	\$4.50
<i>Yuan Xiang</i>	12-Nov-10	1-May-11	170	General Cargo	\$3.60
<i>Vega 5 (Spanish Crew)</i>	28-Dec-10	11-May-11	134	Fishing Vessel	\$5.00
<i>Khaled Muhieddine K</i>	20-Jan-11	25-May-11	125	Bulk Carrier	\$2.50
<i>Zirku</i>	28-Mar-11	11-Jun-11	75	Oil Tanker	\$12.00
<i>Suez</i>	2-Aug-10	13-Jun-11	315	General Cargo	\$2.10
<i>Susan K</i>	8-Apr-11	16-Jun-11	69	General Cargo	\$5.70
<i>Jubba XX</i>	16-Jul-11	27-Jul-11	11	Product Tanker	\$0.20
<i>Sinin</i>	12-Feb-11	13-Aug-11	182	Bulk Carrier	\$4.00
<i>Eagle</i>	17-Jan-11	19-Aug-11	214	Bulk Carrier	\$4.00
<i>Polar</i>	30-Oct-10	26-Aug-11	300	Product Tanker	\$7.70
<i>Panama</i>	10-Dec-10	6-Sep-11	270	Container Ship	\$7.00
<i>SY ING (Danish hostages)</i>	24-Feb-11	7-Sep-11	195	Yacht	\$3.00
<i>Hoang Son Sun</i>	17-Jan-11	17-Sep-11	243	Bulk Carrier	\$4.50
<i>Dover</i>	28-Feb-11	30-Sep-11	214	Bulk Carrier	\$3.50
<i>Blida</i>	1-Jan-11	3-Nov-11	306	Bulk Carrier	\$3.50
<i>Rosalia D'Amato</i>	21-Apr-11	25-Nov-11	218	Bulk Carrier	\$6.00
<i>Gemini</i>	30-Apr-11	30-Nov-11	214	Chemical Tanker	\$4.05
<i>Savina Caylyn</i>	8-Feb-11	21-Dec-11	316	Oil Tanker	\$11.50
TOTAL RANSOMS PAID IN 2011					\$159.62¹²



The *Irene SL* received a record \$13.5 million ransom in April 2011.
Source: Trade Winds

for hijacked vessels in 2011. Note that some of these vessels were hijacked in 2010, but were not released until 2011. We include all ransoms paid in 2011 in order to analyze the 2011 'ransom price' market.

In 2011, we also witnessed a worrying development in the ransom business model. In some instances, after receiving a ransom, pirates have released the vessel but not all of the crew. In other cases, the vessel has been abandoned, and hostages have been taken ashore in Somalia, where pirates have demanded a ransom for their release. Two examples highlight this distressing trend:

- **Asphalt Venture:** The *Asphalt Venture* was captured in September 2010. In April 2011, \$3.6 million was paid to release the ship, but pirates continued to detain seven Indian crewmembers, of whom two are reported to have died while in captivity¹⁴. The pirates claimed that the Indians would not be released in retaliation against India's arrest and detention of around 120 suspected Somali pirates.¹⁵
- **Choizil:** The South African yacht was captured in October 2010. In November 2010, the yacht ran aground. The skipper refused to abandon the vessel, and was later rescued by naval authorities. However, the other two sailors were taken ashore to Somalia, where they continue to be held for ransom by pirates.¹⁶

As noted in our 2010 report, the 'cash value' of the ransom paid to pirates is not the only cost of hijackings. The total cost incurred by shipping companies is expanded by a number of factors, including the delivery of the ransom, which is most frequently conducted by a light aircraft dropping waterproof containers of cash in US dollars into the water.¹⁷ In May 2011, the Transitional Federal Government of Somalia arrested three Britons, two Kenyans and one American at Mogadishu airport, for attempting to deliver a ransom of over \$3 million. The six foreigners were subsequently pardoned, but fined \$100,000 for the release of their aircraft.¹⁸

Other excess costs include damage caused to the vessel while it is held, the cost of negotiators, consultants and lawyer fees, and psychological trauma counseling for crew members.¹⁹ Further, there is a high cost of having ships held and out of service. For example, at charter hire rates of perhaps \$17,500 per day, a bulk carrier held hostage for six months could cost as much as \$3.15 million in unrealized charter hire rates alone²⁰. Indeed, according to Stephen Askins of Ince & Co., the excess costs of having ships held hostage for months on end is potentially as large as \$20 million for a \$4 million ransom. Each ship owner and insurance company therefore must conduct a delicate cost-benefit analysis when negotiating for a ship's release: the incentive to drive down the ransom price, and 'wait out' a reasonable negotiation must be contrasted with the high cost of having ships out of service, and the considerable impact on the crew.²¹



A cash ransom is dropped onto the *Vela* in 2008. BBC News

Since most ransoms are paid under shippers insurance, we do not include the cash value of ransoms in the total cost of piracy. Instead, we account for the above excess costs of ransoms, which we have estimated to be approximately 100% of the 'cash value' of ransoms of \$159.62 million.

2. The Cost of Piracy Insurance

As ships and their crew members are under increasing threat of pirate attack, shipping companies have naturally sought insurance against attacks and especially as financial protection to pay ransoms. War Risk and Kidnap and Ransom (K&R) are the two primary forms of piracy-related insurance²².

- **War Risk:** Vessels transiting through 'war risk areas' are required to pay war risk premiums. War risk areas are identified by the Lloyds Market Association (LMA) Joint War Committee, in London.²³ As of January 2011, the War Risk zone covers the Indian Ocean, the Gulf of Aden, the Red Sea and the Gulf of Oman²⁴.

According to a 2011 study by Marsh, titled *Piracy: The Insurance Implications*, war risk is the most appropriate form of insurance to cover against pirate attacks, although there are certain benefits to purchasing an 'extra layer' of protection under K&R (detailed below)²⁵. A separate report on piracy insurance by Aon also indicated that more losses were covered under war risk premiums than K&R in 2011²⁶.

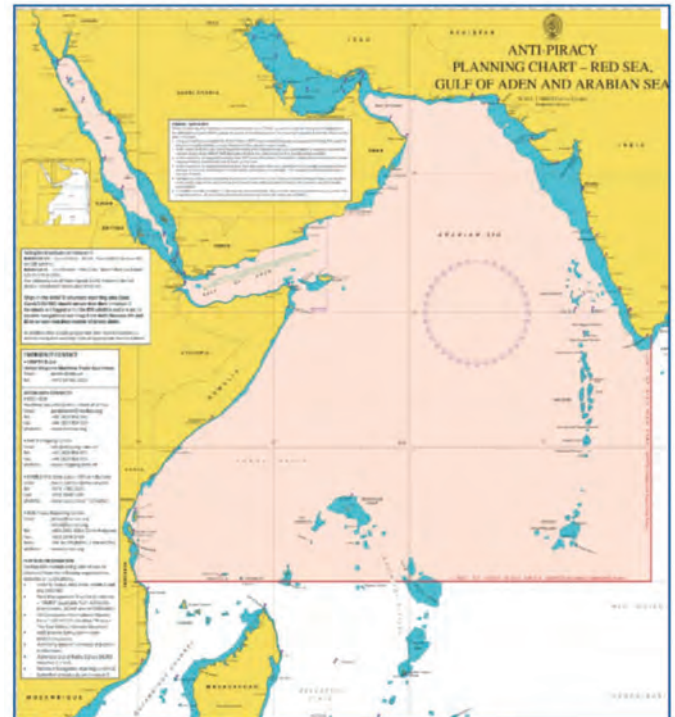
War risk premiums may be reduced if ships have armed security guards, or other security equipment such as citadels, razor wire, or sonic deterrent equipment. Compliance with the most recent version of Best Management Practices (BMP) is usually expected as standard, and may be a requirement of underwriting²⁷.

- **Kidnap and Ransom (K&R):** K&R insurance typically protects the crew, but not the vessel or hull (which is insured separately)²⁸.

K&R can add a useful additional layer of insurance protection to war risk insurance, and is often used to cover fees for public relations, negotiators, medical and psychological treatment, ransom delivery costs, and travel costs for hostages' families. Having K&R insurance cover may also reduce the length of the hostage period, and protect against the loss record for war and/or hull premiums. K&R insurers maintain close relationships with hostage negotiators, who bring specialized expertise to ransom negotiations²⁹.

The costs of war risk and K&R insurance are not mutually exclusive, and many war risk insurers will reduce premiums for shipping companies who have purchased K&R insurance³⁰. However, this can be difficult for some shipping companies to utilize in practice, since K&R policies often include a requirement that they are kept confidential. In order for war risk insurers to reduce premiums for companies carrying K&R protection, ship owners must obtain the K&R underwriter's agreement to disclosure³¹.

According to Aon, there has been a large growth in the marine K&R market in recent years, with underwriters receiving premiums as large as the land based K&R market (which has been developing for over 40 years)³². Indeed, we may continue to see the K&R market expand, as we increasingly witness pirates moving hostages off vessels, and taking them ashore into Somalia, where they are held for several months³³. Under these circumstances, K&R insurance for crewmembers is crucial³⁴.



High Risk Area 2011. Source: BMP4

Assessing the global cost of piracy-related insurance is a difficult and contentious task. In our 2010 analysis of the cost of piracy insurance, we made a rough estimate that the total cost might fall anywhere between \$460 million and \$3.2 billion. The upper bound of this figure was challenged by the insurance industry, and this feedback has been very useful in shaping the calculations for the current report. Through discussions with multiple industry and insurance representatives, we have been able to obtain greater detail about the piracy-related insurance market, and further develop the precision of our study.

There continues to be an ongoing debate over the total value of the marine war risks and K&R insurance markets. On the one hand, some insurance brokers, such as Willis Group Holdings (the world's third largest), have stated that piracy is among its 'fastest-growing' businesses³⁵. On the other hand, Andrew Voke, Chairman of the LMA Marine Committee has stated that piracy claims have overtaken the income gained from premiums, and that some underwriters would like to withdraw from the market³⁶. Neil Roberts, Senior Executive for Underwriting at LMA, has estimated that piracy costs ship owners an additional \$160 million a year in premiums.³⁷

The challenge of assessing the total cost of insurance continues to be a difficult task due to a lack of available data on total premiums, the variation in premiums for each individual ship, and the various available premium reductions (e.g. the presence of armed guards on ships, security equipment, or multiple forms of cover).³⁸

In 2011, a larger number of vessels were subject to war risk and K&R insurance premiums, due to the expansion of the war risk area.³⁹ To estimate the number of vessels transiting this area, we have used information from EUNAVFOR's Maritime Security Center Horn of Africa (MSC HOA). To be in compliance with Best Management Practices Version Four (BMP4), all ships transiting the HRA are required to register with MSC HOA. An October presentation by EUNAVFOR's Chief of Staff, Captain Keith Blount, showed the number of vessels registering with MSC HOA between January and August 2011. From these figures, we estimate the average number of vessels registering each month to be around 2,830, or 33,960 vessels registered in 2011.⁴⁰ Since adherence to BMP (and registration of vessels) is estimated to be around 80% compliant, we presume 33,960 vessels represents approximately 80% of the total.⁴¹ Therefore, the total number of vessels transiting is likely to be around 42,450 per year.⁴²

We use this figure of 42,450 as the estimated number of vessels subject to piracy-related premiums. Since we were not able to identify the precise makeup of different vessels in the entire risk zone, we have proxied the type of vessels transiting the Suez Canal, using data from the Suez Canal Authority⁴³. We calculate the proportional representation of each type of ship in the Suez, and use that percentage to estimate the breakdown of ships in the greater war risk region. Of course, this estimation is not perfect and the composition of ship traffic in the entire risk zone will not necessarily be identical to the Suez, but it does provide a starting point for estimations.

In order to calculate the cost of war risk premiums, we used estimations by the insurance industry that the 'starting value' of war risk premiums is around 0.1% of a vessel's hull value⁴⁴. Information on the value of the hull is taken from the United Nations (UN) Conference on Trade and Development (UNCTAD), *Review of Maritime Transport, 2011*⁴⁵. We then make some approximations of the various premium reductions available⁴⁶. We estimate that all ships receive a 50% 'no claims bonus' reduction (because relatively few ships make a piracy claim). We then further reduce that value by 50% for those ships purchasing K&R insurance (which we hypothesize to be around half of all vessels). The final reduction is made for those vessels purchasing private armed security, which we estimate reduces the premium by approximately 30%. The reduction for private armed security is applied to 25% of ships⁴⁷. Further details on the insurance premium calculations are included in Appendix 1.

To calculate the cost of K&R insurance, we use two broad ranges of K&R premium prices, which were obtained from discussions with an insurance industry representative. For ‘low and slow’ vessels (e.g. tankers), which are at the greatest risk of attack, we understand that the average K&R policy costs \$15,000 - \$20,000 per transit. For ‘high and fast’ vessels (e.g. container ships) K&R policies cost \$5,000 - \$10,000, on average. Using these figures, we calculate the cost of insurance for each of these two types of ships, using the estimate that 50% of vessels would purchase K&R insurance, as shown in the following table:

Table 2: Piracy-Related Insurance Costs, 2011

Type of Ship	Number in Suez (2010)	Proportion in Suez	Estimated Representation in Indian Ocean (proxied by Suez Canal traffic)	Estimated Average Hull Value	Estimated War Risk Insurance Premium (top rate)	No Claims Bonus (all vessels)	Reduction for K&R (50% of vessels)	Reduction for Armed Guards (25% of vessels)	Estimated War Risk Insurance	Estimated K&R Premium Per Ship ⁴⁶	Estimated K&R Insurance
Tanker	3,550	19.73%	8,375	\$44,000,000	0.10%	50%	50%	30%	\$138,187,500	\$12,500	\$52,343,750
LNG	855	4.75%	2,016	\$25,000,000	0.10%	50%	50%	30%	\$18,900,000	\$12,500	\$12,600,000
Bulk/Combined Carriers	2,809	15.61%	6,626	\$33,000,000	0.10%	50%	50%	30%	\$81,996,750	\$12,500	\$41,412,500
General Cargo	1,618	9%	3,816	\$19,000,000	0.10%	50%	50%	30%	\$27,189,000	\$12,500	\$23,850,000
Container Ships	6,852	38.08%	16,165	\$19,000,000	0.10%	50%	50%	30%	\$115,175,625	\$7,500	\$60,618,750
Ro/Ro Ships	270	1.50%	637	\$19,000,000	0.10%	50%	50%	30%	\$4,538,625	\$7,500	\$2,388,750
Car Carriers	1,004	5.58%	2,369	\$19,000,000	0.10%	50%	50%	30%	\$16,879,125	\$7,500	\$8,883,750
Passenger Ships	100	0.56%	238	\$19,000,000	0.10%	50%	50%	30%	\$1,695,750	\$12,500	\$1,487,500
Other	935	5.20%	2,207	\$19,000,000	0.10%	50%	50%	30%	\$15,724,875	\$10,000	\$11,035,000
TOTAL	17,993	100%	42,450	-	-	-	-	-	\$420,287,250	-	\$214,620,000

Combining these cost estimates for war risk and K&R insurance, we estimate that around \$635 million in piracy-related insurance premiums were paid in 2011.

3. The Cost of Security Equipment and Guards

An increasing number of ship owners are seeking to protect their vessels against pirate attack when transiting the HRA with security equipment and/or private armed (or unarmed) security guards.

a) Security Equipment

According to the latest (fourth) version of Best Management Practices for Protection against Somalia Based Piracy (BMP4), a number of security measures should be taken by vessels to prevent and defend against a pirate attack. BMP4 describes these ship protection measures as “the most basic that are likely to be effective,” and ship owners are encouraged to conduct a full risk assessment prior to entering the high risk area. Suggested measures include (but are not limited to)⁴⁹:

- Enhanced watch keeping, lookout, and vigilance
- Enhanced protection of, and controlling access to, the bridge
- Razor wire
- Water spray and foam monitors
- Maneuvering practice
- Closed circuit television
- Upper deck lighting
- Alarms
- Citadels/ safe muster points.

Table 3: Cost of Security Equipment

Security Equipment	Average Cost/Ship/Year	Total Cost in 2011	
		Lower Bound	Upper Bound
Razor Wire ⁴⁸	\$12,796 ⁴⁹	\$434,552,160	\$434,552,160
Electrified Barrier	\$1,529.80 ⁵⁰	\$3,247,000 ⁵¹	\$9,741,000
Warning Signs	\$4.50 ⁵²	\$286,538 ⁵³	\$286,538
Acoustic Devices ⁵⁴	\$21,000	\$44,572,500	\$133,717,500
Sandbags	\$1,424.16 ⁵⁵	\$48,364,473	\$48,364,473
		\$533,609,653	\$629,248,653

Because BMP compliance rates are estimated to be at 80%, we estimated the cost of security measures per ship and multiplied by 33,960 unless otherwise indicated (given our estimation that 42,450 ships traverse the HRA each year). We also account for the fact that many forms of security equipment last more than one trip. We find the aggregate cost of security equipment and guards deployed on vessels in the region to be a substantial cost to the industry in 2011. Commercial vessels have employed everything from barbed wire fences around the ship’s perimeter to private armed guards. Further, as technology advances, the cost of security measures is expected to continue to rise.

b) Private Armed Security

In 2011, we saw a rapid escalation in the deployment of private armed security on commercial vessels as a deterrent mechanism against pirate attacks. Over the course of the year, a number of flag states permitted



Private Armed Security and Military. Source: U.S. Navy

the use of armed security onboard ships. The use of armed guards was also endorsed by the International Maritime Organization (IMO), the International Transport Workers’ Federation (ITF), and some insurance companies⁵⁹.

Varying sources estimate that the additional costs of armed guards are anywhere between \$30,000 and \$100,000 per transit through the HRA⁶⁰. According to the Independent Maritime Security Association, the use of a private

armed security team generally costs around \$50,000 per transit⁶¹. We have estimated that approximately 25% of vessels transiting the HRA employ armed guards⁶². It is important to note that this figure of 25% is an estimation of the entire year of 2011. From discussions with leading shipping industry representatives, we understand that the proportion of vessels employing armed guards increased rapidly throughout 2011, and by the end of the year this figure was closer to 50% of vessels.

Flag States Allowing Private Armed Security ⁵⁶	
▪ Cyprus	▪ Italy
▪ Denmark	▪ Netherlands
▪ Finland	▪ Norway
▪ Germany	▪ Spain
▪ Greece	▪ UK
▪ Hong Kong	▪ USA
▪ India	

If there are approximately 42,450 transits through the HRA each year, then around 10,612 transits employ armed security. At an average cost of \$50,000 per transit, the total costs of private armed security are estimated to be in the region of \$530.6 million per year.

