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“Robin Hook”: The Developmental Effects of Somali Piracy

Anja Shortland

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Abstract

Naval counter-piracy measures off Somalia have failed to change the incentives for pirates, raising calls for land-based approaches that may involve replacing piracy as a source of income. This paper evaluates the effects of piracy on the Somali economy to establish which (domestic) groups benefit from ransom monies. Given the paucity of economic data on Somalia, we evaluate province-level market data, nightlight emissions and high resolution satellite imagery. We show that significant amounts of ransom monies are spent within Somalia. The impacts appear to be spread widely, benefiting the working poor and pastoralists and offsetting the food price shock of 2008 in the pirate provinces. Pirates appear to invest their money principally in the main cities of Garowe and Bosasso rather than in the backward coastal communities.

JEL Codes: K42, O17, O18, R11

Keywords: Somalia, piracy, cash transfers, economic development, remote sensing, satellite imaging

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Introduction

There is widespread agreement in the academic and naval communities that Somali piracy cannot be resolved from the sea but needs a land-based solution ((Boot (2009), Kraska and Wilson (2008), Menkhaus (2009), Percy and Shortland (2010), Bueger *et al* (2011)). Several years of naval counter-piracy missions have "failed to strategically deter piracy"[1]. Pirates have simply shifted their attacks to ships not adopting best management practice and operate in the open sea to evade counter-piracy measures in the Gulf of Aden (Shortland and Vothknecht (2010)). Since mid 2010 piracy off the coast of Somalia has changed in character.[2] Pirates and navies have become considerably more violent.[3] Because of the increased difficulty of hijacking ships under the noses of warships from over 30 nations, pirates also seem to invest more resources into maximising the return from each captured ship. Ransom negotiations have dragged on for longer and have resulted in new record payments.[4] Moreover, there are assertions that *Al-Shabaab* is offering attractive co-operative agreements to pirates, i.e. piracy might at some stage be funding regional instability and terror.[5] There are therefore strong incentives to try a fresh approach to resolving the issue of piracy off the Horn of Africa.

Given that a large number of interest groups prevent the restoration of effective central governance in Somalia,[6] a land-based solution might involve replacing piracy as a source of income to relevant local communities. However, it is currently far from clear where the beneficiaries from piracy are located (including whether or not the money is mostly channelled abroad) and how widely the benefits are spread. Due to the absence of central government, we lack almost all conventional data on economic activity in Somalia since 1991.[7] The methodological contribution of this paper is therefore to propose and evaluate a number of innovative indicators for economic activity in Somalia.

We firstly evaluate data collected by internationally funded NGOs, monitoring rainfall[8] and regional food and commodity prices[9]. The entries in many of these datasets are too sporadic to allow the creation of reliable time series indicators. They also show large regional variation in prices even in highly standardised commodities, indicating the profound fragmentation of the Somali economy. However, we argue that the presence and absence of data and the extent of unexploited arbitrage gains themselves convey important information about how well (informal) governance functions in Somalia. We show that 1) a significant proportion of pirate ransoms is converted into Somali

[1] Major General Buster Howes, Operational Commander of the EU Naval Forces, Conference on Future of Naval Forces RUSI London 6 July 2011
[2] UN (2011)
[3] Hassan, *Somali Pirates threaten to Kill Korean Hostages* 23 Jan 2011 http://in.reuters.com/article/2011/01/23/idINIndia-54338020110123 and Hulburt (2011)
[4] Interview with Steven Askins, also in Kim *Somali Pirates release South Korean Tanker* Nov 8 2010 http://www.insurancejournal.com/news/international/2010/11/08/114674.htm
[5] AEI *Pirate Threat is Not Going Away* 22 Feb 2011 http://www.aei.org/article/103204
[6] See for example Menkhaus (2007a) and Jeffrey Gettleman, *In Somalia, Those Who Feed Off Anarchy Fuel It*, Nytimes.com, April 25, 2007, at http://www.nytimes.com/2007/04/25/world/africa/25somalia.html
[7] To the extent that these exist they are often rough estimates. For example the population estimate in the CIA World Factbook is based on the 1975 census.
[8] Somalia Water and Land Information Management
[9] United Nations Food and Agriculture Organisation

Shillings, 2) that cattle prices have risen *inter alia* with the development of the pirate industry, 3) that consumers benefit from piracy through lower commodity prices and 4) that piracy has offset the loss of purchasing power of local wages after the 2007 / 08 food price shocks.

Second, we analyse nightlight emissions from Somalia, which have recently been shown to be an excellent proxy for local and regional production and income in statistically challenged countries (Elvidge *et al* (2009), Henderson *et al* (2009)). We note that none of the "pirate towns" on the Puntland coast have enough power output to feature on the global nightlight chart. This supports the contention that coastal communities have not seen the full benefit of piracy. Instead the regional centres of Garowe and Bosasso, which provide the material inputs and the "fire power" of the pirate operations, as well as being less vulnerable to sea-based attacks, appear to benefit from pirate-related inflows. Whereas nightlight emissions in other cities in Somalia were reduced in a series of economic shocks after 2007, Garowe and Bosasso bucked the trend and continued to grow and show increasing income differentials.

Third we analyse changes in the built environment using high resolution satellite images from Eyl, Hobyo and Garowe to corroborate the results above. In Garowe we see massive investment in housing and hotels, infrastructure and religious and educational facilities between 2002 and 2009, with much of the development taking place in the latter part of the period. Eyl and Hobyo, however, have seen much less investment, although the former was often called Somalia's "pirate capital". There are a few more houses and a lot more cars, but the only clearly identifiable "public investment" is a large radio tower in Hobyo, which benefits both locals and pirates. In Eyl the most noticeable changes are a number of new perimeter walls around storage facilities, which suggest tensions in the relationship between pirates and the host community.

While each of the data-sources has significant weaknesses and it was impossible to source data on a number of important control variables, a consistent story emerges regarding the impact of ransom moneys on the Somali economy. The results also square with the assessments of intelligence sources and confirm the insights of the literatures on remittances and aid effectiveness: Somalia retains a deep-seated "culture of sharing" and has developed financial networks to facilitate the spreading of resources within the country (Lindley (2010), Horst (2006), Ali *et al* (2005)). Piracy appears to lead to widespread economic development and hence a large interest group for its continuation. However, Puntland's coastal communities may be open to a negotiated solution which makes them better off than piracy. The international community should bear both these results in mind when developing land-based strategies to resolve Somalia's pirate problem.

The paper is organised as follows: the following section gives some background on Somalia and the business of piracy. Section 3 discusses the available data on economic activity and models the effects of piracy on various aspects of the Puntland economy. Section 4 checks these results against information obtained from satellite images. Section 5 concludes.

2: Background on Somalia

The Political Situation

The United Republic of Somalia was formed from the former British protectorate of Somaliland and Italian Somalia and became independent in 1960. From 1969 to 1991 Somalia was governed autocratically by Mohammed Said Barre. His corrupt administration was based on cold-war fuelled foreign aid and "divide-and-rule" tactics, which generated deep animosities between clans. When Western aid was drastically reduced after 1989, state failure was almost inevitable and a full scale civil war erupted in 1991. Since then Somalia has become the archetypal failed state. Neither the Somali people nor the international community have been able to configure and place a stable and effective government in Mogadishu (Menkhaus (2007a), Soerenson (2008)). Consequently the World Bank's quality of governance data put Somalia right at the bottom of international comparison tables.[10]

However, Menkhaus (2007b) and Leeson (2007) argue persuasively that absence of government does not necessarily mean absence of governance. In Somalia clans[11] have filled the vacuum left by the absence of central authority in the regions and form the backbone of governance. Local courts backed by clan elders, business people and clergy take responsibility for maintaining law and order. In most areas these local governance structures are strong enough for people to transact with confidence, as the success of trust-based money transfer companies in Somalia shows (Lindley 2009). Nenova and Harford (2004) outline some of the innovative approaches of private entrepreneurs in Somalia to substitute for the lack of government public goods provision. Walls (2009) argues that the embedded social norms are strong enough to achieve relatively peaceful consensual governance in Somaliland. Indeed, it can be argued that these informal arrangements provide better development outcomes than the previous, predatory government (Leeson 2007). However, Somalia continues to see episodes of armed fighting as various militias assert rival claims on power. One upshot of this political instability is widespread displacement and poverty. Somalia is one of the poorest countries in the world with per capita GDP estimated at 273 US$. In 2010 Somalia was ranked number 224 out of 227 countries in terms of its GDP *per capita* at PPP.[12] A quarter of the population relies on food aid provided by the World Food Programme.[13] Another symptom of the absence of central government has been the development of a thriving piracy business in the Gulf of Aden, the wider Somali Basin and beyond.

The Somali Economy and the Pirate "Industry"

Few specific details are known about the Somali economy. The IMF's 2009 assessment of Somalia simply stated that the Somali government "has not been able to restore order" and that the "absence of an internationally recognised government and official information about economic and financial developments precludes a full assessment…"[14] The CIA Factbook opines that Somalia has maintained a "healthy informal economy" despite the absence of central government.[15] The CIA estimates that 65% of GDP comes from agriculture and fishing. Most of the industrial production

[10] http://info.worldbank.org/governance/wgi/index.asp
[11] Kinship groups tracing their lineage back to a common ancestor.
[12] https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html?countryName=Somalia&countryCode=so&regionCode=af&rank=224#so accessed August 2010
[13] "Countries – Somalia", World Food Programme, http://www.wfp.org/countries/somalia
[14] IMF (2009) p3
[15] https://www.cia.gov/library/publications/the-world-factbook/geos/so.html

based around food processing collapsed as factories were looted during fighting, but there is a service sector (around 25% of GDP) based around the intermediation of remittances from and telecommunications with the Somali *diaspora*.[16] Hammond *et al* (2011) argue that the Somali *diaspora* is the main contributor to Somali economic development and reconstruction, providing resources for family support, humanitarian and development assistance and investment. Unfortunately, the *hawala* networks used for sending remittances are so opaque that it is impossible to provide accurate figures for the total annual amount of remittances and their variation over time.

Despite the lack of detailed information about the employment and output of the different sectors, we attempt to pin down the relative importance of piracy in the Somali economy. A considerable number of people appear to be directly employed in the piracy business. Kraska and Wilson (2009a) estimated that as many as 5,000 Somali men were working as pirates, divided into five large groups. Firstly there are those directly involved in the hijacking. Pirates generally operate in teams consisting of a "mothership" and two to three small, open, high-powered wooden fishing boats (skiffs). Each skiff's crew generally consists of up to 8 people: One ex-fisherman who is responsible for navigating, one person to operate the technical apparatus and the rest ex-militia men with extensive experience of using firearms.[17] Hijacked ships are steered into Somali territorial waters and anchored a few miles off the coast. The guarding of the ship then tends to be subcontracted to local militias, with up to 50 people on each ship and another 50 on the coast.[18]

The owner of the ship is contacted by experienced negotiators with reasonable English language skills (often former teachers). Some of the hostages (generally including the captain) are taken off the ship and are guarded in local households. This discourages the remaining crew and foreign troops from attempting to take control of a hijacked ship.[19] As the Somali piracy business is based on ransoming the crew, hostages are treated reasonably well. In 2010, the IMB reported 1,016 hostages being taken by Somali pirates and in need of food - creating employment for local cooks, producers and traders.[20] There are even reports that restaurants have sprung up to cater for the needs of the hostages.[21] Individual pirates' profits are estimated at about US$10-45,000.[22] Compared to Somalia's annual *per capita* income of 273 US$, piracy is clearly a financially attractive career for unemployed young men.[23]

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[16] Lindley (2009) and Seikh and Healy (2009) provide overviews of this sector

[17] Hunter, *Somali Pirates living the High Life* 28 Oct 2008 http://news.bbc.co.uk/1/hi/world/africa/7650415.stm

[18] [18]Marc Engelhardt (2009): "Piraten vor Somalia" Zeit online http://www.zeit.de/online/2009/17/piraten-somalia

[19] Interviews with ransom negotiators, see also Walker, *Inside Story of a Somali Pirate Attack*; 4 June 2009 http://news.bbc.co.uk/1/hi/world/africa/8080098.stm

[20] IMB Piracy Report (2010)

[21] Knaup, *The Poor Fishermen of Somalia* 12 April 2008 http://www.spiegel.de/international/world/0,1518,594457,00.html

[22] Gilpin Raymond, (2009); More recent estimates are considerably higher though, in the region of $40,0000. Bahadur *Pirates inc* 23 June 2010 http://www.gaops.com/index.php?option=com_content&view=article&id=326:23-june-2010-pirates-inc-by-jay-bahadur-as-published-in-ft&catid=3:news&Itemid=13

[23] Osma *We are Hungry* 12 Dec 2008 http://www.timesonline.co.uk/tol/news/world/africa/article5327626.ece

A single pirate hijack can result in a ransom ranging from US$500,000 to a record US$9.0 million in 2010.[24] As ransom amounts are often kept as a commercial secret, estimates of total incomes from piracy in Somalia come in all sizes, mostly vastly inflated. About US$40 million were paid in ransoms in 2008.[25] A realistic figure for 2009 is in the region of US$70 million.[26] To put this into context, in 2008 and 2009 the official government budgets of Puntland province were US$11.7 million and US$17.6 million respectively.[27] The proceeds of total official cattle exports from Somalia in 2009 are in the region of US$ 43 million.[28] Piracy therefore potentially generates a large amount of foreign exchange receipts and income relative to the size of the Somali (and especially the Puntland) economy.[29]

The proceeds of piracy are shared between the pirates, the guards, the negotiation teams, the financiers of the piracy expeditions and bribes for local officials.[30] The UN estimates that 40% of the proceeds fund local employment directly, of which the pirate crews get 30% and those employed on the land-side operations 10%. Another 10% is paid in gifts and bribes to the local community, while 50% is paid to the financiers and "sponsors" of the business, which are often said to be based abroad.[31] If the money was invested or spent in local businesses so as to create multiplier effects, it could have a transforming effect on deprived coastal communities, impoverished by years of economic uncertainty and illegal and destructive overfishing.

