

The Economic Cost of Maritime Piracy

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Executive Summary

At the end of 2010, around 600 seafarers from more than 18 countries are being held hostage by pirates.¹ 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,² 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.³

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.

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.

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List of Acronyms

DWT	Dead Weight Tonnage
IMB	International Maritime Bureau
TEU	Twenty-Foot Equivalent Units
VLCC	Very Large Crude Carrier

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.⁴ 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.⁵

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.⁶ These

⁴ Rosenberg, David , "The Political Economy of Piracy in the South China Sea", in Elleman, B.A, A. Forbes, and D. Rosenberg (eds). *Piracy and Maritime Crime*, Naval War College Newport Papers, Newport: Naval War College Press.

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

⁶ Chalk, Peter, *The Maritime Dimension of International Security: Terrorism, Piracy and Challenges for the United States*, The RAND Institute, 2008. See also Maritime Security Market's study, estimating costs to be around \$15.4 billion in 2010: *The Maritime Security Market 2010-2020: Piracy, Shipping & Seaports*, April 2010

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 GIRO⁷ 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

⁷ General Insurance Research Organising (Committee)

⁸ GIRO: Sanders, David et al, *Marine Piracy*, The Actuarial Profession, 11 October 2010

⁹ Eden, Scott, “The Pirates’ Toll: Insurance and Razor Wire”, *TheStreet.com*, 17 March 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.

¹⁰ Gwin, Peter, “Dangerous Straits”, *National Geographic*, October 1, 2007. The UK government also estimates that piracy attacks occur about 25% more than official reporting. See, House of Commons, “House of Commons: Select Committee on Transport Eighth Report: Conclusions and recommendations”, 6 July 2006.

¹¹ Koburger, Charles W Jnr., “Selamat Datang, Kapitan”, *Piracy and Maritime Crime*, Naval War College Newport Papers, in Elleman, B.A, A. Forbes, D. Rosenberg eds. Newport, Naval War College Press, 2010 p75.

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.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.¹⁴ The ransom demonstrated the exponential increase in the price of ransoms in recent years. In 2005, ransoms averaged around \$150,000.¹⁵ By 2009, the average ransom was around \$3.4 million. In 2010, ransoms are predicted to average around \$5.4 million.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.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

¹³ BBC News, "Somali pirates receive record ransom for ships' release", November 6, 2010, <http://www.bbc.co.uk/news/world-africa-11704306>. Note that in August 2010, a Saudi insurance company was rumored to be set to pay \$20 million in ransom for the release of 14 crew and the Al-Nisr Al-Saudi ship. See Google News, "Saudi insurer 'to pay pirates \$20mln ransom'", August 2, 2010, <http://www.google.com/hostednews/afp/article/ALeqM5hhBIG7tEe6oLmMu11br3FEQaKgMw>

¹⁴ Baldauf, Scott, "Somali pirates fight over record ransom", *Christian Science Monitor*, January 18, 2010; Kraska, James "Freakonomics of Maritime Piracy", *Brown Journal of World Affairs*, Spring/Summer 2010, Vol. 16(2)

¹⁵ Payne, John C., "Piracy Today: Fighting Villainy on the High Seas", *Wall St Journal*, April 8, 2010

¹⁶ GIRO: Sanders, David et al, *Marine Piracy*. Note, some analyses estimate the average ransom in 2010 to be around \$4 million, however these studies were conducted before the large payouts towards the end of the year (such as the *Samho Dream*). See: Bandel, Carolyn and Kevin Crowley, "Somali Pirate Attacks Sink Premiums as Insurers Leap Aboard", Bloomberg, August 2, 2010, <http://www.bloomberg.com/news/2010-08-02/somali-piracy-attacks-surge-premiums-sink-as-more-insurers-leap-aboard.html>; Chalk, Peter, "An Old Scourge Needs a Modern Solution", *New York Times*, September 3, 2010; Milmo, Cahal, "Insurance firms plan private navy to take on Somali pirates", *The Independent*, September 28, 2010

¹⁷ "Pirate Hostages Held Twice as Long as in 2009," *NPR*, November 18, 2010. Online at: <http://www.npr.org/templates/story/story.php?storyId=129752448&ft=1&f=>

held captive, and the physical delivery of the ransom money, often done by helicopter or private plane.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.¹⁹

Table 2: Cost of Somali Piracy Ransoms 2009 and 2010

	Average Ransom	Total Number of Successful Hijackings	Cost of Ransoms
2009	\$3.4 million	52	\$177 million
2010	\$5.4 million	44	\$238 million
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.²⁰

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.

