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RESEARCH PAPER

Economic Transformation of the Nicobar Islands Post-tsunami: A Material Import–Export Analysis

Shaina Sehgal[1] and Suresh Babu[2]

Abstract: Natural disasters can have lasting impacts on regional economies. Island economies, in particular, have protracted recoveries from disasters due to their location, size, and economic dependence on trading partners. As imports and exports are especially explicit and discernible in ports, islands facilitate investigations on the long-term effects of disaster relief, reconstruction, and redevelopment on trade. In this paper, we examine the transformational impact of the 2004 Indian ocean earthquake and tsunami. We examine changes to physical imports and exports in the archipelago to reflect on the social, economic, and ecological impacts of the 2004 disaster and subsequent recovery. We analyse disaggregated physical import and export data for 2003–2017 from revenue ports in the Nicobar Islands in India along with data from field surveys and interviews conducted on the islands. We find that while the archipelago's physical trade balance has been continuously growing since 2003, it increased at a higher rate after the disaster and thereafter stabilized to levels comparable to the pre-tsunami period. However, further analysis indicates that the nature and quantity of physical imports during this period, such as of fuel and construction materials, are unprecedented; and there are diverging trajectories of redevelopment within the archipelago. By highlighting the key features of the relief, reconstruction, and redevelopment efforts following the tsunami, we argue that the development policy and imports post-2004 have qualitatively transformed production practices and trade in Nicobar and simultaneously reinforced historical trajectories of the development of certain ports and islands.

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1. INTRODUCTION

Catastrophic events, particularly natural disasters, have altered the developmental trajectories of economies and transformed island nations and areas (Pelling, Özerdem, and Barakat 2002). Small islands are particularly vulnerable to climate change impacts, sea-level rise, and extreme disasters (Mimura *et al.* 2007). Climate change models indicate that the frequency, intensity, and unpredictability of such disasters will continue to increase (IPCC 2007). Natural disasters can cause simultaneous sectoral expansions and contractions in island economies. A study on sectoral redevelopment responses after cyclone incidences in 28 Caribbean-basin countries between 1970 and 2006 found that the construction sector expanded (presumably due to reconstruction) while tourism, agriculture, and allied sectors suffered the most losses (Hsiang 2010). Furthermore, these significant sectoral impacts appeared to persist beyond the year of the initial event. Empirical evidence indicates the negative short-run economic effects (direct and indirect) of natural disasters and the negative long-run effects of hydro-meteorological disasters (Botzen, Deschenes, and Sanders 2019). Small Island Developing States (SIDS) and offshore islands are especially vulnerable due to their small size, insularity, remoteness, and frequency of natural hazards that impact key sectors of their economy, such as agriculture, fishery, and tourism[3] (Pelling and Uitto 2001).

Imports and exports are explicit and discernible in island settings because of the clearly demarcated ports of entry and exit. An analysis of trade on islands can provide insight into their economies. However, conventional analyses of trade pose significant methodological limitations to understanding embodied sociopolitical and ecological processes (Schaffartzik *et al.* 2014). A significant development in trade analyses has been the move towards evaluating the physical dimensions of commodities, typically on a national scale (Dittrich and Bringezu 2010). Analysing the movement of materials (as opposed to their monetary value) facilitates reconciling society and ecology with production and trade. This approach draws its theoretical basis from socio-ecological systems and social and industrial metabolism (Martinez-Alier and Schlüpmann 1987; Schandl and

[3] The Small Island Developing States (SIDS) are a distinct group of 52 small island countries that face unique social, economic, and environmental vulnerabilities, while offshore islands refers to islands that are economically and politically subordinated to a mainland or main island.

Schaffartzik 2015). However, social (or societal) metabolic analyses have been critiqued for their methodological emphasis on material or energetic interactions between "nature" and "society" to the exclusion of analytical connections with social processes (Fischer-Kowalski and Hüttler 1998; de Molina and Toledo 2014). Novel approaches for finding ecological processes embodied in commodities, or in indirect flows of traded products, include using "cradle-to-product" coefficients for various commodities or input–output calculations for product groups (Dittrich, Bringezu, and Schütz 2012, 33). Contemporary advances in the field have also highlighted how the ecosystem is embodied in trade through analyses of virtual land use (Würtenberger, Koellner, and Binder 2006), virtual water (Ansink 2010), embodied carbon flows (Sato 2014), energy flows, and ecological footprints (Moran *et al.* 2009). These studies shed light on environmental variables embodied in traded commodities (especially natural resources) that are otherwise not visible in trade economics.