The testimony of locals interviewed on the effect of piracy on the economy is, however, conflicting.[32] On the one hand, piracy is said to bring a lot of direct employment opportunities to the local community. In addition pirate financiers and ex-pirates are said to be investing in local businesses and contributing to the provision of local governance and public goods.[33] Any form of conspicuous consumption requires employing private security guards around the person, car(s) and compound, generating further employment opportunities.

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[24] Kim *Somali Pirates release South Korean Tanker* Nov 8 2010 http://www.insurancejournal.com/news/international/2010/11/08/114674.htm

[25] Menkhaus(2009), p. 23.

[26] Personal communication Bundespolizei, Luft- und Seesicherheit, Bundesministerium des Innern, Germany. Ship-owners have to clear ransom payments with their domestic authorities before the cash is taken to Somalia. This information on ransom amounts is collected, but it is not publicly available.

[27] Garowe Online, *Puntland Cabinet Passes 2009 Budget* 2 May 2009 http://allafrica.com/stories/200905040544.html. UN (2011) reports similar figures for 2009: Puntland government revenue of US$16mn and piracy revenues of US$ 82mn.

[28] Based on total exports and average cattle prices reported by FSNAU

[29] While the ransom estimates are dwarfed by the estimates of total *diaspora* remittances, the vast majority of remittances are used to cover basic household consumption (Hammond *et al* 2011 p53). Here we are comparing piracy to local drivers of economic activity and the ability of the government to raise taxes.

[30] Knaup (2008) "Prelude to Piracy" http://www.spiegel.de/international/world/0,1518,594457,00.html

[31] UN (2008), Bahadur *Pirates inc* 23 June 2010 http://www.gaops.com/index.php?option=com_content&view=article&id=326:23-june-2010-pirates-inc-by-jay-bahadur-as-published-in-ft&catid=3:news&Itemid=13

[32] Osma *We are Hungry* 12 Dec 2008 http://www.timesonline.co.uk/tol/news/world/africa/article5327626.ece
ABC Radio *Problem Pirates of Somalia* 28 February 2010 http://www.abc.net.au/rn/backgroundbriefing/stories/2010/2826603.htm

[33] Marc Engelhardt (2009): "Piraten vor Somalia" Zeit online http://www.zeit.de/online/2009/17/piraten-somalia

On the other hand there are complaints that the participation of locals in the gains generated by piracy is negligible, because much of it is moved abroad funding property purchases in Nairobi or Mombasa.[34] Money spent on imported status goods such as Sport Utility Vehicles (SUVs) does not create local economic development.[35] Critics of piracy also express concern that the local poor suffer because piracy is generating inflation and disrupting trade flows causing price increases in important commodity prices.[36] Residents in coastal communities often complain that they are not participating in the gains from piracy.[37]

Overall, there is therefore considerable uncertainty regarding the effect of ransom payments on the Somali economy. To create a land-based solution we firstly need to know the proportion of ransoms that actually benefit the local economy. Secondly we need to evaluate the extent to which any inflows create positive or negative spill-overs for local communities and hence the size of the pro-pirate interest group which needs to be "bought off". Thirdly, we need to know where the main beneficiaries of piracy are located.

Literature on Cash Transfers and Economic Development in Somalia

To shed more light on the likely consequences of piracy incomes on the Somali economy, we consult the literature on transfers into Somalia. Transfers come in the form of remittances from the Somali *diaspora* and (probably less importantly) foreign aid. Country experts point to a deep-rooted "culture of sharing".[38] Well-off people raise their social status by sharing resources within social (mostly clan-based) networks, where individuals have an obligation to assist other members. A Somali proverb says: "The man who owns 100 goats, but his relatives have nothing, he is poor".[39] There is a clear economic rationale for this cultural norm in a pastoral and nomadic society in an arid and therefore marginal environment. Dispersing investments and assets geographically within the wider clan is a very effective risk reduction strategy when entire herds are regularly wiped out by drought or conflict (Horst 2006). The large financial networks that have sprung up to facilitate the remittances of the worldwide Somali *diaspora* to family back in Somalia or in refugee camps in Kenya are a testimony to the strength of this tradition of sharing resources. Recipients of remittances in Somalia often further share the remittances locally (Lindley 2010). Leeson (2007) backs this up with the observation that Somalia has been able to improve its performance on a number of human development indicators despite the absence of government.

[34] Associated Press, *Somali Pirates behind Kenya Property Boom?* 1 Jan 2010 http://www.msnbc.msn.com/id/34661327/; Inside Somalia *Nairobi: Somali capital is Pushing up Property Prices* 29 June 2009 http://insidesomalia.org/200906291404/News/Business/Nairobi-Somali-capital-is-pushing-up-property-prices.html

[35] Hareper, *Growing Sophistication of Somali Pirates* 11 April 2010 http://news.bbc.co.uk/1/hi/world/africa/7995170.stm

[36] Hunter, *Somali Pirates living the High Life* 28 Oct 2008 http://news.bbc.co.uk/1/hi/world/africa/7650415.stm ; http://news.bbc.co.uk/1/hi/world/africa/8103585.stm

[37] Knaup, *The Poor Fishermen of Somalia* 12 April 2008 http://www.spiegel.de/international/world/0,1518,594457,00.html

[38] E.g. Ali *et al* (2005) p 11

[39] Cited in Lindley (2010) p73

Further evidence for a deep-seated culture of sharing and a well developed financial infrastructure comes from NGOs delivering aid to drought-stricken communities in central Somalia using cash transfer programmes (Majid (2006), Ali *et al* (2005)). Despite considerable skepticism in the aid community about the effectiveness of cash as an instrument in humanitarian response, Oxfam, Horn Relief and Norwegian People's Aid evaluated their cash relief programmes as successful. Aid was well targeted at the most vulnerable households identified at consensual meetings at the village level. There was minimal evidence that funds were diverted to the better off or misused to buy *khat*[40] or weapons. The local cash transfer companies were well able to handle the volume of transactions. Mostly the money was used to repay loans, which unblocked previously frozen credit lines, benefiting poor pastoralists, local traders and water trucking companies.

Finally, whenever well-off people choose to engage in conspicuous consumption, this generates local employment, even if the goods are imported. Conspicuous consumption in Somalia requires private protection: owning a car also requires the employment of a chauffeur and at least one armed guard, preferably several. Owning a "nice villa" requires a watchman or members of the wider family to look after the property whenever it is empty (Lindley 2010). A Somali interviewee summed up the two ways in which one could gain social status in Somali society as the following: "Sharing - and the conspicuous consumption of security".

The related literature therefore suggests that the most likely developmental effect of piracy would be one of widespread but incremental progress rather than conspicuous consumption by the few. Interviews with pirate bosses back this up, too. Pirate chief Abshir Boyah questioned on how he spent his considerable profits from piracy simply referred to his extended clan network: "it's not like three people split a million bucks. It's more like three hundred." Another pirate boss, Mohamed Abdi laughed off the UN threat to freeze pirate assets: "What assets?"[41]

3. Data analysis

3.1. Data

Somalia does not have a statistical service. However, a number of NGOs are collecting data to monitor threats to food security in this poor, conflict-ridden and drought-prone country. In the following section we introduce these data and data sources to capture various aspects of development in Somalia, explore their interrelations and how they are affected by the growth of piracy in Puntland.

3.1.1. Dependent variables

[40] A mild narcotic imported from Ethiopia ,the Arab peninsula or Kenya
[41] Gettleman, The Pirates are Winning 14 Sept 2010
http://www.nybooks.com/articles/archives/2010/oct/14/pirates-are-winning/

The data used were obtained from the Somali Food Security and Nutrition Analysis Unit (FSNAU), an NGO funded by a number of international donors.[42] The FSNAU's work in Somalia is concerned primarily with food security among the poorest in Somali Society. For this purpose it reports commodity prices and daily wages in regional markets in Somalia, as well as collecting information about exports of goats, sheep, camels and cattle. Price data are collected every Monday and averaged over the month. If no price is available for a certain commodity, then this generally means that it was not traded during the period.[43]

Wages

FSNAU reports the daily wage rate for occasional labourers presenting themselves for work at the local market. The first observation to make about daily wage rates is that wages differ widely between the markets. The highest wages are paid in Somaliland, which has managed to create political and economic stability. Similarly high wages are paid in the border regions with Kenya where cities are said to be of "strategic importance" - especially during times of heightened security issues.

Because most hijacked ships are taken to the Puntland coast during ransom negotiations, [44] we focus on the three provinces that make up Puntland: Bari, Nugal and Muduq, of which the latter two contain the main pirate towns of Eyl, Hobyo and Gharadeere. In Bari data are collected in Bosasso, which is a thriving trading centre based around a harbour handling much of Somalia's imports and exports. For Nugal and Muduq data are from the regional cities of Garowe and Galkaio respectively. As a comparator we use the Southern coastal province of Banaadir, which includes Mogadishu. From diagram (1) it appears that nominal daily wages in the pirate provinces of Nugal and Muduq have caught up with or even overtaken the non-pirate regions since the explosion of piracy (and hence ransom incomes) in 2008.

However, when we calculate the "real wage" by dividing the local wage rate by the local price of a staple (1kg of rice or sorghum), it becomes clear that people in the pirate provinces do not feel that they have gained from piracy, because nominal wage gains have been entirely offset by the food price increases of 2007/08 (diagram 2). Puntlanders have made gains – but only relative to the rest of the country, where the food price increases have massively eroded real wages. In the analysis below, therefore, we analyse real wages in Puntland with Banaadir as a comparison.

Exchange rate

The Somali Shilling is neither backed by a government, nor is there any monetary authority. Many transactions are conducted in US$, but the Somali Shilling continues to circulate and is used in transactions locally. It appears to be simply upheld by "common assent" and remittances from abroad.[45] We evaluate the effect of piracy on the average exchange rate across markets to examine

[42] http://www.fsnau.org/
[43] Personal communication with Kamau Wanjohi, data manager at FSNAU
[44] "Puntland remains the epicentre of piracy..." according to UN (2011) p14
[45] Somalis also referred to the Shilling's greater "legitimacy of utilisation" in a climate of suspicion or hostility regarding the USA in interviews. The Economist, *Commerce Among Chaos*, Feb 10 2011 http://www.economist.com/node/18119051

the macro-economic effects of the development of a new industry generating foreign exchange. We compare the effects of piracy on the exchange rate to other export sectors to gauge how much of the ransom payments find their way into local currency transactions. Because the exchange rate is trending upwards we analyze the percentage depreciation in the month-on-month SSh / US$ rate. This series is stationary.

Cattle Prices

We use the SSh price of "local quality" cattle in regional markets as a proxy for spill-over effects of piracy into the wider economy. "Local quality" cattle are an investment rather than a consumption good (the main meat consumed being mutton or goat) and are distinct from "export quality" cattle. *Ceteris paribus*, cattle price increases related to piracy would indicate that local nomadic communities are participating in the gains from piracy.

Rice prices

We use month-on month changes in the average price charged for 1kg of the food staple "imported red rice" as tracked by FSNAU to determine whether there are inflationary effects of ransoms (proxied by lagged successes). We also test whether there is evidence that increases in the total number of incidents deter overseas traders.

3.1.2. Variable of Interest: Piracy

Information on pirate attacks is published annually in the International Maritime Bureau's Annual Piracy Report. The IMB publishes narratives on all incidents of piracy reported (voluntarily) by captains and ship-owners. From the narratives we can distinguish between successful and unsuccessful hijacking attempts. One way to measure the strength of the piracy "industry" is a count of the number of all the reported incidents in the relevant month. Perhaps more relevant from the point of view of local development are the incidents of successful piracy. We code as a "success" any reported incident where the pirates either stole property from the ship or (most often) hijacked a ship and ultimately extracted a ransom payment from the owners. We use several lags of this variable, as ransom negotiations take some time to conclude.

In the analysis we use the (lagged) total number of incidents of piracy, the incidents of piracy averaged over the last 6 months and the (lagged) incidents of successful piracy. The former measures the impact of the industry as a whole on the economy, while the latter captures money inflows through ransom payments. As successes are subset of total incidents (and highly correlated) they are not simultaneously statistically significant.