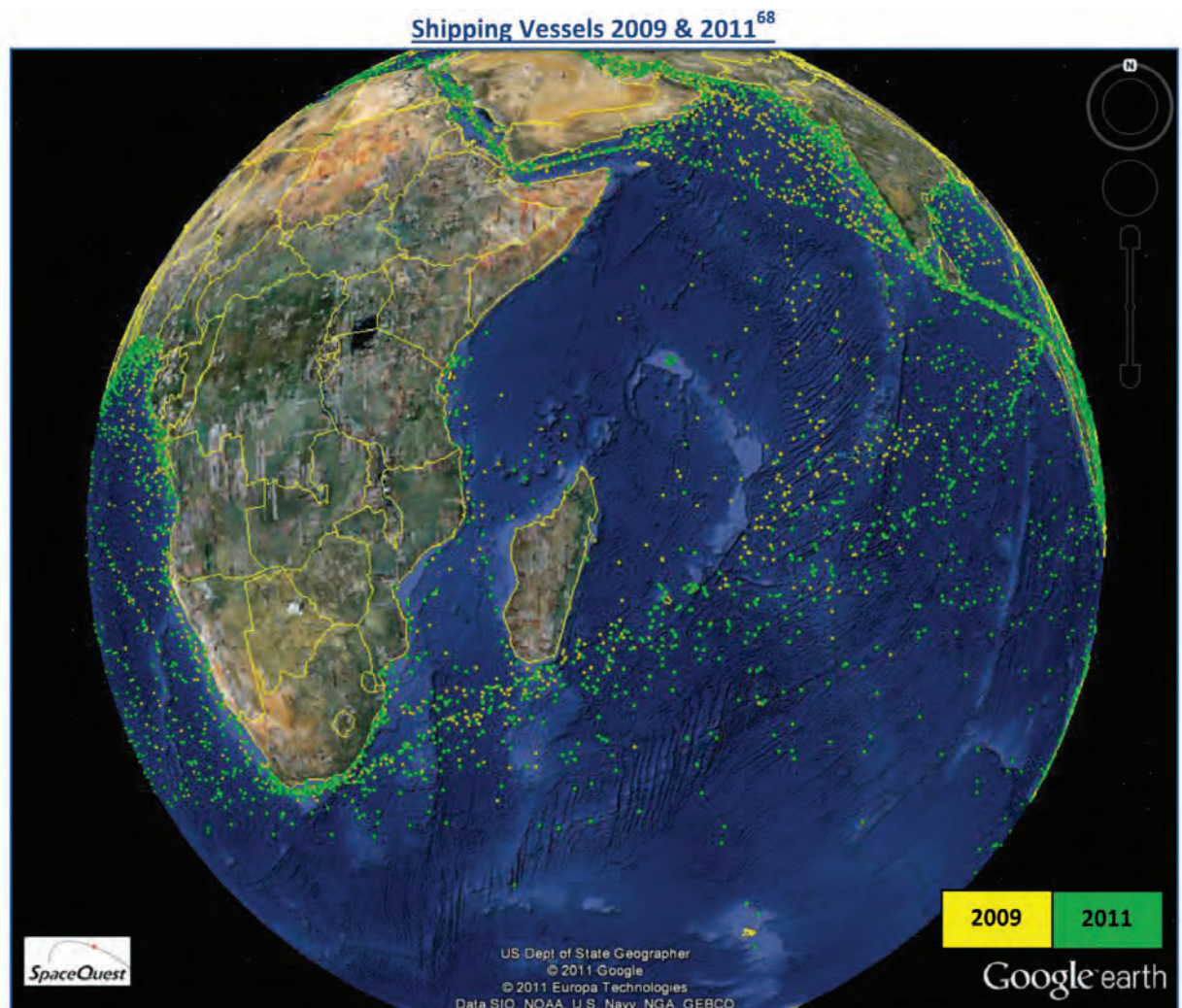
In addition to the costs of security equipment and guards to the shipping industry, private security companies also incur multiple costs themselves. For instance, there exist accreditation standards for private security companies. The Security Association for the Maritime Industry (SAMI) is the main such accreditation body, and on average members pay \$3,824 per year. Since the organization has approximately 76 members, the total costs of licensing accreditation is around \$290,624 per year. Note that SAMI is not the sole licensing body for private maritime security companies, so this number is likely lower than in reality.

Total Cost of Security Equipment & Guards	
Total Cost of Security Equipment	\$534 - \$629 million
Total Cost of Private Armed Security	\$530.6 million
Private Security Accreditation	\$290,624
TOTAL	\$1.064 - \$1.16 billion

4. The Cost of Re-Routing

In order to avoid piracy attacks on ships, some ship owners may opt to avoid the HRA altogether. In our 2010 report, we calculated the cost of some ships opting to transit around the Cape of Good Hope rather than through the Suez Canal and Gulf of Aden.⁶⁴ In our 2011 analysis, multiple trends in piracy and shipping lead us to believe that fewer ships are now opting to re-route around the Cape of Good Hope (although some ships certainly do continue to re-route via the Cape). These factors include:

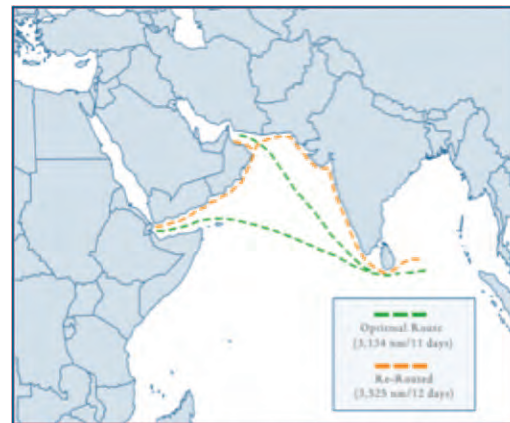
- Shipping companies have increasingly placed private armed security on their ships. At the time of writing, no ship with armed guards is believed to have been successfully hijacked. Therefore, many ship-owners appear to find paying for armed security and transiting directly through high-risk zones to be more cost effective than re-routing around the coast of Africa.
- As pirates expanded their area of operation, the war risk zone has been extended into the larger Indian Ocean. As a result, there is increasingly “no such thing” as a “piracy safe passage”.⁶⁵
- Suez Canal revenues reached record levels in 2011, which suggests that there was not a substantial re-direction of shipping traffic away from the Suez.⁶⁶ In August 2011, Egypt’s Suez Canal Authority announced that despite political turmoil in Egypt and surrounding countries, the waterway had collected a record \$5.05 billion in the 2010/11 fiscal year, with revenues collected by the Authority increasing by 12.7% on the same period in 2010.⁶⁷



Discussions with multiple representatives from the shipping industry have also confirmed that very few ships are now opting to re-route around the Cape of Good Hope due to piracy concerns, and that most ship-owners consider paying for excess insurance premiums and armed guards to be more economical than re-routing around the Cape of Good Hope. According to The Baltic and International Maritime Council (BIMCO), the main factor that might change this economic calculus would be a high enough increase in insurance premiums to make transiting around the Cape of Good Hope more cost efficient⁶⁸. Further, discussions with experts analyzing Automatic Identification System (AIS) data on a regular basis have also affirmed that most shipping traffic does not appear to be re-routing around the Cape.

The re-routing we witnessed in 2011 is that of ships hugging the Indian coastline, in an attempt to transit around the east side of the piracy risk zone. This more moderate model of re-routing adds approximately one excess day to an average transit between East Asia (Singapore) and the Middle East (Oman). The Google earth image on the previous page shows the patterns of vessel traffic. The image on the previous page highlights the pattern of vessel traffic on a given day in November 2009 (yellow) with a given day in November 2011 (green)⁶⁹, while the image below traces the optimal and re-routed routes.

In 2011, we utilized BIMCO’s ‘Piracy Cost Calculator’ to assess the cost of re-routing ships. BIMCO’s excellent tool allows for shipping companies and other interested stakeholders to enter details about an individual ship (such as charter hire rates, fuel consumption, distance traveled etc.) to assess the cost of re-routing for that particular ship.⁷¹ Note that in this analysis, we have not included the extra cost of insurance premiums for longer transits nor the possible insurance reductions for transiting outside the eastern border of the war risk zone (since insurance costs are calculated separately). Our calculations account for excess charter hire cost, fuel costs, and opportunity cost (i.e. the longer duration taken) of re-routing vessels.



Optimal and Re-routed Route

While the image above shows the concentration of 2011 traffic off the Indian Coast and suggests some developments in shipping routes, it still remains difficult to assess precisely how many ships are re-routing. While other types of vessel may indeed re-route, we have opted to conservatively focus on two vessel types - tankers and bulk carriers - given their slower speed and lower bridge, which places them at greater risk of hijack by pirates. In addition, we understand that some tankers are reluctant to have armed guards on board (due to the possibility of live weapons igniting fuel transported by tankers), and are therefore more susceptible to attack.

Using our calculation of the total vessels transiting the HRA (discussed in Section 2), we estimate that 8,375 tankers and 6,626 bulk carriers transited the HRA in 2011. However, since some of these journeys may be made between the Middle East and Europe, not all of these voyages would opt to hug the Indian coastline on a North/South transit. Since we were not able to access data on the precise number of each vessel type opting to re-route away from the Somali coast line towards India, we have therefore estimated the cost of re-routing to tankers and bulk carriers when 50% of vessels re-route, and when 70% of vessels re-route, which allows for at least 30% of traffic to be coming to/from the Middle East towards Africa/Europe⁷². It is worth noting that these proportions can be updated in our model, to generate different assumptions, and results. (See Appendix 2 for further details on the methodology used). Under these specific scenarios, the cost of re-routing in 2011 was between \$486 million and \$680 million.

	Tankers	Bulk Carriers	Total Cost of Re-Routing
Scenario One	50%	50%	\$486 million
Scenario Two	70%	70%	\$680 million

5. The Cost of Increased Speed

To date, there has not been a successful pirate attack on a vessel travelling at 18 knots or faster. BMP4 therefore recommends that vessels transit at 'full sea speed' or at least 18 knots, throughout their transit of the HRA⁷³. This increased speed is an added cost to vessels given that they are transiting at higher speeds than their most 'economically optimum' speed. These costs are primarily translated through higher rates of fuel consumption, and therefore greater bunker costs.

While all vessel types would find increasing their speed beyond the most 'cost efficient' rate an increased cost, we have focused our analysis only on container ships. We selected container ships as a case study since they have the capacity to travel faster than other vessel types, but over the past couple of years have been traveling substantially slower than their full-speed capacity to decrease fuel consumption and costs. According to AP Moller-Maersk, the world's largest container ship company, the optimum economical speed for container ships is between 10 and 15 knots, rather than their average full capacity of 25 knots⁷⁴. Indeed, in 2010, AP Moller-Maersk mandated its ships to sail at 12 knots, also known as 'super slow steaming.'⁷⁵ A report in 2010 also found the average speed of container ships to be 11.4 knots. For our analysis, we have estimated that the average speed of container ships 'in the absence of piracy' is 12 knots. Appendix 3 lists the 'economical' and 'normal' speed of various vessels, as well as a detailed methodology.

As we did for calculating re-routing costs, we have also utilized BIMCO's Piracy Calculator to assess the cost of increased speeds. BIMCO's calculator accounts for multiple factors in its cost calculation, including: bunker cost, charter hire, insurance, and opportunity cost. We have not factored charter hire rates or insurance premiums into our calculations. In addition, although in some instances increased fuel costs might be offset by a reduced opportunity cost (i.e. greater delivery speeds, and therefore an increase in the number of deliveries per year), the depressed economic market in shipping and over-supply of ships dilutes this opportunity cost, and we therefore also do not include this in our total calculations. We do however, account for the lower number of 'burning days' (i.e. the duration of the voyage which fuel is consumed) for ships traveling at a faster rate, which translates into some savings for a vessel. Our calculations therefore focus exclusively on direct excess bunker costs.

We recognize that including all of the different effects on cost would make our analysis more complete, and we regret that we were not able to include all these factors in this analysis. Nevertheless, bunker costs is the major cost component for increased speeds and factoring in insurance and charter hire rates would not significantly alter our estimate. Further, because we have only calculated the cost for container ships, our estimate is a conservative, lower-bound approximation, because we do not account for the costs to various other vessels types transiting the HRA.

This analysis also points to an interesting aspect in the economic cost of piracy which is that different costs fall on different sectors of the shipping industry. While container ships may accrue excess costs from increasing their speed, tankers and bulk carriers may experience increased costs from re-routing.

From discussions with shipping industry experts, we understand that most container ships will not transit at 18 knots through the entire Indian Ocean, especially if they have private armed security on board. They will however speed up to at least 18 knots when they are transiting towards the Northeast of Somalia and through the Gulf of Aden.⁷⁷ We assume that:

- When vessels are transiting South/North through the Indian Ocean, they are traveling at an increased speed of 13 knots (up from their 'economically optimum' speed of 12 knots).
- When vessels transit towards the Northeast of Somalia and through the Gulf of Aden, they are traveling

at speeds between 18 and 20 knots. (We have capped our analysis at the lower-bound speed of 18 knots). We assume a typical voyage to be from Oman (port of Muscat) to Yemen (port of Mokha).

- We estimate 20% of container ships in the HRA do not transit the Indian Ocean at all (they are transiting East/West between the Gulf/Europe through the Gulf of Aden). Given our earlier estimate that approximately 16,165 container ships transited the HRA in 2011, 20% of container ships is 3,233 vessels.
- The transits of the remaining 80% (12,932 vessels) is calculated such that for approximately 50% of their voyage (i.e. 1,613nm from Sri Lanka to Pakistan) they travel at around 13 knots; and for the remaining 50% of the voyage (i.e. 1,601nm from Pakistan to Yemen), at 18 knots:

Region	Distance	Average 'Optimum' Speed	Increased Speed
Indian Ocean	1,613nm	12 knots	13 knots
Gulf of Aden & NE Somalia	1,334nm (Oman to Yemen)	12 knots	18 knots
	1,601nm (Pakistan to Yemen)		

Under the specific scenarios and assumptions discussed above, we calculate that the excess cost of container ships transiting at increased speeds through the HRA was approximately \$2.7 billion in 2011.

6. The Cost to Labor

- 24 seafarers killed
- 1,118 seafarers held hostage

Maritime piracy imposes significant costs on seafarers. In 2011, 1,118 seafarers⁷⁹ were held hostage by Somali pirates, and 24 killed⁸⁰. In addition, seafarers face increased stress and risk associated with transiting through pirated waters, with extreme psychological pressures for those unfortunate victims held hostage on hijacked vessels.

While this report does not attempt to calculate the 'human cost' of piracy in terms of seafarer welfare or suffering, it does assess the associated monetary costs of paying seafarers excess wages to transit pirated waters⁸¹.

According to an agreement worked out between the ITF (which represents over 600,000 seafarers through affiliated unions), ship owners and companies - seafarers are eligible for double pay when they transit the HRA: *"During the period of transit of the area designated as the IBF [International Bargaining Forum] High Risk Area seafarers shall be entitled to compensation amounting to 100% of the basic wage and a doubled compensation payable in case of death and disability."*⁸²

In addition, the Philippine Government requires that all contracts with Filipino seafarers include a provision for hazard pay in the form of 200% of wages when transiting the HRA. This applies to a significant portion of shipping labor given that Filipino seafarers account for around 25% of all seafarers⁸³. As it takes approximately seven days to transit the area and hazard pay is equal to wages of approximately \$2,100 per vessel per day⁸⁵, the cost per vessel is approximately \$14,700.

If all crews aboard the 42,450 vessels that transit the HRA each year⁸⁶ received hazard pay, the cumulative cost would be around \$624 million. However, not all ship owners have signed the agreement. We therefore assume that crews on 30% of vessels received hazard pay, amounting to around \$187.2 million⁸⁷.

Transit Costs (Labor)	
Average Daily Wages per Vessel	\$2,100
Number of Days to Transit HRA	7 days
Average Vessels per Year	42,450
Annual Additional Labor Costs	\$624,015,000
% of Vessels Paying Additional Wages	30%
Labor Costs Associated with Somali Piracy	\$187,204,500

Furthermore, the ITF agreement not only impacts transits through the HRA, but also provides for 200%

compensation for seafarers held hostage in the region, since the agreement covers “each day of the vessel’s stay” in the HRA. There were 28 vessels hijacked in 2010 that remained in Somali pirate control in all or part of 2011, and 25 more captured in 2011, for a total of 53 vessels carrying 1,118 seafarers. To calculate the 200% pay figure, this report uses the estimate of total wages on the average ship to be \$2,100 (as listed above), and an average of 20 seafarers per vessel (derived from the average for all ships held captive in 2011). The length of captivity was calculated using an analysis of all vessels held by pirates in 2011, including total number of days held hostage for each seafarer aboard the hijacked vessels. If all seafarers received 200% pay while in captivity, \$39.1 million would have been distributed to seafarer-hostages and their families.

However, not all contracts require 200% pay. This report therefore calculates seafarer-hostage compensation only for those seafarers with a hazard pay provision in their contract, namely all Filipino seafarers and the crews aboard vessels subject to the ITF agreement. In 2010, Filipino seafarers accounted for 20% of all hostages held, while 5 of the 53 hijacked vessels were subject to the ITF agreement. For all other vessels, it is assumed that no wages are paid because we were not able to determine on which remaining vessels seafarers continued to receive compensation. Labor costs for seafarers in captivity therefore totaled around \$7.9 million in 2011.

Cost Factor	Amount
Transit	\$187,200,000
Captivity	\$7,870,000
Total Excess Labor Cost	\$195,060,000

There is another labor cost associated with Somali piracy that is not included in this report, but is worth noting. This is the ‘replacement’, or ‘opportunity cost’ of the seafarer hostages’ time.

In simple terms, if these seafarers had not been taken hostage, they presumably would have continued working and delivering cargo shipments. With them held in captivity, the company is required to contract new employees to complete those deliveries. Further, in many cases seafarers may face psychological trauma, which delays them from returning to work after their hostage experience. Unfortunately we were not able to make a robust quantitative assessment of these cost figures, and our calculations were deemed too speculative to include in this report.

Using both the cost of excess salaries for transiting the HRA, and the estimated cost of salaries to seafarers held hostage by Somali pirates, we estimate that the total excess piracy-related labor cost for seafarers in 2011 was approximately \$195 million.

7. The Cost of Prosecutions & Imprisonment

- Total Cost of Prosecutions and Imprisonment, 2011: \$16.4 million

The rule of law for prosecuting pirates is encapsulated in the UN Convention on the Law of the Sea (UNCLOS), the Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA), as well as the independent domestic jurisdictions of different states. International law grants states universal jurisdiction to seize suspected pirates. This means that any state, regardless of whether it has a nexus to the piratical act, may prosecute pirates in its domestic courts as long as it has criminalized piracy in its penal code.