The dominant theoretical models for explaining the indirect economic impacts of disasters and post-disaster recovery on the macroeconomy employ social accounting matrices, neoclassical growth theory, or endogenous productivity, and have been criticized for ignoring regional geography (Botzen, Deschenes, and Sanders 2019). Further, few studies use regional development models to measure economic impacts over multiple decades. We, therefore, follow a regional perspective to analyse the medium-term impact of the disaster and recovery process in an offshore island setting in the Union Territory of Andaman and Nicobar Islands in India.

The Andaman and Nicobar Islands' economy relies predominantly on tertiary (tourism and public-sector employment) and primary-sector activities (agriculture and fishery) (Planning Commission 2008). The share of the primary sector in the gross state domestic product (GSDP) has been decreasing steadily since 2014, while the secondary and tertiary sectors have been expanding (Directorate of Economics and Statistics, n.d.-c.). However, the Nicobar group's economy relies mainly on the primary sector (dominated by coconut plantations) as economic possibilities in the Nicobar Islands are mediated by critical concerns pertaining to tribal welfare and environmental protection. The Nicobar Islands are a tribal reserve as per notifications under the Andaman and Nicobar (Protection of Aboriginal Tribes) Regulation, 1956 (ANPATR), although some parts were denotified to permit the creation of revenue areas.[4] In the tribal reserve

[4] Pigeon, Megapode, Isle of Man, and parts of Car Nicobar, Kamorta, and the Great Nicobar Islands are excluded *vide* Notification No. ANPATR/3(1)/1, dated April 2, 1957,

areas of the archipelago—basically all of the Nicobar Islands—there are additional levels of governance and politics that shape development and trade. ANPATR has been pivotal in determining the role of local governance institutions (namely, the Nicobarese Tribal Council and panchayats), which regulate developmental interventions by the state. In addition, environmental legislations that govern national parks and sanctuaries regulate the unbridled development of these islands. The Nicobar Islands are a hotspot for biodiversity and are, therefore, part of India's protected area network.

The Nicobar Islands have a turbulent history of colonization and post-Independence settlements along with policies that effectively regulated and curtailed free trade. European trading companies, including the Danish, Austrian, and English East India Companies, were largely unsuccessful at colonizing the Nicobars between the eighteenth and nineteenth centuries (Sehgal 2021). However, British colonization of the Nicobars from 1869 onwards marked a distinct chapter with the creation of the Nancowry penal settlement and implementation of trade regulations (Vaidik 2010). Car Nicobar emerged as a key port due to interventions by the British colonial state in the pre-Independence period, while Campbell Bay port and other revenue areas in Great Nicobar were created in the 1960s and 1970s for strategic reasons (Singh 2003). The historical trade relations between Nicobarese society, the state, and markets were unequal in terms of embodied labour (Singh and Ramanujam 2010). The island development policy acknowledges these historical legacies and contemporary concerns and conceives of a diversity of interventions (Planning Commission 2008). However, recent projects envisaged for the islands appear to have deviated from this understanding (Sekhsaria 2021).

The production and trade of horticultural and marine produce in the Nicobar Islands are deeply embedded in the cultural and ecological landscape of the islands. A key example is the coconut (*Cocos nucifera*), which is a major crop of the Nicobar Islands. In addition to being an export commodity, the drupe, trunk, and leaves of the coconut palm have historically been used for food, fuel, medicine, shelter, trade, and rituals in Nicobarese communities, as demonstrated through analyses of their diet, vocabulary, folklore, rituals, traditional medicine, and lifestyles (Dagar and Dagar 1986; Roy and Roy 1969; Man 1886). Nicobarese dietary staples historically include coconut, pandanus (*Pandanus leram*), yams, fish, pig,

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and Notification No. 62/72/F.No.81-9/71-J (1), dated April 20, 1972, issued by the Andaman and Nicobar Administration, Chief Commissioner's Secretariat, printed in the *Andaman and Nicobar Gazette*, Port Blair.

poultry, and imported rice. Recently, coconut plantations were ranked highest overall in analyses of the economic, nutritional, social status, ceremonial, functional, and substitutability attributes of important material resources in Nicobarese society, indicating their centrality in Nicobarese culture (Chandi 2016). These production relations were impacted by the 2004 Indian Ocean earthquake and tsunami. The Nicobar Islands were the epicentre of an earthquake measuring M_w 9.3 on the Richter scale and were the first landmass to encounter the resulting tsunami waves that reached up to 1,000 m inland. This disaster took the lives of over 3,500 people and destroyed and inundated coastal villages and plantations (Ministry of Home Affairs 2006; Sankaran 2005; Ramanamurthy *et al.* 2005).