- 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,²¹ from \$500 per ship, per voyage; to up to \$150,000 per ship, per voyage, in 2010.²² Other regions affected by piracy have also

¹⁸ BBC News, “Somali pirates ‘free arms ship’”, February 5, 2009, <http://news.bbc.co.uk/2/hi/africa/7871510.stm>; Bandel and Crowley, “Somali Pirate Attacks Sink Premiums as Insurers Leap Aboard”; Aon One, “Danger at Sea”, March 31, 2010, <http://one.aon.com/danger-sea>; GIRO *Marine Piracy*; Percy, Sarah and Anja Shortland, *The Business of Piracy in Somalia*, DIW Berlin Discussion Papers, 1033

¹⁹ Kraska, “Freakonomics of Maritime Piracy”

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.

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

²² UNODC (United Nations Office of Drugs and Crime), *The Globalization of Crime: A Transnational Organized Crime Threat Assessment*, 2010, p198; MARAD (US Department of Transportation), “Economic

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

Impact of Piracy in the Gulf of Aden on Global Trade”, November 2008; Gwin, Peter, “Dangerous Straits”, *National Geographic*, October 1, 2007.

²³ GIRO, *Marine Piracy*, 2010

²⁴ See: Emmanuel, “Time to Join the Fight Against Maritime Piracy”, *International Political Economy Zone*, September 23, 2010, <http://ipezone.blogspot.com/2010/09/its-time-to-join-fight-against-maritime.html>; Raymond, Catherine, “Piracy and Armed Robbery in the Malacca Strait: A Problem Solved”, *Piracy and Maritime Crime*, Naval War College Newport Papers, 2010; OOCL Pty Ltd, “Gulf of Aden Surcharge”, February 9, 2009, <http://www.oocl.com/australia/eng/localinformation/localnews/2009/9feb09.htm>; CMA CGM, “Aden Gulf Surcharge”, December 17, 2008, http://www.cma-cgm.com/AboutUs/PressRoom/Press-Release_Aden-Gulf-Surcharge_7426.aspx; Maersk Line, “Gulf of Aden Emergency Surcharge”, December 8, 2008, <http://www.maerskline.com/localfile/?path=/europe/ukraine/files/Aden>; Nall, Stephanie, “The Costs of Piracy Are Passed Along”, *America.gov*, June 2009, <http://www.america.gov/st/peacesec-english/2009/May/20090529160944berehellek0.8213159.html>

²⁵ Cape Business News, “Our Exposure To The Risk Of Piracy”, August 16, 2010, http://www.cbn.co.za/index.php?Page=daily&daily_id=4868

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

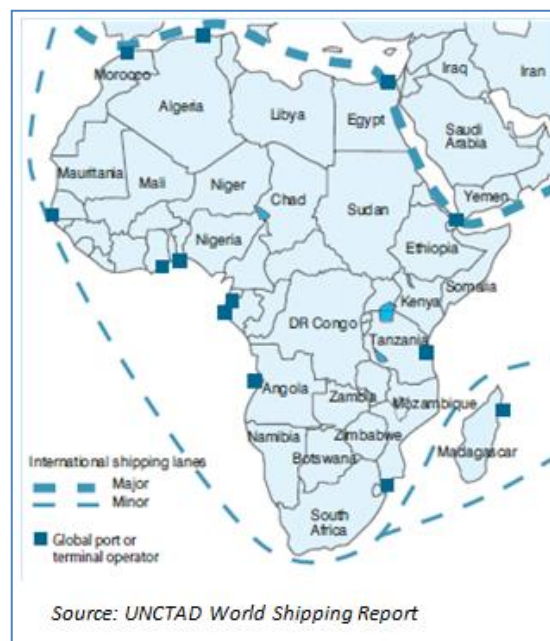
	2009	2010
Kidnap & Ransom Surcharge	\$540 million	\$540 million
War Risk Premium Surcharge	\$4.05 billion	\$4.05 billion
TOTAL INSURANCE COSTS (if all ships purchased)	\$4.59 billion	\$4.59 billion
Lower Bound Estimate (10%)	\$459 million	\$459 million
Upper Bound Estimate (70%)	\$3.213 billion	\$3.213 billion

