The Economic Cost of Maritime Piracy

One Earth Future Working Paper
December 2010

Project Manager: Anna Bowden
Project Team: Kaija Hurlburt, Eamon Aloyo, Charles Marts, Andrew Lee
Executive Summary

At the end of 2010, around 600 seafarers from more than 18 countries are being held hostage by pirates. Piracy clearly affects the world’s largest trade transport industry, but how much is it costing the world? One Earth Future (OEF) Foundation has conducted a large-scale study to quantify the cost of piracy as part of its Oceans Beyond Piracy project. Based on our calculations, maritime piracy is costing the international economy between $7 to $12 billion, per year.

This report details the major calculations and conclusions made in the study. The project focuses on direct (first) order costs, but also includes some estimates of secondary (macroeconomic costs), where data is available. It concentrates on the supply-side costs to both industry and governments. The study set out to analyze the cost of piracy to the Horn of Africa, Nigeria and the Gulf of Guinea, and the Malacca Straits. The focus is inevitably on the costs of Somali piracy because this is the region where contemporary piracy is most highly concentrated, and is the greatest source of current data and information.

This project is designed to be a collaborative effort, and we welcome feedback and suggestions from stakeholders concerned with the issue of maritime piracy. We hope that it will be a useful tool for analysts and policy makers working towards solutions to piracy.

Should you wish to access or comment on the model, please contact Cost of Piracy Project Manager, Anna Bowden: abowden@oneearthfuture.org.

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1 Countries include: Bangladesh, China, Ghana, Greece, India, Indonesia, Kenya, Korea, Myanmar, Pakistan, the Philippines, Sri Lanka, Sudan, Ukraine, United Kingdom, Turkey, Yemen, and Vietnam.
2 Unless otherwise indicated, all dollar costs throughout this paper are in United States (US) dollars.
3 In 2010, 44 successful ship hijackings out of a global total of 48, were conducted by Somali pirates.
Acknowledgements

Sincere appreciation goes to experts in the field who kindly devoted their time to reviewing our work, and contributing crucial insight:

- Peter Chalk, RAND Institute
- Peter Sand, BIMCO
- Professor Pierre Cariou, World Maritime University, Malmö, Sweden
- Dr. Adolf Ng, Hong Kong Polytechnic University
- Dr. Theo Notteboom, ITMMA, University of Antwerp, and Antwerp Maritime Academy
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# List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWT</td>
<td>Dead Weight Tonnage</td>
</tr>
<tr>
<td>IMB</td>
<td>International Maritime Bureau</td>
</tr>
<tr>
<td>TEU</td>
<td>Twenty-Foot Equivalent Units</td>
</tr>
<tr>
<td>VLCC</td>
<td>Very Large Crude Carrier</td>
</tr>
</tbody>
</table>
Introduction

Approximately 80% of world trade currently travels by sea, representing around 93,000 merchant vessels, 1.25 million seafarers, and almost six billion tons of cargo. Since the end of the Second World War, seaborne trade has doubled every decade. In recent years, the international community has witnessed one of the world’s oldest crimes against this trade—piracy—re-emerge and flourish.

Yet, we still do not have a clear sense of the cost of maritime piracy. This paper attempts to add to discussions held between industry representatives and academics alike over the global cost of piracy. Although it focuses on economic costs, there are also tremendous human costs associated with this crime. Over the past five years (2006-2010) there have been around 1,600 acts of piracy which have caused immeasurable harm to the world’s seafarers, including the deaths of over 54 individuals.

The following paper addresses:

1) The project’s framework and background, including some of the complex methodological difficulties we faced in conducting a study of this nature.

2) The direct financial costs of piracy, such as: ransoms, insurance premiums, the costs of re-routing to avoid piracy regions, deterrent security equipment, naval forces, piracy prosecutions, and anti-piracy organizations.

3) The secondary (macroeconomic) costs of piracy, such as: effects on regional trade, fishing and oil industries, food price inflation, and reduced foreign revenue.

4) A concluding section aggregates these global costs of piracy.

Project Framework

Some good efforts have been made to assess the global cost of maritime piracy. Most notably, the RAND Institute’s Peter Chalk, as well as the International Maritime Bureau (IMB), have estimated that piracy costs between $1 and $16 billion per year. These estimates range from a low of $1 billion to a high of $16 billion. These figures are based on various factors, such as the number of piracy incidents, the amount of ransom paid, and the costs associated with re-routing ships to avoid piracy regions. Some estimates also take into account the costs of anti-piracy measures, such as the deployment of naval forces and the costs of installing security equipment on ships.

References:


5. All figures are from International Maritime Bureau Piracy Reporting Centre annual reports. See: http://www.icc-ccs.org/home/piracy-reporting-centre

studies note the complex difficulties faced in calculating the cost of piracy, and most have been primarily focused on addressing first-order costs (such as the cost of ransoms, security deterrence equipment, and the presence of international navies). They have generally not looked at the knock-on secondary costs of piracy, such as affects on foreign investment in regional nations, or how piracy affects commodity price inflation.