In view of the social and ecological underpinnings of Nicobar's economy, we pose the following research questions:

1. What were the transformations in Nicobar's economy after the 2004 disaster?

2. What are the social and ecological underpinnings of these changes?

To reflect on the economic transformations in the Nicobar archipelago and the associated social and ecological underpinnings, we study changes in physical imports and exports as proxies (disaggregated by port and key categories) and draw on field surveys and interviews we conducted on the islands. This study, to our knowledge, is the first of its kind to use port-wise cargo data available from Indian port authorities to analyse physical trade at the sub-national or regional scale.

The paper is organized as follows. In Section 2, we briefly introduce the study area and dataset and outline our analysis. Subsequently, the physical trade balance and important material imports and exports of the Nicobar Islands are disaggregated port-wise and analysed in Section 3. The post-tsunami redevelopment and trade are situated within the socio-ecological context of the islands and discussed in Section 4, followed by a conclusion in Section 5.

2. MATERIAL AND METHODS

2.1. Study Area

The Nicobar archipelago comprises 22 islands in the Bay of Bengal, between 92° to 94° E and 6° to 10° N, over 1,200 km off the east coast of India. They are separated by channels of open sea from the Andaman archipelago in the north and Indonesia in the south (Figure 1). The Nicobar Islands were declared a tribal reserve as per the ANPATR, which recognizes the rights of indigenous dwellers to their land and resources and

regulates all trade by using permits.[5] The archipelago has a population of 36,842 people (Census of India 2011) comprising indigenous Nicobarese and Shompen communities, mainland Indians and international refugees originally settled by the state, and a floating population of government employees and migrant labour. Both the Nicobarese and descendants of settlers cultivate and export coconut.

The archipelago is designated as a district under the Union Territory of the Andaman and Nicobar Islands. The Nicobar district consists of three sub-divisions (tehsils)—Car Nicobar, Nancowry, and Campbell Bay—which encompass the northern, central, and southern groups of islands (Figure 1 inset). Car Nicobar Island is the district headquarters. There are four revenue ports in the Nicobars—Car Nicobar, Katchal, Nancowry, and Campbell Bay. Car Nicobar and Katchal are the eponymous ports of their respective islands. Nancowry refers to the port on Kamorta Island in the harbour formed by the Kamorta and Nancowry islands, and Campbell Bay is the port on Great Nicobar Island.

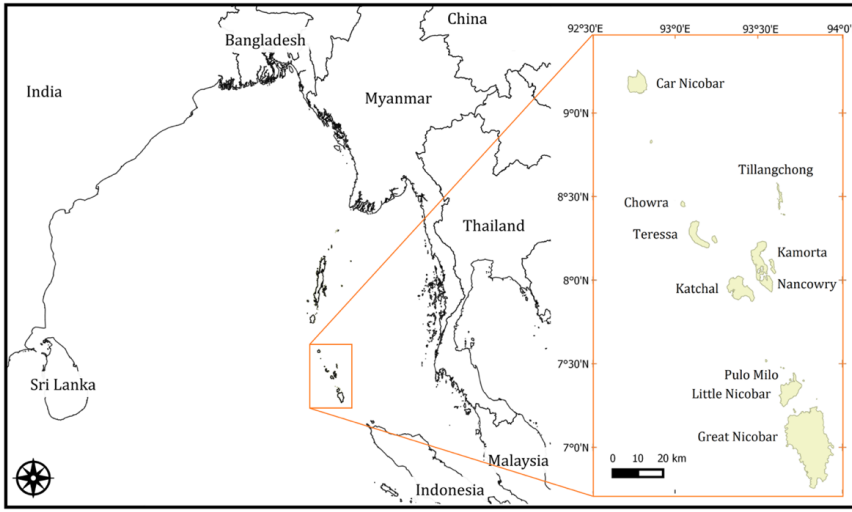


Figure 1: Map of the Nicobar Islands in the Indian Ocean
Source: Author

The islands have a tropical climate and experience both the south-west and north-east monsoons. The Nicobar Islands have a high degree of endemic flora and fauna across tropical rainforests, grasslands, mangroves, and coral

[5] Access to the tribal reserves in the Andaman and Nicobar Islands is not permitted without a tribal area permit issued by the deputy commissioner of the relevant jurisdiction.

reef ecosystems, and are part of the Sundaland biodiversity hotspot (Myers *et al.* 2000; Saldanha 1989). Of the total land area of 1,841 km^2, 84% is protected forestland (Directorate of Economics and Statistics, n.d.-c.). The protected areas in the Nicobar Islands form two national parks, four wildlife sanctuaries, one biosphere reserve, and seven community-protected marine areas (Patankar *et al.* 2015).