In practice, the prosecution of Somali pirates is both complicated and contentious. Western countries have generally been reluctant to try and subsequently incarcerate pirates (unless they had a direct connection to the pirate attack) due to concerns about granting asylum to prisoners or legal issues associated with repatriation. Combining this reluctance with Somalia’s low prosecutorial capacity has meant that many regional countries have been engaged by the international community to conduct prosecutions. Kenya, Mauritius, and the Seychelles have all made agreements with multiple countries to accept arrested pirates for trial.⁸⁹

Over the past few years, approximately 1,089 pirate suspects have been arrested for piracy, and have either been tried or are awaiting trial in 20 countries, up from 10 countries in 2010⁹⁰. Despite the fact that an increasing number of countries are accepting suspected pirates for trial, the international community seems to be approaching a saturation of willpower and/or capacity to accept further pirates for trial. According to a report released in January 2011 by Jack Lang, the UN Secretary General's Special Advisor on Legal Issues Relating to Piracy off the Coast of Somalia, *"more than 90 per cent of pirates captured by States patrolling the seas will be released without being prosecuted."* He states that while around a third of pirates captured between 2008 and 2010 were prosecuted, that rate was lower than 10% at the beginning of 2011⁹¹. In response to this lack of capacity, Lang proposed the development of a specialized extraterritorial Somali court system to be based in Arusha, Tanzania. The cost of this court was estimated to be \$2.73 million in 2011, and \$2.33 million for each following year. In addition, Lang estimated that the cost of assistance and funding for courts and facilities in Somaliland and Puntland from the UN Development Program (UNDP) and the UN Office on Drugs and Crime (UNODC) would be around \$24.4 million over three years⁹².

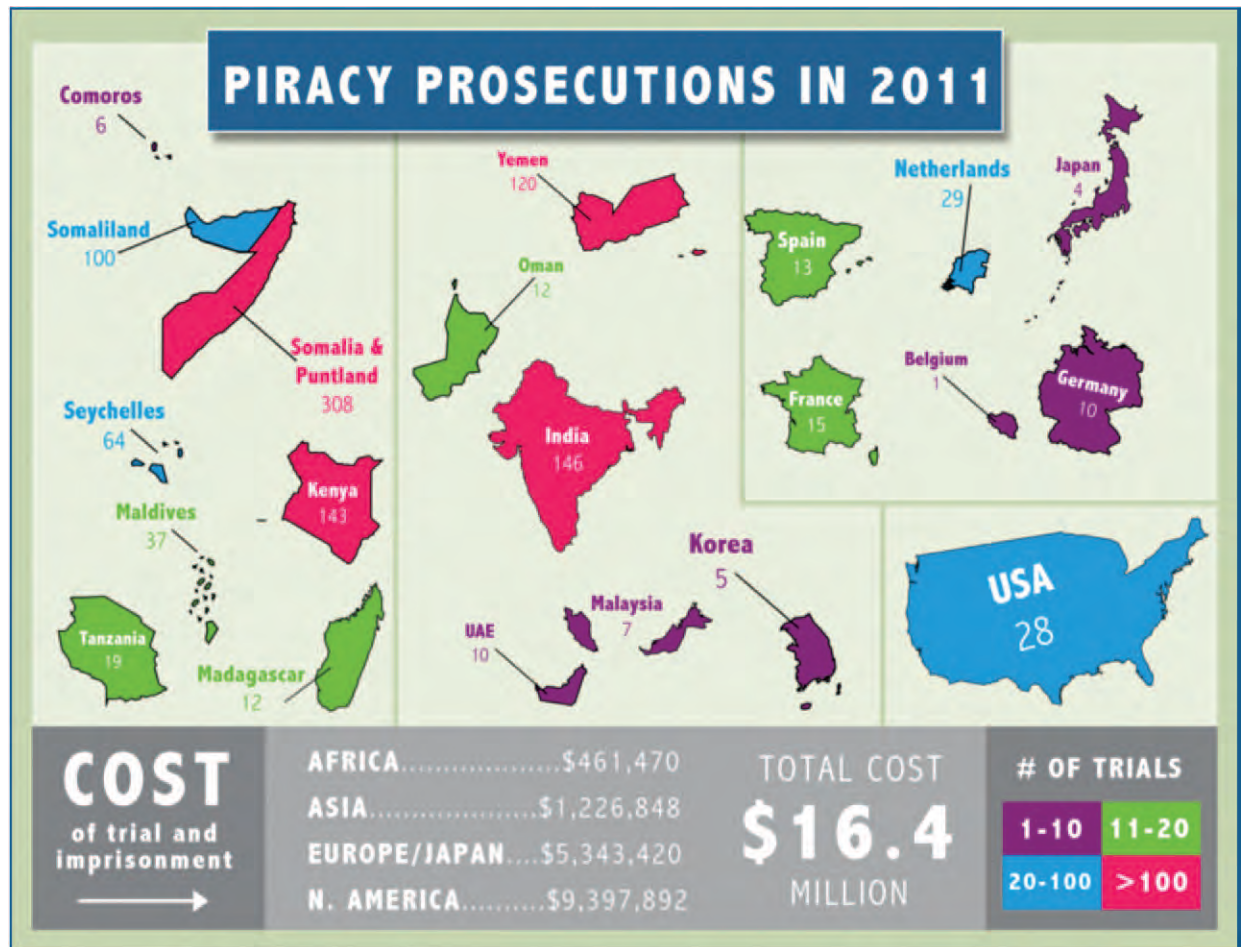
In addition in October 2011, the UN Security Council called on UN member states to criminalize piracy, and asked that all member states report to the Secretary General on the measures they have taken to criminalize piracy, by the end of the year⁹³.

The length of detention for convicted pirates ranges from anywhere between three years (in Oman) to 439 years (in Spain).⁹⁴ Some countries including Oman and the United States have sentenced pirates to life imprisonment.⁹⁵ This year, South Korea sentenced one convicted pirate to death, for the attempted murder of the *Samho Jewelry's* Captain, Seok Haekyun, whom the convicted pirate shot at pointblank range.⁹⁶

To estimate the cost of prosecutions in 2011, we calculate both the average cost of pirate trials which occurred in 2011, as well as the cost of imprisonment for suspected Somali pirates in the same year, for four regions: Africa, Asia, Europe and Japan, and North America. The countries are divided into these four groupings given their levels of economic development, and prosecutorial costs. Note that the cost

Table 4: Pirate Suspects & Trials⁸⁶

Country	Total Suspects	Trials in 2011	Region
Belgium	1	Unknown	Europe & Japan
Comoros	6	Unknown	Africa
France	15	6	Europe & Japan
Germany	10	10	Europe & Japan
India	146	146	Asia
Japan	4	Unknown	Europe & Japan
Kenya	143	6	Africa
Korea	5	5	Asia
Madagascar	12	Unknown	Africa
Malaysia	7	Unknown	Asia
Maldives	37	0	Africa
Netherlands	29	10	Europe & Japan
Oman	12	13	Africa
Seychelles	64	20	Africa
Somalia & Puntland	308	Unknown	Africa
Somaliland	100	6	Africa
Spain	13	2	Europe & Japan
Tanzania	19	6	Africa
UAE	10	Unknown	Africa
USA	28	20	North America
Yemen	120	Unknown	Africa
TOTAL	1,089	104	



of trials and imprisonment in Kenya and the Seychelles is not included, since much of these costs are covered by funding from UNODC Counter Piracy Programme, as well as other international funding mechanisms (covered in Section 8 on the Cost of Counter-Piracy Organizations). To our knowledge, no pirates have completed their detention periods. Therefore, 882 suspects are accounted for in the cost of imprisonment (i.e. 1,089 total suspects less 207 suspects held in Kenya and the Seychelles).

Table 5: Cost of Piracy Prosecutions

Region	Pirates Imprisoned	Average Imprisonment Cost (per year)	Total Imprisonment Costs per Year	Pirate Trials	Average Trial Cost (each)	Total Trial Cost	Total Regional Cost in 2011
Africa	624 ⁹⁵	\$730 ⁹⁶	\$455,520	25 ⁹⁷	\$238 ⁹⁸	\$5,950	\$461,470
Asia	158	\$338.15 ⁹⁹	\$53,427.70	151 ¹⁰⁰	\$7,771 ¹⁰¹	\$1,173,421	\$1,226,849
Europe & Japan	72	\$48,187 ¹⁰²	\$3,469,464	28 ¹⁰³	\$66,927 ¹⁰⁴	\$1,873,956	\$5,343,420
North America	28	\$28,284 ¹⁰⁵	\$791,952	28	\$307,355 ¹⁰⁶	\$8,605,940	\$9,397,892
TOTAL	882			232			\$16,429,631

From the above rough calculations, we estimate that the cost of piracy prosecutions and imprisonment in 2011 was around \$16.43 million.

8. The Cost of Military Operations

In 2011, over 30 countries contributed military forces to counter-piracy efforts in the Gulf of Aden and Indian Ocean. The cost of these military efforts must be accounted for in two forms. First is the administrative budgets of the ‘big three’ missions in the region: the European Union Naval Force

(EUNAVFOR) Operation Atalanta, NATO's Operation Ocean Shield, and Combined Task Force (CTF) 151. Second, the costs of military assets and vessels are borne by each contributing state under the principal that costs 'lie where they fall'. Nations contribute to one of the major missions through:

- Navy vessels (surface combat vessels and auxiliary ships).
- Maritime patrol/reconnaissance aircraft.
- Vessel Protection Detachment teams.
- Military staff assigned to Operational Headquarters or onboard units.¹⁰⁹

According to the former Operation Commander of EUNAVFOR, Major General Buster Howes, there are anywhere between 10 and 16 vessels deployed on any given day in the Gulf of Aden and Indian Ocean.¹¹⁰ In October 2011, a spokesman from NATO said that there were a total of 18 vessels on duty from NATO, EUNAVFOR and CTF 151.¹¹¹

Military efforts have ultimately been successful at disrupting piracy attacks in the Gulf of Aden. However, with the region affected by piracy expanding, military efforts face an exceptionally difficult challenge of patrolling over four million square kilometers, an area which is roughly equivalent to one and a half times the size of mainland Europe, or ten times the size of Germany.¹¹²

According to naval authorities, counter-piracy military efforts will likely decline over the next year. EUNAVFOR's Chief of Staff, Captain Keith Blount has stated that EUNAVFOR will provide no more than eight vessels in 2012, and NATO between three and four. He also noted the budgetary pressures on many nations to reduce their defense expenditure.¹¹³ Furthermore, Commander Stein Hagalid, Branch Head of the NATO Shipping Centre in Northwood, London, stated that both the EU and NATO military efforts were due to expire in December 2012, although it is expected that their mandate will be extended.¹¹⁴




Given the budgetary, resource and capacity constraints of the existing military efforts in the region, we may see an increasing number of vessels contributed by independent deployers, such as China and India, over the next couple of years. Alternatively, the world's largest shipping associations, (the International Chamber of Shipping, BIMCO, Intercargo, and Intertanko) also urged the UN to consider creating a force of armed guards to be deployed on merchant ships to protect them against piracy attacks.¹¹⁵



Figure 6: EUNAVFOR Counter-Piracy Forces. Source: EUNAVFOR

Calculating the economic cost of military deployments in the region is difficult. Indeed, calculating the cost of any military mission is a contentious issue, and there is an ongoing debate about whether costs should include total costs of deployment, or just incremental costs. By incremental costs we refer to the specific, additional costs that accrue from counter-piracy activities, over normal military activities. Since military personnel, vessels, and equipment are generally already accounted for under national budgets, and presumably would be stationed 'somewhere', the argument for assessing costs incrementally is that only additional costs should be accounted for. Additional costs include factors such as vessels' fuel consumption, specific training operations, personnel rotation, basing costs, and specific equipment.

Table 6: Counter-Piracy Military Missions and Administrative Budgets

Mission	Description	Costs and Contributing Nations
 <p>European Union Operation Atalanta¹¹⁴</p>	<p>EUNAVFOR's Operation Atalanta was launched in November 2008 under UN Security Council mandate. The mission is tasked with:</p> <ul style="list-style-type: none"> ▪ Deterrence, prevention, and repression of piracy and armed robbery off the Somali coast. ▪ Protection of World Food Programme (WFP) vessels delivering food aid to Somalia. ▪ Protection of African Union Mission on Somalia (AMISOM) shipping. ▪ Protection of vulnerable shipping off the Somali coast on a case by case basis. ▪ Monitoring of fishing activities off the coast of Somalia. <p>The military deployments of EUNAVFOR are typically composed of 5-10 frigates or destroyers, one auxiliary, and three maritime patrol or reconnaissance aircrafts.</p>	<p>Administrative Costs 2011¹¹⁵: \$10.9 million¹¹⁶ Contributing nations include (not limited to):</p> <ul style="list-style-type: none"> ▪ Belgium ▪ Estonia ▪ France ▪ Germany ▪ Greece ▪ Italy ▪ Luxembourg ▪ The Netherlands ▪ Norway ▪ Portugal ▪ Spain ▪ Sweden ▪ United Kingdom
 <p>NATO Operation Ocean Shield</p>	<p>NATO's Operation Ocean Shield was launched in August 2009. The mission focuses on counter-piracy operations and capacity building in regional states. The initiative was originally established to protect WFP ships delivering humanitarian aid to Somalia.</p>	<p>Administrative Costs, 2011: ~\$5.5 million¹¹⁷ Contributing nations include (not limited to):</p> <ul style="list-style-type: none"> ▪ Denmark ▪ Norway ▪ Turkey ▪ United States
 <p>Combined Task Force</p>	<p>CTF 151 is tasked with supporting Maritime Security Operations in the Gulf of Aden, and off the coast of Somalia. It was established to deter and disrupt piracy and armed robbery at sea. It is headquartered in Bahrain.¹¹⁸</p>	<p>Administrative Costs, 2011: ~\$5.5 million Contributing nations include (not limited to):</p> <ul style="list-style-type: none"> ▪ Australia ▪ Bahrain ▪ New Zealand

In 2011, we attempted to estimate these additional, incremental costs of military deployments. In order to do so, we looked at fuel costs and estimated additional operational costs of contributing vessels. We attempted to track the different military vessels that were tasked with counter-piracy missions over the course of 2011 (according to available information). It is likely that additional vessels were deployed, that we were not able to account for in this analysis.

We were not able to calculate the incremental cost of each specific contributing vessel because we lacked precise information about the vessels deployed, or the deployment period. On average, vessels may be deployed for anywhere between two and six months per year. Many vessels may also be tasked with multiple missions, or may be temporarily redirected for other initiatives. This was especially the case in 2011, when we witnessed vessels redeployed for military missions related to the 'Arab Spring' and NATO operations off Libya. We were also unable to calculate basing costs for military missions in surrounding countries.

Our estimate of the cost of military operations is based on an approximation of the number of vessels deployed on a daily basis. Using the figures above on the average number of vessels deployed for the three major operations, as well as independent deployers, we estimate that on any given day, the vessels deployed might be double the typical composition of the EUNAVFOR forces (that is between five and ten frigates or destroyers, one auxiliary, and three maritime patrol or reconnaissance aircrafts). We then calculate the fuel and other operational costs for those vessels are shown below. (Further details on the data and methodology are included in Appendix 4.)

Table 7: Cost of Counter-Piracy Military Vessels

Vessel Type	Average Number Deployed	Average Pre-Tax Fuel Price (per gallon)	Adjusted* Daily Fuel Consumption (gallons/day)	Daily Operating Cost	Total Annual Cost
Frigate ¹²¹	5-10 (8)	\$3.61	18,034	\$52,147	\$342,366,159
Destroyer ¹²²	5-10 (7)	\$3.61	40,909	\$56,145	\$520,775,590
Auxiliary ¹²³	2	\$3.61	10,300	\$21,032	\$42,498,360
Maritime Patrol/ Reconnaissance Aircraft ¹²⁴	6	\$3.61	6,335	\$1,912	\$54,269,663
TOTAL	23		75,578	\$131,236	\$959,909,773

In 2011, we also estimated the cost of unmanned aerial vehicles (UAVs) working on counter-piracy efforts in the Indian Ocean. There are two main types of UAVs: drones and remotely piloted vehicles. To our knowledge, the major suppliers of UAVs for counter-piracy missions are the US, India and Spain. Since India's UAVs are deployed for various national security activities in the region, we estimated that only a third of those UAVs were used towards counter-piracy activities. Again, we only included the operational cost of UAVs in our total cost calculations (and not the unit cost). Appendix 4 provides further detail on the methodology and assumptions.

By adding up the cost of military expenditure on vessels, UAVs, and administrative costs, we estimate

Table 8: Cost of UAVs Deployed in Counter-Piracy Activities

Country	Model	# of Units	Unit Cost	Hourly Cost	Missions per Day	Mission Duration	Total Operational Cost	Other Costs	Counter-Piracy Initiatives
USA	Reaper	4 ¹²⁴	\$53,500,000 ¹²⁵	\$3,234 ¹²⁶	2	24 ¹²⁷	\$56,659,680	\$9,300,000	100%
India	Searcher II	100	\$7,500,000	\$1,351	50	14	\$345,180,500	\$0	33%
India	Heron	50	\$10,000,000	\$1,351	25	24	\$295,869,000	\$0	33%
Spain	Scan Eagle	4	\$2,679,600	\$675.5	2	24	\$11,834,760	\$0	100%
Total Operational Costs									\$291,456,238

that the total cost of counter-piracy military efforts off the Horn of Africa, and in the Indian Ocean were at least \$1.27 billion in 2011.