**a) Methodological Difficulties**

The cost of piracy is notoriously difficult to calculate. A recent actuarial GIRO\(^7\) study on the same topic concluded, "the challenge to the actuaries involved in pricing maritime insurance products is considerable...information about the attacks issued by shipping owners is often vague. Understandably, shipping owners don’t wish to encourage further acts of piracy, but without knowing the full details we cannot come up with the true cost."\(^8\)

There are also strong disagreements between different industry and government representatives over the costs of piracy. One study shows some of the key contentions between different representatives. It relays how a shipping investment specialist in New York says: "It's no big deal - insurance covers it." A maritime lawyer claims: "It's putting a lot of pressure on costs at a time when the market is still quite depressed from where it was 18 months ago. Either you pass on those costs or it drops to the bottom line." While an industry consultant asserts: "The insurance industry hasn't completely got its hands around it." Finally, Per Gullestrup, CEO of the Danish Clipper Group who had a ship captured in 2008, states: "This whole thing is costing the industry billions."\(^9\)

Some of the toughest challenges that we faced in calculating the cost of piracy were:

1. **Data limitations:** This study has faced difficult challenges in locating and assembling data on the costs of piracy. The project analyzed around 350 articles and papers on piracy and the shipping industry, but unfortunately there is still data missing. We have used proxies, averages, and estimations in some areas in order to fill some of these gaps. We welcome any data sources, suggestions, or information that academics, industry representatives, or others might have.

2. **Imperfect reporting on piracy:** The IMB is generally accepted as the primary source of information on piracy in the world. However, the IMB is restrained by the volume of piracy attacks it is permitted to report and document. Noel Choong, head of the IMB’s Piracy Reporting Centre, reckons that about half of all pirate attacks go

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\(^7\) General Insurance Research Organising (Committee)
\(^8\) GIRO: Sanders, David et al, *Marine Piracy*, The Actuarial Profession, 11 October 2010
unreported: “In some cases the ship’s owners dissuade the captain from reporting an attack....They don’t want bad publicity or the ship to be delayed by an investigation.”¹⁰ Others have suggested that “[o]nly an estimated 30-40 percent of pirate attacks on commercial ships are reported.”¹¹ Piracy is downplayed by both governments and industry for both political and commercial reasons.

3. **Disaggregating effects from general financial/political instability:** As is mentioned in different sections throughout this paper, it is incredibly difficult to disaggregate the effects of piracy on macroeconomic variables such as reductions in foreign direct investment (FDI), tourism, or commodity price inflation. Since piracy often surfaces in poor, developing, or failed states which are prone to political instability, we are forced to speculate over what impact piracy independently has. The current global economic recession is another complicating factor. How can we determine whether changes in shipping behavior is related to piracy, or an overall deflation of the industry?¹²

The following cost estimations are therefore produced as accurately as possible, bearing these methodological difficulties in mind. We broadly divide the costs into direct costs, and secondary (macroeconomic) costs.

**The Direct Economic Costs of Piracy**

The following section addresses the main direct costs of piracy, including: the cost of ransoms, piracy insurance premiums, deterrent equipment, re-routing vessels away from piracy risk zones, naval deployments in piracy hot zones, piracy prosecutions, and organization budgets dedicated to reducing piracy.

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¹² For instance, in 2010, the Baltic Dry Index declined for 24 consecutive days, its longest streak since August 2005. The reduction was primarily blamed on falling demand from China for commodities such as coal and iron ore. See: The Economist, “Baltic dries up”, *The Economist*, July 15, 2010. A study conducted by the Congressional Research Service also states that hire rates for dry bulk carriers dropped over 90% in late 2008, partly because of the poor economic environment. See: Ploch et al, “Piracy off the Horn of Africa”, Congressional Research Service, April 19, 2010.
a) The Cost of Ransoms

One of the most spectacular increases in the costs of piracy in recent years has been the increasing price of ransoms paid to release hijacked ships. Ransoms are generally sought by Somali pirates. Pirates in other regions have more often stolen the vessel or cargo, rather than ransoming the value of the seafarers' lives and their ship.

In November 2010, the highest ransom on record, $9.5 million, was paid to Somali pirates to release the *Samho Dream*, a South Korean oil tanker.\(^\text{13}\) Indeed, 2010 set a remarkable record for the cost of ransoms, with the year kicking off to a $7 million ransom paid in January to release the Greek supertanker *MV Maran Centaurus*, which had been carrying $162 million of crude oil from Saudi Arabia to the United States.\(^\text{14}\) The ransom demonstrated the exponential increase in the price of ransoms in recent years. In 2005, ransoms averaged around $150,000.\(^\text{15}\) By 2009, the average ransom was around $3.4 million. In 2010, ransoms are predicted to average around $5.4 million.\(^\text{16}\)

Problematically, increasing ransom payments appear to be lengthening negotiations, and therefore the duration seafarers are held hostage. The average length of negotiations has more than doubled over the past year as pirates seek, and receive, larger ransom payments. Ships were held for an average of 106 days between April and June of 2010, up from just 55 days in 2009, and the last four ships released in November 2010 were held for an average of 150 days.\(^\text{17}\) Seafarers now face the likelihood of three to four months of captivity.

The total cost of ransom is estimated to be around double the value actually paid to pirates. The total cost is duplicated by a number of factors, such as: the cost of negotiations, psychological trauma counseling, repair to ship damage caused while it is


held captive, and the physical delivery of the ransom money, often done by helicopter or private plane.\textsuperscript{18} Finally, large costs result from ships being held and out of service. For instance, it costs around $3 million for a cargo ship to be held for two months at a charter hire rate of $50,000 per day.\textsuperscript{19}

<table>
<thead>
<tr>
<th>Average Ransom</th>
<th>Total Number of Successful Hijackings</th>
<th>Cost of Ransoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 $3.4 million</td>
<td>52</td>
<td>$177 million</td>
</tr>
<tr>
<td>2010 $5.4 million</td>
<td>44</td>
<td>$238 million</td>
</tr>
</tbody>
</table>

| Cost of Ransoms 2009 and 2010 | $415 million |

By doubling the cost above for the estimated cost of ransoms for 2009 and 2010 ($415 million) to incorporate excess costs such as negotiation and delivery fees, we approximate that over the past two years, around $830 million has been spent on ransoms.\textsuperscript{20}

\textit{b) The Cost of Insurance}

In reaction to the growing threat and cost of ransoms, the maritime insurance industry has responded by increasing its shipping rates and premiums, especially in designated high-risk piracy zones. Shipping insurance comes in four main types: war risk, kidnap and ransom, cargo, and hull insurance.