The Nicobar Islands are in a seismically active region. On 26 December 2004, these islands were the first landmass to be devastated by the Indian Ocean tsunami that followed an undersea Sumatra–Andaman M_w 9.3 earthquake at 6:29 AM IST on the subduction plate boundary (3.7° N, 95° E), where the Indian and Australian plates converge and plunge below the Sunda plate (Thakkar and Goyal 2006). In that month, 55 more earthquakes with magnitudes of over 5 on the Richter scale occurred in the vicinity of the Nicobar Islands (Directorate of Economics and Statistics, n.d.-d). According to government sources, at least 3,513 people died in the Nicobar Islands (Ministry of Home Affairs 2006). Tens of thousands of people were evacuated to relief camps, with over 5,000 brought to the mainland (Relief Commissioner 2005). In the months that followed, villages and plantations were inaccessible, and residents were discouraged from returning to them. Survivors had to cope with the loss of loved ones, homes, livelihoods, infrastructure, and years of protracted recovery.

The earthquakes destroyed physical structures, and the tsunami decimated coastal villages and plantations. Infrastructural damage to the power and water supply systems, ports, ships, roads, and bridges was estimated at ₹11 billion (USD 249.4 million) [6] (Relief Commissioner 2005). The islands experienced an uplift of 1–1.5 m in the north (Diglipur, North Andaman Island) and a submergence of 3 m in the south (Indira Point, Great Nicobar Island) (Rajendran *et al.* 2007; Rajendran *et al.* 2008). Seawater ingress in several locations destroyed plantations, farms, and mangrove forests. The tsunami damaged 7,556 km^2 of agricultural land in the Andaman and Nicobar Islands, affecting 6,324 farmers (Hassan 2010). Over 70% of this damage was to the Nicobar Islands.

2.2. Data Collection and Analysis

We compiled the dataset from the annual reports for 2003–04 to 2016–17[7] brought out by the four revenue ports of the Nicobar Islands, i.e., Car Nicobar, Katchal, Nancowry, and Campbell Bay, maintained by the Port

[6] 2005 INR to USD exchange rate of USD 1 = INR 44.1.

[7] Data on Nancowry Island for 2003–04 was unavailable.

Management Board (PMB), Andaman and Nicobar Administration.[8] We limited our study to the period 2003–2017 due to the unavailability of data for the pre-tsunami period, as several records stored in the PMB offices were destroyed during the 2004 disaster. The data were cleaned for an exploratory analysis in R (R Core Team 2018; Grolemund and Wickham 2017). The PMB records the mass of cargo loaded and unloaded in ports annually in a standard template (48 commodities in 23 categories). We calculated the physical trade balance, defined as imports less exports (measured in metric tonnes or MT), for the Nicobar Islands and examined the trends in imports and exports for all 48 commodities disaggregated by port. Thereafter, we shortlisted commodities into seven categories: construction materials; agricultural commodities; food stuff; general cargo; petroleum, oil, and lubricants (POL) (including petroleum crude); scrap items; and others (for the list of commodities, see Appendix, Table A1). We also analysed secondary data on infrastructure from statistical publications of the Directorate of Economics and Statistics, Andaman and Nicobar Islands Administration. The relevant results of our analysis are presented in the next section; the vertical dotted line in the graphs indicates the earthquake and tsunami in December 2004.

The primary observations concerning production and trade were derived from interviews with farmers, local leaders, and government officials, as part of the authors' respective doctoral research on the Great Nicobar Island between 1999–2009 (SB) and 2014–2018 (SS).

3. RESULTS

Nicobar's physical trade balance has been increasing since 2003–04 (or the financial year 2004), but it grew at a substantial rate after the earthquake and ensuing tsunamis in December 2004 (Figure 2). There was a decline from 2007–08 till 2011–12, after which the physical trade balance appears to have stabilized to levels comparable to the pre-tsunami period. As an analysis of the physical trade balance alone obscures the qualitative transformation in economic processes, the quantities and nature of physical imports and exports are visualized in Figures 3, 5, 6, and 7.