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



²⁷ Bandel and Crowley, "Somali Pirate Attacks Sink Premiums as Insurers Leap Aboard"

²⁸ See for instance: ICIS.com, "Odfjell to avoid Gulf of Aden due to piracy threat", November 17, 2008, <http://www.icis.com/Articles/2008/11/17/9172271/odfjell-to-avoid-gulf-of-aden-due-to-piracy-threat.html>; Ship Management, "Frontline could follow Odfjell lead and steam around the Cape to avoid piracy attacks", November 18, 2008, <http://www.shipmanagementinternational.com/?p=652>

Egypt's Suez Canal revenue (fees collected from ships transiting the Suez Canal) has decreased by 20% in the past couple of years.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.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.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.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.³³

We then multiply each of these figures by the average number of excess days various re-routed voyages take to complete.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.

²⁹ Sullivan, Alexa K. "Piracy in the Horn of Africa and its effects on the global supply chain", *Journal of Transport Security*, 2010, Vol. 3 pp: 231-243.

³⁰ MARAD, "Economic Impact of Piracy in the Gulf of Aden on Global Trade", November 2008

³¹ Unterreiner, Ben, "The Cost of Piracy in the Gulf of Aden", Montana State University, Department of Economics, 2009.

³² MARAD, "Economic Impact of Piracy"

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,

https://www.bimco.org/Members/Reports/Shipping_Market_Analysis/2010/04/23_Need_for_rethinking.aspx

³⁴ A re-routed transit from Europe to the Far East takes around six days longer for a liner, 17.5 days for a cargo ship. A re-routed transit from Asia to Europe takes around five days longer, and ten days longer from Asia to the Middle East. See Unterreiner, "The Cost of Piracy in the Gulf of Aden", 2009; and comments from Odfjell SE, a Norwegian company with 100 chemical tankers, in Miller, John W. "Piracy Spurs Threats to Shipping Costs", *Wall St Journal*, November 19, 2008; MARAD, "Economic impact of Piracy in the Gulf of Aden"; Otini, Rawlings, "Drop in piracy cases boon for consumers and goods importers", July 27, 2010, Business Daily, <http://www.businessdailyafrica.com/Company%20Industry/Drop%20in%20piracy%20cases%20boon%20for%20consumers%20and%20goods%20importers/-/539550/965262/-/rvv2wnz/-/>; Emmanuel, "Time to Join the Fight Against Maritime Piracy"; Kraska, "Freakonomics of Maritime Piracy".

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.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%.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

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

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.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,

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.

³⁶ Fu, Xiaowen, Adolf Ng and Yui-Yip Lau, "The impact of maritime piracy on global economic development: the case of Somalia", *Maritime Policy and Management*, Vol. 37 No. 7, pp1-21. The study assesses container liner trade in Far East-Europe transits.

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

Equipment	Cost
Licensed Security Guards	\$80,000 ³⁸
Sonic Deterrent Equipment	\$1,250 ³⁹
Barbed/Razor Wire	\$12,000 ⁴⁰
Sandbags	\$1,200 ⁴¹
Electric Fences	\$40,000 ⁴²
Total Per Ship, Per Transit	\$134,450
Total Security Costs If All Purchased Per Year	\$3.6 billion
Lower Bound Estimate Per Year	\$363 million
Upper Bound Estimate Per Year	\$2.5 billion

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",

³⁹ Worked out by average of \$20,000: MMWC (Merchant Maritime Warfare Centre), "Countermeasures Comparison Chart", http://www.mmwc.org/propeller_arresters.php, and \$20,000 to \$30,000: Jawani, Ravi, "The Recent Decision – 'Piracy a Boon For Ship Owners?'" , *Fichte & Co*, July 19, 2010, http://www.fichtelegal.com/en/news_article.php?news_id=73. Divided by 20 for per trip figures.

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.⁴³ 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,⁴⁴ 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 budgets⁴⁵ 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.⁴⁶

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

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.

⁴⁴ GAO (Government Accountability Office), “Maritime Security: Actions Needed to Assess and Update Plan and Enhance Collaboration among Partners Involved in Countering Piracy off the Horn of Africa”, Report to Congressional Requesters, September 2010

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’.