\textit{a) War Risk:} War Risk insurance is an excess charge for a vessel transiting a ‘war risk area.’ The Gulf of Aden was classified as a war risk area by Lloyds Market Association (LMA) Joint War Committee in May 2008. Since this date, the cost of war risk premiums have increased 300 fold,\textsuperscript{21} from $500 per ship, per voyage; to up to $150,000 per ship, per voyage, in 2010.\textsuperscript{22} Other regions affected by piracy have also

\textsuperscript{19} Kraska, “Freakonomics of Maritime Piracy”
\textsuperscript{20} Note that in the cost of piracy model, we only incorporate the excess cost of ransoms into the total global cost of piracy, since the actual ransom value paid to pirates is generally covered by insurance, and is therefore already accounted for in the costs of insurance premiums below.
\textsuperscript{21} According to insurance broker Marsh & McLennan, the cost actually increased by 1,900% between January and June 2009, and shipping firms that were paying 0.05% of the value of their cargo in insurance, are now paying up to 0.1%. See Maritime London, “Piracy: a tax for shipping?”, June 26, 2009, http://www.maritimelondon.com/london_matters29june09.htm#1
been classified as war risk zones in the past, such as the Malacca Strait between 2005 and 2006.

b) Kidnap and Ransom (K&R): Generally K&R insurance covers the crew against ransom demands, but not the vessel or cargo. However, some marine insurance policies have recently expanded to include both crew and property. Insurance giant Munich Re., estimates that K&R premiums increased tenfold between 2008 and 2009.23

c) Cargo: Cargo insurance covers goods transported by a vessel. The excess premium on cargo transiting piracy regions is estimated to have increased by between $25 and $100 per container in the past few years.24

d) Hull: Hull insurance covers physical damage to the ship, including harm from heavy seas, collision, sinking, capsizing, grounding, fire or piracy. It estimated that piracy has doubled the cost of hull insurance.25

In calculating the global costs of maritime piracy, we take the largest insurance premiums related to piracy (war risk and K&R) and multiply these rates by 90% of the total ship traffic transiting the high risk region of the Gulf of Aden (around 30,000 ships). We deduct 10% of ship traffic under the assumption that this proportion of ships opts to re-route around the Cape of Good Hope, and is therefore not liable for insurance premiums in the war risk region. (See further explanation in the section below on re-routing ships). This gives us a figure for the total amount payable for war risk insurance and K&R insurance if all ships purchased this insurance. Under the assumption that not all ships purchase insurance premiums, we then work out a lower bound estimate of 10%, and a higher bound estimate of 70% of ships purchasing insurance.26


23 GIRO, Marine Piracy, 2010


26 These proportions are an educated guess, ascertained through discussions with representatives from the shipping industry, and other external studies. The OEF Cost of Piracy Model also allows the user to set these proportionalities at any percentage they choose, therefore feeding into the end results of the total cost of piracy.
Table 3: Cost of Excess Insurance Premiums from Transiting around the Horn of Africa

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidnap &amp; Ransom Surcharge</td>
<td>$540 million</td>
<td>$540 million</td>
</tr>
<tr>
<td>War Risk Premium Surcharge</td>
<td>$4.05 billion</td>
<td>$4.05 billion</td>
</tr>
<tr>
<td>TOTAL INSURANCE COSTS (if all ships purchased)</td>
<td>$4.59 billion</td>
<td>$4.59 billion</td>
</tr>
<tr>
<td>Lower Bound Estimate (10%)</td>
<td>$459 million</td>
<td>$459 million</td>
</tr>
<tr>
<td>Upper Bound Estimate (70%)</td>
<td>$3.213 billion</td>
<td>$3.213 billion</td>
</tr>
</tbody>
</table>

Note that as piracy continues to increase across the globe, and insurance against piracy attacks becomes an increasingly lucrative business, we may witness premiums actually decrease as competitors move into the market. As one Marine Underwriter at Lloyd’s of London stated, “Traditional carriers have been cutting each other so much to get the premium in that the price has fallen off the end of a cliff.”27

**c) The Cost of Re-Routing**

For some vessels, especially ‘low and slow’ moving ships, which are at the greatest risk of piracy attack, avoiding risk zones altogether may be a safer or cheaper option. For example, some ships may opt to avoid the risk of transiting through the Gulf of Aden and Suez Canal, and instead take the longer voyage around the Cape of Good Hope.

While robust data on the proportion of ship owners and masters who re-route their vessels via this longer route is not readily available, some companies have announced that they are diverting their fleet. For example, AP Moller-Maersk, Europe’s largest ship owner, is diverting all 83 tankers, as are the Norwegian Stolt tanker fleet, Odfjell shipping group (with a fleet of 90 tankers), and Frontline, one of the world’s major oil carrier companies.28 We also know that

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27 Bandel and Crowley, “Somali Pirate Attacks Sink Premiums as Insurers Leap Aboard”
Egypt’s Suez Canal revenue (fees collected from ships transiting the Suez Canal) has decreased by 20% in the past couple of years.\textsuperscript{29} We hypothesize that around half of this figure (10%) is a result of reduced shipping volume related to the recent global economic downturn. Therefore, we speculate that around 10% of shipping traffic avoids transiting this region as a result of the threat of piracy.