[8] We consulted records at the PMB offices in Port Blair and Campbell Bay between 2016 and 2018.

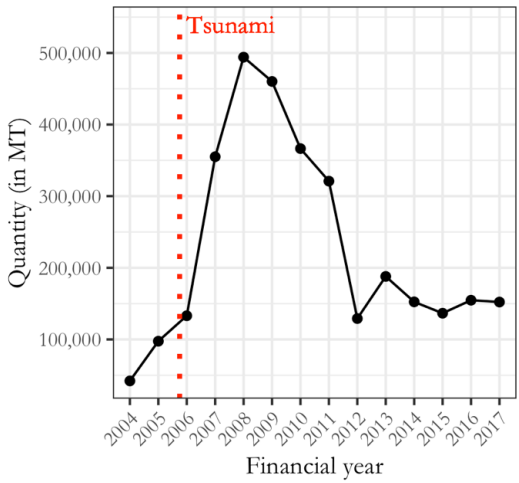


Figure 2: Physical Trade Balance in the Nicobar Islands (2003–2017)

Construction materials were the principal category of material (or physical) imports into the Nicobar Islands every year between 2003 and 2017. Agricultural commodities were the main physical exports from the Nicobar Islands, except for four years—the two years following the tsunami, and 2014–2015 and 2015–16—when they were surpassed by general cargo and construction materials, respectively, owing to trans-shipments to smaller islands. The Nicobar Islands largely export to Port Blair on South Andaman Island; they also export some agricultural and marine products to other islands within the group. We further disaggregated key imports and exports by the four revenue ports in the archipelago into four categories, i.e., construction materials, fuel, food stuff, and agriculture.

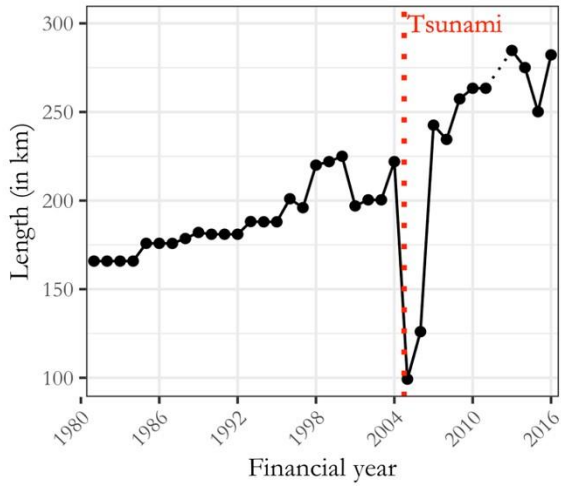
Construction materials such as bitumen, cement, stone, sand, steel, timber, and heavy machinery were imported in large quantities after the tsunami (Figure 3). The quantity of construction materials imported for post-disaster reconstruction dwarfs all other imports to these islands. These materials have been used to create economic infrastructure, such as jetties, houses, schools, health centres, government schools, offices, and the extended road network on the islands (see Table 1 and Figure 4). However, the reconstruction efforts have not been evenly spread across the islands. For example, bitumen, cement, and finished steel imports into Car Nicobar were larger and took place before imports to other islands, as it was the Nicobar district headquarters and the most populous island in the group (Figure 3).

Figure 3: Construction Material Imported into the Nicobar Islands (2003–04 to 2016–17)

The construction of the economic and social infrastructure of the islands continued for over a decade after the tsunami. Challenges associated with construction included the distance from the mainland (which made importing materials difficult), a very short dry season of four months for the construction work, and unavailability of jetties for cargo ships in Nancowry tehsil. Therefore, loading and unloading of cargo were largely done through stevedoring. Select indicators of infrastructure built are given in Table 1. Permanent housing shelters and community buildings[9] were constructed by the Central Public Works Department after deliberations on their design with the tribal councils and panchayats. Extension of medical and education facilities was also prioritized. The number of these

[9] Community buildings include community halls, recreation halls, and customary birth and death houses in the Nicobarese villages.

institutions in 2016–17 obscures the fact that there are now fewer villages in the Nicobar Islands, which has resulted in a concentration of administrative and development focus. In the Campbell Bay tehsil, for example, survivors from the eight Nicobarese villages and hamlets on the west coast of Great Nicobar were eventually relocated to three permanent villages created on the island's east and north coasts; the two east coast villages are connected by road. The newer and fewer villages in the Nicobar Islands have now been brought into a closer embrace with state-led development.