3.1.3. Control variables

Governance / Infrastructure / Instability

Somalia has slowly rebuilt its physical and institutional infrastructure after the high intensity phase of the civil conflict in the 1990s. However, outbreaks of violence have continued in recent years,

with varying degrees of intensity and the geographic spread. We would expect trading activity to be aided by improvements in institutional and physical infrastructure and reduced when conflict intensity increases. In the absence of concrete information on monthly variations in governance quality we construct a number of innovative proxies for violent conflict and the ease of trading and contracting.

We use data collected by the Somalia Water and Land Information management agency (SWALIM).[46] SWALIM is funded by development agencies, the EU and the United Nations. It attempted to rebuild the data collection network for rainfall and river stream-flow data in Somalia following the civil war. Data collection simply required locating a measuring gauge in a particular way, reading daily data and sending a monthly report in the post. Although the well resourced SWALIM was an exceptionally attractive employer, it found it very difficult to reach many of the old stations and in several cases had to site stations in alternative locations.

Once a station was under contract, rainfall data are often patchy. Occasionally contracted stations simply did not submit a report to SWALIM, so that days or whole months are missing (diagram 3). Apparently this was generally linked to a worsening security situation – i.e. staff could not leave their homes or fled the area because of territorial disputes.[47] Several stations were discontinued after reporting lapsed for a number of months, which explains the occasional drop in the number of stations contracted. In July 2009 manual rainfall data collection was abandoned in favour of computerized data collection in a small number of locations. For this reason we have extrapolated the data through 2010 at the last observed level.

- **Contractual environment:** We use the percentage of pre-war stations contracted as a proxy for the feasibility of entering into a long-term contract / supply relationship and building (very) basic infrastructure.

Analogous to the missing rainfall data above, the market data provided by FSNAU often miss observations for a number of markets in the time series. Again this is caused by traders not trading in a market because of a worsening security situation, or because the observer was unable to travel or otherwise obtain the information (diagram 4). A further interesting feature of the FSNAU commodity datasets is the considerable spread of prices between markets. Even in commodities which are high value to weight, large gains from arbitrage remain unexploited. For example the exchange rate between the US$ and the Somali Shilling exhibits large regional variations – even though *hawala* networks ensure that traders would not have to travel with cash US$ between regional centres to take advantage of arbitrage gains (Diagram 5a).[48] The standard deviation of the exchange rate as a percentage of its mean value is therefore proposed here as a proxy of local monopolies and information problems. The much larger variation in the local rice and sorghum prices occurs because of the additional problems encountered merchants who have to physically transport their goods to markets over rickety physical infrastructures and with the need to make

[46] Somalia Water and Land Information Management (SWALIM), *www.faoswalim.org.*
[47] Information reported by SWALIM
[48] Ali *et al* (2005) note that within a single province (Sool) beneficiaries of US$ denominated cash relief faced exchange rate variations of 35%.

arrangements for private protection against opportunistic gangs. We use the following proxies constructed from the FSNAU market data:

- **Instability / Missing markets**: Number of markets in which no rice (or alternatively sorghum) price was reported for a given month.[49]
- **Unexploited Arbitrage gains**: We use the standard deviation of the rice and US$ exchange rate relative to the monthly mean as a proxy for local monopolies and the ease of trading and safe movement inside Somalia. (Diagram 5b)

Finally we use a **UIC dummy** to control for the period of the rule of the **U**nion of **I**slamic **C**ourts from June to December 2006. This period is generally considered to have been the most successful administration in delivering governance and stability in Southern and Central Somalia over the last 20 years.[50]

Exports

We use the FNSAU data on the exports of cattle from Somali harbours to control for legal foreign exchange earnings, the effect of livestock export bans and as another indicator for the ease of doing business and transporting goods over large distances. In months when the FSNAU did not report any export figures, we have assumed that no exports took place because the situation was too chaotic to risk transporting these important assets.

Seasonality

Trading could also have a seasonal pattern. This might be either because of the increased availability of certain types of agricultural produce at certain types of year, or because trade winds make the transport of goods easier or more difficult at certain times of year. Finally, Ramadan might be a special time for trading activity. We included dummies for the timing of the Ramadan and the monsoon seasons and report them where appropriate.

World Market Prices

We use the FAO food price and cereal price indices to control for food price changes worldwide. There was a major hike in food prices in 2008, which was only partially reversed in 2009 and 2010.

Time effects

A count variable was included in some model specifications to strip out possible pure time effects in prices and exchange rates. Because the ineffective transitional governments have been unable to generate tax revenues, they occasionally have new bank notes printed abroad to cover expenditures, generating inflation. Similarly, it is possible that social networks, governance and infrastructure were simply rebuilt over time as the country recovered from the ravages of the high intensity civil war. However, the proxies for quality of informal governance (which are highly

[49] Missing rice and sorghum markets are correlated but not identical. Rice is imported and is therefore well represented in coastal markets with more sporadic availability in the centre and *vice versa* for the Sorghum produced in the interior.

[50] Menkhaus (2007a)

correlated with the count variable) outperformed the pure count variable, which is therefore not included in the models reported below.

3.2. Methodology, Results and Interpretation

We either used differences or deflators to create stationary time series or included lagged variables to strip out time effects. We use Ordinary Least Squares regression and checked that the residuals do not exhibit a time trend and are normally distributed. Where we analyse regional time series, we have not interpolated or otherwise replaced missing values, as these are mostly associated with difficult circumstances for trading or observing trading. Where we analyse average price series, we have calculated the average across all markets that are reporting data for the month.

3.2.1. Wage regressions

The regression the real wage series are shown in table 1. The real wages of casual workers in Bari, Muduq and Nugaal have risen significantly in response to the establishment of the piracy industry.[51] Partially this may reflect the direct employment effects, but it is likely to also reflect effects of ransom-funded investments into local businesses and construction activities. Interestingly no such effect is observed for Banaadir, which has a long coastline and several ports, but only sees very occasional acts of piracy. This result may help to allay concerns about the result being driven by reverse causality, i.e. the Somalis going a-pirating in response to deteriorating living standards.[52]

Of the control variables we see the expected effect of the erosion of real wages when international food prices rise and with the depreciation of the Somali Shilling. The positive and significant coefficient on the UIC dummy indicates that casual labourers benefited from improvements in security and governance under the Islamist rule, in line with Menkhaus (2007a) and that this effect was particularly strong in the Banaadir region. However, the negative coefficient on the missing markets variable suggests that some forms of labour might benefit from local instability. This could be because some of the occasional labourers are drawn into local militias (i.e. increased demand for labour) or because people migrate, reducing the supply of available workers. Cattle exports have the expected positive effect on wages indicating that greater demand for a domestically produced good improves opportunities for local labour. Finally the South West Monsoon which makes the import of foreign goods more difficult reduces wages - probably through reduced demand for labour involved in trade, transport and production relying on foreign imports.

[51] We report the 6 month moving average, but qualitatively the same result is found for a 5 month moving average or the natural log of (1+monthly intensity).

[52] In any case pay-offs from the pirate business far exceed the returns from casual labour. Pirate kings in addition tend to recruit people who own guns – i.e. not poor casual workers. Changes in the daily wage rate are therefore unlikely to have much of an impact on potential recruits. Bahadur, *I'm not a pirate*, 16 April 2009 http://www.timesonline.co.uk/tol/news/world/africa/article6100783.ece

3.2.2. Exchange Rate Regressions

The results for the exchange rate series are reported in table 2. The regressions indicate that piracy works exactly in the same way as the cattle export sector by supplying additional US$, raising the price of the Somali Shilling (table 2). However, it seems to take some time (5 months) before successful hijackings translate into increased demand for Somali shillings. Given that ransom negotiations generally took between 2-4 months, this suggests that pirates conduct their transactions in a parallel US$ economy.[53] The effects of piracy on the exchange rate are only in the second round of spending as those paid by pirates in US$ exchange this into local currency.

Comparing the coefficients of the cattle and pirate success variables, a single success was on average "worth" 1650 cattle to the SSh exchange rate. At 2009 average cattle prices this means that in the region of US$ 450,000 flow into the SSh-denominated local economy. While this is low compared to recently reported ransom records, one should bear in mind that until late 2008 ransoms tended to be below US$ 1 million. Also, a significant proportion of hijacked ships are "small fry" such as fishing trawlers and Dhows rather than fully loaded supertankers. With 44 successful hijacks in 2009 the result suggests local residents in Somalia gained around US$21mn out of total payments of US$ 70mn. This is very close to the UK Foreign Office and MoD estimate based on local sources that about one third of ransoms stay in the country.[54] The United Nations' (2008) estimate that 50% of the ransoms was paid out locally (in wages and bribes) is slightly higher, but this includes dollars that continued to circulate in parallel to the Somali Shilling and dollars used to fund imports of equipment, luxury goods and *khat*.

Of the control variables, we see that the international rise in food prices had the expected effect of increasing the rate of depreciation of the SSh, as additional US$ were needed to pay for imports. There is also a significant effect of regional price variation on the exchange rate. When markets are thin and traders charge monopoly prices it appears that customers respond by reducing their purchases of foreign currency and imported goods.

3.2.3. Rice prices

Table 3 reports the results for the rice price series. The average rice prices in regional markets in Somalia have, if anything, fallen due to piracy. The food price rises observed when piracy exploded in 2008 were due to international rather than local or national developments, as shown by the highly significant FAO food price index. Claims about piracy creating inflation are therefore likely to have been caused by confusion about trends in international food prices. The result that the growth of the pirate industry has lowered the average price of imported rice (over and above their positive effect in raising the purchasing power of Somali Shillings discussed above) might be explained by pirates providing local governance and stability which has the side effect of helping other

[53] Cars are imported and therefore require hard currency, real estate appears to be priced in US$.
[54] Personal communication received at a Cabinet Office hosted cross-Whitehall meeting in London in March 2011

entrepreneurs to trade more easily as well.[55] An alternative explanation might be that trucks acquired by successful pirates are used for transporting merchandise.

The rest of the control variables also have the expected signs. Exchange rate depreciation raised the domestic currency price of the imported rice. The North-East trade wind significantly lowers the cost of transporting imports across the Indian Ocean. Our proxies for quality of governance and ease of trading show that the rice price rises when traders have greater monopoly power (i.e. when regional variation in exchange rates increased) and was reduced as contracting over large distances became more reliable.

3.2.4. Cattle Prices

From the cattle price regressions reported in table 4 we have evidence that piracy drives up the price of this investment good, benefiting pastoralists by raising the value of their assets.[56] In all provinces we see that the general strength of the pirate industry is associated with an increase in cattle prices. In Muduq an alternative model specification shows that we can link increases in cattle prices directly to pirate successes in the past. If a count variable is included in the regression (which has a correlation coefficient of 0.72 with piracy) the piracy coefficients and significance levels are slightly lower, but the statistical significance of the piracy variable is retained in Bari and Muduq.

3.3. Summary

To summarise, our data analysis indicates that there are widespread and significant benefits to the Somali economy from pirate incomes. Although only a fraction of ransoms are exchanged into Somali Shillings, the resulting appreciation of the Somali Shilling benefits people relying on imported food staples benefit from greater purchasing power. There are clear "trickle-down" effects from pirates and other beneficiaries of ransoms employing casual labour. Pastoralists also benefit from increasing affluence and investment through higher cattle prices. Although there are concerns about data quality, our estimate of local intermediation of the ransoms based on the exchange rate model is very close to estimates based on traditional intelligence sources, giving the analysis additional credibility.

We also see that there is significant explanatory power in the unusual proxies for changes in the business environment as Somalia rebuilt itself after the civil war in fits and starts – despite lacking a central government. Missing markets, changes in the extent of local monopoly power and the ability of a well-funded organization to contract effectively over long distances appear to capture important aspects of the quality of informal governance in Somalia.

[55] See for example Gambetta (1993) about the use of mafia-provided "protection" by ordinary citizens

[56] An additional control variable tracking the number of cattle exports does not have a statistically significant coefficient, indicating a clear market segmentation between "local" and "export quality".

From the analysis above we were able to demonstrate the positive impact of piracy in the regional centres of Puntland where the FSNAU collects data. In the following section we go a step further and try and pin down local effects and identify the main beneficiaries of piracy within Puntland.

4. Evidence from Satellite Images

4.1. Nighttime light emissions

There is now a growing awareness of the potential applications of satellite imagery of the earth in the social sciences. There are a number of studies demonstrating the relationship between night-time light emissions and economic parameters such as urban development[57], economic activity[58] and poverty[59]. The use of this approach seems to be particularly promising in the context of an underdeveloped country such as Somalia, where data collection is sporadic and unreliable and where changes in light emissions are a clear sign of changes in disposable income rather than changes in environmental awareness.

Most of Somalia's electrical infrastructure was damaged or destroyed in the civil war. The main company responsible for electricity generation and supply in Somalia is the government-owned Ente Nazionale Energia Elettrica (ENEE), but there are also some private providers. ENEE's electricity generations facilities are predominantly located around the capital Mogadishu and some in the major towns of Puntland and Somaliland. Neither of the three pirate settlements has a power-station. Electricity generation is primarily at the household level using Diesel generators, which are unaffordable (to buy or run) for poor households. However, private entrepreneurs offer electricity contracts to neighbouring households using second-hand generators bought in Dubai (Nenova and Harford 2005), thereby providing access to electricity to less well-off urban people.