⁴⁶ The European Institute, “Led by the EU and NATO, International Efforts to Stem Maritime Piracy Begin to Pay Off”, October 2010, <http://www.europeaninstitute.org/October-2010/led-by-the-eu-and-nato-international-efforts-to-stem-maritime-piracy-begin-to-pay-off.html>. See also Didier Lenoir, Head of Military Operations at the EU’s, comments that Operation Atalanta costs €500 million (\$736 million) per year.

criminal, nationality of the crew), to the act.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.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.

⁴⁷ For a detailed discussion of universal jurisdiction see Randall, Kenneth, "Universal Jurisdiction Under International Law", *Texas Law Journal*, Vol. 66, March 1988.

⁴⁸ Xinhua News, "EU pledges more support to Kenya for piracy trials", July 28, 2010, <http://www.kbc.co.ke/story.asp?ID=65581>

Table 6: Somali Piracy Prosecutions⁴⁹

Country	Trial Suspects	Prosecutions
Kenya	136	136 ⁵⁰
Seychelles	40	22
Somalia/Puntland	260	235
Somaliland	100	78
Maldives	27	
Tanzania	1	
Yemen	120	12
Netherlands	25	5
France	6	6
Germany	10	10
USA	11	3
TOTAL	752	507

⁴⁹ Data compiled from: BBC News, “Somali pirates sentenced to 10 years in Seychelles”, July 26, 2010, <http://www.bbc.co.uk/news/world-africa-10763605>; 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; Chalk, “An Old Scourge Needs a Modern Solution”, September 3, 2010; Szkotak, Steve, “Attorneys: Accused pirates blindfolded, handcuffed”, Associated Press, July 19, 2010, <http://www.google.com/hostednews/ap/article/ALeqM5ikox2w8uO1e80g1mndtiJU16gobQD9H2BR005>; Muhumed, Malkhadir M. , “Kenyan Court Convicts, Sentences 7 Somali Pirates”, Associated Press; BBC News, “Yemen sentences Somali pirates to death”, May 8, 2010, http://news.bbc.co.uk/2/hi/middle_east/8689129.stm; United Nations Office of Drugs and Crime (UNODC), PowerPoint presentation shared with OEF Foundation; Barnard, Bruce, “Somalis Face Piracy Charges in Dutch Court”, *The Journal of Commerce*, May 25, 2010; Barnard, Bruce, “Dutch Court Sentences Somali Pirates”, *The Journal of Commerce*, June 17, 2010; BIMCO, “Piracy: Outcome of CGPCS Working Group 2”, November 4, 2010, https://www.bimco.org/Members/News/2010/2010/11/04_CGPCS_WG2.aspx; Oudah, Abdul-Aziz (2010), “Piracy Costs Yemen Millions”, *Yemen Observer*, November 10, 2010; Xinhua News, “EU pledges more support to Kenya for piracy trials”, July 28, 2010; Szkotak, Steve, “Attorneys File New Claims in US Piracy Cases”, *Washington Examiner*, July 19, 2010; Menyha, Walter, “Island seeks aid to fight piracy”, *Daily Nation*, September 13, 2010; Security Council SC/10079, “Piracy off Coast of Somalia Outpacing International Efforts to Defeat It”, November 9, 2010. Security Council 6417th Meeting; Associated Foreign Press (The Hague), “Dutch Navy Arrests 20 Somali’s Over S. African Yacht Attack”, http://www.terradaily.com/reports/Dutch_navy_arrests_20_Somalis_over_SAFfrican_yacht_attack_999.html; The Associated Press, “10 alleged Somali pirates to be tried in Germany”, November 1, 2010, <http://www.businessweek.com/ap/financialnews/D9J795A81.htm>; Sandford, Alasdair, “Somali pirates face prosecution in France”, April 16, 2008, *BBC News*; Los Angeles Times, “U.S. brings 11 suspected pirates to Virginia to face charges”, April 23, 2010, <http://latimesblogs.latimes.com/dcnw/2010/04/us-indicts-11-suspected-pirates-in-norfolk-va.html>; Riley, Ann, “Germany court opens country’s first piracy trial in 400 years”, *Jurist Legal News and Research*, University of Pittsburgh, <http://jurist.org/paperchase/2010/11/germany-court-opens-countrys-first-piracy-trial-in-400-years.php>