Total Cost of Counter-Piracy Military Efforts	
Total Cost of Administrative Budgets	\$21,900,000
Total Cost of Military Vessels	\$959,909,772.82
Total Cost of UAVs	\$291,456,238
TOTAL	\$1,273,266,011

9. The Cost of Counter-Piracy Organizations

- Total cost of Counter-Piracy Organizations: \$21.3 million

In 2011, we saw a number of new civil society and multilateral initiatives working towards mitigating Somali piracy and its impact. The major organizations are detailed below:

a) Trust Fund to Support Initiatives of States to Counter Piracy off the Coast of Somalia ('Trust Fund')

The Trust Fund was launched by United Nations Secretary General Ban Ki Moon, on January 27, 2010, by a mandate of the 46 member states making up the CGPCS. The objective of the Trust Fund is to: "help defray the expenses associated with prosecution of suspected pirates, as well as other activities related to implementing the Contact Group's objectives regarding combating piracy in all its aspects."¹³⁸ Since its inception, the

Total Financial Contributions to the Trust Fund, 2011: \$4.7 million	
European Union ¹³⁰	\$1.48 million ¹³¹
United Arab Emirates ¹³²	\$1 million
Norway	\$750,000 ¹³³
France	\$500,000 ¹³⁴
Netherlands	\$400,000 ¹³⁵
Belgium	\$150,000 ¹³⁶
Abu Dhabi Ports Company	\$200,000
DP World	\$100,000
E Marine Co.	\$100,000
Philippines	\$25,000 ¹³⁷

Trust Fund has supported 15 projects with a total value of around \$7 million.¹³⁹

In 2010, total donations to the Trust Fund were around \$6.9 million, and total spending on projects was \$4.2 million.¹⁴⁰ By early 2011, the Trust Fund was in dire need of further financing, and was reported to have only \$100,000 remaining in its budget. According to the Trust Fund Manager, Tuesday Reitano, the Trust Fund requires an annual stream of \$20 million to remain financially sustainable.¹⁴¹ Under Resolution 1976 (April 2011), the UN Security Council urged financial support for the Trust Fund for recommended judicial and detention-related projects.¹⁴² Funding was later provided by donors such as the United Kingdom, the European Union and the United Arab Emirates.

b) The United Nations Office of Drugs and Crime (UNODC)

The Trust Fund works closely with the UNODC Counter Piracy Programme (CPP). The CPP was launched in 2009, with an original mandate of assisting Kenya in managing increasing piracy attacks in the region, and specifically to prosecute Somali pirates according to international standards, rule of law, and human rights.¹⁴⁵ That mandate has since expanded, and UNODC is assisting six countries in the region including Somalia, the semi-autonomous region of Puntland, Mauritius, Tanzania, and the Seychelles.¹⁴⁶

Total Financial Contributions to UNODC, 2011: \$16.6 million	
United Kingdom ¹⁴³	\$11.9 million ¹⁴⁴

The UNODC’s CPP focuses on three key areas:

- Prisons and staff, including refurbishing six prisons in the region to ensure that basic health and welfare is provided to prisoners in line with international human rights standards; and training over 600 prison staff to ensure best practices. UNODC funds were used to develop the Hargeisa prison in Somaliland at a cost of \$1.5 million¹⁴⁷ and to fund the construction of a courtroom and equipment for the Bossasso prison in Puntland.
- Support to the police, including developing the capacity of the police forces to effectively gather evidence and prepare case work on piracy-related cases.
- Support to prosecutions by training Kenyan officials on prisoner transfer agreements or post-trial transfer agreements, the law of the sea, and advocacy and evidential issues.¹⁴⁸

c) The Contact Group on Piracy Off the Coast of Somalia (CGPCS)

The CGPCS was established under UN Security Council Resolution 1851 in January 2009 to “facilitate the discussion and coordination of actions among states and organizations to suppress piracy off the coast of Somalia.” As of October 2011, the CCPCS had over 66 participants, including member states and international, regional, and nongovernmental organizations.¹⁴⁹

The CGPCS now has five Working Groups dedicated to specific issues of piracy deterrence:¹⁵⁰

Total Cost of Contact Group Meetings, 2011: ~\$1.218 million ¹⁵¹	
In total at least 14 working group meetings ¹⁵² , plus three CGPCS plenary meetings were held in 2011 - a total of 17 meetings.	

- **Working Group 1:** WG1 is chaired by the United Kingdom, and works on coordinating naval operations in the region, as well as developing the prosecutorial and judicial capacity of regional states. WG1 meets three times per year at the IMO headquarters in London.
- **Working Group 2:** WG2 is chaired by Denmark and focuses on legal and judicial issues related to counter-piracy issues. WG2 meets four times per year in Copenhagen.
- **Working Group 3:** WG3 is chaired by the USA and is dedicated to working on best practices and self-defense against piracy. The group meets twice per year in Washington DC and London.
- **Working Group 4:** WG4 is chaired by Egypt and works on information, messaging, and media efforts

associated with aspects of piracy. The group met twice in 2011.

- **Working Group 5:** WG5 was established as an additional working group in July 2011. It is dedicated to tracking and disrupting illicit financial flows associated with the financing of piracy. It is chaired by Italy, and preparatory meetings for the group were held in the U.S., Korea and Italy, in 2011.

While many of the initiatives identified by the CGPCS are implemented and funded by the Trust Fund, there is a substantial cost associated with hosting and attending these meetings. At the very least, participating nations and organizations must pay for their travel and accommodation to plenaries and individual working group meetings. This does not include the opportunity cost of having staff dedicating time towards counter-piracy initiatives that might be dedicated elsewhere.

d) The Djibouti Code of Conduct

The Djibouti Code of Conduct was launched in 2009. It is led by a Project Implementation Unit from the IMO. The Djibouti Code focuses on developing regional cooperation and coordination to deter piracy in the Western Indian Ocean, Gulf of Aden and Red Sea. The Code has four key ‘pillars’ of work: training, capacity building, rule of law, and information sharing.

Total Financial Contributions to the Djibouti Code, 2011: \$1.25 million	
▪ Japan ¹⁵¹	\$1 million
▪ Saudi Arabia ¹⁵²	\$100,000
▪ Marshall Islands	\$100,000
▪ Netherlands ¹⁵³	\$50,000

The Djibouti Code now has 18 national signatories, including: Comoros, Djibouti, Egypt, Eritrea, Ethiopia, Jordan, Kenya, Madagascar, Maldives, Mauritius, Oman, Saudi Arabia, Seychelles, Somalia, Sudan, United Arab Emirates, United Republic of Tanzania, and Yemen. Djibouti Code signatories work towards ensuring their national legislation includes laws that criminalize piracy and armed robbery against ships, and provide for the effective exercise of jurisdiction, investigations, and prosecution of pirate suspects.¹⁵⁷

In 2010, the Djibouti Code received \$13.8 million in funding (primarily from Japan), which was expected to provide financing until 2013. In 2011, the Djibouti Code received additional funding from the IMO, and bilateral donations.

e) The United Nations Development Programme - Somalia¹⁵⁸

In addition to funds provided by the Trust Fund (accounted for in the section on the Trust Fund above), the U.K donated \$321,000 (£200,000) to UNDP-Somalia to conduct a maritime security needs assessment in Puntland and Galmudug.

Total Financial Contributions to UNDP Somalia (piracy related) 2011: \$321,000
In addition to funds provided by the Trust Fund (accounted for in the section on the Trust Fund above), the U.K donated \$321,000 (£200,000) ⁱ to UNDP-Somalia to conduct a maritime security needs assessment in Puntland and Galmudug. ⁱⁱ

One of UNDP Somalia’s programs works to strengthen national and local abilities to prevent, reduce, and manage the impact of violence, and to develop improved security and protection under the rule of law. In 2010, it also contributed to training and equipping police in Somaliland. According to the UN Secretary General’s Special Advisor on Legal Issues, Jack Lang, the cost of UNDP’s assistance towards prosecutorial capacity in Somaliland and Puntland, including developments in the judiciary and police, the High Judicial Council, Defense Counsel, and basic infrastructure for the courts, at \$2.7 million in 2011. The UNDP received \$908,567 from the Contact Group Trust Fund for these efforts. It is not clear whether the remaining amount was received.¹⁶¹

f) UN Political Office for Somalia (UNPOS)

The Contact Group Trust Fund gave \$237,300¹⁶² to a UNPOS media plan to reopen the Somalia National News Agency, establish a Ministry Training Centre to improve the capacity of staff working with the Ministry of Information, and pay for air time on Radio Mogadishu. These efforts were aimed at increasing

awareness amongst the general Somali population of the negative effects and long term implications of piracy, preventing youth from participating in piracy acts, and challenging the belief that pirates are to be esteemed because they ‘protect’ the Somali coastline. UNSCR 1976, requests the Secretary General to strengthen UNPOS as the UN’s focal point for counter-piracy.¹⁶³

UNPOS additionally hosts the ‘Kampala Process’ which is designed to promote internal coordination, information generation and sharing, and coordinate counter-piracy efforts, among the regional authorities in Somalia.

g) Save Our Seafarers (SoS)¹⁶⁸

SoS was established in March 2011, with a mission of advocating for greater awareness of the human and economic cost of piracy. According to an Intertanko presentation on SoS, the total income of SoS in 2011 was £116,250 (\$187,057) in 2011. This funding was received from 16 contributing organizations.¹⁶⁶

h) Maritime Piracy Humanitarian Response Programme (MPHRP)¹⁶⁷

MPHRP was established in September 2011. The mission of the MPHRP is to: *“implement a model for assisting seafarers and their families with the humanitarian aspects of a traumatic incident caused by piracy attack, armed robbery or being taken hostage.”*¹⁶⁹ MPHRP is funded by the ITF Seafarers Initiative and the TK Foundation.

Total Financial Contributions to Maritime Piracy Humanitarian Response Programme: \$188,325	
▪ ITF	\$113,325 ¹⁶⁶
▪ TK Foundation	\$75,000

i) Seaman’s Church Institute, Piracy Study

The Seamen’s Church Institute is working on a multi-year clinical assessment of the treatment of crew members who have survived piracy attacks. The study is being conducted in conjunction with the Disaster Psychiatry Outreach at the Mount Sinai School of Medicine, and the New York Psychoanalytic Society and Institute.¹⁷⁰ According to the Seamen Church Institute’s report on the project, *Post Piracy Trauma Assessment and Treatment*, the project is estimated to cost \$100,000 per year for five years.¹⁷¹

Seaman’s Church, Annual Budget: \$100,000
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j) PiraT Project

The PiraT project is a piracy research initiative conducted in conjunction with various partners in Germany and the European Union. The main goal of this analysis is to develop German *“inter-agency governmental options for action that will enable the implementation of non-military measures to strengthen maritime trade security.”* The German Federal Ministry of Research and Education has granted just under one million Euros for the project for a total of 33 months, ending in December 2012.

PiraT Project, Annual Budget: \$460,400¹⁷¹
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k) Oceans Beyond Piracy (OBP)

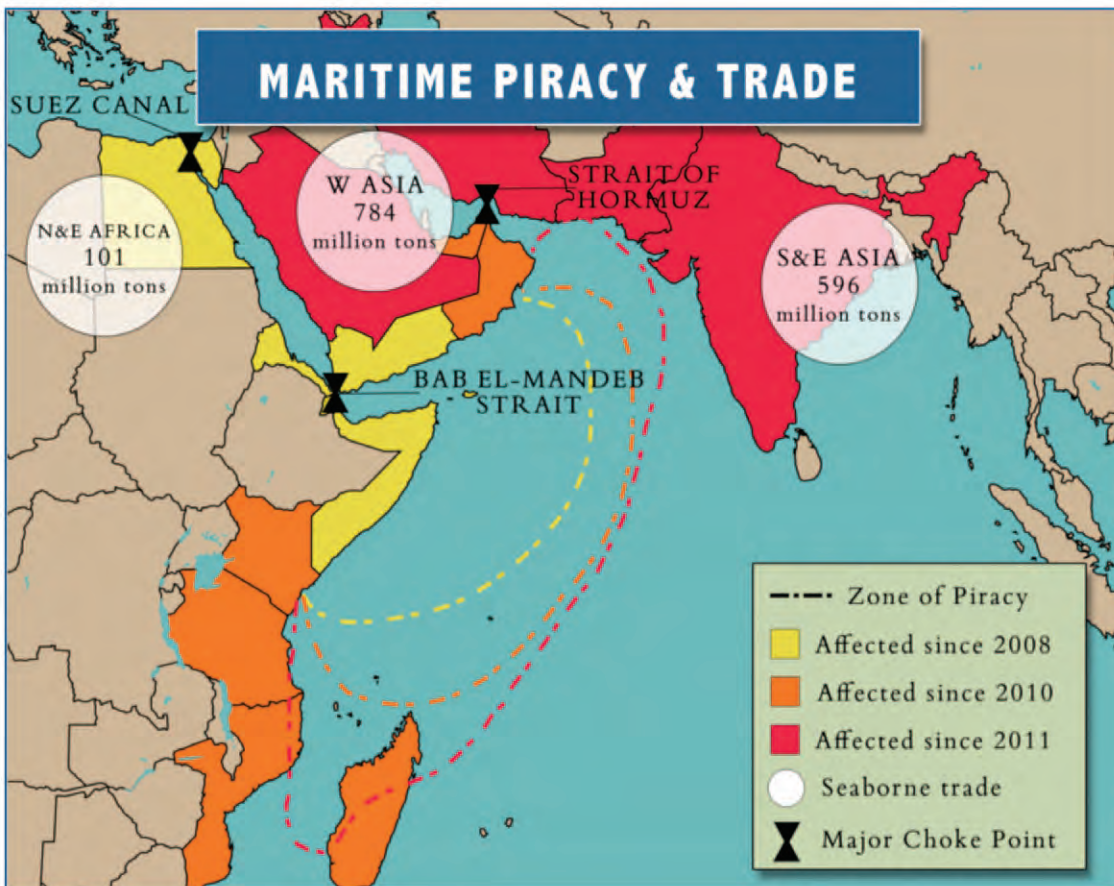
OBP was launched by One Earth Future Foundation in 2010. OBP *“seeks to develop a global response to maritime piracy that deals comprehensively with deterrence, suppression, and prosecution of piracy while building the foundation for a longer-term solution”*. A key component of the project is establishing public-private partnerships by engaging and mobilizing a wide range of maritime community stakeholders including ship owners, seafarers, governments, international organizations, and the insurance industry. OBP’s budget expenditure was \$889,000 in 2011, which included \$25,000 towards supporting an IMB initiative to develop reporting on the violence experienced by seafarers during piracy attacks. The Arsenault Family Foundation (AFF, a grant making foundation whose founder also established OEF), made two grants in 2011, one to Radio Daljiir, Somalia (\$35,000) and one to a UNODC Messaging Campaign (\$100,000).

Oceans Beyond Piracy and AFF 2011 Budget and Contributions: \$1.02 million

The Economic Impact on Regional Nations

In addition to the ‘direct costs’ of Somali piracy on industry, government, and civil society stakeholders, piracy also severely impacts regional countries as it disrupts trade patterns, regional security and stability, and demand for leisure activities like tourism. Accurately assessing the macroeconomic impact of piracy on countries in Eastern Africa and the Indian Ocean is a difficult task for a number of reasons including a lack of robust or transparent data, challenges in disaggregating the economic impact of regional instability from piracy, and the current pervasive impacts of global economic decline. In conducting analyses on the regional impact of piracy, we utilized averages, proxies and hypotheses to increase the accuracy of our estimates as much as possible. However, in many cases the data was simply not robust enough to make strong quantitative assertions. In these cases we drew on anecdotal trends and other sources of information to discuss some of the potential economic impacts of piracy on countries in the region. Because these regional indirect costs were speculative, we have not included them in our total cost calculations.

The image below shows the expansion of regional countries and trade routes affected by piracy between 2008 and 2011. For 2011, we focus our attention on the regional impact on two countries: Kenya (as the most persistently impacted regional country) and India (as one of the emerging countries of concern in 2011).



10. A Regional Case Study: The Impact on Kenya

Sharing its northeastern border with Somalia, Kenya perhaps suffers the greatest regional economic impact of Somali piracy. In 2011, piracy negatively impacted maritime trade, tourism, and stability in Kenya, as discussed below.

a) Impact on Kenyan Trade

Piracy attacks off the coast of Somalia may negatively impact Kenya's maritime trade through increased insurance premiums charged to ships transiting the region, a reduction of ship traffic as vessels re-route to avoid the HRA, and increased delays in the delivery of goods. These costs lead to economic 'inefficiencies' in trade, resulting in a financial impact that may be passed down supply chains to end consumers.

Due to data limitations, as well as recent market fluctuations, it is difficult to quantify the precise impact on Kenya's trade. However, we are able to assess those industries that are most threatened in Kenya. Kenya's major export items are tea, coffee, and other agricultural goods. Agricultural goods which are exported by sea from Kenya include mangoes, avocados, and canned beans. The value of these exports is estimated to be around \$120 million per year. The economic impact of piracy on this export trade is felt in a number of ways, one of which is increased transport time. Dr. Stephen Mbithi, Chief Executive of the Fresh Produce Exporters Association of Kenya (FPEAK), indicated in an interview with OBP that it now takes on average, seven more days to transport goods to Europe from Kenya, which translates into increased transportation costs. He added, "We cannot put a number to say precisely by how much, but it [piracy] has certainly reduced the profit margin."¹⁷⁵

b) Impact on Kenya's Tourism Industry

In September 2011, Somali gunmen entered the Kenyan resort Kiwayu Safari Village, and killed British tourist David Tebbutt, and kidnapped his wife, Judith Tebbutt, who is believed to still be held hostage in Somalia (as of January 2012).

In the following month, Marie Dedieu was dragged from her home in the Lamu archipelago in Kenya. Tragically, Ms. Dedieu died less than three weeks later in Somalia after being taken hostage. It is understood that Ms. Dedieu was not permitted access to life-saving medication, upon which she was dependent. Following the abductions, the Australian, Canadian, French, New Zealand UK, and US governments all issued travel advisories to tourists to avoid the Lamu archipelago.

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Kenya's tourism industry is a major source of revenue for the country, accounting for approximately 12% of GDP, or \$3.85 billion annually. In 2010, over one million international tourists traveled to Kenya, with the largest proportion visiting from the UK (16%) and the US (10%).¹⁷⁹ As with many

issues assessed in this report, it is especially difficult to quantitatively assess the recent economic impact of piracy on tourism, given that we can expect that the tourism industry would have been depressed in any case, due to global economic downturn.

Nonetheless, perceived instability and risk associated with piracy off the coasts of Somalia and Kenya likely reduces the number of tourists opting to travel to Kenya, and especially those traveling by cruise ship or to beach resorts. Furthermore, in 2011 the alarming trend of Somali militants traveling by sea and kidnapping western tourists from Kenyan beach resorts is likely to have an even greater impact on the tourism industry. Although these instances would not be strictly classified as 'piracy' (under the definition of acts committed against vessels on the high sea), it is widely believed that this development has emerged as an off-shoot of Somali piracy. Tellingly, the kidnappings occurred during the monsoon season, which normally limits the pirates' activity, so it is possible that pirate clans pursued a 'softer' target on land during that time. The kidnapers have also exhibited similar behavior to pirates, by holding them captive for ransom.