Re-routing ships via this longer voyage also has its costs. Routing a tanker from Saudi Arabia to the United States via the Cape of Good Hope, adds about 2,700 miles to the voyage.\textsuperscript{30} A re-routing from Europe to the Far East will add almost six extra days to a journey for a liner and up to 15 to 20 days for a cargo ship.\textsuperscript{31} This excess duration of transit time reduces a vessel’s annual voyages from six to five, equal to a 17% reduction in its yearly delivery capacity.\textsuperscript{32}

The OEF Cost of Piracy Model uses data from the U.S Department of Transport Maritime Administration (MARAD) and the Baltic and International Marine Council (BIMCO) for a 10,000 TEU (Twenty Foot Equivalent Units shipping container) and a 300,000 DWT (Dead Weight Tonnage) VLCC (Very Large Crude Carrier), to estimate the costs of re-routing each ship, per day, as shown in Table 4 below.\textsuperscript{33}

We then multiply each of these figures by the average number of excess days various re-routed voyages take to complete.\textsuperscript{34} We find that the average number of days is around ten. Note that the Cost of Piracy Model allows this figure to be altered by the user to adjust the overall calculation of the cost of re-routing.

\begin{itemize}
  \item[\textsuperscript{30}] MARAD, “Economic Impact of Piracy in the Gulf of Aden on Global Trade”, November 2008
  \item[\textsuperscript{31}] Unterreiner, Ben, “The Cost of Piracy in the Gulf of Aden”, Montana State University, Department of Economics, 2009.
  \item[\textsuperscript{32}] MARAD, “Economic Impact of Piracy”
  \item[\textsuperscript{33}] For a more thorough computation of the cost of re-routing per ship, see BIMCO’s calculator which can be used for precisely this measurement. See: BIMCO, “Need for rethinking about when to sail around the Cape of Good Hope?”, April 2010, \href{https://www.bimco.org/Members/Reports/Shipping_Market_Analysis/2010/04/23_Need_for_rethinking.aspx}{https://www.bimco.org/Members/Reports/Shipping_Market_Analysis/2010/04/23_Need_for_rethinking.aspx}
\end{itemize}
Using our assumption above that 10% of ships opt to take the longer route, we work out our lower bound estimate by multiplying the cheaper ship to re-route (the 300,000 DWT VLCC) by 10% of ships transiting the Gulf of Aden region (3,000 ships), which amounts to around $2.34 billion per year. We then do the same for the more expensive ship to re-route (the 10,000 TEU ship), which amounts to around $2.95 billion per year. Therefore, we make a rough estimate that the shipping industry pays around $2.3 to $3 billion per year to re-route ships to avoid piracy each year.\textsuperscript{35}

Note that a study by Fu et al predicts that in the absence of government efforts to confront Somali pirates, the proportion of shipping vessels transiting through the Gulf of Aden could decline by as much as 30%.\textsuperscript{36} They estimate that the overall macroeconomic welfare loss to the international economy of this re-routing would be around $30 billion.

Table 4: Costs of Re-Routing, Selected Ships

<table>
<thead>
<tr>
<th>Ship Cost: Hire and Fuel</th>
<th>Cost per day</th>
<th>Excess Cost for 10 day voyage</th>
<th>Cost if 10% of ships re-route</th>
</tr>
</thead>
<tbody>
<tr>
<td>300,000 DWT VLCC Charter Hire</td>
<td>$30,000</td>
<td>$300,000</td>
<td>$900 million</td>
</tr>
<tr>
<td>300,000 DWT VLCC Fuel</td>
<td>$48,500</td>
<td>$480,000</td>
<td>$1.44 billion</td>
</tr>
<tr>
<td><strong>Total Cost Per Day: 300,000 DWT VLCC</strong></td>
<td><strong>$955,000</strong></td>
<td><strong>$9,550,000</strong></td>
<td><strong>$2.34 billion</strong></td>
</tr>
<tr>
<td>10,000 TEU Containership Charter Hire</td>
<td>$40,000</td>
<td>$400,000</td>
<td>$1.2 billion</td>
</tr>
<tr>
<td>10,000 TEU Containership Fuel</td>
<td>$58,200</td>
<td>$582,000</td>
<td>$1.75 billion</td>
</tr>
<tr>
<td><strong>Total Cost Per Day: 10,000 TEU</strong></td>
<td><strong>$100,000</strong></td>
<td><strong>$1,000,000</strong></td>
<td><strong>$2.95 billion</strong></td>
</tr>
</tbody>
</table>

\textit{d) The Cost of Deterrent Security Equipment}

Ship owners may also attempt to protect their property and crew from pirate attacks by preparing their ships with security equipment and/or personnel prior to transiting a high-risk zone. Robust data on the proportion of ships purchasing deterrence equipment, and the type of deterrence equipment, is not easily accessed.\textsuperscript{37} Nonetheless, average costs of deterrence equipment and personnel are listed in Table 5 below. These rates reflect costs for equipment used to transit around the Horn of Africa,

\textsuperscript{35} Excess costs would also be accumulated for a number of ancillary reasons, such as the cost of controlled environment cargo containers for perishable goods, which cost $4,800 as opposed to $1,200 for normal refrigerated containers. See Turana, Johnstone Ole and Allan Odhiambo, “New piracy levy to push up the cost of imported goods”, Business Daily, March 9, 2010, http://www.businessdailyafrica.com/Company%20Industry/New%20piracy%20levy%20to%20push%20up%20the%20cost%20of%20imported%20goods%20/-/539550/875618/-/view/printVersion/-/nubcfg/-/index.html; Otini, “Drop in piracy cases boon for consumers and goods importers”, July 27, 2010.