We used the nightlight pictures available from NOAA satellite and information systems from 2000-2009.[60] The images are annual records of "stable nightlights", i.e. a composite of all images of each location taken by a series of satellites each evening over a year. The detected light emissions are a function of several factors, including emitted intensity, the size of the target and emission wavelength. Individual camera shots are disregarded if there is cloud cover or moon glare. Lights which only occur occasionally are excluded to ensure that the dataset does not record lights emitted by fires or thunderstorms. The intensity of light emissions is measured on a scale of 0 to 64, of which observations at the bottom end of the spectrum (1 to 3) are censored to reduce noise in the data.[61]

At the sensor system's brightness setting used for illustrating global nightlights Somalia is not visible at all. Increasing the brightness setting Mogadishu, Hargeisa and Bosasso are the first settlements to appear. None of the well known pirate villages, Eyl, Hobyo or Gharardeere emit sufficient light to be

[57] Imhoff *et al* (1997)
[58] Gosh *et al* (2009), Henderson *et al* (2009)
[59] Elvidge *et al* (2009)
[60] http://noaasis.noaa.gov/NOAASIS/ . We used the imagery provided by the most recently launched satellite for each year.
[61] See Henderson et al (2009) for more details

visible on the nightlight images available from NOAA, even when using the maximum brightness and contrast settings in Adobe Photoshop Elements 7.0 (diagram 6). The only visible coastal settlement in Puntland is Bosasso on the Northern coast bordering the Gulf of Aden. This is the principal city and harbour of Puntland as well as the capital of the province of Bari. The capitals of the provinces Muduq and Nugaal (Garowe and Galkaio) are also visible on the nighttime images and increase in brightness and size over time.[62]

4.1.1. Analysis

The nightlights analysis tracks 15 cities in Somalia from 2000-2009 for which nighttime lights appear regularly in the NOAA Images.[63] We used ArcGIS (9.3) software. We discarded all zero observations and created a polygon around each city for each year. We used the Spatial Analyst tool to extract the following information from each city's nightlight image: The total amount of light emitted from each city-polygon, the total number of lit pixels detected by the satellite and the light intensity score of the brightest pixel.

Total electricity consumption increases over time in Puntland and Somaliland. This is likely to reflect both reconstruction after the civil war and *diaspora* remittances supporting consumption and development: "a tide that lifts all the boats." After 2007, however, we see a marked downturn in total light emissions in 12 of the 15 cities; the exceptions are Garowe, Bosasso and Kismayo (diagram 7). The pronounced general decrease in light emissions can be linked to the massive increases in global food and energy prices in 2008, the beginning of below average rainfalls across the country, the resumption of violence in South Central and potentially a slowdown of *diaspora* remittances as the global economy began to suffer from the financial crisis.

The pattern of total lit areas of the towns confirm the generalized decline in electricity consumption in Somalia after 2007 – we see that many poor or less densely settled areas completely disappear from the nightlights images (diagram 8). In Garowe and Bosasso the decline is delayed to 2009, but it does occur.[64] The only city to increase its light footprint is the harbor city of Kismayo in South Central. Kismayo was captured by the Islamist *Al Shabaab* militia in August 2008. It appears that basic provision of electricity was restored in the town by the *Al Shabaab* administration in 2009.

Finally we examine the light emissions from the brightest pixel in each city as a proxy for changes in wealth and disposable income of the richest (diagram 9). There are only three cities in the dataset where the brightest nightlights of 2009 exceed those of 2007: in Hargeisa (rising from 48 to 50), Garowe (9 to 12) and Bosasso (20 to 25).

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[62] Generally speaking an increase in light emissions can create "bleeding", or spillovers from the brightly lit pixel into adjacent pixels and therefore the perceived change in size of the settlement can reflect either an increase in size or greater electricity consumption. However, in Somalia, none of the pixels is even remotely close to saturation and the observed growth can therefore be attributed to changes in settlement size.

[63] Baydabho, Beletweyne, Berbera, Boraama, Bosasso, Burao, Erigavo, Galkaio, Garowe, Hargeisa, Jowhar Kismaio, Lasanood, Mogadishu, Quardho. Berbera, Hargeisa and Mogadishu are considerably larger and richer than the other cities and are therefore excluded from the illustration graphs.

[64] Majid (2010) shows that during 2009 there was a shift in the cattle trade from Bosasso to Berbera.

4.1.2. Result and interpretation

To summarise the results of the nightlights data: disposable income in Somalia has declined considerably due to adverse local, regional and global developments since 2007, hitting the poorest particularly hard and generally also affecting the richer sections of society. The only two cities which deviate from this general pattern are Garowe and in Bosasso where the growth in electricity of consumption of the richest has more than offset declines in the spending power of the poor. Both cities are generally perceived to be closely associated with piracy. Indeed, the growth spurt of both cities begins after 2005, which is perceived to be the watershed in terms of transforming piracy from the extraction of on the spot fines to hijack and ransom operations. It accelerates with the "explosion" of piracy in the Gulf of Aden in 2008.[65]

Garowe is at the heart of the pirates' tribal heartland (Hansen (2009)). Naval intelligence officers interviewing captured pirates established that the heavily armed boarding teams tend to come from the interior and specifically Garowe, with only a hired fisherman / navigator from the coast.[66] Bosasso has long been a pirate port. Nowadays, however, officials in Bosasso make a show of co-operating with foreign naval forces and pursuing pirates. Ransom negotiations have not been conducted from the vicinity of Bosasso since the international naval mission started.[67] Bosasso's prison is said to house a significant population of pirates.[68] Nonetheless, Bosasso is the main port for importing pirate equipment such as communications technology, motors and weapons. There is also unlikely to be a problem with successful (ex-) pirates investing their newly-found wealth in businesses and real estate in Bosasso.[69]

According to the nightlights data, smaller coastal towns seem to gain little from the pirate business carried out in their local waters.[70] Although piracy creates local employment, coastal communities may be missing out on investments as they are vulnerable to strikes from the Southern Somali militias (Islamists have taken over Gharadeere and Hobyo in the past) and foreign military aircraft patrolling the coast.[71] The final part of the analysis will therefore consult high resolution daytime images to track changes in development in three locations associated with piracy.

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[65] Kraska and Wilson (2009b)

[66] Interviews with naval intelligence officers.

[67] Bahadur, *I'm not a pirate*, 16 April 2009
http://www.timesonline.co.uk/tol/news/world/africa/article6100783.ece

[68] Garowe Online *Puntland Fighting Al Shabab Arresting Pirates* 15 September 2010
http://www.garoweonline.com/artman2/publish/Somalia_27/Somalia_Puntland_fighting_Al_Shabaab_arresting_pirates_UN_report.shtml
Horseed Media*, 11 Pirates go on Trial in Bosasso Court;* April 2010
http://horseedmedia.net/2010/04/24/somalia-11-pirates-go-on-trial-in-bosaso-court-puntland-semi-autonomous/

[69] Both Foreign office and MoD officials rejected the alternative hypothesis that the observed effect is due to Bosasso elites receiving financial transfers from the counter-piracy operation. Personal communication received at a Cabinet Office hosted cross-Whitehall meeting in London in March 2011

[70] Past US air-strikes in Somalia have occurred in broad day-light. http://www.cfr.org/somalia/terrorism-havens-somalia/p9366 It is therefore unlikely that the pirate villages are following a "black-out" policy to reduce the likelihood of night-time attacks.

[71] Garowe Online *Puntland Forces Arrest Wanted Pirates* 18 May 2010
http://allafrica.com/stories/201005180912.html

4.2. Analysis of high resolution daytime images

We compare high resolution satellite images of the coastal pirate towns of Eyl and Hobyo as well as the provincial capital Garowe before and after the explosion of piracy in 2008. Before 2008 the area was not surveyed frequently (less than once a year), as it is of little commercial interest. Several of the few images were partially obscured by clouds making them unusable. Our chosen imagery of Eyl was collected on 24 Sep 2005 by IKONUS and 05 Jul 2009 by GEOEYE. Imagery of Hobyo was collected by IKONUS on 04 Jul 2006 and by GEOEYE on 24 Jun 2010. The imagery of Garowe was collected by IKONUS on 12 Feb 2002 and by GEOEYE on 13 Jul 2009.[72] Each image was available in orthorectified format, full colour and (almost) cloud free. Spatial ground resolution of the IKONUS was approximately 100cm and approximately 50cm for GEOEYE. Photoshop [elements 6] and Arc impression media software enabled both manipulation and additional image enhancement and management. The resultant images were viewed on a high resolution monitor and printed for stereoscopic viewing.

Since the images were taken at different times and with different angular fields of view it was possible to use stereoscopes to provide pseudo 3D images of extant structures and to enhance the detection of change. We focused on changes in settlement size, investment in large scale buildings and improvements in local infrastructure.[73] The essential factors in object identification were its overall shape, its size, any shadow, its colour and tone and the related features (e.g. its position, location and any associated activity).[74] Ground based imagery sourced from the internet was used for scene familiarisation and to verify the overhead imagery interpretation.

4.2.1. Image Analysis Eyl

The town of Eyl has two areas, a lower part situated directly on the coast and an upper part further along a valley, presumably to provide shelter from wind or sea-borne raiding parties. There are no significant changes in the size or housing density of either settlement, which we call the 'Fishing village' and 'Main town' below. In the fishing village the rather crude system of gravel roads and paths remain unaltered although some small increase in vehicle numbers was observed. Some houses - probably private homes - have also been improved with new roofing and a few newly built. The fishing fleet of small boats has largely remained unaltered and there is no upgrade of harbour facilities. Some new, fortified storage (?) buildings have been built and older ones are surrounded by high perimeter walls in the later image (diagram 10). While perimeter walls are an integral part of domestic architecture (for religious reasons), for storage buildings this was not common practice until 2005. The development suggests a combination of a rising value of stored "goods" and community tensions.

A similar situation is seen in the main town (Diagram 11). The roads and paths infrastructure is not changed significantly as it might have been if any major scheme for town improvement was

[72] There were no usable images of Gharardeere.

[73] We were unable to source images taken at the same time of year, so we are unable to compare cultivation activity over time.

[74] Hamshaw-Thomas (1916), Oxlee (1997 and 2000)

underway. However, there appear to be significantly more vehicles in the town. A small number of new (private) houses have been constructed, mostly on the northern edge of the town and the roofing has been upgraded on others. There are two new large buildings in the centre of the town, which do not have any cars around them, making it unlikely that they have civic or retail functions. The most noticeable changes to existing structures are again the massive perimeter walls erected around a number of residential and non-residential buildings, including a compound with two layers of security walls. Given that when the first image was taken in 2005 Somalia had already experienced 16 years of internal conflict, it is highly likely that the new walls are related to piracy.

Photographic images from Eyl show that most of the housing is of poor quality with flat roofs, while the new houses have pitched roofs and appear to be of a higher quality. In interviews many successful pirates say they bought "a house and a car" with their ransom moneys (Hansen 2009, p40). The limited new-builds and home improvements in Eyl could well be associated with the fishermen hired by inland pirate financiers for their navigational skills. The rest of the population does not appear to be earning more than a fistful of dollars from the piracy business, nor is there investment in infrastructure which could be used by the local population, such as roads or harbour facilities. Interviews with residents show considerable local scepticism about the benefits to the local community from piracy and several grass-roots anti-piracy initiatives led by clerics have taken place.[75] The high perimeter walls around major compounds in Eyl suggest that pirates were concerned about deteriorating community relations and ready to defend their properties and hostages, in case of an anti-pirate backlash, as had already happened elsewhere.[76] Indeed, the UN (2011 (p14)) reports that the Puntland authorities concentrated their land-based counter-piracy operations in 2010 on Eyl, leading to the relocation of pirate activity towards Hobyo and Garacad. This would not have been possible without local support.

4.2.2. Image Analysis Hobyo

Hobyo is a small settlement of around 5,000 people surrounded by encroaching sand dunes. The local elder Abdullahi Ahmed Barre s' complaints "We have no schools, no farming, no fishing. It's ground zero here" and "The nearest hospital is an eight-hour drive on a rough road"[77] are backed up by the image analysis. There is no evidence of upgraded road infrastructure, nor has Hobyo grown significantly in size. However, there are some signs of increased private affluence: traffic in Hobyo appears to have increased and some alterations to existing buildings are evident. There are also a few new, larger than average, thickly walled dwellings concentrated on the town's northern end. Hobyo has a small beach area away from the town where boat launching takes place. The launch place has not changed, although there is marginally greater activity on the later imagery.

[75] http://news.bbc.co.uk/1/hi/world/africa/8103585.stm, http://www.youtube.com/watch?v=XJbAY46L2wo&NR=1
[76] BBC News *Somali Vigilantes capture Pirates* 28 April 2009 http://news.bbc.co.uk/1/hi/world/africa/8022820.stm
[77] Jean-Marc Mojon *In the heart of a Somali pirates' lair* 2 Sep 2, 2010 http://www.garoweonline.com/artman2/publish/Somalia_27/In_the_heart_of_a_Somali_pirates_lair.shtml

The main change to Hobyo's infrastructure is a new, heavily secured communications centre with a very tall microwave broadcasting relay tower on the northern end of Hobyo (diagram 12). Telecommunication is an important economic sector in Somalia with several competing networks, funded by *diaspora* investment. City skylines are often dominated by large communication towers.[78] Since the systems are more or less line-of-sight, such towers are tall; the lattice construction ameliorates the impact of high winds. Signals are received by microwave dish aerials, amplified and sent on to the next relay or terminal. Radio and telephone signals for local consumption are beamed omni-directionally to the immediate area. Hobyo's relay tower seems to operate in several directions as it has a number of differently aligned dishes.