Data Source: DES, ANI

Figure 4: Physical Trade Balance in the Nicobar Islands (2003–2017)

POL products and liquified petroleum gas (LPG) are key sources of fuel in the Nicobar Islands, and their imports have increased rapidly in the post-tsunami period (see Figure 5). LPG cylinders are used as household cooking fuel, while petrol and diesel provide fuel for power generation, construction machinery (such as road rollers, earthmovers, asphalt and cement mixers), and transport vehicles. As seen in Table 1, LPG connections on the islands have increased by 13 times between 2005–06 and 2016–17, while the installed power capacity has increased by 21 times. We observed that the number of private, government, and commercial vehicles on the islands, such as fishing boats, trucks, buses, cars, and motorcycles, have also increased. Consequently, fuel imports into Car Nicobar, Nancowry, and Campbell Bay ports are at unprecedented levels as compared to the pre-tsunami period; moreover, they are unlikely to decrease.

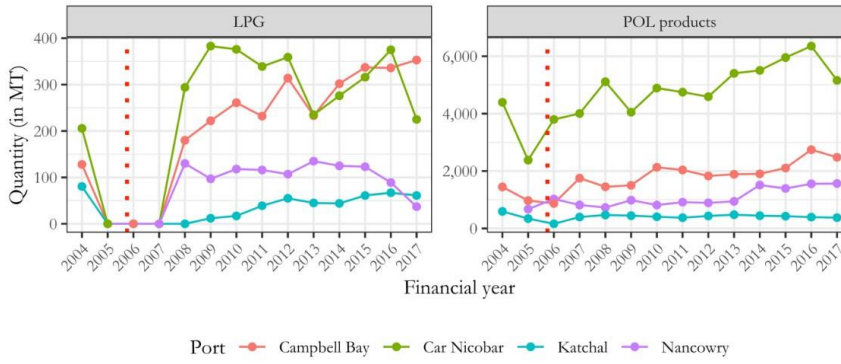
Table 1: Select Indicators of Infrastructure in the Nicobar Islands

Category	**2005–06**	**2016–17**
Housing		
Permanent shelters	NA	7,001
Health		
Medical institutions[10]	41	46
Education		
Schools	70	59
School enrolment	7,103	6,587
Fuel and power		
LPG connections	230	3,329
Installed capacity	562 KW (kilowatt)	12,193 KW
Electrified villages	91	98
Industry		
Small-scale industries	71	72
Telecommunication[11]		
Broadband connections	0	371
Transportation		
Country craft (fishing boats)	-	338
Mechanized fishing boats	175	170
Surfaced road length	85.23 km	282.23 km
Storage		
Fair price shops	41	52
Godowns and warehouses	8	17

Source: Directorate of Economics and Statistics (n.d.-a.; n.d.-b.; n.d.-e.; n.d.-f.); "Status Report of Permanent Shelters in A&N Islands" (n.d.)

[10] Medical institutions include hospitals, community health centres, primary health centres, dispensaries, and sub-centres.

[11] Mobile telecommunication was introduced in the post-tsunami period.



Data Source: Port Management Board, ANI

Figure 5: Fuel Imports into the Nicobar Islands (2003–04 to 2016–17)

Food stuff is a critical import; it includes food grains, oil, salt, sugar, tea, fruits, and vegetables. Food imports increased in the post-tsunami period due to relief efforts and stabilized thereafter (see Figure 6). Car Nicobar receives the largest volume of food imports in the group as it is the most populous island in the archipelago. The quantum of wheat imports into Campbell Bay reflects its diversity in population and their food culture.

Agriculture and fishery (and stone quarrying to a limited extent) are the main export sectors of the Nicobar Islands.[12] Other exported items represent the movements of cargo or material flows from the islands but not those originating from it. These exports include construction material and general cargo for trans-shipments and scrap material from the islands, including debris from infrastructure destroyed by the earthquake and tsunami which was removed from the islands from 2009 onwards (see Appendix, Figure A1).

[12] Commercial harvest of timber and non-timber forest products is not permitted in the Nicobar Islands and therefore absent from documented exports. From our fieldwork, we are aware that limited quarrying for rocks was permitted following the tsunami on the Great Nicobar Island.