\textsuperscript{37} Some ship owners may be reluctant to disclose whether they purchase deterrent equipment for fear of liability concerns or insurance increases.
since this is the area that ship owners would likely be most interested in purchasing deterrent equipment.

The OEF Cost of Piracy Model estimates that if a ship were to purchase all forms of security equipment and personnel, on average, they would pay around $134,000 per transit. We then multiply this by 90% of the total ship traffic transiting the Horn of Africa. (We deduct 10% of the total shipping traffic, under our earlier assumption that this proportion might opt to re-route around the Cape of Good Hope, therefore avoiding having to purchase security equipment to transit the high-risk piracy zone of the Horn of Africa.)

Just as we did for the cost of insurance premiums above, we approximate a lower bound (10% of ships) and an upper bound (70% of ships) estimate, for the total cost of deterrence equipment to the shipping industry. We calculate that the total cost of deterrence equipment to the shipping industry is between $360 million and $2.5 billion, per year.

### Table 5: Deterrent Equipment and Personnel Cost

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensed Security Guards</td>
<td>$80,000³⁸</td>
</tr>
<tr>
<td>Sonic Deterrent Equipment</td>
<td>$1,250³⁹</td>
</tr>
<tr>
<td>Barbed/Razor Wire</td>
<td>$12,000⁴⁰</td>
</tr>
<tr>
<td>Sandbags</td>
<td>$1,200⁴¹</td>
</tr>
<tr>
<td>Electric Fences</td>
<td>$40,000⁴²</td>
</tr>
<tr>
<td>Total Per Ship, Per Transit</td>
<td>$134,450</td>
</tr>
<tr>
<td>Total Security Costs If All Purchased Per Year</td>
<td>$3.6 billion</td>
</tr>
<tr>
<td><strong>Lower Bound Estimate Per Year</strong></td>
<td><strong>$363 million</strong></td>
</tr>
<tr>
<td><strong>Upper Bound Estimate Per Year</strong></td>
<td><strong>$2.5 billion</strong></td>
</tr>
</tbody>
</table>

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³⁸ Calculated as an average of two sources of $60,000 for GoA, see: MARAD, “Economic Impact of Piracy in the Gulf of Aden”, and $100,000 for Suez, see: Emmanuel, “Time to Join the Fight Against Maritime Piracy”.
⁴⁰ Worked out from $30,000, lasts 2-3 transits (divided by 2.5): MMWC, “Countermeasures Comparison Chart”
⁴¹ Worked out from $3,000 lasting 2-3 trips (divided by 2.5): MMWC, “Countermeasures Comparison Chart”
⁴² Worked out from $100,000 lasting 2-3 trips (divided by 2.5): MMWC, “Countermeasures Comparison Chart”
e) The Cost of Naval Forces

Over 27 countries currently contribute naval forces towards piracy deterrence. Most military and naval attention is devoted to the Horn of Africa, where “the big three” anti-piracy missions are focused: Operation Atalanta, Operation Ocean Shield, and Combined Task Force (CTF) 151. Operation Atalanta was launched in November 2008 by the European Union with the primary goal of protecting World Food Program vessels delivering aid to Somalia, as well as other shipping in the region. Operation Ocean Shield is a NATO initiative to protect shipping in the region, with a current mandate to the end of 2012. CTF 151 is a multinational task force established in January 2009 in the Gulf of Aden and the eastern coast of Somalia.

Together, the three military efforts make up over 43 vessels operating off the Horn of Africa and the Indian Ocean. We take the estimation given by the 2010 Government Accountability Office (GAO) report on Maritime Security, that one U.S. navy vessel costs around $82,794 to operate per steaming day. Multiplying this by the total 43 vessels deployed, and 365 days, we approximate the costs of these military vessels to be around $1.3 billion per year. Adding in the administrative budgets of the three major missions, along with additional independent expenditures from other nations, we come to a rough estimate of $2 billion being spent on military operations in the region every year. This is also the approximation made by the European Institute in its October 2010 study.

f) The Cost of Piracy Prosecutions

Under Universal Jurisdiction for piracy, any state can prosecute the crime, regardless of whether it has a direct nexus (e.g. nationality of the ship owner, nationality of the

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43 Countries include: Australia, Belgium, Bulgaria, Canada, China, Comoros, Denmark, France, Germany, Greece, India, Indonesia, Italy, Japan, Korea, France’s Reunion territory, Madagascar, Malaysia, Mauritius, Netherlands, Pakistan, Portugal, Russia, Saudi Arabia, Seychelles, Singapore, Spain, Sweden, Switzerland, Thailand, Turkey, United Arab Emirates, United States, United Kingdom, and Yemen. Note that South Africa was considering deploying a vessel, but put the decision on hold due to the high costs associated with this.