On the (2009) satellite image of Garowe there are three comparable telecommunications towers, as well as other considerably smaller and/or less complex masts. There is no telecommunications tower on our image of Eyl. The question is therefore, why Hobyo, a remote and impoverished provincial backwater, has a telecommunication facility to rival the state of the art facilities in Puntland's capital city.[79] Piracy is the most probable explanation for this first-rate installation in Hobyo, which as cited above lacks most other public facilities. The extreme height of the Hobyo mast indicates that it serves a large area. Its outreach to sea is probably more relevant than its ability to broadcast to the surrounding desert. Hijacked ships are moored a distance of several nautical miles from the coast, as there are no harbour facilities and it is easier to guard ships from rival gangs in the open sea. Reliable telecommunications are needed to ensure that ships are appropriately guarded and supplied.[80] Mobile phone calls are used in ransom negotiations and to prove that hostages are alive. Pirates may also use the internet to research their victims' background and thus condition their ransom demands.[81]

We may therefore be seeing some give and take between pirates and the local community in Hobyo (which gets a radio station[82] and telecommunication facilities), leading to a cooperative relationship. While perimeter security around the radio tower appears to be strong, we do not observe massive investment in fortification elsewhere around the town and the Puntland authorities have not mounted credible counter-piracy operations in this location.

4.2.3. Garowe

Garowe is the capital of Puntland, with a population of between 40-70,000 people[83] and is situated well inland. Here we see investment and wealth on a completely different scale from the coastal communities. Between February 2002 and July 2009 the town almost doubled in area with

[78] John Winter 19 November 2004 Telecoms thriving in lawless Somalia http://news.bbc.co.uk/1/hi/world/africa/4020259.stm

[79] Diagram 12 shows one of the Garowe masts for comparison to the Hobyo tower. It is situated in a large walled compound with 13 parked cars, i.e. it is part of a major business. The telecommunications facilities in the UN compound are less complex than the Hobyo radio tower.

[80] "When a pirated vessel arrives within VHF radio range of Hobyo, pirates in small boats provide re-supply for food, weapons, and personnel reinforcements." *Jean-Marc Mojon* http://bbs.keyhole.com/ubb/ubbthreads.php?ubb=showflat&Number=1160408

[81] http://www.telegraph.co.uk/news/worldnews/africaandindianocean/somalia/8694887/Somali-pirate-used-mobile-to-surf-web-for-US-kidnap-victim-information.html

[82] http://www.hobyoradio.com

[83] UN sources find it difficult to estimate the population due to the large number of IDPs. UN Habitat (2008)

significant housing and light industrial/commercial developments to the South East and South of the town (Diagram 13). North of the town, on the other side of the Togga-Garowe River and along the main highway to the West many new large scale buildings and commercial developments are noticeable (Diagram 14). In the centre of town existing facilities seem to have undergone development both in terms of expansion, roofing and security and the increase in traffic too appears to be substantial. Diagram 15 illustrates the changes in a part of the central area to the East of the central market. In the outlined area there have been at least 30 changes, including newly built, improved or enlarged houses and outlets during the period. There is also evidence that a greater number of private cars and vehicles are appearing inside the enclosed areas of properties or just outside. On the edges of town, gravel roads are laid out indicating plans for further growth.

Using photographic images from *flickr*, *Somalinet* and *Garowe Online* it is possible to identify a number of the larger buildings, as well as the dates of their completion. The buildings on the northern edge of the town are associated with the foreign sponsored Puntland State University and the hospital, both of which have seen enlargement since 2002. A new development is the Teacher Training College, which opened in 2004.[84] The UN guest house and compound was completed in 2007.[85] Some of the recent development in Garowe is clearly associated with UN and NGO funds supporting the Puntland government. These tend to be medium to large-scale projects: UN Habitat and its various sponsors have for example invested in the upgrading of municipal buildings and the slaughterhouse. On the Southern side of the town the UN completed several large compounds to house internally displaced people (IDP).[86]

Returnees from the *diaspora* are also likely to be investing in housing and businesses in Garowe. The main North-South Highway offers significant opportunities for business investment. The number of businesses servicing cars and trucks and retail areas (with associated car parking) has grown significantly. In the centre of town the old main mosque was replaced with the huge Masjid al Huda with its minaret clearly visible (diagram 16). It was funded by public donations[87] and completed in May 2008 at a cost of $350,000.[88]

However, mass emigration from Puntland was relatively recent and the Puntland *diaspora* is less able to contribute than the well-established Somaliland *diaspora* who emigrated under Siad Barre's regime in the 70 and 80s. Several of the large scale new developments opened in 2009 / 10[89], i.e. at the time when the *diaspora* was under pressure from the global financial crisis – but when pirate ransoms took off. There are a number of flash new hotels clearly built for rich customers and an internet commentator on the "New Rays" Hotel opening reports jokes about "pirate money".[90] It is therefore probable that pirate money has contributed to the rapid growth of this town at the heart of the pirates' tribal homeland.

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[84] http://puntlandstateuniversity.com/ and http://www.gtecsom.org/
[85] http://www.geolocation.ws/v/P/32812835/un-compound-garowe/en
[86] UN Habitat (2008)
[87] http://www.garoweonline.com/artman2/publish/Islam_28/Somalia_Donate_to_the_construction_of_Al-Huda_Mosque_in_Garowe_printer.shtml
[88] http://www.somalinet.com/forums/viewtopic.php?f=246&t=163717
[89] These are not visible in the maps in UN habitat (2008).
[90] http://www.somalilife.com/vbforum/showthread.php?t=93217

Regarding the residential developments, it is commonly asserted by local residents that pirates are living and spending money in Garowe – they are said to be easily identifiable by their flash cars, lavish weddings and expensive drug habits.[91] Reports and interviews show that pirates have been openly living in Garowe for several years.[92] The satellite images provide some evidence for this: in the 2002 image it is very rare to see any cars associated with residential buildings – even though the image was taken on a Friday and privately owned vehicles were likely to be parked at home. Traffic is concentrated in the immediate vicinity of the main highway. In the 2009 image car ownership is still rare. However, there are now a significant number of houses in residential areas of town with a car parked within the perimeter walls. In most cases these are newly-built, not particularly large houses with very noticeable security walls, often in small clusters of other new houses with cars (see diagram 17 for two examples). The structures are considerably less flash and elaborate than the high status villas marketed to *diaspora* investors with a minimum price tag of US$ 45,000.[93] While the "home + car" combination is evidence of "new money" rather than "pirate money", it should be interpreted in combination with the pirates' own statements that they tend to buy "a house and a car" and the local residents' common assertion that piracy and car ownership are linked.

4.2.4. Summary

The high resolution satellite imagery analysis complements the results of the previous strands of investigation. There is evidence of new affluence in the three locations Eyl, Hobyo and especially in Garowe. Investment in Garowe is on a completely different scale to that in the coastal areas. Although Garowe has been able to attract international sponsorship, it also appears to attract considerable private investment into housing and new businesses. Much of the new investment has come at a time of financial retrenchment for the *diaspora* and is concurrent with the explosion of piracy. If "low key new house + car" ownership is linked to piracy, it tallies well with the results from the previous sections that a) a considerable proportion of ransom money is spent in country, b) pirates' spending choices are formed by social norms limiting conspicuous consumption, and c) are concentrated inland rather than on the coast. The imagery from Eyl and Hobyo suggests that these coastal communities have not seen an economic renaissance. A solution to the piracy problem might exploit local disappointments in this regard and offer coastal communities a deal which makes them significantly better off than they are as pirate hosts.

5. Conclusions

The paper has firstly demonstrated the impact of the piracy sector both on the local and on the national economy of Somalia. Piracy has created employment and considerable multiplier effects in the Puntland economy even if a significant proportion of the proceeds from piracy are invested in foreign goods or are channeled back to foreign financiers. The distribution of the gains of piracy

[91] http://www.guardian.co.uk/world/2011/may/24/a-pioneer-of-somali-piracy, http://www.somalinet.com/forums/viewtopic.php?f=18&t=254668

[92] http://www.somaliaonline.com/community/showthread.php/37905-Infamous-Abshir-Boyax-captured-in-a-government-offensive-outside-Garowe-State-Capital , http://www.puntland-gov.net/viewnews.asp?nwtype=News&nid=News204852118105379706

[93] E.g. http://www.mubarakonline.com/

follows traditional patterns in Somalia, with redistribution through clan networks and employment generation in urban centres far from the coast. The observation that the gains from piracy were at least partially offset by the contemporary rise in international food prices may explain the negative testimonies of local residents vis-à-vis the media regarding the inflationary impact of piracy.

Our result that one should expect a numerically large group of people benefitting from piracy should not discourage the international community from seeking a land-based solution. The total cost of piracy off the Horn of Africa (including the counter-piracy measures) was estimated to be in the region of US$7-12 bn for 2010, while ransoms paid in 2010 were said to be in the region of US$ 250mn (Bowden (2010)).[94] Even if Somali communities received all of the current ransoms, replacing this source of income (for example with a combination of a foreign-funded coastguard and development aid) would be considerably cheaper than continuing the current policy.

Secondly, the paper makes the case that even in a statistical desert such as Somalia, there are interesting time series data to be constructed from information collected locally and by remote sensing. Our results are comparable to those gathered by intelligence sources, providing an important validation of the methodology. We established that there is information content in absent data in the records and price discrepancies in standardised commodities between locations. These can be used to proxy for developments in market imperfections over time. The evidence from images created by remote sensing indicates that this source of data should be exploited methodically in future work on the nexus of development and security, in particular in environments characterised by state failure, where research has been hampered by the paucity of economic data.

[94] These figures have not been verified independently and given the information on ransoms in the previous years they look on the large side. They are used here simply to illustrate that there is considerable scope for a solution that makes both sides better off.

Bibliography

Ali, Degan, Fanta Toure and Tilleke Kiewied (2005) Cash Relief in a Contested Area: Lessons from Somalia Humanitarian Practice Network at ODI Network Paper #50 2005

Boot, Max (2009) "Pirates, Then and Now," *Foreign Affairs,* Vol. 88, No.4, p. 107.

Bowden, Anna (2010): The Economic Cost of Maritime Piracy, One Earth Future Working Paper December 2010.

Bueger, Christian, Stockbruegger, Jan and Werthes Sascha (2011): Pirates, Fishermen and Peacebuilding: Options for a Sustainable Counter-Piracy Strategy in Somalia; forthcoming in *Contemporary Security Policy, Vol. 32, No. 2*

Elvidge, C. D., P. C. Sutton, T. Ghosh, B. T. Tuttle, K. E. Baugh, B. Bhaduri, and E. Bright , 2009, "A Global Poverty Map Derived from Satellite Data", *Computers and Geosciences*, 35, 1652 – 1660

Gambetta, Diego. 1993. *The Sicilian Mafia: the Business of Private Protection*. Cambridge, MA: Harvard University Press.

Gilpin Raymond (2009), *Counting the Costs of Somali Piracy*, United States Institute of Peace Working Paper

Ghosh, T., Anderson, S., Powell, R. L., Sutton, P. C., Elvidge, C. D., (2009), "Estimation of Mexico's Informal Economy and Remittances Using Nighttime Imagery", *Remote Sensing*, 1 (3), 418-444

Hamshaw-Thomas, Hugh (1916): Interpretation from Aero-plane Photography War Office June 1916

Hammond, Laura; Awad Mustafa; Dagane, Ali; Hansen, Peter; Horst, Cindy; Menkhaus, Ken and Obare, Lynette (2011): Cash and Compassion; the Role of the Somali Diaspora in Relief, Development and Peacebuilding (Unpublished, available at http://eprints.soas.ac.uk/11710/)

Hansen Stig Jarle (2009) Piracy in the Greater Gulf of Aden: Myths, Misconceptions and Remedies, NIBR report 2009:29
http://en.nibr.no/uploads/publications/26b0226ad4177819779c2805e91c670d.pdf

Horst, Cindy (2006*) Transnational Nomads: How Somalis Cope with Refugee Life in the Dadaab Camps of Kenya*; Studies in Forced Migration Vol 19; Berghahn Books

Hulburt Kaija (2011): The Human Cost of Somali Piracy One Earth Future, Oceans Beyond Piracy Report, One Earth Future Foundation

IMF (2009) Review of the Fund's Strategy on Overdue Financial Obligations 18 August 2009 http://www.imf.org/external/np/pp/eng/2009/081809.pdf

Imhoff, M.L., Lawrence, W.T., Stutzer, D.C. and Elvidge, C.D. (1997): A technique for using composite DMSP/OLS 'city lights' satellite data to map urban area. *Remote Sensing of Environment* 61, 361–70.

James and Brian Wilson (2009), "The Co-operative Strategy and the Pirates of the Gulf of Aden," *The RUSI Journal*, Vol. 154, No.2 (April, 2009), p. 75.