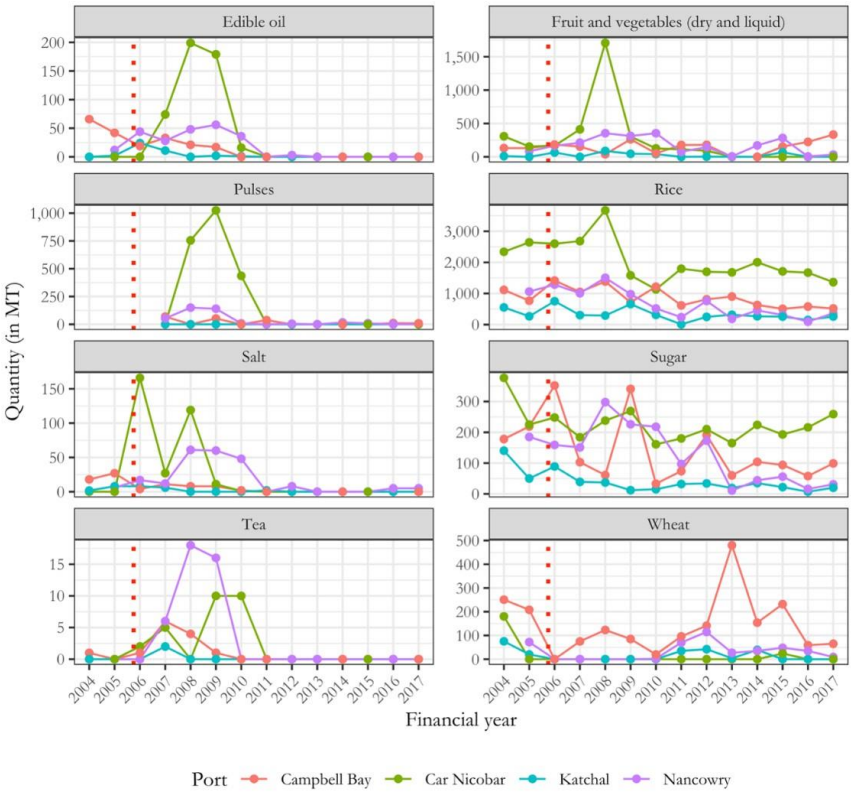


Figure 6: Food Imports into the Nicobar Islands (2003–04 to 2016–17)

The rubber plantations of Katchal were established by the Rubber Board in 1968 and transferred in 1983 to the Andaman and Nicobar Islands Forest and Plantation Development Corporation Limited (ANIFPDCL). ANIFPDCL was closed in 2017 after incurring losses since 2001, when forestry activities were suspended by a Supreme Court order (Dhingra 2005; Cabinet Committee on Economic Affairs 2017). Katchal also experienced the largest damage by area to its agricultural plantations (Hassan 2010). Consequently, the island was depopulated in subsequent years and has reduced material flows.

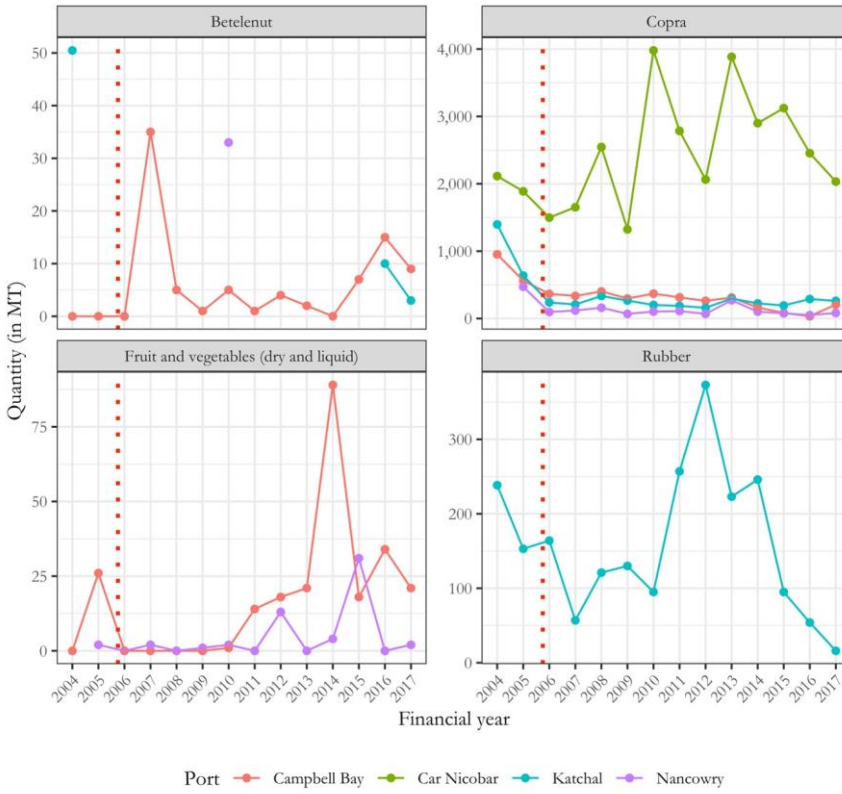


Figure 7: Agricultural Exports from the Nicobar Islands (2003–04 to 2016–17)