This study has utilized analyses on the economic impact of crime and violence in other countries such as the U.S. and Caribbean nations, to understand the potential impact of piracy on Kenya's tourism industry. Since the above kidnaping incidents mirror crime and violence on land, using past studies on the impact of crime and violence on tourism industry seems apt. A detailed description of assumptions, methodology, and data are provided in Appendix 5. In summary, the potential impacts on the tourism industry in Kenya during 2011 were:¹⁸⁰

- Between \$129 and \$795 million lost in tourism revenue, and 3% and 20% of tourism jobs lost.
- Increased cost of security for businesses (short-term impact).
- Decreased spending on business development (long-term impact).
- Even if only 10% of businesses are direct victims of crime, as much as 57% of businesses could face a decline in financing.

c) The Humanitarian Impact of Piracy

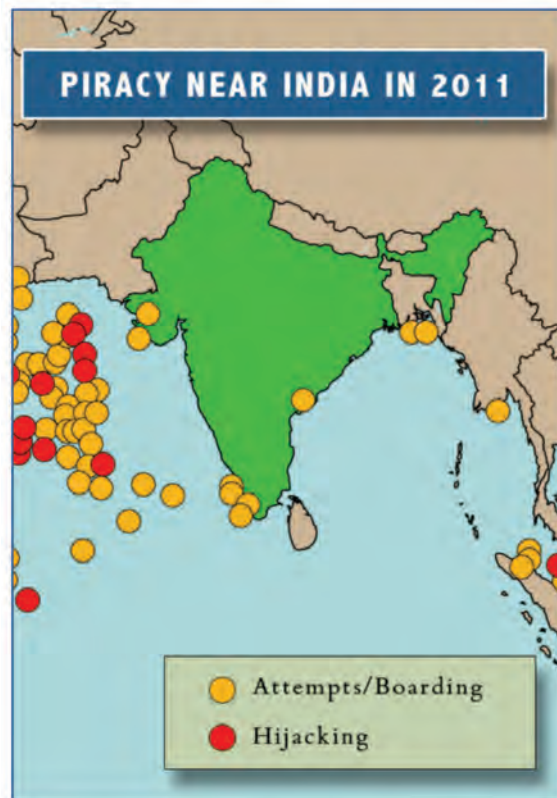
One of the primary reasons naval operations were initiated off the coast of Somalia was to ensure the safe passage of World Food Program vessels delivering humanitarian aid to the Horn of Africa.¹⁸¹ Four years later, in the midst of the worst famine to plague Somalis in a generation, the need for food aid is direr than ever. Since Somalia is often considered too precarious for western aid organizations to open offices in, many aid organizations run Somali-related operations from Nairobi and elsewhere in Kenya.¹⁸² Kenya also hosts one of the largest refugee camps in the world - the Dadaab camp. Dadaab is located approximately 100 kilometers from the Kenya/Somalia border, and houses 440,000 refugees.¹⁸³ As a result of both severe drought and increased targeted conflict, about 1,300 Somali refugees arrived each day at the Dadaab refugee camp during the summer months of 2011.

Sadly, a spate of kidnappings of humanitarian aid workers by Somali militants along the Kenya-Somalia border forced one of the largest international NGOs operating in Kenya, Mediciens Sans Frontiers, to reluctantly withdraw personnel from areas most in need, putting their work on hold during one of the most severe humanitarian crises in the recent history of the volatile Horn of Africa. The potential implications of a vast aid organization evacuation are far-reaching. Removing aid workers from the region, during the worst drought to hit Somalia and the Horn of Africa in sixty years, and a subsequent cholera outbreak in the Dadaab refugee camp where nearly half a million people are currently seeking assistance, risks a significant humanitarian disaster.

Aside from the large humanitarian effect of a possible scaling back of aid organizations in Kenya, a secondary effect of an exodus of NGOs from Kenya is a reduction of foreign currency into Kenya. The US Department of State estimates that roughly 15,000 Americans have registered with the US Embassy as residents of Kenya, approximately 70% of which participate in charity work of some sort. Each foreign staff member represents a new source of foreign revenue to the Kenyan economy given that each employee must pay for accommodation, food and clothing, transportation, and leisure activities. For instance, UN employees receive an average housing stipend of \$1,888. The annual housing stipend for UN employees in Nairobi, Kenya alone totals \$226,501,200. Considering the large percentage of foreign nationals employed by the UN and other western aid organizations, the Kenyan economy could certainly take a noticeable hit from their removal.

11. A Regional Case Study: The Impact on India

As piracy attacks have spread further east into the Indian Ocean in recent years, a number of Indian industries and other stakeholders are increasingly impacted by the crime. India is a crucial economic leader in the region. It is the thirteenth largest importer in the world with approximately 90% of its total trade by volume, and 70% by value, transported by sea. Trade accounts for around 51% of its GDP, of which approximately 52% is handled by major ports on the western coast. Furthermore, an estimated \$110 billion worth in Indian trade transits through the Gulf of Aden each year, and India imports 75% of its oil supply from the Middle East.



d) Impact on Indian Trade

Indian trade is impacted by piracy in multiple ways. Indian imports and exports incur additional costs from increased war risk insurance and longer transit times. Potentially, the long-term impact on India could also involve changes in trading partners - a pattern we are already beginning to witness.

In 2010, India's total exports and imports were valued at \$220 billion and \$269 billion, respectively.¹⁹² If 70% of that trade is seaborne, and 52% of seaborne trade transits via India's west coast, then approximately \$178 billion in Indian trade transits through the Indian Ocean.¹⁹³

Based on these calculations as well as information on India's major trading partners and commodities; the seaborne trade, major commodities and major stakeholders at risk in India are as follows:

- \$178 billion worth of seaborne trade transiting through the Indian Ocean
- Major commodities at risk: petroleum and petroleum products; precious stones (such as gold, gems, and jewelry); machinery and instruments; coal, and briquettes¹⁹⁶

■ Major trading stakeholders: UAE, USA, Saudi Arabia, and the Netherlands

Any impact on India’s international trade will also bear a secondary macroeconomic impact on the price of goods. For example, there is evidence that coal imports into India from South Africa have incurred increased costs due to longer transit times and higher insurance premiums in the region.¹⁹⁷ India imports 30% (18.3 million tons) of its coal from South Africa, the value of which was around \$1.75 billion in 2010¹⁹⁸ The increasing risk of piracy in the transit zone between India and South Africa, as well as the associated increase in import costs has meant that many Indian coal importers have canceled their imports from South Africa. For instance, the Indian Adani Trading Company, which imports about 70% of India’s coal imports, cancelled 600,000 tons of South African coal imports.¹⁹⁹ The Chief Executive of the company stated, *“Of course we are concerned about Somali pirates. It’s a potential loss of \$130 a tonne.”* Given that India’s coal imports are expected to increase by 70% between 2011 and 2012, this potential loss may have a significant economic impact.²⁰⁰

Further, since coal is used in the production of steel, we might also expect to see a knock-on effect on the price of steel. However, given the volatility of commodity prices in general, especially in recent years, it is difficult to assess the precise economic impact on specific commodities. That is, while it is usually possible to compare the price of steel (and other commodities) in 2011 with prices in previous years to analyze potential economic impacts related to piracy, the rise in the value of commodities in early 2011 associated with economic recovery makes isolating any effect of piracy difficult.²⁰¹ Nonetheless, some rough estimations of the

Table 9: India’s Major Trading Partners¹⁹²

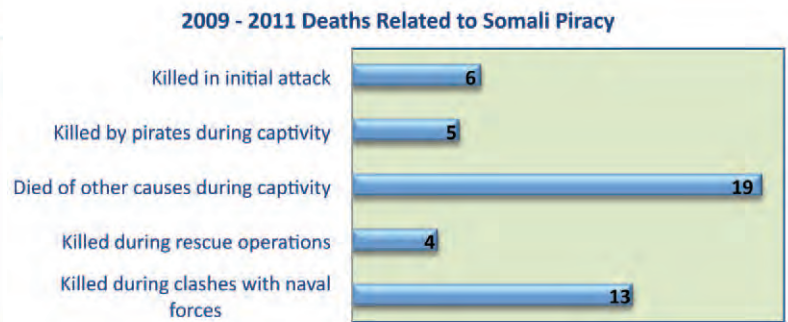
Major Export Partners	Export (Seaborne) Value ¹⁹³	Major Import Partners	Import (Seaborne) Value
UAE	\$19.2 billion	UAE	\$16.5 billion
USA	\$8.6 billion	Saudi Arabia	\$10.6 billion
Netherlands	\$2.4 billion	USA	\$5.6 billion
Total	\$30.17 billion	Total	\$32.74 billion
Total Seaborne Import & Exports, with Major Trading Partners			\$62.9 billion

economic impact on the steel industry can be made. Since the added cost to South Africa is estimated to be around \$2 per ton, the extra cost could be as high as \$36.6 million. Under a ‘worst case scenario’, a larger cost could arise if the entire trade of coal from South Africa to India were to cease. The estimated cost in such a case is estimated to be approximately \$1 billion. This scenario is not impossible, with some major Indian importers of South African coal already stating, *“we’ve not done any fresh South African deals for one to two months, and I don’t think other people have either.”*²⁰²

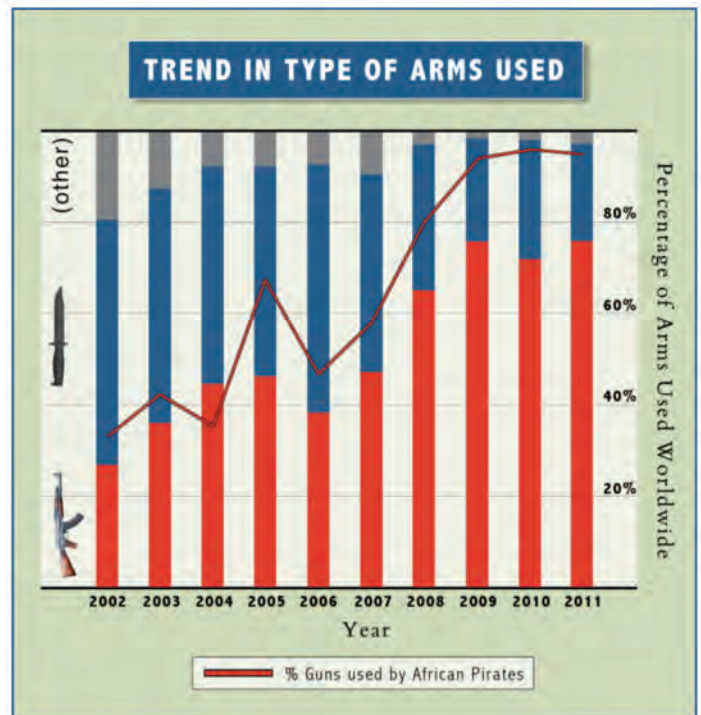
Emerging Trends

12. Increasing Seafarer Deaths

While multi-billion dollar investments into ship hardening, armed security, and naval forces have helped mitigate the number of successful hijackings, tragically the number of seafarers killed as a result of piracy, continues to grow. The number of seafarer deaths has tripled from 8 in 2009 to 24 in 2011.²⁰³ In February 2011, the public eye turned to the tragic deaths of four sailors aboard the private yacht *Quest*, who were killed by pirates when U.S. naval forces approached. This increasing rate of fatality is a concerning development, which suggests that pirates may be growing more desperate and willing to use force against hostages in order to hijack vessels or force the payment of ransoms.



Seafarers face severe physical and psychological trauma both during an initial attack, and throughout the length of their captivity. In fact, the greatest number of deaths occurred while seafarers were held hostage, as a result of malnutrition or disease, and even suicide. This is of serious concern, given that the duration of hostage situations continues to grow, and seafarers now face an average of more than six months in captivity. Many vessels are held for longer periods. At the end of 2011, three vessels hijacked in 2010 carrying 64²⁰⁴ seafarers have been held captive for over a year: the *Iceberg I* (642 days as of December 31, 2011), the *Albedo* (400 days), and the *Orna* (376 days).



It is crucial to recognize that piracy continues to impose a severe cost on its victims, namely the innocent people attacked and held hostage. This cost, though impossible to quantify, far exceeds the financial expenditures outlined throughout this report. While \$7 billion may be spent each

year, this has not eliminated the risk of physical harm and deaths caused by piracy. Further, hundreds of desperate Somali pirates are believed to die every year as a result of pirate activity.

13. Increasing Risk of Piracy in West Africa

Piracy off the west coast of Africa became an increasing concern over the course of 2011. According to the IMB Annual Report, a total of eight hijackings, ten vessel boardings, and two other piracy attacks were reported near Benin in 2011, compared with no incidents in 2010. In addition, two vessels were successfully hijacked directly off Nigeria in 2011, and there were at least three attempted attacks and five boardings. In 2010, 14 vessels were boarded and six more attempted off the coast of Nigeria.²⁰⁵ In August 2011, the region was listed as a war risk zone for shipping by Lloyd's Joint War Committee.²⁰⁶ Importantly, it is also understood that piracy off the west coast of Africa is severely underreported. According to John Drake, a senior risk consultant with security firm AKE, "In Nigeria it is estimated that approximately 60 percent of pirate attacks go unreported."²⁰⁷

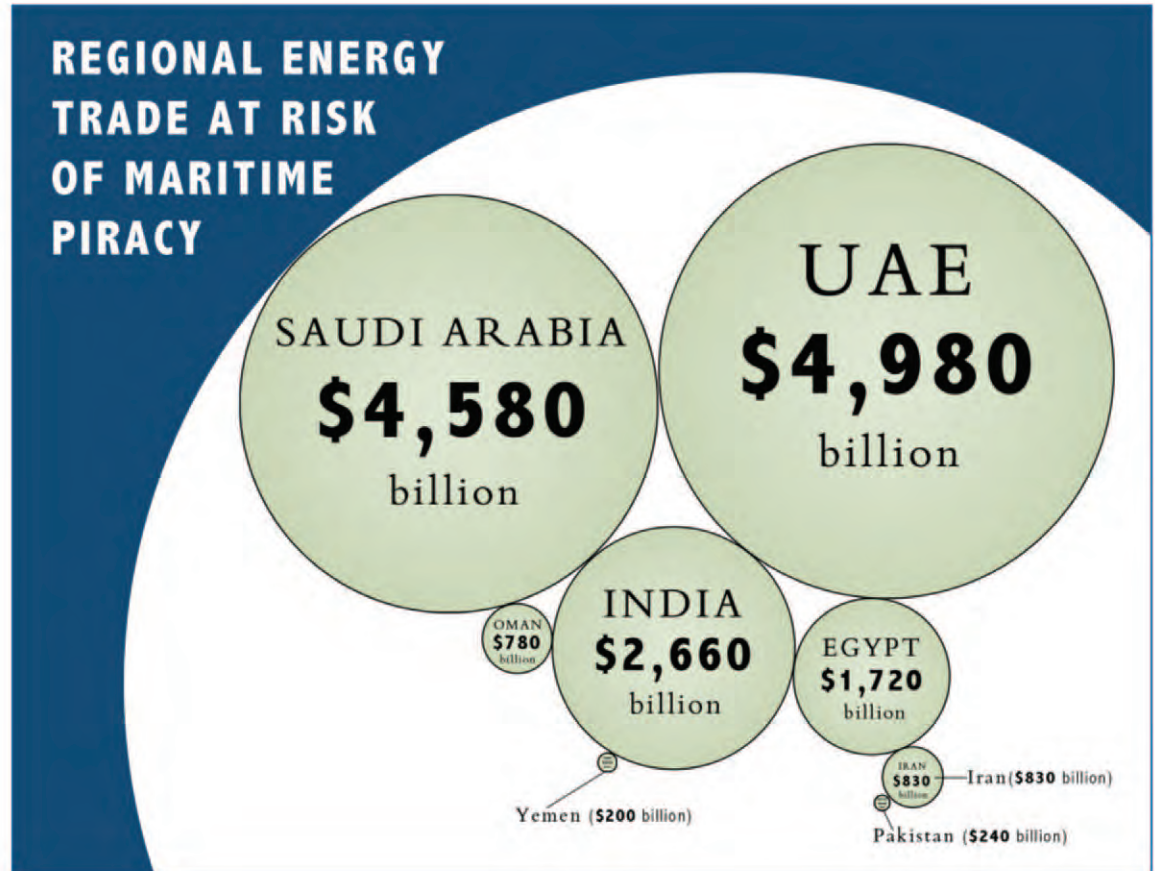
The economic impact of piracy on regional economic leaders such as Nigeria could be significant. Nigeria is one of the largest crude oil producers in the world, and is the largest exporter in Africa; approximately 95% of Nigeria's exports are petroleum and petroleum-based products. In 2010, Nigeria exported about \$70 billion worth of petroleum products. Nigeria's major trading partners are the USA, India, Brazil, and Spain.²⁰⁸ In addition to Nigeria, almost all the major oil exporters of Africa (including Angola, Gabon, Ghana, Equatorial Guinea, and the Democratic Republic of the Congo) are located in Western Africa.²⁰⁹

Therefore, although the focus of this report is on the economic cost of Somali piracy, developments off the west coast of Africa (including their economic impact) are important to track and assess. We encourage further studies in this area, especially should West African piracy continue to increase.

14. Increasing Impact of Piracy on Oil Trade

Over the course of 2011, emerging trends in the Somali piracy business model ushered greater concern about its potential impact on oil trade. This concern stems from two important developments. First, we witnessed increasing attacks on oil tankers. Pirates appear to consider tankers a particularly lucrative target given the record breaking ransoms paid to release them in recent years. For instance in December 2010, the *Samho Dream* fetched \$9.5 million for its release - a record at the time. In February 2011, two oil tankers were hijacked by Somali pirates over the course of two days. One of those tankers, the *Irene SL*, received the highest ransom paid on record, at \$13.5 million. The *Irene* was carrying the equivalent of approximately 20% of one day's worth of the U.S.'s crude imports.

Second, pirate attacks in 2011 increasingly moved northeast towards the Gulf and Middle East, where oil trade is heavily concentrated. According to the U.S. Energy Information Administration, the Hormuz Strait and the Gulf of Oman carry around a third of all seaborne traded oil, and approximately 17% of all globally traded oil with approximately 17 million barrels of oil and 13 oil tankers passing through the Strait every day.²¹⁰ In addition, Gulf Cooperation Council (GCC) countries are expected to provide a quarter of the world demand for oil in coming years, further highlighting the severe impact piracy could have on the world's energy supply in the future.²¹¹



In a survey conducted for a Gulf Petro-Chemical and Chemical Association (GPCA) conference in Abu Dhabi in November 2011, over 83% of participants stated that piracy was a significant concern to their organizations, resulting in increased costs and greater environmental and crew risks. In the same survey, 20% of members stated they had been direct victims of attacks and 53% believed the problem was likely to escalate in the future in the absence of greater intervention. Dr. Al-Sadoun, Secretary General of GPCA, stated, “chemical and oil vessels were considered among the easiest targets for pirates as they sail from the Gulf and Red Sea, fully laden with cargo, rendering them slow and often lower to the sea’s edge making it more accessible.” He also claimed that “*piracy activities, if left undeterred, have the potential to interrupt, not only MENA [Middle East and North Africa] but also Asian-European trade routes as well. This is not only a GCC and Gulf issue, it’s a global issue.*”²¹²

The Total Cost of Somali Piracy

- Total cost of Somali Piracy 2011: \$7 billion

This study has calculated the economic impact of Somali piracy in 2011. It has addressed the direct economic cost of nine different economic cost factors: ransoms, insurance, security guards and equipment, re-routing, increased speed, labor, prosecutions and imprisonment, military operations, and counter piracy organizations. The total cost of these nine impacts is estimated to be between \$6.6 and \$6.9 billion.