Kraska James and Brian Wilson, (2008) "Fighting Pirates: The Pen and the Sword," *World Policy Journal*, Vol. 25, No. 4 p. 46.

Kraska James and Brian Wilson (2009a) "The Global Partnership and Somali Piracy," *Defense & Security Analysis*, Vol. 25, No.3, p. 225

Kraska, James and Brian Wilson (2009b): "The Co-operative Strategy and the Pirates of the Gulf of Aden," *The RUSI Journal*, Vol. 154, No.2

Leeson, Peter (2007): "Better Off Stateless: Somalia Before and After Government Collapse." *Journal of Comparative Economics*, 35(4): 689-710.

Lindley, Anna (2009), "Between 'Dirty Money' and 'Development Capital': Somali Money Transfer Infrastructure Under Global Scrutiny," *African Affairs* (August, 2009), pp. 519-539.

Lindley, Anna (2010) *The Early Morning Phonecall: Somali Refugees Remittances*; Studies in Forced Migration Vol 28; Berghahn Books

Majid, Nisar (2006) Alternative Interventions in Insecure Environments, The case of cash in Southern Somalia; Humanitarian Exchange Magazine www.odihpn.org

Majid Nisar (2010): Livestock trade in the Djibouti, Somali and Ethiopian Borderlands; Chatham House Briefing Paper AFP BP 2010/01

Menkhaus, Ken (2007a) "The Crisis in Somalia: Tragedy in Five Acts," *African Affairs,* Vol. 106, No. 204, pp. 357-390.

Menkhaus, Ken (2007b) "Governance Without Government in Somalia," *International Security,* Vol. 31, No.2, pp. 74-106.

Menkhaus, Ken (2009) "Dangerous Waters," *Survival,* Vol. 51, No.1, p. 22-??.

Nenova Tatiana and Tim Harford (2004), Anarchy and Invention, World Bank; Public Policy for the Private Sector Note number 280 http://rru.worldbank.org/Documents/PapersLinks/280-nenova-harford.pdf

Oxlee Geoffrey (1997): *Aerospace Reconnaissance* Brasseys UK

Oxlee Geoffrey (2000): *Photography and Digital Imaging,* Encyclopedia of Forensic Science

Percy, Sarah and Anja Shortland (2010) "The Business of Piracy in Somalia"; Discussion Papers of DIW Berlin # 1033

Shortland A. and Vothknecht M. (2011): Combating "Maritime Terrorism" in Somalia; forthcoming in *European Journal of Political Economy*

Sörenson, Karl. 2008. "State Failure on the High Seas – Reviewing Somali Piracy." Swedish Defence Academy OFI Report 2610-SE

Walls, Michael (2009) The Emergence of a Somali State: Building Peace from War in Somaliland, *African Affairs* 108/432 pp 371-389

UN Habitat (2008): Garowe: First Steps towards Strategic Urban Planning, http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2599

United Nations (2008): Report of the Monitoring Group on Somalia Pursuant to Security Council Resolution 1811, available at: http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N08/604/73/PDF/N0860473.pdf?OpenElement

United Nations (2011): Report of the Special Adviser to the Secretary-General on Legal Issues Related to Piracy off the Coast of Somalia, available at: http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N11/206/21/PDF/N1120621.pdf?OpenElement

Diagram 1

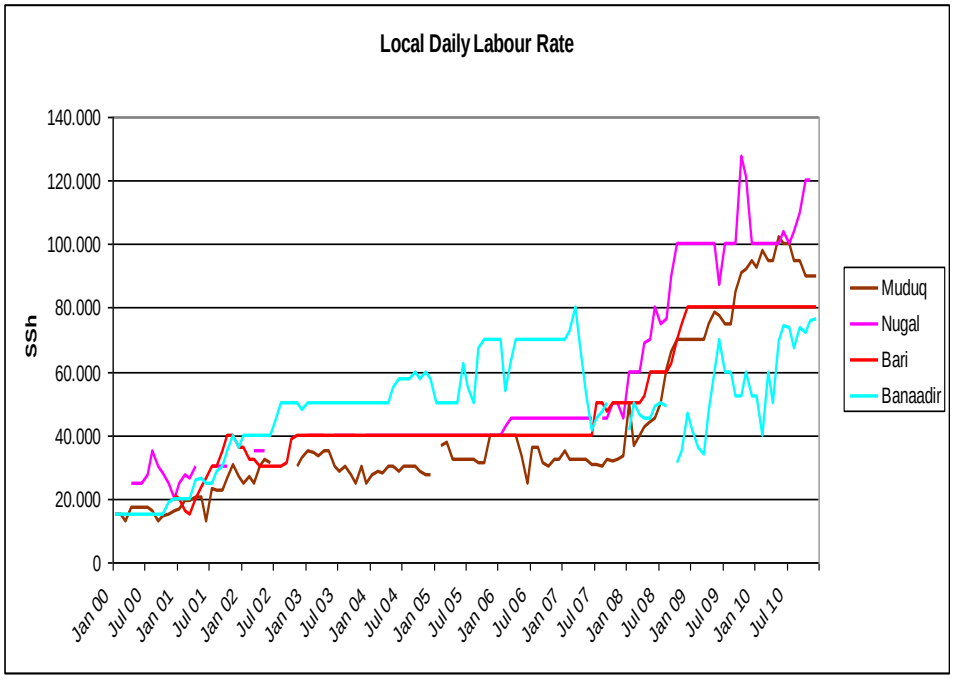
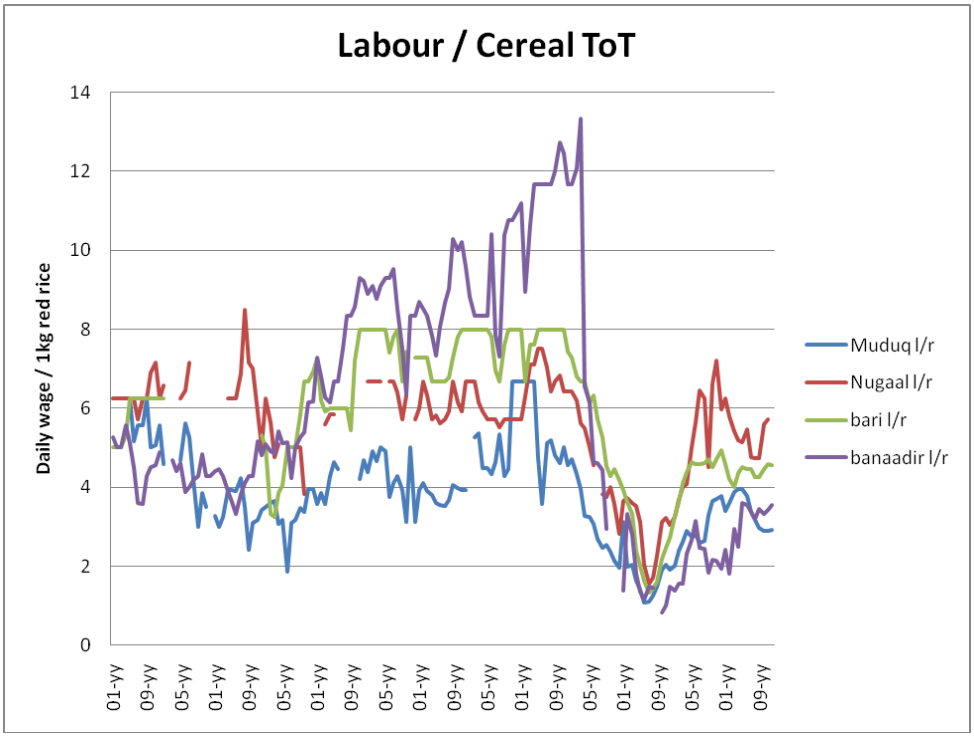


Diagram 2



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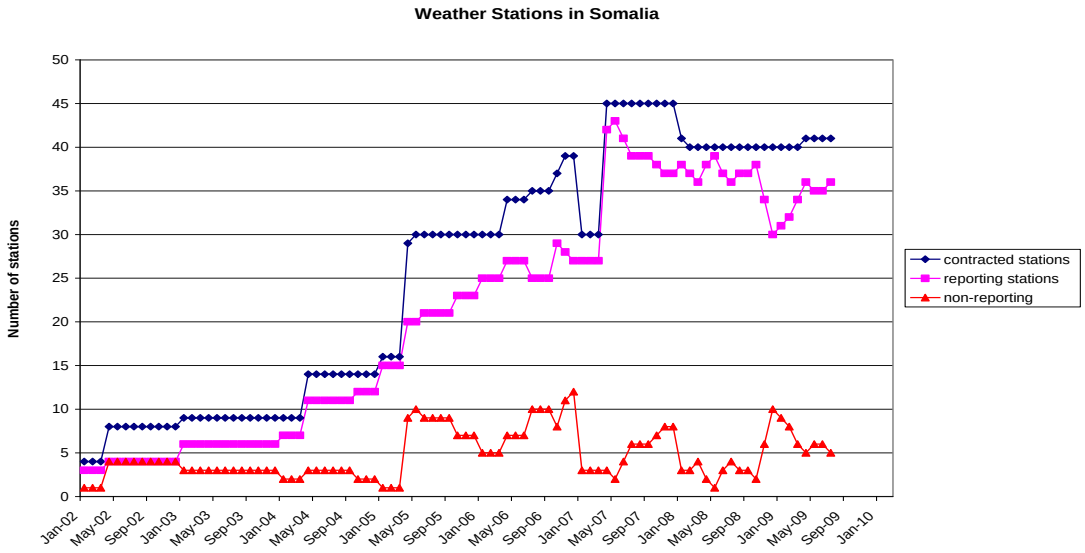