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

Region	Prosecutions	Average Cost	Total Cost of Prosecutions
Regional	483	\$52,000 ⁵¹	\$25,116,000
Europe	21	\$246,000 ⁵²	\$5,166,000
North America	3	\$335,733 ⁵³	\$1,007,199
Total Cost of Prosecutions 2010			\$31,289,199

g) The Cost of Piracy-Deterrence Organizations

As the threat of piracy has increased in recent years, a number of national and multi-national 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

⁵² Using Dutch estimate of €36,000 for prosecution (including imprisonment) for one piracy suspect, per year, which assumes imprisonment of 5 years = €180,000 per suspect. Exchange rate calculated on 12 November 2010 = US\$246,000. See: Europa, “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” *SEC/2006/1080,* August 29, 2006, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SEC:2006:1080:FIN:EN:HTML>; Sterling, Toby, “Dutch Court Sentences 5 Somali Pirates to 5 Years”, *The Associated Press*, June 17, 2010, <http://abcnews.go.com/International/wireStory?id=10937793>; The Associated Press, “10 alleged Somali pirates to be tried in Germany”, November 1, 2010;

⁵³ Taken from average cost of robbery trial in the US (which accounts for opportunity cost of US citizens, but not the cost of flying in suspects and witnesses for international trials like piracy). See: DeLisi, Matt et al, “Murder by numbers: monetary costs imposed by a sample of homicide offenders”, *The Journal of Forensic Psychiatry & Psychology*, Vol. 21. (4), August 2010 pp.501-513; Blow, Charles, M. “High Cost of Crime”, *New York Times*, October 8, 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

Organization	Funds
UN Contact Group on Piracy off the Coast of Somalia	\$3.7 million ⁵⁵
IMO Djibouti Code	\$13.8 million ⁵⁶
Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia (ReCAAP)	\$2 million ⁵⁷
UNODC	\$5 million
Total Cost of Anti-Piracy Organizations	\$24.5 million

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.

⁵⁵ The Contact group has spent \$2,437,372 of its \$3,662,271 budget, endowed on 27 January 2010. See: Online at: <http://www.imo.org/OurWork/Security/PIU/Pages?DCCMeeting.aspx><http://www.imo.org/OurWork/Security/PIU/Pages?DCCMeeting.aspx>

⁵⁶ International Maritime Organization (IMO), "Project Implementation Unit", 2010, <http://www.imo.org/OurWork/Security/PIU/Pages/Project-Implementation-Unit.aspx>

⁵⁷ ReCAAP (Regional Cooperation Agreement on Combating Piracy and Armed Robbery Against Ships in Asia), "Corporate Report 2006-2008", Second Edition. Based on the 09/10 budget of SGD 2,572,000. Foreign currency conversion made to USD on October 25, 2010. See also: Vestergaard Madsen, Jens, "Possibilities and Limitations of Replicating Regional Institutions: A Case Study of ReCAAP and the Djibouti Code of Conduct", August 2010, Master's Thesis, Graduate School of International Studies, Seoul National University. Note this amount does not include the staffing capacity of ReCAAP that China, India, Japan, Korea, and the Philippines sponsor at the secretariat.

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.”⁵⁹

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%.⁶⁰

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

Country	Effects on Trade
Yemen	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. ⁶¹
Seychelles	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. ⁶²

⁵⁹ Horseed Media, “Somalia Pirates’ Success Rate Rises, Stunting East Africa Economies”, November 3, 2010.

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”.

⁶¹ Saba Net, Yemen News Agency, “Yemen losses reach US\$ 150mIn due to piracy in 2009”; Oudah, “Piracy Costs Yemen Millions”

⁶² Converted from €8 billion to US dollars 2 December 2010. See Dikov, Ivan, “Seychelles Minister Joel Morgan: Somali Pirates Damage Both Maritime Trade and Regional Stability”, Novinite (Sofia News Agency), March 10, 2010, http://www.novinite.com/view_news.php?id=114068; Afrique Avenir, “Seychelles lost € 28 million in 2009 due to piracy, says minister”, April 7, 2010,

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." ⁶³
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. ⁶⁴

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.⁶⁵ Over the last fifty years, the value of the oil stolen or wasted has amounted to between \$300 and \$400 billion.⁶⁶

b) Cost to Food Price Inflation

Approximately 40% of piracy attacks have been on bulk carriers and general cargo vessels.⁶⁷ Together, these vessels carry the majority of the world's food staples (such as

<http://www.afriqueavenir.org/en/2010/04/07/seychelles-lost-e-28-million-in-2009-due-to-piracy-says-minister/>; Latham, Brian, "Seychelles Insurance Costs Rise 50% on Piracy, Michel Says", July 12, 2010, Bloomberg, <http://www.businessweek.com/news/2010-07-12/seychelles-insurance-costs-rise-50-on-piracy-michel-says.html>

⁶³ Associated Foreign Press, "Piracy sidelines third of Taiwan's Indian Ocean tuna fleet", November 26 2010.