45 The budgets of the three missions do not encompass the costs of each naval vessel, which is paid for by each vessel-contributing nation, under the agreement that ‘costs lie where they fall’.  

criminal, nationality of the crew), to the act.\textsuperscript{47} Due to the low prosecutorial capacity of countries where pirates originate (such as Somalia), the international community has lent financial support to regional countries to encourage them to conduct piracy trials, and in some cases, imprisonment. For example in recent years, Kenya and the Seychelles have signed Memorandums of Understanding (MoUs) with the European Union, United States, United Kingdom, Canada, Denmark, and Australia, stating their willingness to accept pirates for trial. The table below shows the prosecutions of Somali pirates undertaken by different countries.

Improving prosecutorial capacity in regional countries has its costs. In May 2009, the United Nations Office of Drugs and Crime (UNODC) Counter Piracy Programme received $10 million in funds from the European Commission, the United Nations, United States and Canada, among others.\textsuperscript{48} Much of these funds are dedicated to building piracy prisons, such as the Shimo La Tewa prison in Mombasa, Kenya, as well as legal training and development.


Table 6: Somali Piracy Prosecutions

<table>
<thead>
<tr>
<th>Country</th>
<th>Trial Suspects</th>
<th>Prosecutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>136</td>
<td>136</td>
</tr>
<tr>
<td>Seychelles</td>
<td>40</td>
<td>22</td>
</tr>
<tr>
<td>Somalia/Puntland</td>
<td>260</td>
<td>235</td>
</tr>
<tr>
<td>Somaliland</td>
<td>100</td>
<td>78</td>
</tr>
<tr>
<td>Maldives</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yemen</td>
<td>120</td>
<td>12</td>
</tr>
<tr>
<td>Netherlands</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>France</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Germany</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>USA</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>752</strong></td>
<td><strong>507</strong></td>
</tr>
</tbody>
</table>


50 Kenya has stated it expects all prosecutions to be completed by the end of the year,
We estimate the cost of piracy prosecutions each year by multiplying the average cost of criminal prosecutions in ‘regional’ nations (i.e. Kenya, the Seychelles, and Yemen), North America, and Europe, by the number of prosecutions occurring in each of those respective regions, as shown in the table below. From these rough calculations, we estimate that the cost of piracy prosecutions in 2010 was around $31 million.

Table 7: Total Cost of Prosecutions 2010

<table>
<thead>
<tr>
<th>Region</th>
<th>Prosecutions</th>
<th>Average Cost</th>
<th>Total Cost of Prosecutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>483</td>
<td>$52,000[^51]</td>
<td>$25,116,000</td>
</tr>
<tr>
<td>Europe</td>
<td>21</td>
<td>$246,000[^52]</td>
<td>$5,166,000</td>
</tr>
<tr>
<td>North America</td>
<td>3</td>
<td>$335,733[^53]</td>
<td>$1,007,199</td>
</tr>
<tr>
<td><strong>Total Cost of Prosecutions 2010</strong></td>
<td><strong>$31,289,199</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**g) The Cost of Piracy-Deterrence Organizations**

As the threat of piracy has increased in recent years, a number of national and multinational organizations working towards a solution to the problem have emerged. Excluding the opportunity cost for the staff of these organizations (what they might be doing if they weren’t working to reduce piracy[^54]), we can calculate the costs of these organizations through their annual budgets, as shown below.

[^51]: Calculated as an average of the cost of prosecution per suspect Kenya ($77,000) and Seychelles ($27,500). Calculated from: United Nations Security Council, “Report of the Secretary-General on possible options to further the aim of prosecuting and imprisoning persons responsible for acts of piracy and armed robbery at sea off the coast of Somalia”, UNSC 2010/394, July 26, 2010


[^54]: It would be interesting to assess the opportunity cost for personnel, however it is beyond the scope of this analysis. It is also worth noting that all industries, especially those in the transport sector, would undoubtedly have personnel and funds committed to securing their staff and capital, so we’re not sure it should be assessed as a unique added cost.
Table 8: Cost of Anti-Piracy Organizations and Trust Funds

<table>
<thead>
<tr>
<th>Organization</th>
<th>Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN Contact Group on Piracy off the Coast of Somalia</td>
<td>$3.7 million$^{55}</td>
</tr>
<tr>
<td>IMO Djibouti Code</td>
<td>$13.8 million$^{56}</td>
</tr>
<tr>
<td>Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP)</td>
<td>$2 million$^{57}</td>
</tr>
<tr>
<td>UNODC</td>
<td>$5 million</td>
</tr>
<tr>
<td><strong>Total Cost of Anti-Piracy Organizations</strong></td>
<td><strong>$24.5 million</strong></td>
</tr>
</tbody>
</table>

Note that in the OEF Cost of Piracy Model, we do not include the UNODC budget in the total costs of piracy, as much of these funds are dedicated to improving the prosecutorial capacity of Kenya and the Seychelles, and so are already encompassed in the cost of prosecutions above.

Secondary (Macroeconomic) Costs

To date, calculations of the cost of piracy have generally focused on the first order (direct costs) to the shipping industry or governments.$^{58}$ The OEF Cost of Piracy Model also accounts for some secondary (macroeconomic) costs to regional countries surrounding piracy zones. As noted earlier, the Model is primarily focused on supply side costs to governments and industries. There are, of course, certain countries and industries that benefit from piracy. For instance, if foreign investment is reduced in one country as a result of the threat of instability from piracy, that investment may be redirected elsewhere. This is certainly an important issue to examine, but it is beyond the current scope of this project.