Diagram 4

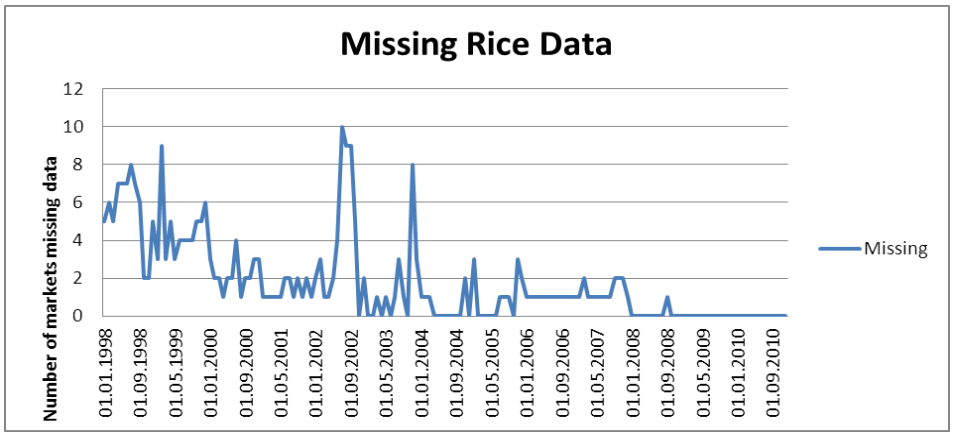

Diagram 5a: Regional Variation in the Somali Shilling/US$ exchange rate

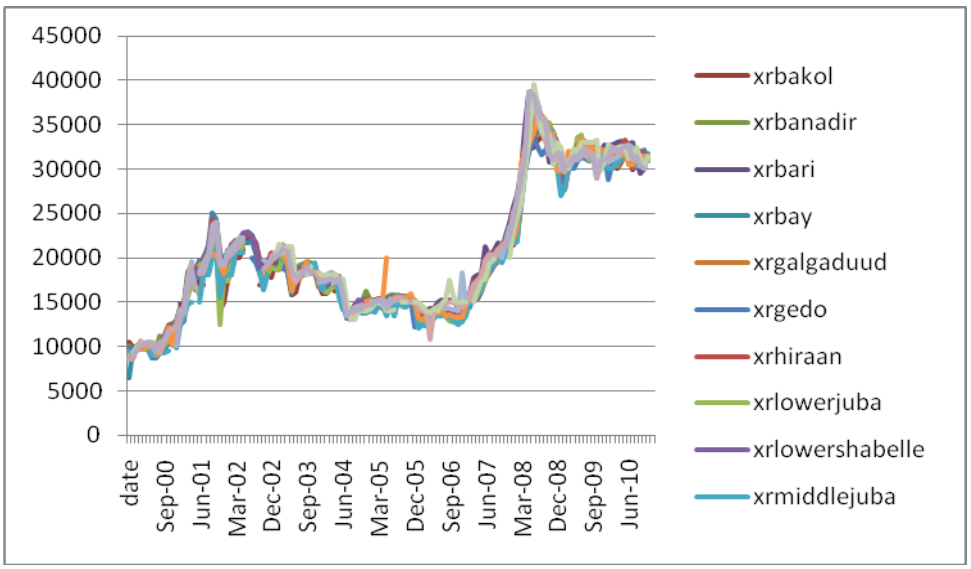

Diagram 5b: Development of standard price deviation between regions over time

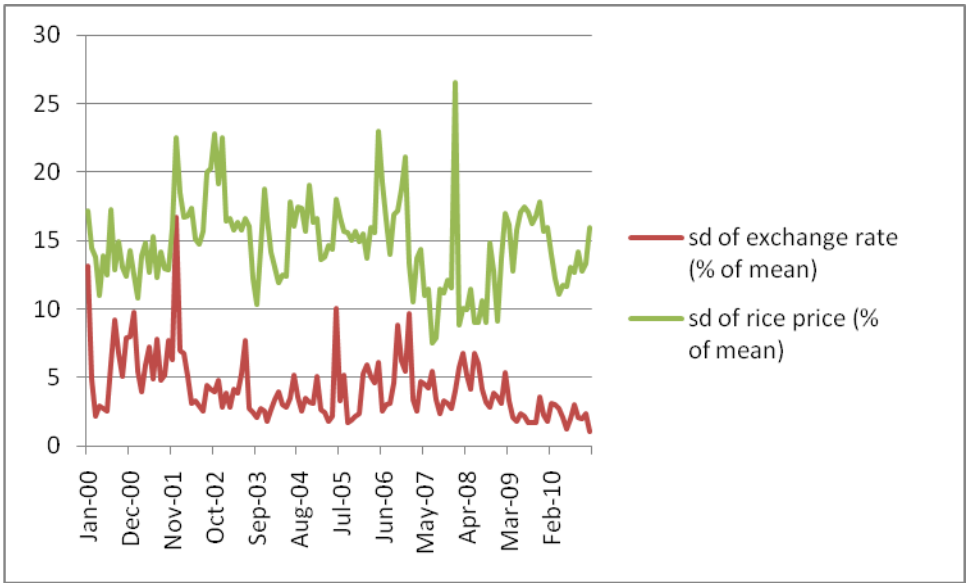

Diagram 6: Somalia Nightlights 2009

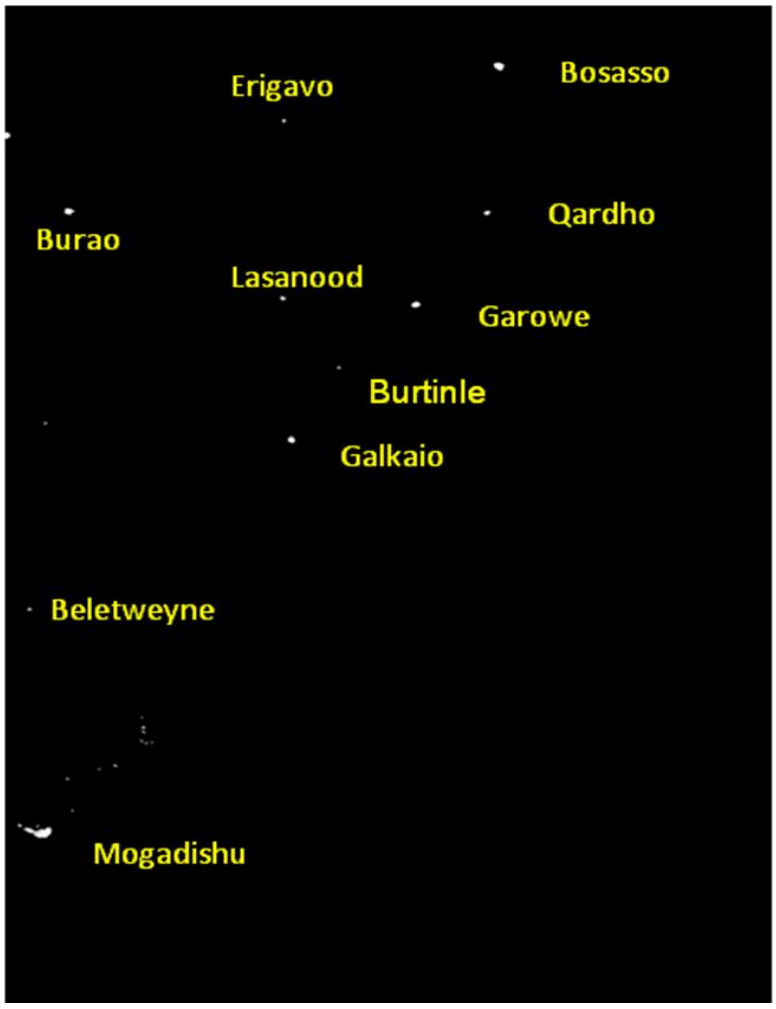

Diagram 7: total nightlight emissions from Somali cities

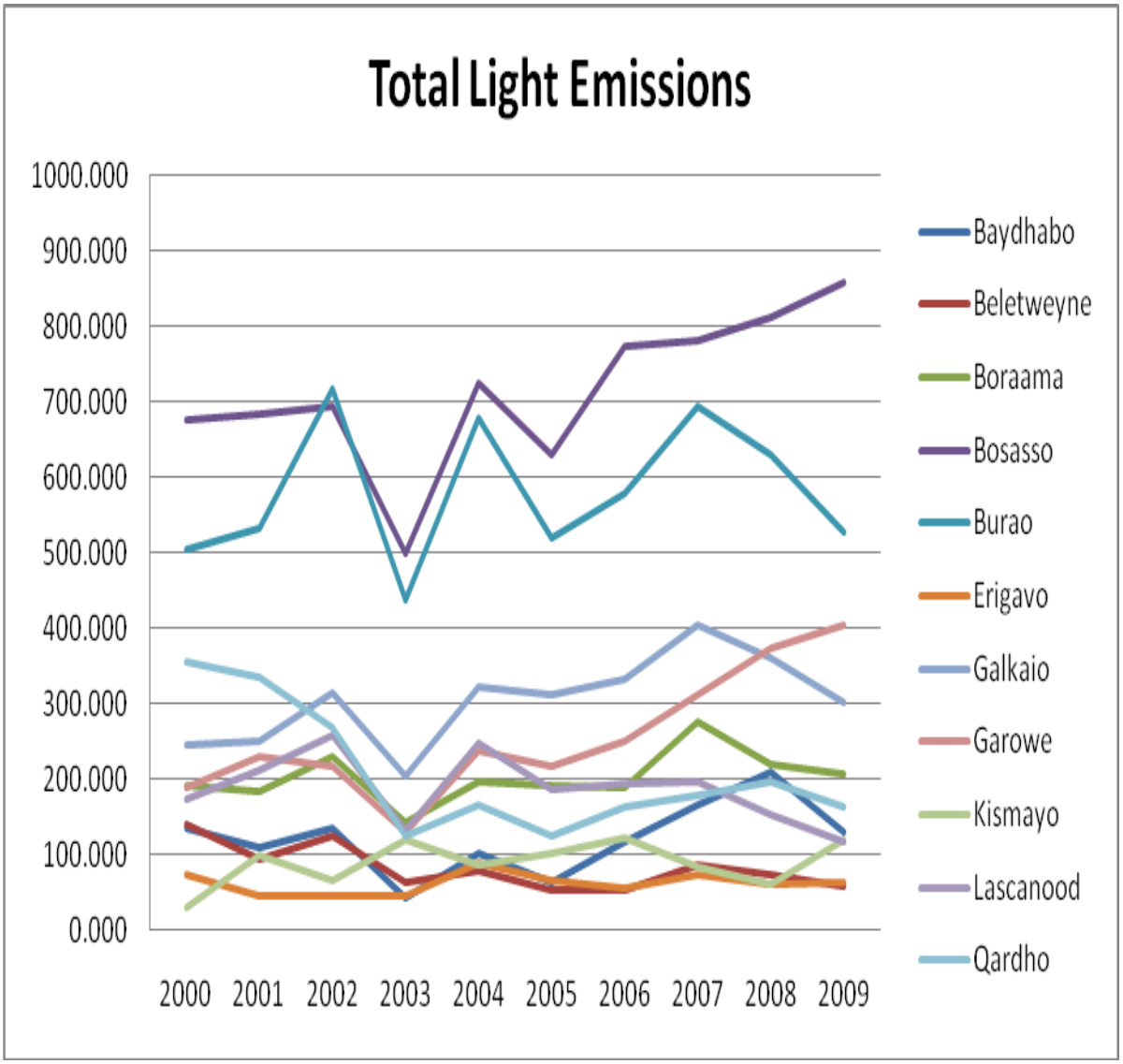

Diagram 8: Number of pixels lit in Somali cities

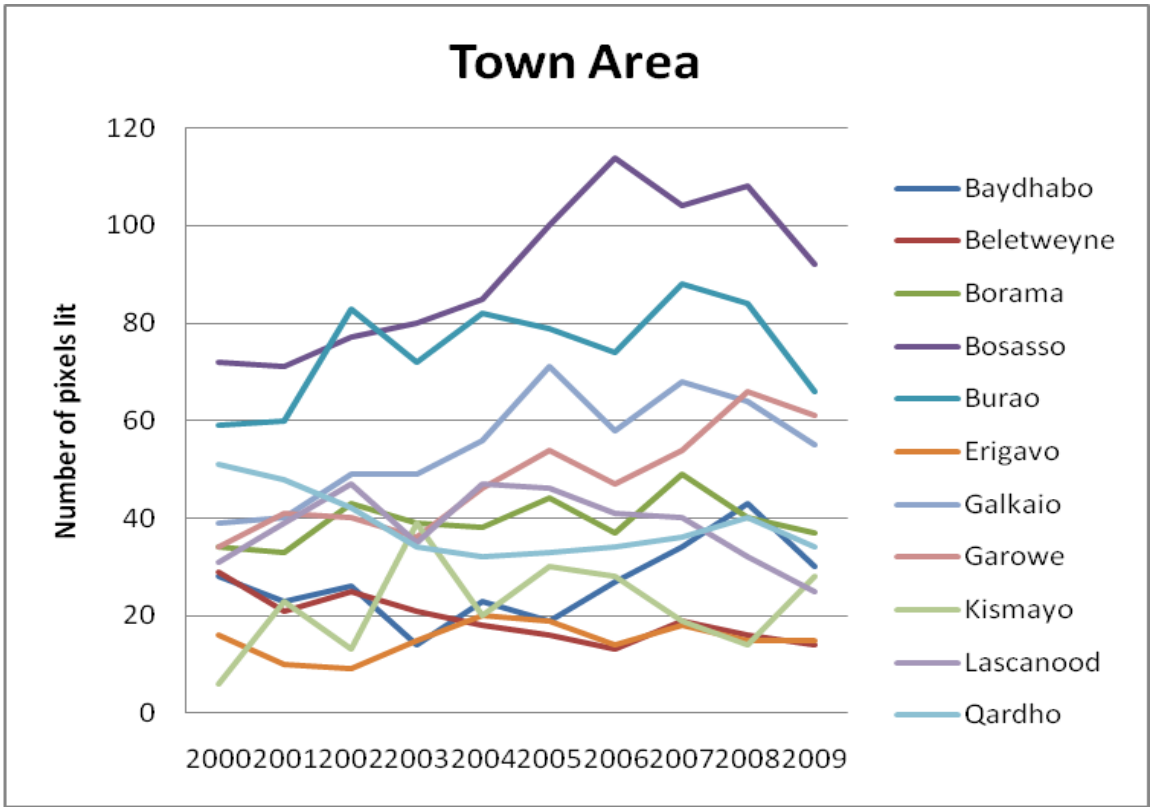

Diagram 9: maximum light emission from Somali cities

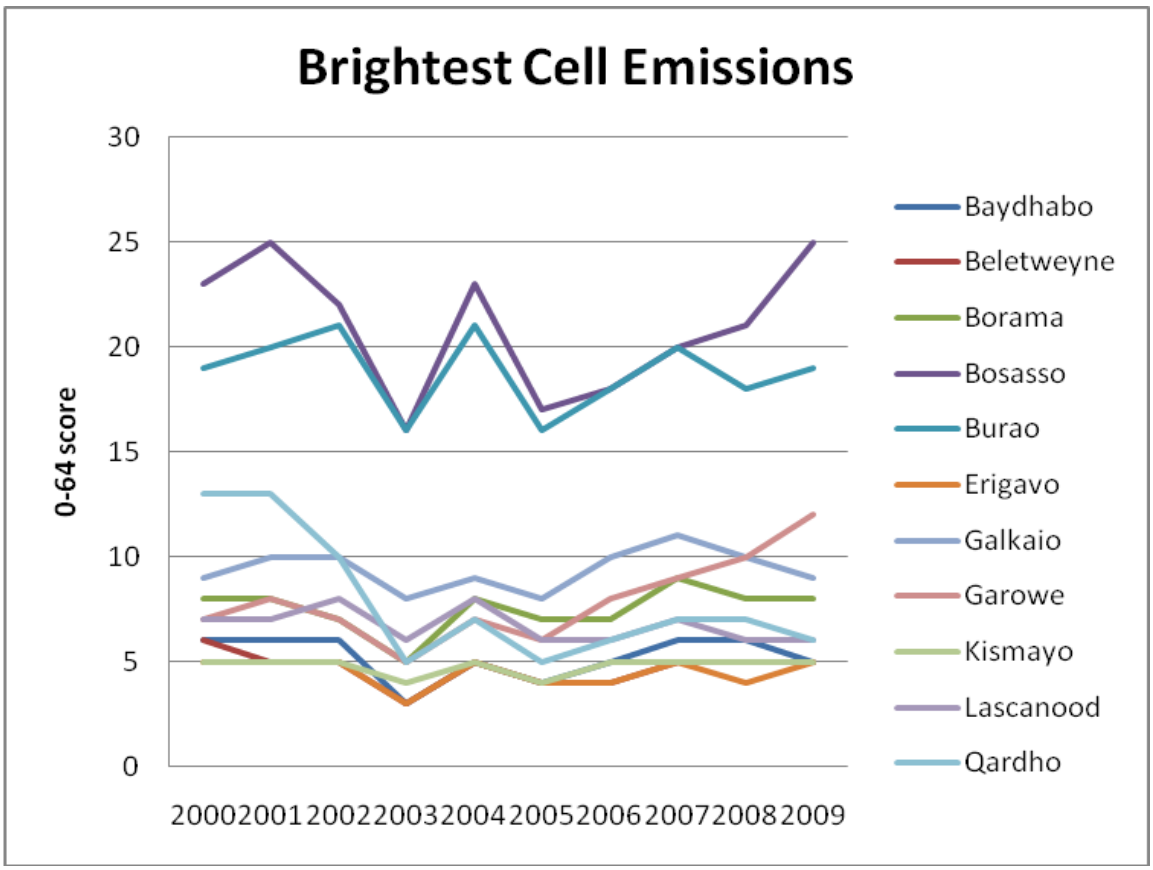

Diagram 10: Fishing Village Eyl Sept 2005 vs July 2009

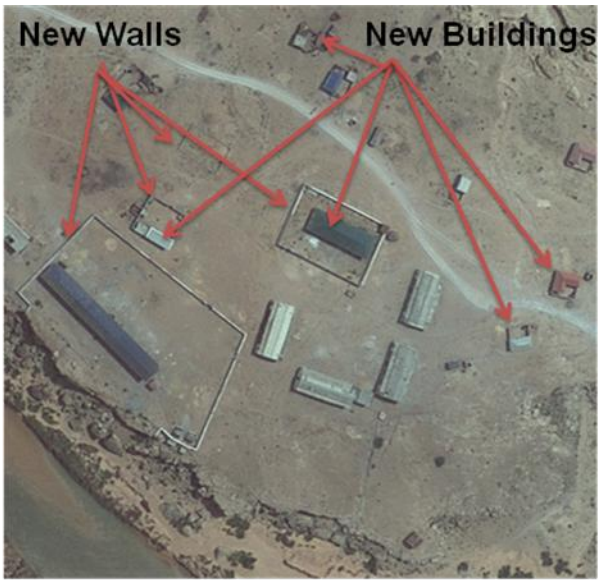

Diagram 11: Main Town Eyl Sept 2005 vs July 2009

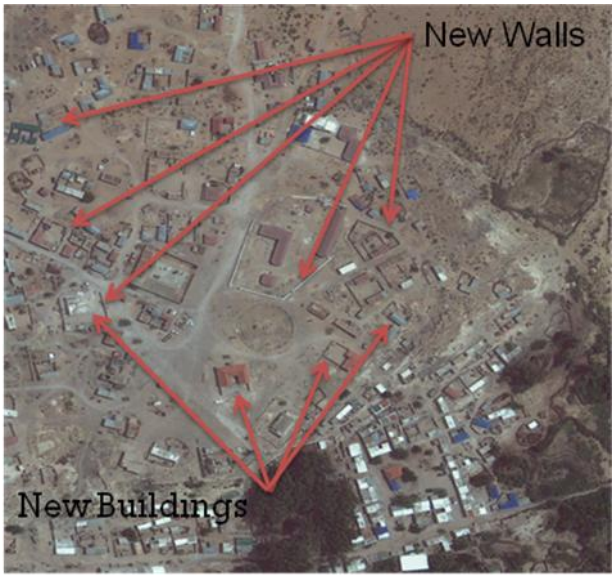

Diagram 12: Hobyo July 2006 vs June 2010

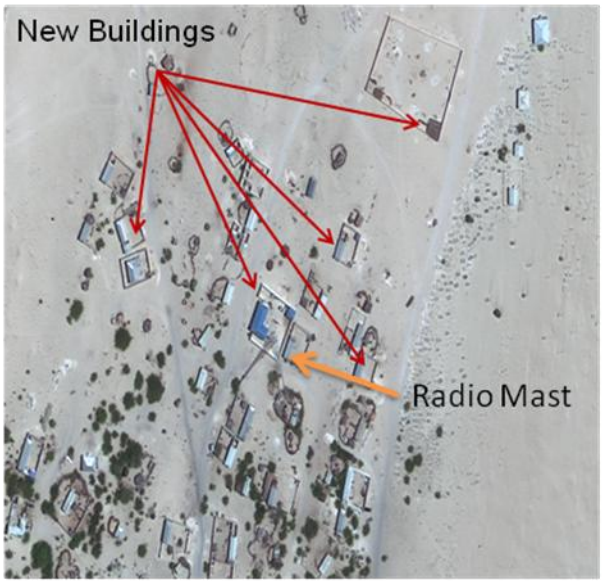

Diagram 13: Garowe overall growth

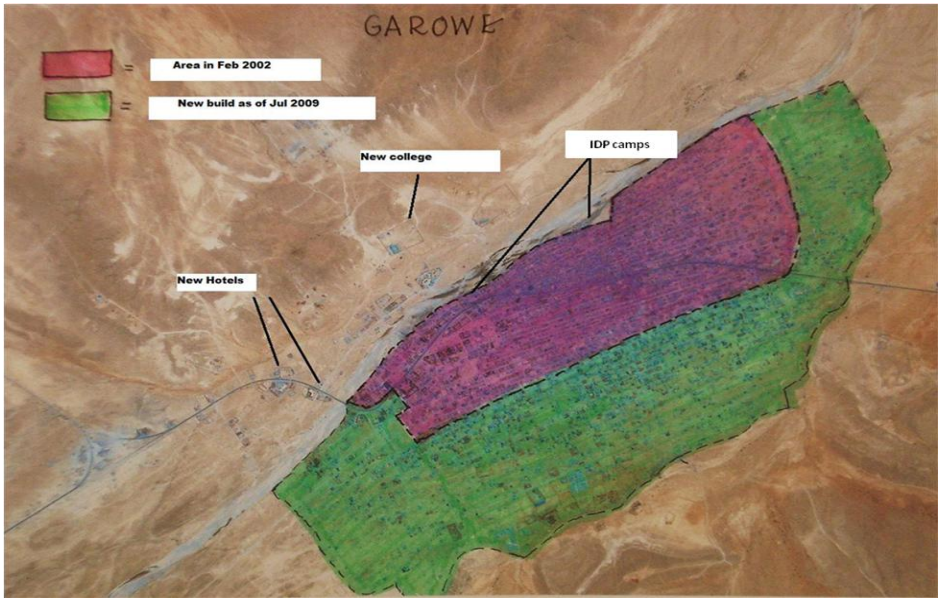

Diagram 14 South West Garowe Feb 2002 vs July 2009

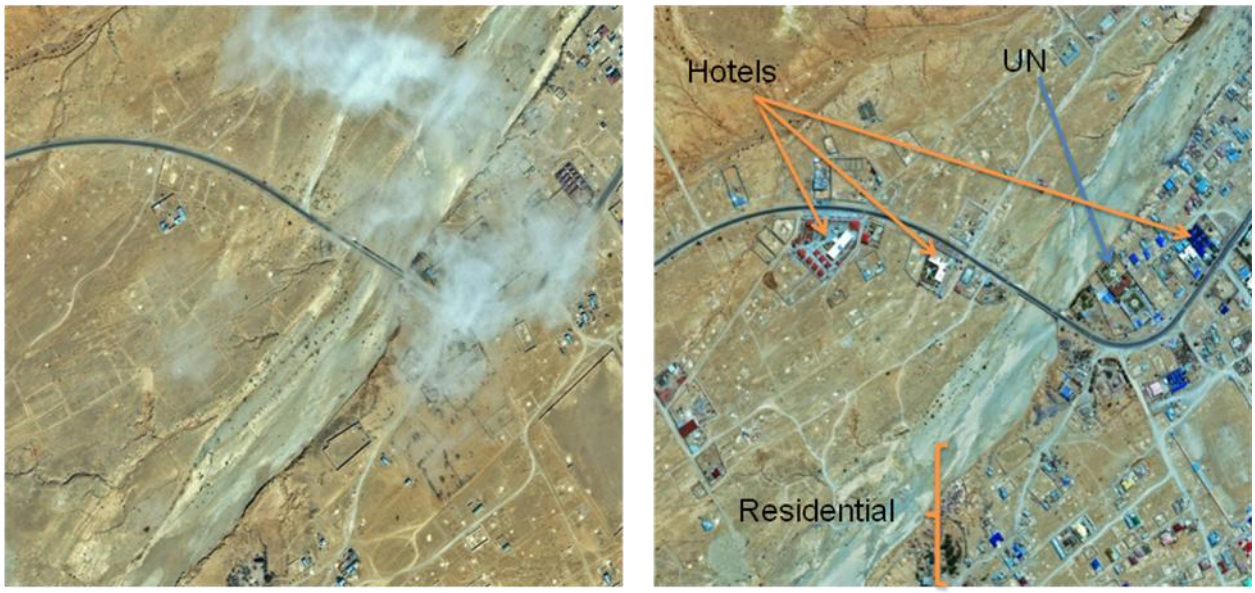

Diagram 15: Changes in Central Garowe Friday 12 Feb 2002 vs Monday 13 June 2009

Diagram 16: Central Garowe Feb 2002 vs July 2009: Mosque

Diagram 17: Central Garowe Feb 2002 vs July 2009: "House + Car"

Tables

Table 1 Real wages (daily labour rate / rice price)

	Muduq	Nugal	Bari	Banaadir
FAO food index	-0.0238***	-0.0289***	-0.0294***	-0.0289**
	(0.0042)	(0.0047)	(0.0055)	(0.0119)
S.Sh / US$	-0.0675***	-0.1073***	-0.1628***	-0.2288***
	(0.0177)	(0.0208)	(0.0235)	(0.0446)
Missing market (Sorghum)	0.1772***	-0.0497	0.1702**	0.4398***
	(0.0612)	(0.0858)	(0.0653)	(0.1171)
UIC	0.9027***	0.9466***	1.1931***	4.4345***
	(0.3160)	(0.3362)	(0.4234)	(0.8021)
Southwest Monsoon	-0.4804***	-0.1759	-0.2747	-0.6608*
	(0.1519)	(0.1676)	(0.2039)	(0.3791)
Camel Exports	0.1269***	0.0787***	0.075**	0.1754***
(1000s)	(0.0264)	(0.0282)	(0.0352)	(0.069)