Cost Factor	Total Cost, 2011
Ransoms	\$160 million
Insurance	\$635 million
Security Equipment and Guards	\$1.064 - \$1.16 billion
Re-Routing	\$486 million - \$681 billion
Increased Speed	\$2.71 billion
Labor	\$195 million
Prosecutions and Imprisonment	\$16.4 million
Military Operations	\$1.27 billion
Counter Piracy Organizations	\$21.3 million
Total Economic Cost of Somali Piracy, 2011	\$6.6 billion to \$6.9 billion

In our previous report on the Economic Cost of Piracy in 2010, we estimated that the cost of piracy in that year was \$7 - \$12 billion. It is important to note that the new cost estimate of \$6.6 - \$6.9 billion does not necessarily suggest that the impact of piracy declined in 2011. The different estimations are related in part to improved information availability, as well as changes in the methodology used to calculate the overall cost:

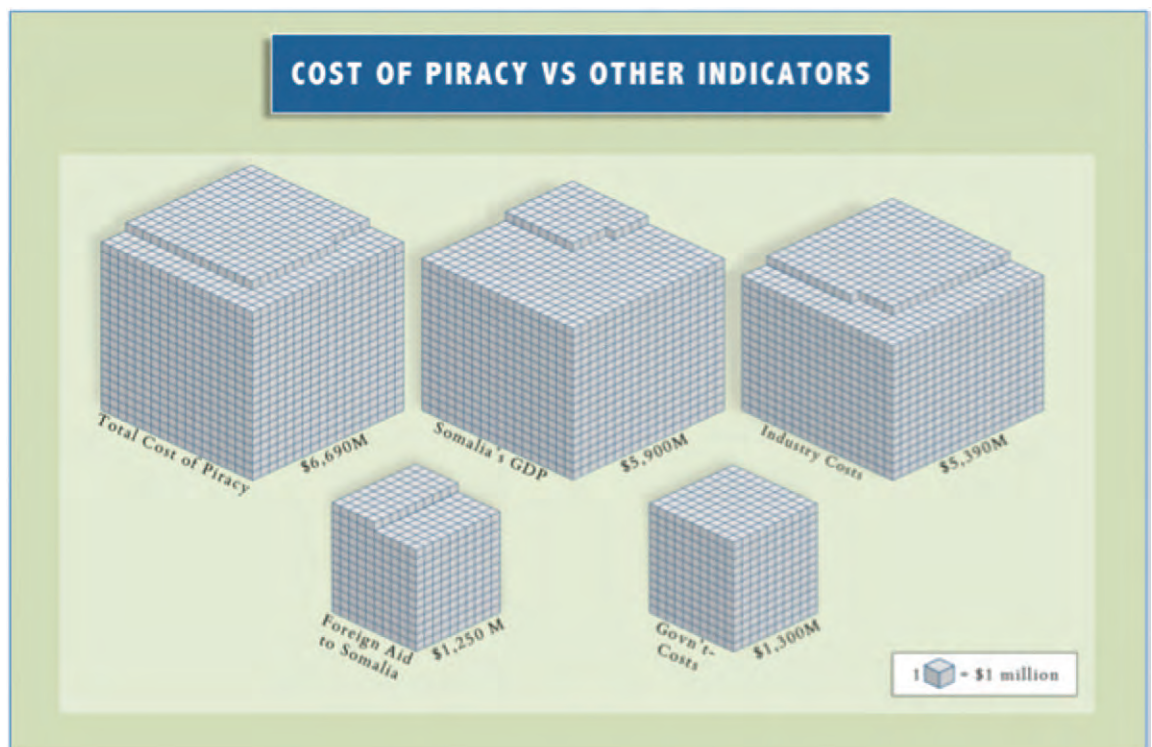
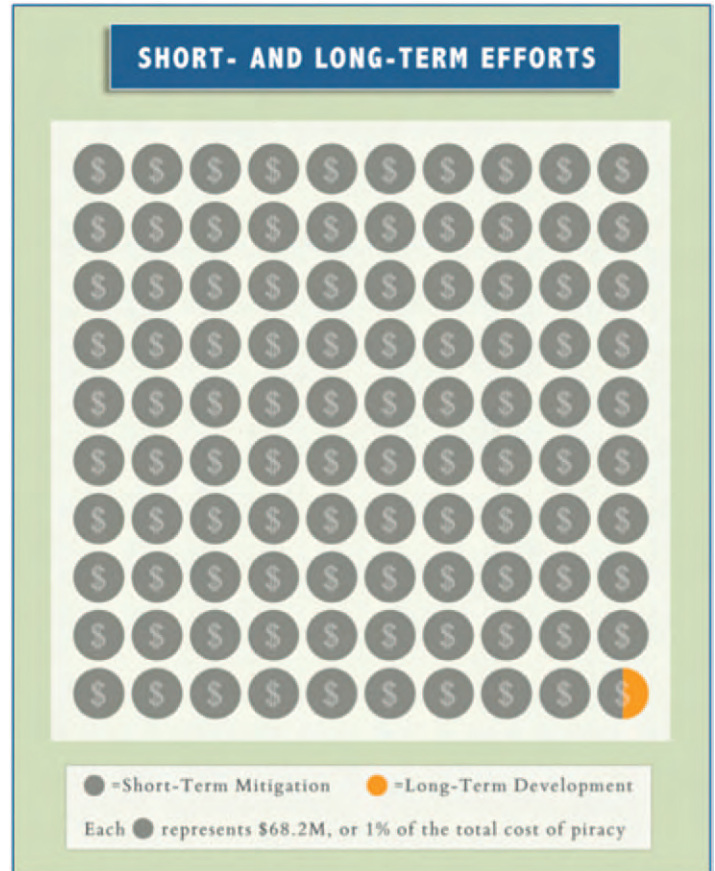
- Our initial 2010 report produced a vast amount of dialogue and opened new doors to collaboration on calculating the cost of piracy. This project is the product of much cooperation and discussion with stakeholders from all sectors, which has allowed us to fine-tune the accuracy of the study. OEF encourages continued feedback and discussion about the 2011 report, as per the 2010 report.
- This report has only calculated the direct costs of piracy, since it was not possible to accurately quantify the indirect costs of piracy. Although the study discusses the potential impact on regional countries, these costs, are not included in the total cost of piracy.
- The lower total cost numbers also reflect evolving trends in piracy. For instance, in 2010 it was predicted that some ships might opt to re-route their voyages around the Cape of Good Hope to avoid the HRA. Due to the availability of better data on ship re-routing, in 2011 we have only assessed the cost of ships re-routing by hugging the Indian coastline, and transiting to the east of the HRA. This model of re-routing is less extreme and costly. There has also been an increase in defensive tactics against piracy, especially the use of private armed security. These tactics have often meant that ships have not engaged in other costly activities, such as re-routing.

Of the total costs of \$7 billion in 2011, over 80% were borne by the shipping industry, 19% by government, and less than 1% by civil society. Further, two of the total costs (counter-piracy organizations and prosecutions) could be considered developments in long-term solutions to piracy. These two factors, at \$37 million, account for about 1% of the total costs of piracy.

The remaining 99% (\$6.8 billion) of these costs were devoted to mitigating the symptoms of piracy, and defending against pirate attack.

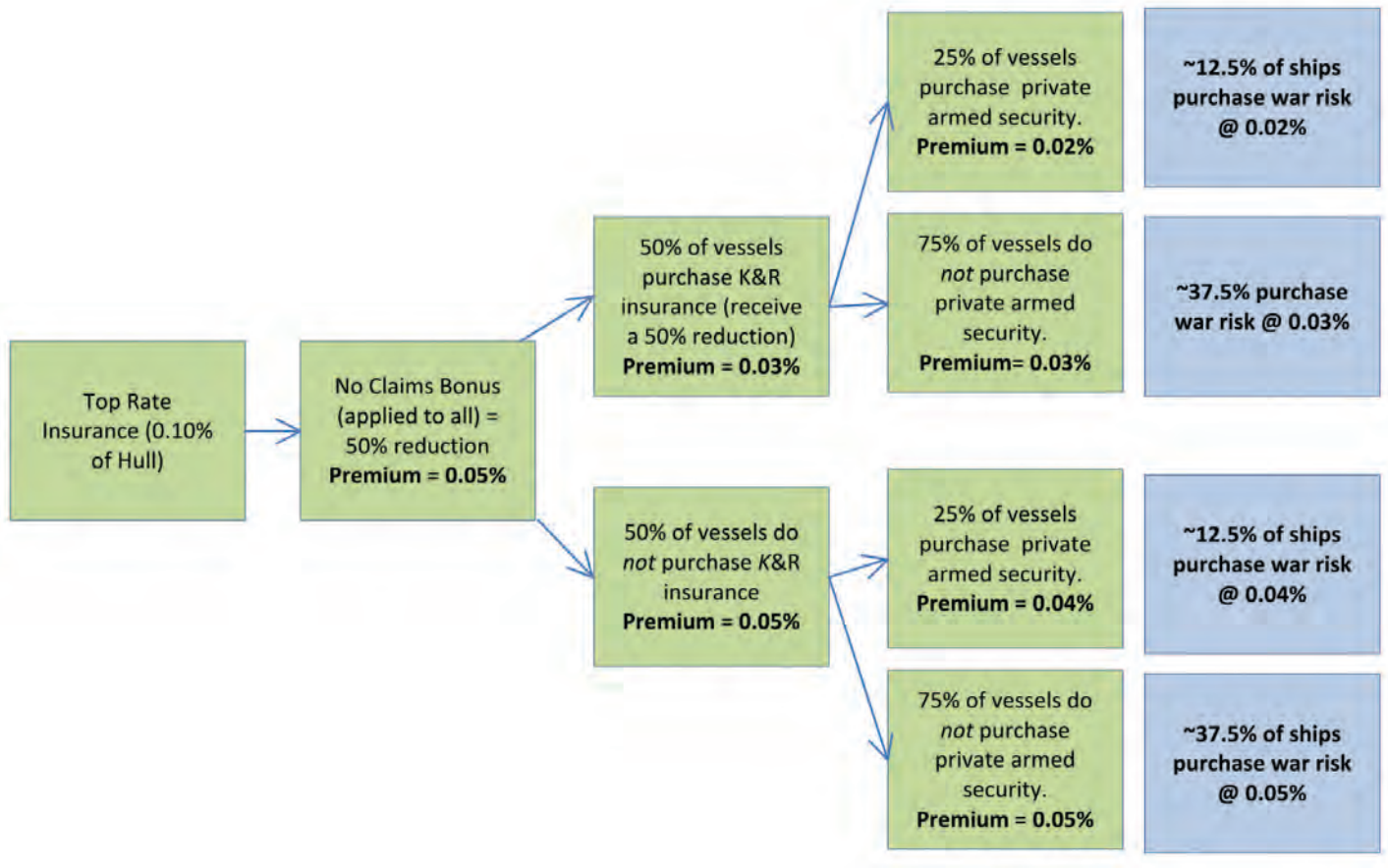
Without adequate investments in long-term, sustainable solutions to the piracy problem in Somalia, the cost of mitigating the symptoms of piracy are likely to be a perpetual expense for the shipping industry, and governments. From a cost-benefit perspective, this highlights a concerning dimension of the cost of piracy: as funds are consistently spent by industry to treat the symptoms of piracy, very little is invested in resolving the root causes. While the costs of piracy persist, we are faced with an increasingly risky piracy model, inflicting more deaths and violence against seafarers, expanding its geographical reach, and threatening oil trade. Substantially

reducing the economic and human cost of piracy will require a redirection of investments from short-term symptoms to long-term solutions.²¹³



Appendix One: Methodology for Calculating Piracy Insurance Premiums

To calculate the different war risk premiums paid by ships, we estimated the different proportions of ships which might be purchasing war risk premiums at different rates, as shown below:



The war risk premiums for each type ship is then calculated as follows:

$$SUM = \{(0.0002 * HVST) * (0.125 * STPI)\} + \{(0.0003 * HVST) * (0.375 * STPI)\} + \{(0.0004 * HVST) * (0.125 * STPI)\} + \{(0.0005 * HVST) * (0.375 * STPI)\}$$

Where:

HVST: Hull Value, Ship Type

STPI: Ship Type, Proportion in Indian Ocean

Appendix Two: Methodology for Calculating the Cost of Re-Routing

As indicated in Section 4 on the costs of re-routing vessels, we utilized many of the assumptions and format of BIMCO’s re-routing calculator to estimate the aggregate cost of re-routing. A summary of the information fed into the BIMCO calculator is shown below. It is important to note that one of the most important assumptions in these calculations is the proportion (percentage) of ships which do indeed re-route to avoid high risk areas. We have estimated that approximately 30% of vessels are not relevant for re-routing, because they only transit East/West from Middle East/Africa/Europe, and therefore do not transit the Indian Ocean. This estimate is based on trade patterns in the region, as well as available AIS data. Therefore, the maximum (upper bound) proportion of ships re-routing is 70%. Since some vessels may not re-route, we have also created a lower bound estimate of 50%. Note that stakeholders interested in the total cost of re-routing can change this percentage figure in the below table, to match different assumptions. The total cost is then divided by two for both the lower bound and upper bound estimations, since the BIMCO calculator assesses costs for a round-trip voyage, and our interest lies in a one-way voyage.

Table 10: Estimated Cost of Re-Routing Tankers and Bulk Carriers

Vessel	Type	DWT	Hull Value	Bunker Rate	Charter Hire Rate/Day	Speed (knots)	Consumption (ton/day)	Estimated No. in Indian Ocean	Round-Trip Voyage from Singapore-Oman								
									Direct Route		Alternative Route (via Sri Lanka, India, and Pakistan)		% Re-routing (lower bound)	% Re-routing (upper bound)	Re-routing cost per vessel	Total Cost of Re-routing (Lower Bound)	Total Cost of Re-routing (Upper Bound)
									Distance	Voyage Days	Distance	Voyage Days					
Tanker	Handysize	50,000	26,000,000	\$732	\$12,800	12	42	8,375	3,134	11	3,525	12	25%	35%	129,535	\$135,607,313	\$189,850,238
	Aframax	85,000	44,000,000	\$732	\$16,800	12	42		3,134	11	3,525	12	25%	35%	143,654	\$150,387,566	\$210,542,592
Bulk Carrier	Handymax	40,000	20,000,000	\$732	\$17,500	11	30	6,626	3,134	12	3,525	13	25%	35%	120,878	\$100,117,294	\$140,164,212
	Panamax	75,000	25,000,000	\$732	\$17,500	11	30		3,134	12	3,525	13	25%	35%	120,878	\$100,117,294	\$140,164,212
Total																\$486,229,467	\$680,721,254

The charter hire and hull value costs used in the model are taken from the United Nations Conference on Trade and Development, Review of Maritime Transport, and are summarized below:²¹⁴

Type	Economical Speed (knots)	Full Capacity/ 'Normal' Speed (knots)
Tankers ²¹⁶	12	24
Bulk Carriers ²¹⁷	10.4	13
Containers ²¹⁸	12	25

Our alterations on the BIMCO calculator are shown below:

Variable	BIMCO Model	Economic Cost of Piracy Model
Number of days assessed	Uses 365 days (one year)	Uses 18 days to assess approximately one round-trip transit per vessel
Dead Weight Tonnage	Uses a fixed DWT	Assesses costs for various DWT sizes (not a significant change to the overall cost estimates)
Alternative route	Ships re-routing around the Cape of Good Hope	Ships hug the Western Indian coastline ¹
Bunker Cost	\$640 USD/Metric Tonnes	\$731.76 ¹¹ USD/Metric Tonnes
Suez Canal Toll	Accounts for Suez Canal toll	Does not account for Suez Canal toll as the alternate route also transits through the Suez
Hull Value	Specific hull costs	Adjusted according to data from UNCTAD Review of Maritime Transport (for various vessel size)
Insurance Cost	Uses premium of 0.15% of hull value	Does not account for insurance cost

Appendix Three: Methodology for Calculating the Cost of Increased Speed

The calculations of excess bunker costs for ships transiting at faster speeds are shown below. Note that the total cost was divided in half to assess a one-way transit, rather than a round-trip voyage.

Route	NORMAL SPEED			INCREASED SPEED		Additional Cost Per Round Trip	Number in Indian Ocean	Total Cost
	Speed Increase	No. of round voyages	Bunker cost per voyage	No. of round voyage	bunker cost per voyage			
From Oman to Yemen	12 knots to 18 knots	1.08	\$ 338,947	1.62	\$587,508	\$ 248,561	3,233	\$401,799,270
From Sri Lanka to Yemen	Sri Lanka to Pakistan: 12 knots to 13 knots	0.89	\$ 409,836	0.97	\$469,105	\$ 59,269	12,932	\$383,231,098
	Pakistan to Yemen: 12 knots to 18 knots	0.90	\$ 406,787	1.35	\$705,098	\$ 298,311	12,932	\$1,928,877,453
Total Cost								\$2,713,907,820

Variable	Formula
Voyage time (days)	Distance/speed/24
Grand round voyage	2* voyage time (days)
No of round voyage	No. of days in interest (10 here)/grand round voyage
Burning days	Grand round voyage (NOTE: We do not count the Suez port time in this calculation)
Bunker	Burning days*consumption
Bunker cost	No. of round voyage*bunker*bunker cost

The economical and full capacity speeds for different ship types is shown below:

Type	Economical Speed (knots)	Full Capacity/ 'Normal' Speed (knots)
Tankers ²¹⁶	12	24
Bulk Carriers ²¹⁷	10.4	13
Containers ²¹⁸	12	25

In order to more precisely understand how vessels change their speeds in the HRA, we gathered the speed and geo-location of all vessels broadcasting their AIS signal on January, 27, 2012. Using data graciously provided by exactEarth, we have divided the Indian Ocean into three different zones, which is detailed in the table below. Vessels transiting Zones outside of the HRA travel at much slower speeds than those within the HRA. As there is no clear alternative explanation for this consistent increase in speed across these Zones, this suggests that the vessels are in fact increasing their speed in the HRA to avoid attack.

We assume that in the absence of piracy, container ships would transit at the economical speed of 12 knots, and increase their speed up to 18 knots in response to piracy. The data suggests that in Zones 1 and 3, vessels are transiting at a speed of 16.26 and 13 knots, respectively. While this could certainly be the ‘actual average’ cruising speed of the vessels, it could also be attributed to the fact that the data assesses ‘tankers’ and ‘cargo’ ships. Therefore, multiple types of cargo ship are encompassed under ‘cargo’ ships, including ships that transit at slower rates than container ships. This also explains the significant variation (standard deviation of more than 3 knots) of speeds for ships classified as ‘cargo’.