$^{58}$ One notable exception is the study completed by Fu et al, “The impact of maritime piracy on global economic development: the case of Somalia”. This study assesses the macroeconomic (secondary) impact of reduced transits by Far East to Europe container liners away from the Gulf of Aden.
a) Costs to Regional Trade

In November 2010, Secretary General of the United Nations, Ban Ki-moon, reported; “Piracy... has had an immense impact on the economies of East Africa and also the wider world....International trade routes are threatened and goods in the region as well as Somalia are becoming more expensive. This is made worse by the bleak state of the global economy.”

Piracy affects the cost of trade not merely because particular ships are intercepted when delivering goods. Further, as regions are increasingly regarded as threatened by piracy, unstable, or volatile, entire trading routes are altered, insurance premiums increase, cargo shippers use alternative ports to pick up and deliver their goods, and so forth.

Some have argued that Kenya bears the economic brunt of Somali piracy. The Kenyan Shippers Council (KSC) has estimated that piracy increases the cost of imports by $23.8 million per month, and exports by $9.8 million per month. These costs are then redirected to Kenyan consumers. Gilbert Langat, Chief Executive of the KSC has estimated that piracy could push up the price of imported goods by 10%.

A number of nations have also indicated that their fishing sector has declined in response to the threat of piracy. Some examples are shown in the table below.

### Table 10: Effects on Fishing Industries

<table>
<thead>
<tr>
<th>Country</th>
<th>Effects on Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yemen</td>
<td>In 2009, Prime Minister Al Mohammed Mujawar announced that the Yemeni fishing sector had lost $150 million as a result of piracy and armed robbery against vessels.</td>
</tr>
<tr>
<td>Seychelles</td>
<td>Seychellois Minister for the Environment and Natural Resources, Joel Morgan, has stated that “Maritime attacks...[pose] a direct threat to our fishing and tourism industries, the two main pillars of our economy,” reducing the Seychelles economy by around four percent of GDP every year. Impacts on fishery and other sectors are estimated to cost the Seychelles economy up to $10.5 billion per year.</td>
</tr>
</tbody>
</table>

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60 Xinhua News, “EU pledges more support to Kenya for piracy trials”; Turana and Odhiambo, “New piracy levy to push up the cost of imported goods”, 9 March 2010; Van Der Linden, Eric, “Piracy: Why Kenya Should Care”.
Taiwan

According to a Taiwanese delegate at a fisheries meeting in November 2010, more than a third of Taiwan’s fishing fleet has been scared off by the threat of piracy. One document stated that 66 of 141 vessels equipped to fish bigeye tuna "have ceased their operations due to the escalating situation."\(^6^3\)

Nigeria

One 2008 study states that over 170 Nigerian fishing vessels were fearful of going to sea due to the piracy risk, threatening approximately 50,000 jobs. It estimates that Nigeria has lost around $600 million in export earnings due to piracy threats to its fisheries.\(^6^4\)

While fishing is incredibly important to these nations, it is difficult to accurately pinpoint the exact cost of piracy to the fishing industry. This is because the price of fish can be expected to actually increase if its supply reduces. That is, as piracy increases, and fishing fleets are unwilling to operate in certain areas, the supply and demand model for the fishing industry is expected to equilibrate, so that the price of fish increases, which may be a benefit to the fishing sector. We therefore do not directly address the costs to the fishing industry in our overall calculation of the cost of piracy.

Some nations’ oil industries are also adversely affected by piracy. For instance, Nigeria’s oil industry has been directly targeted by piracy and armed robbery against its ships and oil platforms by local movements protesting the inequitable division of Nigeria’s oil wealth. One study calculates that oil production in Nigeria has dropped by around 20% since 2006 as a result of piracy and other attacks. Royal Dutch Shell reckons that 10% of Nigeria’s daily oil output (approximately 100,000 barrels), valuing $1.5 million, is stolen every day.\(^6^5\) Over the last fifty years, the value of the oil stolen or wasted has amounted to between $300 and $400 billion.\(^6^6\)

\(b)\) Cost to Food Price Inflation

Approximately 40% of piracy attacks have been on bulk carriers and general cargo vessels.\(^6^7\) Together, these vessels carry the majority of the world’s food staples (such as

\(^6^3\) Associated Foreign Press, “Piracy sidelines third of Taiwan’s Indian Ocean tuna fleet”, November 26 2010.


\(^6^5\) It is not clear, however, how much of this loss results from piracy, as opposed to attacks in territorial waters, or even on land. We therefore use the US Department of Navy estimation on the cost of piracy and other sea robberies in Nigeria. See: US Department of the Navy, “Nigeria/Nation Loses N25bn to Piracy, Sea Robberies”, African Press Organization, December 17, 2008

\(^6^6\) Nincic, “Maritime piracy in Africa: The humanitarian dimension”

rice and grain). Pirate attacks on these vessels have direct consequences on the price of food, as deliveries of food cargo is delayed, or in the case of perishable goods, lost.