⁶⁴ Nincic, Donna "Maritime piracy in Africa: The humanitarian dimension", African Security Review 18.3, Institute for Security Studies, 2009.

⁶⁵ 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

⁶⁶ Nincic, "Maritime piracy in Africa: The humanitarian dimension"

⁶⁷ Meija, Maximo Q., Pierre Cariou and Francois-Charles Wolff, "Is maritime piracy random?", *Applied Economics Letters*, Vol. 16 pp:891-895, 2009

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

⁶⁸ Ahmad, Razak, “Pirates rob tanker as attacks rise in S.China Sea”, *Reuters Africa*, September 6, 2010, <http://af.reuters.com/article/worldNews/idAFTRE6850I620100906>

⁶⁹ Rowling, M. “From Maputo to Mogadishu”, August 1, 2010, Alert Net/Thomson Reuters <http://www.alertnet.org/db/blogs/20316/2010/08/1-154349-1.htm>

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.⁷¹ 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.⁷²

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.⁷³ The Kenya Tourist Board estimates that the number of tourists visiting Mombasa by cruise ships between January and April 2010 declined by 95%.⁷⁴ The Seychelles has also indicated its tourism industry has been severely affected by piracy, particularly for activities such as boat charters.⁷⁵

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.

⁷¹ MARAD, "Economic Impact of Piracy in the Gulf of Aden"; Nall, "The Costs of Piracy Are Passed Along"; GIRO, *Marine Piracy*

⁷² Oxford Business Group, "Suez Canal: International Shipping Changes Course", SeaRates.com, November 16, 2009, <http://www.searates.com/news/4720/>

⁷³ Van Der Linden, "Piracy: Why Kenya Should Care"; BBC News, "Kenya ends trials of Somali pirates in its courts", April 1, 2010, <http://news.bbc.co.uk/2/hi/africa/8599347.stm>. Note that some reduction in tourism in recent years is likely connected to enduring fears of instability following the post-election violence in Kenya in 2008.

⁷⁴ VOA News, "Piracy Forces Kenya Cruise Tourism Down 95 Percent", June 1, 2010, <http://www.voanews.com/english/news/africa/Piracy-Forces-Kenya-Cruise-Tourism-Down-95-Percent-95324914.html>

⁷⁵ Martin, Michele, "National Assessment Report: Republic of Seychelles (2004-2009)" Prepared for UN-DESA and the Government of the Seychelles, February 2010. Note the Seychelles has also publicly stated piracy does not affect tourism, likely in order to continue attracting tourists to the islands. See: Virtual Seychelles, "Tourists Perfectly Safe in Seychelles", 2010, http://www.virtualeyichelles.sc/index.php?option=com_content&view=article&id=603:tourists-perfectly-safe-in-seychelles&catid=42:tourism&Itemid=82; The Independent, "How the Seychelles Became a Pirates' Paradise", February 8, 2010; E Turbo News, "Seychelles tourism safe despite pirate activity", April 5, 2009, <http://www.eturbonews.com/8637/seychelles-tourism-safe-despite-pirate-activity>

Table 11: Macroeconomic Costs to Selected Countries

Country	Indicated Loss Per Year
Egypt	\$642 million
Kenya	\$414 million
Yemen	\$150 million
Nigeria	\$42 million
Seychelles	\$6 million
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

Cost Factor	Value (Dollars)
Ransoms: excess costs	\$176 million ⁷⁶
Insurance Premiums	\$460 million to \$3.2 billion
Re-Routing Ships	\$2.4 to \$3 billion
Security Equipment	\$363 million to \$2.5 billion
Naval Forces	\$2 billion
Prosecutions	\$31 million
Piracy Deterrent Organizations	\$19.5 million
Cost to Regional Economies	\$1.25 billion
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.