Area	Average Speed	Minimum/Maximum Speed
Zone 1 (Red Sea to west of Oman)	16.26 knots	6.9 knots/23.8 knots
Zone 2 (Oman to India)	14.52 knots	3.8 knots/22.3 knots
Zone 3 (Asia to Sri Lanka)	13.29 knots	7 knots/21.8 knots

Appendix Four: Methodology for Calculating the Cost of Military Operations

The assumptions and methodology used to calculate the cost of counter-piracy military vessels are shown below:

1. Fuel Cost: \$3.61 per gallon; calculated using the pre-tax average diesel price from January-October 2011 from Belgium, France, Germany, Italy, Netherlands, UK, and USA.²²⁰
2. Methodology for adjusted daily fuel consumption:
 - a. Calculation of daily fuel consumption:
 - i. Divide the listed range by the listed fuel capacity (in some cases converted from tons to liters) to calculate the 'gas mileage' for each craft.
 - ii. Divide the 'gas mileage' by the listed cruising speed to calculate 'gallons burned per hour'.
 - iii. Multiply 'gallons burned per hour' by 24 to get daily fuel consumption.
 - b. Adjustment: as per discussions with a navy representative, ships are assumed to be operating 25 days per month; and aircraft fly 5 hours per day.
 - c. Model ships used for classification: Frigate: Oliver Hazard Perry Class (U.S.); Destroyer: Arleigh Burke Class (U.S.); Auxiliary: average of Quinghaihu Supply Ship (China), INS Sukanya Patrol Ship (India), and Galicia Class Amphibious Ship (Spain); Aircraft: P-3C Orion (multiple countries).

The assumptions and methodology used to calculate the cost of UAVs are shown below:

1. Hourly Cost:
 - a. Searcher II: Use that of the Hermes 450 because it is a single craft, as opposed to a 'system,' like the Reaper.
 - b. Heron: Use that of the Hermes 450 because it is a single craft, as opposed to a 'system,' like the Reaper.
 - c. Scan Eagle: use half the cost of the Hermes 450 because the Scan Eagle is not piloted.
2. Missions per day: as per discussions with a navy representative, assume that half the fleet are in the air each day, the other half at base, or stationed on military vessels.
3. Daily mission duration: assume if endurance is greater than 24 hours, then the aircraft is in the air all day; the Searcher II's endurance is 18 hours, so we have assumed a mission time of 14 hours, figuring that a four hour cushion was a conservative estimate.
4. U. S. 'other costs': \$3.1 million for 4 months. The cost is annualized to \$9.3 million.

Appendix Five: Methodology for Calculating the Impact on Kenya's Tourism Industry

- According to World Bank country information, tourism accounts for 12% of GDP in Kenya. Since Kenya's GDP in 2010 in current US dollars was \$32.092 billion, approximately \$3.85 billion is attributable to the tourism industry.
- There were a total of 1,095,945 international tourist arrivals to Kenya in 2010.²²² Therefore, average tourist revenue per tourist is approximately \$3,513 (\$3.85 billion ÷ 1,095,945).
- Tourists from the UK account for 16% (the highest share) of international tourist arrivals in Kenya. France accounts for 4.8% of all international tourist arrivals. This analysis looks at the potential impact on tourists from the UK and France, given the public attention devoted to kidnappings of citizens from both countries.
- In 1993, Florida was regarded as the leading crime state in the USA. As a response to increase crime in the state, 89% of Britons and 93% of Germans decided not to visit Florida. Similarly, Miami saw a 24% decline in tourists from the UK, and a 21% decline from Germany. As such, we can hypothesize that anywhere between 25% and 90% of tourists from France and the UK may have decided not to visit Kenya.
- Total tourists from the UK and France = 147,548
- Total tourists from the USA and other European countries = 375,452²²³
- A 25% decline in tourists from the UK and France = 36,887 fewer tourists. $36,887 * \$3,513 = \underline{\$129 \text{ million}}$ revenue loss.

25% decline in tourists from the USA and other European countries = 93,863 fewer tourists. $93,863 * \$3,513 = \329 million revenue loss.

90% decline in tourists from UK and France = 132,793. $132,793 * \$3,513 = \466 million

There are two different statistical databases that can be used to calculate the associated job base. Both databases generate the same conclusion:

Source 1 (UNCTAD): In 2008, approximately 483,000 jobs were in the Kenyan tourism industry.

Source 2 (World Bank): In 2010, approximately 11% of the Kenyan labor force was employed in tourism. Based on the total employed population, this equates to 1,181,400 jobs.

Calculation based on Source 1: \$3.85 billion in revenue is associated with 483,000 jobs. A \$129 million decline therefore might see a reduction in approximately 16,184 jobs. As a percentage of total tourism jobs (483,000), this is 3.3% decrease, based on the lower bound economic estimate. Using the upper bound estimate of a \$795 million impact, the loss of jobs may be as high as 99,736 jobs, or 21% of total jobs.

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- ²⁰ In some instances, if a ship is held for an elongated period of time, it may be classified under ‘total loss’ by marine insurers.
- ²¹ According to a study conducted by the Catlin Group, additional costs to release a ship could amount to around 50% of the ransom

price. That is, ship owners might pay around \$2.5 million in excess costs for a \$5 million ransom. Catlin Group Limited, Piracy 2011: *A Growing Menace*, September 2011. Available from: [http://www.catlin.com/zh-CN/UnitedKingdom/Insurance/War-Political-Risk/~media/Downloads/UK/Thought%20leadership/Catlin-report-Piracy-a-growing-menace.ashx](http://www.catlin.com/zh-CN/UnitedKingdom/Insurance/War-Political-Risk/~/media/Downloads/UK/Thought%20leadership/Catlin-report-Piracy-a-growing-menace.ashx)

²² Other major forms of marine insurance include hull and cargo.

²³ For further details on the Joint War Committee see: http://www.lmalloyds.com/Web/market_places/marine/JWC/Joint_War.aspx/. See also Baldwin, Derek, "Piracy Wave Set to Hit Households in the GCC", *Gulf News*, August 28, 2011. Available from: <http://gulfnews.com/business/features/piracy-wave-set-to-hit-households-in-the-gcc-1.857936>.

²⁴ The risk zone is encircled by the following boundaries: on the northwest to the Red Sea South of Latitude 15°N; on the West of the Gulf of Oman by Longitude 58°E; on the East by Longitude 78°E; and on the South by Latitude 12°S. See Marsh Inc., *Piracy - The Insurance Implications* 2011, Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432.

²⁵ According to Marsh, the major war risk insurers are: Lloyd's, Liberty, O'Farrell, Watkins, XL, and GAREX. Ship owners with close flag, ownership or management ties to certain countries are also able to secure competitive policies from those countries. The major national providers include: Hellenic War Risks Association (Greece), Den Norske Krigsforsikring for Skib (Norway), the Japanese War Pool (Japan), the Arab War Risks Insurance Syndicate (Arab States in Arabian Gulf) and the Combined Group of War Risks Associations (United Kingdom). See Marsh Inc., *Piracy - The Insurance Implications* 2011, Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432.

²⁶ Aon Risk Solutions, 2009-2011 *Piracy Update*, September 2011.

²⁷ Marsh Inc., *Piracy - The Insurance Implications*, July 2011. Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432.

²⁸ Although it does appear that marine K&R policies are increasingly being extended to pay for the release of property as well as personnel, since Somali pirates usually make a single ransom demand to release the vessel, cargo, and crew. See Marsh Inc., *Piracy - The Insurance Implications*, July 2011. Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432.

²⁹ Marsh Inc., *Piracy - The Insurance Implications*, July 2011. Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432; Aon Risk Solutions, 2009-2011 *Piracy Update*, September 2011.

³⁰ Marsh states it has achieved reductions of 50% for typically quoted war risks premiums for ships which are separately covered for K&R with an appropriate limit (at least \$5m), and with a waiver of rights of subrogation from the K&R insurer given to war risks underwriters. See: Marsh Inc. *Piracy - The Insurance Implications*, July 2011. Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432. Similarly, an article in Lloyd's List stated that war risk underwriters may offer discounts as high as 50-60% on insurance premiums for companies purchasing K&R insurance. See McMahon, Liz, "Increase in Private Security Companies Causes Diversification in K&R Market," *Lloyd's List*, December 13, 2011. Available from: <http://www.lloydslist.com/ll/sector/Insurance/article386620.ece>

³¹ Marsh Inc., *Piracy - The Insurance Implications*, July 2011. Available from: http://usa.marsh.com/LinkClick.aspx?fileticket=mlpXR_Q17ss%3d&tabid=1985&mid=10432.

³² Major K&R insurers include (but not limited to): Hiscox (Lloyd's syndicate), Aspen, Catlin, Chartis, CV Starr, Griffin, and Travelers. Aon Risk Solutions, 2009 - 2011 *Piracy Update*, September 2011. Available from: http://www.fortunes-de-mer.com/mer/images/documents%20pdf/documents_piracy/AON_2009-2011%20Piracy%20Update.pdf.

³³ See for instance, the case of the *Asphalt Venture*, described in the ransoms section above.

³⁴ Note that Andrew Bardot, Executive Officer of the International Group of P&I Clubs, has asserted that in cases where the crew was taken ashore, and a separate ransom demand made for their release, P&I Clubs may also become involved. See McMahon, Liz, "Pirate Focus on Crews Will Force P&I Clubs to Pay Ransoms", *Lloyd's List*, October 14, 2011. Available from: <http://www.lloydslist.com/ll/sector/Insurance/article382080.ece>.

³⁵ According to Joseph Plumeri, Willis' Chairman and Chief Executive Officer. See Lowe, Mark, "Fast Growing Business", *Marsec Review*, April 2, 2011. Available from: <http://www.marsecreview.com/2011/04/fast-growing-business/>. In a separate study of German ship owners by PricewaterhouseCoopers, 60% of participants said they pay more for insurance cover, than before piracy increased. See Smith, Neville, "More Bad News on Piracy", *Safety4Sea*, August 17, 2011. Available from: <http://www.safety4sea.com/page/5852/4/more-bad-news-on-piracy>.

³⁶ See Mulrenan, Jim, "Piracy Cover Losing its Allure", *Tradewinds*, September 16, 2011, Vol 22(37), 27.

³⁷ Bockmann, Michelle Wiese, "Lloyd's of London Reviewing Assertion Ship Ransoms May Fund Terror Group", *Bloomberg*, June 17, 2011. Available from: <http://www.bloomberg.com/news/2011-06-17/lloyd-s-reviewing-assertion-that-shipping-ransoms-may-finance-terror-group.html>. According to Lloyd's 2010 Annual Report, gross written premium for Lloyd's total marine sector in 2010 was £1.671 billion (\$2.6 billion), a slight increase from £1.606 billion in 2009. In 2010, seven percent of Lloyd's total earnings were in

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³⁸ Reductions of between 25%-35% are available for ships carrying private armed security.

³⁹ According to Sean Wollerson of Jardine Lloyd Thompson, the number of ships now subject to excess insurance premiums has increased from 22,000 to 28,000. Given that ~18,000 ships transited the Suez Canal alone in 2010, we believe this figure to be an underestimation. See MacAskill, Andrew & Sundaram, Karthikeyan, "India Fights Lloyd's Expanding Piracy Zone After 300-Fold Insurance Jump", *Bloomberg*, June 2, 2011. Available from: <http://www.bloomberg.com/news/2011-06-03/india-fights-lloyd-s-expanding-piracy-zone-after-300-fold-insurance-jump.html>.

⁴⁰ Calculated from the following estimated figures: (January: 1,800, February: 1,800, March: 2,500, April: 2,750, May: 3,250, June: 3,300, July: 3,550, August: 3,700). Therefore totaling 22,650 for eight months, an average of 2,830 per month. See Blount, Keith, *Combating Piracy: Current Situation and Trends*, EUNAVFOR Presentation at the Hanson Wade Combating Piracy Conference, October 18, 2011. Available from: http://piracy-europe.com/uploads/files/1169/Keith_Blount.pdf.

⁴¹ Blount, Keith. "Combating Piracy: Current Situation and Trends." October 18, 2011. Available from: http://piracy-europe.com/uploads/files/1169/Keith_Blount.pdf.

⁴² This figure is also supported by traffic rates in the Suez Canal. According to the Suez Canal Authority, the average daily traffic in December 2011 was 50.8 vessels, which equates to around 18,288 vessels per year. Since this only accounts for the Suez Canal, it is reasonable to assume that traffic in the wider Indian Ocean, and high risk area is at least double that figure. Furthermore, on a typical day more than 4,500 ships are in the Indian Ocean region that broadcast their positions via AIS according to Satellite AIS data supplied by exactEarth. The same Satellite AIS data indicate that approximately half the vessels are cargo ships and one-quarter of the vessels are tankers.

⁴³ Data available from: <http://suezcanal.gov.eg>.

⁴⁴ Sean Wollerson, Jardine Lloyd Thompson as well as Andrew Voke of Lloyds Market Association have estimated that piracy-related insurance premiums are around 0.1% of hull value. Another anonymous broker from a leading insurance firm estimated that the premiums are between 0.125% and 0.2%. See MacAskill, Andrew & Karthikeyan Sundaram, "India Fights Lloyd's Expanding Piracy Zone After 300-Fold Insurance Jump", *Bloomberg*, June 2, 2011, available from: <http://www.bloomberg.com/news/2011-06-03/india-fights-lloyd-s-expanding-piracy-zone-after-300-fold-insurance-jump.html>; Mulrenan, Jim, "Piracy Cover Losing its Allure", *Tradewinds*, 16 September 2011, Vol 22(37), 27; Jones, Aidan, "Somali Piracy a Boost for London's Shipping Insurers", *Christian Science Monitor*, May 31, 2009, Available from: <http://www.csmonitor.com/World/Europe/2009/0531/p06s01-woeu.html>.

⁴⁵ Hull value is for average value of ships approximately five years old. For tankers, price averaged for Handy 45,000 DWT (at \$26 million) and Suezmax 150,000 DWT (at \$62 million). We do not include VLCC Tankers (300,000 DWT) since they are not able to transit the Suez. LNG Tankers use the value of LPG carriers (\$25 million). Containers are averaged for 500 TEUs, 10 years old (\$6 million), 2,500 TEUs, 10 years old (\$23 million), and 12,000 TEU's (\$28 million). Bulk Carriers are averaged for Handysize 28,000 DWT, 10 years old (\$20 million), Panamax 75,000 DWT, 5 years old (\$25 million), and Capesize, 150,000 DWT, 5 years old (\$54 million). All other ship values are proxied by the average value of Container ships. All information taken from United Nations Conference on Trade and Development (UNCTAD), "Review of Maritime Transport, 2011", November 23, 2011.

⁴⁶ Information on premium rates, and available reductions was obtained from discussions with marine insurance industry representatives.

⁴⁷ As per the following section on the cost of security and armed guards, we have estimated that around 25% of vessels purchased private armed security in 2011.

⁴⁸ Low/slow versus high/fast K&R rates are determined based on ships capable of transiting slower/faster than 20 knots, on average. Passenger ships are given the higher K&R insurance rate due to perceived higher liability, and the number of personnel on board ships. Other is assigned the average value of \$10,000 (average of \$7,500 and \$12,500).

⁴⁹ Best Management Practices for Protection against Somalia Based Piracy (BMP4), Version 4, August 2011, Edinburgh, Scotland: Witherby Publishing Group.

⁵⁰ BMP4 recommends Concertina wire. A double roll is suggested for maximum effectiveness. It is also assumed that razor wire will need to be replaced once annually on each ship. 18" of Concertina Razor Wire is sold for \$159.95/box containing 5 rolls, covering 15 linear feet each. See: Fence, Gate and Beyond. Available from: <http://www.fencegateandbeyond.com/razor-wires/18-concertina-razor-wire-made-with-galvanized-steel-1-box-5-rolls-cwgg18r5.html>

⁵¹ Cost calculation: \$159.95/box containing 5 x 18" rolls x 20 (to cover 1,500 ft average ship perimeter x 2 (for double roll to achieve maximum effectiveness) x 2 (one replacement annually). See: GlobalSecurity.org, December 2011. Available from: <http://www.globalsecurity.org/military/systems/ship/container-types.htm>

⁵² Cost calculation: One electric fence charger (averaging \$283.12) + 20 insulators (averaging \$15.72) + 1,500ft wire (\$308.94) equaling

\$906.46. It can be assumed that ships will need to replace insulators and wire once annually, making the annual cost of an electric barrier per ship \$1,529.80. Available from: www.electric-horse-fence.com

⁵³ The upper and lower ranges were created by the author's estimation that between 5% and 15% of vessels transiting the Indian Ocean utilize electrified barriers, equating to 2,123 and 6,368 vessels, respectively.

⁵⁴ Average of \$3 and \$6. \$3 is the cost of one pack containing three signs, and \$6 is the cost of two packs. About half of ships will purchase two packs of signs.

⁵⁵ Cost calculation was developed based on 63,675 warning signs being purchased. The author assumes that all BMP-compliant vessels will purchase one pack of warning signs, and one-half of BMP-compliant ships will purchase two packs of warning signs, equaling 63,675 packs of warning signs purchased.

⁵⁶ Cost of acoustic devices estimated at \$21,000 each. See Bykowicz, Julie, "Stinky Water Walls Sold as Pirate Shield", *Bloomberg*, November 3, 2011. Available from: <http://www.bloomberg.com/news/2011-11-03/stinky-water-walls-sold-as-better-pirate-shield-than-bullets.html>. We estimate between 5% (lower bound) and 15% (upper bound) of vessels transiting the HRA utilize acoustic devices.

⁵⁷ The average width of bridge wings on commercial vessels is 130ft, and sandbag walls would need to be approximately 9ft tall. Filled sandbags are approximately 1ft tall and 1.5ft long. Thus, 1,548 filled sandbags (available for sale at \$0.92/bag) are needed to protect the bridge wing of one vessel.

⁵⁸ Information on Flag States permitting private armed security compiled from: Osler, David, "India Opens Way to Developing Armed Anti-Piracy Guards", *Lloyd's List*, August 31, 2011. Available from: <http://www.lloydslist.com/ll/sector/ship-operations/article378781.ece>; Corbett, Adam, "Japan Considers Guards on Ships", *Trade Winds*, September 9, 2011, Vol. 22(36), 19; Osler, David, "Spain to Permit Heavy-Calibre Machineguns for Defence Against Pirates", *Lloyd's List*, September 30, 2011. Available from: <http://www.lloydslist.com/ll/sector/ship-operations/article381095.ece>; Leander, Tom, "State Department Insists on Guards for US Vessels", *Lloyd's List*, July 25, 2011. Available from: <http://www.lloydslist.com/ll/sector/ship-operations/article375967.ece>; Matthews, Steve, "UK Government Intends to Allow Armed Guards Onboard Ships", *Lloyd's List*, July 18, 2011. Available from: <http://www.lloydslist.com/ll/sector/ship-operations/article375460.ece>; "REFILE - Germany Wants Armed Guards on Europe Ships-Official", *Reuters*, August 23, 2011. Available from: <http://mobile.reuters.com/regional/article/idAFL5E7JN12Y20110823?edition=af>; Kurup, N.K., "Govt to Deploy Armed Guards on Board Cargo Vessels", *Hindu Business Line*, May 24, 2011. Available from: <http://www.thehindubusinessline.com/industry-and-economy/logistics/article2045593.ece?homepage=true>; "British Prime Minister Authorizes Armed Anti-Piracy Teams on UK-Flagged Ships", *GCaptain*, October 30, 2011. Available from: <http://gcaptain.com/british-prime-minister-authorizes?33289>.