Since piracy has historically emanated from failed or developing nations, these effects on the price of food have severe consequences. For example, in countries like Somalia, where over half of the food consumed is commercially imported (in addition to humanitarian food aid), food price inflation has serious financial and humanitarian impacts. Abdinasir Aw Kombe, a Somali businessman who has had a boat hijacked, states that as pirates have increasingly targeted food cargo ships, ship owners “are refusing to carry our goods,” which has created shortages of basic goods, such as rice, flour and sugar." In April 2010, a Somali food importer claimed that in less than a month, piracy had caused the price of a 50kg bag of sugar to increase from $30 to $34, wheat four from $18 to $22, and rice from $25 to $28.68

Rapid food price inflation in such nations may also lead to social unrest, riots, and potentially, conflict. In August of 2010, African countries such as Mozambique and Somalia were extremely concerned about social instability resulting from the most rapid increase in food prices since November 2009.69 The United Nations Food and Agriculture Organization (FAO) has stated that wheat and maize prices have shot past their 2009 record highs in 2010, and they warn that if production does not substantially increase in 2011, global food security could be uncertain for the following two years. International food import bills are predicted to surpass one trillion dollars in 2010.70

There are inherent complexities in attempting to work out exactly what impact piracy has on food price inflation. OEF commissioned independent experts to analyze the effect of piracy on food price inflation, but it was concluded that it was too difficult to scientifically disaggregate the effects of piracy from general instability and state failure in countries harboring pirates.

c) Cost of Reduced Foreign Revenue

Another significant cost to countries located in regions affected by piracy is reduced foreign revenue. Given the instability and volatility of regions affected by piracy, foreign investors may look for alternative regions to invest in, or spend their money.

The effect on foreign investment comes in multiple forms. One of the relatively straightforward costs to calculate is Egypt’s loss of revenue gathered from the fees

70 O’Reilly, Finbarr, “Food and Hunger”, AlertNet/Thomson Reuters, October 21, 2010
shippers pay to transit the Suez Canal. As some vessels opt to avoid this high-risk piracy zone, and re-route around the Cape of Good Hope, less revenue is collected by Egypt. The Suez Canal fees range between $200,000 and $600,000 per vessel, depending on their size.\(^7^1\) Using our estimate earlier, that around 10% of ships might opt to re-route to avoid the Suez Canal, we calculate that Egypt could be losing up to $642 million per year as an indirect cost of piracy. Importantly, revenue from the Suez Canal accounted for around 3.2% of Egypt’s GDP in the 2008 fiscal year, making it the country’s third largest source of foreign currency.\(^7^2\)

Another way in which foreign investment is reduced is through a reduction in the tourism industry. For example, to what extent does piracy reduce tourism in Kenya, the Seychelles, Thailand, Singapore, Malaysia or Ghana? This is a complicated cost to calculate, in large part because it is difficult to decipher to what extent tourists opt to take air travel, rather than oceanic travel or cruises. How do we know the effects on tourism of piracy, as opposed to the current depressed economic environment? There is, nonetheless, some anecdotal evidence that the tourism industry has been affected by piracy. For example, cruise ships are intentionally avoiding Mombasa.\(^7^3\) The Kenya Tourist Board estimates that the number of tourists visiting Mombasa by cruise ships between January and April 2010 declined by 95%.\(^7^4\) The Seychelles has also indicated its tourism industry has been severely affected by piracy, particularly for activities such as boat charters.\(^7^5\)

The OEF Cost of Piracy Model has gathered available data on the macroeconomic costs incurred to regional countries in terms of trade, lost revenue from transiting the Suez Canal, and tourism. Total costs are aggregated in the table below.

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\(^7^1\) MARAD, “Economic Impact of Piracy in the Gulf of Aden”; Nall, “The Costs of Piracy Are Passed Along”; GIRO, Marine Piracy


Table 11: Macroeconomic Costs to Selected Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Indicated Loss Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>$642 million</td>
</tr>
<tr>
<td>Kenya</td>
<td>$414 million</td>
</tr>
<tr>
<td>Yemen</td>
<td>$150 million</td>
</tr>
<tr>
<td>Nigeria</td>
<td>$42 million</td>
</tr>
<tr>
<td>Seychelles</td>
<td>$6 million</td>
</tr>
</tbody>
</table>

**Total Macro Costs** $1.25 billion

Conclusion: Adding up the Costs.

This study has attempted to contribute to discussions on the costs of maritime piracy. The project has been overwhelmingly focused on Somali piracy, because this is the region where contemporary piracy is most highly concentrated and is the greatest source of current data and information.

Our foregoing analyses, and the current economic environment, predicts the below estimation of the global cost of piracy.

Table 13: Total Costs of Maritime Piracy, 2010

<table>
<thead>
<tr>
<th>Cost Factor</th>
<th>Value (Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ransoms: excess costs</td>
<td>$176 million76</td>
</tr>
<tr>
<td>Insurance Premiums</td>
<td>$460 million to $3.2 billion</td>
</tr>
<tr>
<td>Re-Routing Ships</td>
<td>$2.4 to $3 billion</td>
</tr>
<tr>
<td>Security Equipment</td>
<td>$363 million to $2.5 billion</td>
</tr>
<tr>
<td>Naval Forces</td>
<td>$2 billion</td>
</tr>
<tr>
<td>Prosecutions</td>
<td>$31 million</td>
</tr>
<tr>
<td>Piracy Deterrent Organizations</td>
<td>$19.5 million</td>
</tr>
<tr>
<td>Cost to Regional Economies</td>
<td>$1.25 billion</td>
</tr>
</tbody>
</table>

**TOTAL ESTIMATED COST** $7 to $12 billion per year

We conclude, therefore, that the global cost of piracy is at least $7 to $12 billion dollars per year. Wherever possible, we have tried to use conservative estimates, so as to not overinflate the costs.

This is not a definitive figure, but rather intended to be continually developed, adapted and improved. We invite collaborative feedback from experts and industries working on the issue. The model is specifically designed to be utilized by the many stakeholders and

76 We do not include actual ransom value paid, as this is generally covered by insurance costs.
parties effected by maritime piracy. It is a free, public good, sponsored by One Earth Future Foundation. As we receive new or more accurate data, or as the environment changes, we can feed this information into the Model to generate increasingly accurate analyses.