Piracy (6 months moving average)	0.0370***	0.0658***	0.0463***	-0.0116
	(0.0125)	(0.0134)	(0.0167)	(0.0320)
Constant	6.990***	10.627***	11.937***	12.997***
	(0.4559)	(0.5112)	(0.6096)	(1.1975)
Number of observations	120	111	119	121
R-squared	0.6146	0.6615	0.7267	0.6781

Table 2 Exchange rates

	% depreciation SSH / US$	% depreciation SSH / US$
FAO Food Index	0.0691***	0.0340*
	(0.0212)	0.0204
Cattle exports	-0.2732***	-0.3459***
(1000s)	(0.0752)	(0.0707)
Pirate success$_{(t-5)}$	-0.4464**	-0.5901***
	(0.2246)	(0.2044)
Price variation Xr		-0.8731***
		(0.2135)
Price variation rice		-0.5954***
		(0.1447)
Constant	-3.3261	14.4861***
	(2.4008)	3.8605
Observations	126	126
R-squared	0.1398	0.3355

Table 3 Average price of 1 kg of imported rice (SSh)

	Month on month change in rice price (SSh)	Month on month change in rice price (SSh)
North East Monsoon	-656.7114*** (250.1218)	-907.595*** (271.3141)
FAO Food Price index	31.42001*** (5.4500)	46.8045*** (8.4586)
Exchange rate depreciation	92.2715*** (20.9883)	143.4241*** (32.0743)
Piracy (6 months moving average)	-68.27333*** (16.2014)	-46.6526*** (17.8196)
Price variation XR	111.0499* (57.7344)	159.2268* (83.0809)
Contract security (extrapolated June 09-Dec 10)		-27.6336*** (7.9212)
Constant	-3527.639*** 672.0924	-4213.006*** (808.7313)
Number of Observations	126	108
R-squared	0.4006	0.4841

Table 4 Cattle prices (SSh)

	Muduq	**Nugal**	**Bari**	**Muduq**
Lagged regional cattle price	0.8181*** (0.0587)	0.7979708*** (0.0502)	0.8117*** (0.0573)	0.8879*** (0.0330)
FAO Cerealindex	5568.771** (2260.481)	12350.4*** (3122.429)	9016.777*** (3262.898)	4452.126** (2126.703)
Piracy 6 months moving average	40997.33*** (16148.89)	33341.94*** (13004.57)	55306.16*** (14313.34)	
Pirate success t-2				60888.68* (33921.47)
Pirate success t-3				69769.2** (35140.14)
Constant	-208906.7 (231994.1)	-678386.0** (285563.9)	-516384.4* (266712.3)	-223376.9 (224149.9)
Observations	119	98	118	122
R-Squared	0.9453	0.9479	0.9722	0.9466