⁵⁹ "As Piracy Rises, Shipowners Harden Fleets, Hire Guards", *CNBC*, April 18, 2011. Available from: http://m.asia.cnbc.com/asia/top_stories/42448335; "Piracy: IMO Guidelines on Armed Guards on Ships", *BBC News*, May 21, 2011. Available from: <http://www.bbc.co.uk/news/world-africa-13486015>.

⁶⁰ According to the Catlin Group, the average cost of four armed guards is between \$30,000 to \$40,000. See Catlin Group Limited, *Piracy 2011: A Growing Menace*, September 2011. Available from: <http://www.catlin.com/zh-CN/UnitedKingdom/Insurance/War-Political-Risk/~media/Downloads/UK/Thought%20Leadership/Catlin-report-Piracy-a-growing-menace.ashx>. A South African security firm, Specialist Maritime Services, charges up to \$5,000 a day for four guards (i.e. approximately \$35,000 per transit); According to an article in *The Economist*, a four person team can cost as much as \$100,000 per voyage. See Civil-Military Fusion Center: Rinehard, Britta, "Armed Guards on Merchant Vessels", November 2011. Available from: https://www.cimicweb.org/Documents/CFC%20Anti-Piracy%20Thematic%20Papers/CFC_Anti-Piracy_Report_Armed%20Guards%20October%202011_Final_rmb.pdf. See also "Bona Fide Private Security Firms to Become Recognized", *TankerOperator*, May 20, 2011. Available from: <http://www.tankeroperator.com/news/todisplaynews.asp?NewsID=2713>.

⁶¹ Protection Vessels International (PVI), the largest supplier of armed security against piracy charges a flat rate, with an average cost of \$50,000 per voyage. See Arnsdorf, Isaac, "Ex-Marines Fighting Pirates Off Africa as World Shipping Lanes Attacked", *Bloomberg*, October 18, 2011. Available from: <http://www.bloomberg.com/news/2011-10-17/ex-royal-marines-fighting-somali-pirates-as-world-shipping-lanes-attacked.html>; See also "Pirates...What Arrr They Good For?", *Poten Tanker Market Opinions*, October 7, 2011. Available from: <http://www.poten.com/Document.aspx?id=20786&filename=Pirates...%20What%20Arrr%20They%20Good%20For?.pdf>.

⁶² Information based on conversations with shipping companies and leading private armed security providers. The figure of 25% is also supported by a document published by the UK House of Commons in January 2012, stating that between 15% and 25% of ships carry armed guards. See UK Parliament, House of Commons Foreign Affairs Committee, *Piracy off the Coast of Somalia: Tenth Report of Session 2010-12* p.12, January 5, 2012; See also Bockmann, Michelle Wiese, "Somalia Piracy Spurs Private Navy to Start Within Five Months", *Bloomberg*, November 8, 2011. Available from: <http://www.businessweek.com/news/2011-11-08/somalia-piracy-spurs-private-navy-to-start-within-five-months.html>.

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- ⁶⁶ Suez Canal revenues are accrued from fees collected from ships transiting the Suez Canal.
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- ⁶⁹ AIS images are taken from November 17, 2009 and November 21, 2011.
- ⁷⁰ Sincere appreciation to *SpaceQuest* for providing this report with the associated Automatic Identification System (AIS) image.
- ⁷¹ BIMCO Piracy Cost Calculator. Excel spreadsheet available from: https://www.bimco.org/en/Reports/Shipping_Market_Analysis/2011/0308_Update_on_Cost_of_Piracy.aspx.
- ⁷² The report attempted to assess the number of ships re-routing through various means, including analyzing data on the trends in ships transiting the Suez Canal, as well as analyzing AIS data on shipping trends. No significant patterns could be inferred from the Suez traffic figures. The limitation with using AIS data was that many ships will turn their AIS technology off when transiting the HRA.
- ⁷³ *Best Management Practices for Protection Against Somalia Based Piracy (BMP4)* p.7, §3.4. Version 4, August 2011, Edinburgh, Scotland: Witherby Publishing Group. "Best Management Practices for Protection Against Somali Based Piracy", Section 3.4, page 7.
- ⁷⁴ Arnsdorf, Isaac, "Maersk Says More Ships May Cut Speed for Fuel," *Bloomberg*, October 4, 2011,. Available from: <http://www.bloomberg.com/news/2011-10-04/maersk-says-more-ships-may-cut-speed-after-engine-damage-study.html>.
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- ⁷⁷ It should be noted that many vessels travel in convoys through the Internationally Recognized Transit Corridor (IRTC), and this would affect the transiting speed of ships. However, industry representatives have informed us that ships can be ordered in convoy groups according to their size and speed, allowing them to maintain higher speeds through the IRTC.
- ⁷⁸ In the section on re-routing, we estimated that 30% of tankers did not transit the Indian Ocean, and therefore were not subject to re-routing. This figure was higher for tankers than container ships given the large volumes of oil being transported from the Gulf.
- ⁷⁹ This figure includes individuals taken captive in both 2010 and 2011. It does not account for unreported vessels, the inclusion of which would likely increase both the number held hostage and killed.
- ⁸⁰ Compass Risk Management: Edwards, Leslie, & Lee, Jon, *Somali Piracy – Crew Fatalities: 2007 – 2011*, October 31, 2011. Available from: <http://www.compass-rm.com/pdf/Somali%20Piracy%20Fatalities%2010%20Jun%202011.pdf>. Note: In addition to the 22 reported deaths in 2011 (January-October) by Compass Risk Management, this analysis includes 2 seafarers reported to have died from the *Asphalt Venture* based on numbers from EUNAVFOR Pirated Vessels Update for January 16, 2012.
- ⁸¹ For an in-depth analysis of the human cost of Somali piracy, see *Oceans Beyond Piracy: Hurlburt, Kaija, The Human Cost of Somali Piracy*, June 6, 2011. Available from: http://oceansbeyondpiracy.org/sites/default/files/human_cost_of_somali_piracy.pdf.
- ⁸² U.K. P&I Club, *Revision of the IBF High Risk Area in the Gulf of Aden and Indian Ocean*, March 25, 2011. Available from: http://www.ukpandi.com/fileadmin/uploads/uk-pi/Documents/Industry_organisations/Revision%20of%20IBF%20High%20Risk%20Area%20250311.pdf.
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- ⁸⁴ Travel through the HRA is calculated based on 2,415nm from Galle, Sri Lanka to the furthest attack in the Red Sea (a bit further if following the IRTC). Time to transit ranges from six days seven hours (if travelling at 16 knots) to seven days 18 hours (if travelling at 13 knots).
- ⁸⁵ Wages account for 35% of average operating costs, which are \$6,000 per day. See "MarAd Highlights the Difference between US and Foreign-Flagged Fleets," *MaritimeProfessional*, November 9, 2011. Available from: <http://www.maritimeprofessional.com/Blogs/>

Martin-Rushmere/November-2011/MarAd-highlights-the-cost-differences-between-US-a.aspx.

⁸⁶ MacAskill, Andrew & Karthikeyan Sundaram, "India Fights Lloyd's Expanding Piracy Zone After 300-Fold Insurance Jump", *Bloomberg*, June 2, 2011. Available from: <http://www.bloomberg.com/news/2011-06-03/india-fights-lloyd-s-expanding-piracy-zone-after-300-fold-insurance-jump.html>.

⁸⁷ This analysis estimates that 30% of vessels provide hazard pay. While more ship owners likely provide hazard pay, the estimate is based on two key data points: a) approximately 10% of the hijacked vessels were signed onto the ITF Agreement according to the ITF website and b) approximately 20% of seafarers aboard the hijacked vessels were Filipino.

⁸⁸ Prosecutions data compiled from: United Nations Office on Drugs and Crime (UNODC), *Counter-Piracy Programme*, Issue Six, June 11, 2011. Available from: http://www.unodc.org/documents/Piracy/UNODC_Brochure_Issue_6_WV.pdf; "Deadly Yemen Catamaran Raid 'Pirates' Sent to France: Source", December 6, 2011. Available from: <http://www.google.com/hostednews/afp/article/ALeqM5gRhuyFIhSnoj3cStKSYFTk77ORfw?docId=CNG.84013840d691548b4d501bfc5f665885.211>; Cuthbert, Jon, "10 Somali Pirates Get that Sinking Feeling", *Arabian Supply Chain*, November 2, 2011. Available from: <http://www.arabiansupplychain.com/article-6709-10-somali-pirates-get-that-sinking-feeling/>; "Somali Pirates Nabbed off Gujarat Coast", *Rediff News*, June 20, 2011. Available from: <http://www.rediff.com/news/report/somali-pirates-nabbed-off-gujarat-coast/20110620.htm>; Machuhi, Eunice, "24 Pirate Suspects Due in Kenyan Court", June 21, 2011. Available from: <http://www.africareview.com/News/-/979180/1186482/-/hmq108z/-/>; Mohamed, Kassim, "Somali Pirates Sentenced to Five Years in Prison by Kenyan Court", *Radio Netherlands*, September 8, 2010. Available from: <http://www.rnw.nl/africa/article/somali-pirates-sentenced-five-years-prison-kenyan-court>; "South Korea Jails Somali Pirate for 15 years", *AFP*, June 1, 2011. Available from: http://www.google.com/hostednews/afp/article/ALeqM5juQn51Z1n8yF9_BC2t4VjMKIwwMA?docId=CNG.5d549c333d4735278292b7398273a031.401; Lee, Robert, "Court to Open Trial of Somali Pirates", *Korea Herald*, May 22, 2011. Available from: <http://www.koreaherald.com/national/Detail.jsp?newsMLId=20110522000284>; "Somalis Accused of Piracy are Flown to South Korea", *BBC News*, January 29, 2011. Available from: <http://www.bbc.co.uk/news/world-africa-12317578>; "S. Korean Appeals Court Demand Life Imprisonment for Somali Pirates", *Xinhua News*, August 22, 2011. Available from: <http://english.peopledaily.com.cn/90777/7576604.html>; "Malaysia Charges 7 Somalis for Piracy," *Channel News Asia*, February 11, 2011. Available from: http://www.channelnewsasia.com/stories/afp_asiapacific/view/1110131/1/.html; "Somali 'Pirates' Charged in Malaysia", *BBC News*, February 11, 2011. Available from: <http://www.bbc.co.uk/news/world-asiapacific-12430671>; "Somali Pirates Jailed in Netherlands for Choizil Hijack", *BBC News Africa*, August 12, 2011. Available at: <http://www.bbc.co.uk/news/world-africa-14509638>; "Netherlands Jails Somali Pirates", *ITF Seafarers*, August 19, 2011. Available from: http://www.itfseafarers.org/maritime_news.cfm/newsdetail/6323/region/6/section/0/order/1; "Ten Somali Pirates Sentenced to Life Imprisonment", *Gulf News*, November 2, 2011. Available from: <http://gulfnews.com/news/gulf/oman/ten-somali-pirates-sentenced-to-life-imprisonment-1.922673>; "Somaliland: Somali Pirates Receive 8 Years Prison Terms," *Somaliland Press*, December 4, 2011. Available from: <http://somalilandpress.com/somaliland-somali-pirates-receive-8-years-prison-terms-2267>; "Seychelles Jails Five Somalis for Piracy", *Expatica.com*, July 1, 2011. Available from: http://www.expatica.com/fr/news/french-news/seychelles-jails-five-somalis-for-piracy_160204.html; Dickson, Caitlin, "Is It Worth It to Try Somali Piracy?" *Atlantic Wire*, February 23, 2011. Available from: <http://www.theatlanticwire.com/global/2011/02/is-it-worth-it-to-try-somali-pirates/20996/>; AFP, "Spanish Navy Arrests 11 Suspected Somali Pirates", *MSN News*, March 29, 2011. Available from: <http://news.ph.msn.com/business/article.aspx?cp-documentid=4745557>; AP, "Spain Jails Pirates for 439 Years", *Herald Sun*, May 4, 2011. Available from: <http://www.heraldsun.com.au/news/breaking-news/spain-jails-pirates-for-439-years/story-e6frf7jx-1226049513930>; Ng'wanakilala, Fumbuka, "Tanzania Arrests 7 Pirates After Attack on Oil Vessel", *Reuters*, October 4, 2011. Available from: <http://www.reuters.com/article/2011/10/04/tanzania-pirates-idUSL5E7L43LO20111004>; House Foreign Affairs Committee, Subcommittee on Terrorism, Nonproliferation, and Trade: Statement of Andrew Shapiro, *Confronting Global Piracy*, U.S. Department of State, June 15, 2011. Available from: <http://www.state.gov/t/pm/rls/rm/166249.htm>; "Somali Gets 25 Years in US Prison for Piracy", *AFP*, April 7, 2011. Available from: <http://www.google.com/hostednews/afp/article/ALeqM5jh15EEAjvmCjdsM9i6G1CGM2VhA?docId=CNG.8d00429b889e9bb8fbb49b947c2102b1.9d1>; "Tough Sentences for Somali 'Pirates' Urged", *AFP*, November 28, 2011. Available from: <http://www.google.com/hostednews/afp/article/ALeqM5hhjJyzpjkhH3CmEFmRe2BgDL4DmQ?docId=CNG.27a6e64a35e22255ad2677d0e5279658.921>; Thomas, Annie, "Somali Pirates Jailed from French Kidnapping", *AFP*, November 30, 2011. Available from: <http://www.google.com/hostednews/afp/article/ALeqM5j2C4W58BesqW-8be8ZHbxcAkgclQ?docId=CNG.85a35c9c6af40ba247ab9ea982e58b0d.a91>.

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⁹⁷ Accounts for 831 total suspects in Africa, less 207 suspects from Kenya and the Seychelles.

⁹⁸ African imprisonment costs taken from South African cost estimates. See "South Africa: Prisons Filled to Bursting Point", *The Real Cost of Prisons Weblog*, January 2006. Available from: http://realcostofprisons.org/blog/archives/2006/01/south_africa_pr.html.

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¹⁰⁰ No direct information on the cost of trials was available for Africa. The marginal cost of a trial is the time of employees (prosecutors, judges, and prison staff). As such, only the salaries of the staff are accounted for. Since imprisonment costs are based on South African costs, the trial cost is also based on South Africa. Using data from South Africa's Department of Justice and Constitutional Development, we calculate the total expenditure incurred for 'compensation of employees'. Department of Justice and Constitutional Development, Republic of South Africa, *Annual Report 2010/11*, August 21, 2011. Available from: <http://www.info.gov.za/view/DownloadFileAction?id=152429>. Using the conversion rate as of 12/14/2011, 1 SA Rand=0.1185 USD. The total expenditure on employee compensation according to the Department's report is \$337,949,558. The conviction rate in SA is, on average, 12%. See Steenkamp, Lizel, "Concerns over Conviction Rate", *News24*, October 14, 2009. Available from: <http://www.news24.com/SouthAfrica/News/Concerns-over-conviction-rate-20091014>. The European Institute for Crime Prevention and Control (HEUNI) reports that South Africa has 348 prisoners per 100,000 population. European Institute for Crime Prevention and Control, *International Statistics on Crime and Justice 2010* p.164, 2010. Using the total population of South Africa (49,004,031), this equates to 170,534 prisoners in South Africa (384/100,000*49,004,031). With a conviction rate of 12% (number convicted/no tried*100 =12). This makes the total number of trials 1,421,116. Since the total employee expenditure is \$337,949,558, the expenditure per trial is around \$337,949,558/number of trials, or \$337,949,558/1,421,116 = \$238.

¹⁰¹ Asia imprisonment costs taken from Indian cost estimates. See National Crime Records Bureau, *Snapshot 2009*. Available from: <http://ncrb.nic.in/PSI2009/Snapshots-2009.pdf>.

¹⁰² Being for India (146), and Korea (5)

¹⁰³ Using Indian Estimate of Rs.400,000 for cost of trial per suspected pirate. Cost Includes state appointed defense counsel fees, prosecution fees, cost of evidence and witnesses, and escort charges to and from the courts. Exchange rate calculated on December 7, 2011. Information received from Indian prison authorities.

¹⁰⁴ According to a Commission Staff Working Document of the European Union, on average, it costs approximately 3,000 euros to keep a person in prison per month, ie. 36,000 euros per year. This translates to \$48,187: Foreign currency exchange made on December 9, 2011. See *Commission Staff Working Document: Accompanying Document to the Proposal for a Council Framework Decision on the European Supervision Order in Pre-Trial Procedures Between Member States of the European Union, {COM(2006) 468 final}*, *Impact Assessment Summary*, E.C. Document SEC 2006 1080, August 29, 2006. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SEC:2006:1080:FIN:EN:HTML>.

¹⁰⁵ France (6), Germany (10), Netherlands (10), Spain (2).

¹⁰⁶ The trial of pirate suspects in Germany was estimated to cost at least 500,000 euros. We therefore hypothesize that the costs per trial are at least 50,000 euro per suspect, or \$66,927. Foreign currency conversion made on December 9, 2011. See Lakotta, Beate, "German Justice Through the Eyes of a Somali Pirate", *Spiegel Online*, July 4, 2011. Available from: <http://www.spiegel.de/>

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- ¹⁰⁸ According to research by a team at Iowa State University, the average ‘justice’ costs of a murder trial in the US is \$307,355. Although not all piracy trials in the US are with associated murder trials, given the complexity of piracy trials in the US, as well as general lack of precedent, we estimate that the costs of piracy trials are likely to be on the upper end of the cost spectrum (as are the cost of murders). See DeLisi, Matt et al, “Murder by numbers: monetary costs imposed by a sample of homicide offenders”, *Journal of Forensic Psychiatry & Psychology*, Vol. 21 (4), 501-513, August 2010.
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- ¹¹⁶ Information taken from EUNAVFOR, Operation Atalanta, Media Information, November 3, 2011
- ¹¹⁷ This budget is shared between EU member states based on their Gross Domestic Product (GDP). It covers the financing of common costs such as costs for the operational headquarters (in Northwood, U.K.) and the force headquarters (onboard the Flagship vessel), medical services and transport. Note that this figure does not include the staffing costs of the missions, which is generally covered by contributing nations (for example, countries pay the staffing costs of their national personnel working at operational headquarters).
- ¹¹⁸ (EUR 8.05 million). Currency conversion made on November 18, 2011.
- ¹¹⁹ Since data was not available for the administrative costs of NATO’s Operation Ocean Shield or CTF 151, we have estimated that their administrative budgets are approximately half that of EU Operation Atalanta.
- ¹²⁰ For further information on CTF 151, see *CTF-151:Counter-Piracy*, <http://combinedmaritimeforces.com/ctf-151-counter-piracy/>.
- ¹²¹ For information on range, fuel capacity, and cruising speed of Oliver Hazard Perry Class (Frigate) see *The FFG 7 OLIVER HAZZARD PERRY-Class*. Available from: <http://navysite.de/ffg/ffg7class.htm>.
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