While Car Nicobar leads the archipelago in copra exports, Campbell Bay has emerged as an exporter of desiccated coconut powder in recent years. This followed the establishment in 2011 of a small-scale desiccated coconut powder industry in a revenue village on Great Nicobar Island, the exports of which are unfortunately not recorded separately in the dataset. The tonnage alone, therefore, masks the value of the processed goods that are exported and may even show a declining trend (such as in the recent copra exports from Campbell Bay). Local respondents attribute the boost in fruit and vegetable exports from Campbell Bay in recent years to the tenant cultivators who came to Great Nicobar as migrant labourers for post-tsunami reconstruction. Several original plantation owners either emigrated to the mainland after the tsunami or leased their plantations and diversified into transportation and as contractors for expanding civil works (i.e., the infrastructure in Table 1).

4. DISCUSSION

The tsunami is widely considered a watershed moment for the Nicobar Islands and is categorized as a socio-ecological disaster in scholarship (Tripathi 2018). The flows of relief material brought government and aid agencies in contact, resulting in uneasy donor-aid relationships; this period has been referred to as a "tsunami of aid" (Ramani 2010). The nature of aid and implementation of humanitarian relief ran counter to Nicobarese norms of reciprocity and effected social hierarchies within communities. Thus, the influx of multilateral aid and protracted residence in relief camps after the 2004 disaster reconfigured Nicobarese institutions and social structures such as the *tuhet* (Ramanujam, Singh, and Vatn 2012). These social changes have affected traditional natural resource use and management in the post-tsunami period (Patankar *et al.* 2015). As the creation, management, and harvesting of new coconut plantations are labour-intensive activities that are facilitated by reciprocal labour relations among kin, the social changes resulting from the tsunami have also altered the social embeddedness of Nicobarese coconut production and trade (Chandi 2016).

Physical imports into these islands between 2003 and 2017 were dominated by construction materials and fuel, which steadily increased on all islands in the post-tsunami period. The island infrastructure was rebuilt and expanded, and this redevelopment manifested as an improvement in the lives of residents. The infrastructural changes also enabled new consumption patterns in the Nicobar Islands, with larger volumes of consumer durables and assets such as transport vehicles and consumer electronics entering the marketplace. These are reflected in trends in general cargo imports, which is a catch-all category for the movement of household and commercial cargo material by passenger and cargo vessels in the islands. After the initial wave of relief material in the years following the disaster, there was a steady flow of general cargo imports into all four revenue ports in the archipelago. These results indicate the reinforcement of the economic dependency of the islands on the mainland, which is a common problem facing offshore islands (Royle 1989). Island studies scholars highlight how "islandness" is a central quality of islands, defined by boundedness, smallness, isolation, and fragmentation, which become amplified in compressed island spaces (Baldacchino 2018). Scholars therefore advocate rethinking conventional mainland economic models for islands in favour of those encouraging greater economic autonomy and self-determination (Stratford 2017).

Post-disaster rebuilding is not an isolated project as it interfaces with the social and ecological systems of islands. The Nicobar Islands are a tribal

reserve and biodiversity hotspot located in the Indian Ocean and, as such, economic production models and development policy have to contend with these social and ecological realities instead of considering them as constraints to production and trade. In the Nicobar Islands, therefore, the study of economic exchange alone is inadequate to understand historical and contemporary agrarian practices and exchanges (Singh *et al.* 2001; Reddy 1982). We discuss these aspects through the main sector in Nicobar's economy—agriculture.

The export of key agricultural and plantation crops, such as coconut, betelnut, rubber, fruits, and vegetables, is dependent on social and ecological considerations; both considerations were reconfigured by the tsunami and post-tsunami relief and redevelopment. Traditional coconut plantations thrive in coastal zones, can take 8–12 years to attain maturity, and thereafter provide consistent yields. As the tsunami destroyed coastal plantations, the export of perennial crops across the islands suffered and took over a decade to recover. The cultivation of annual fruit and vegetable crops by tenant cultivators in recent years has led to an increase in exports from Great Nicobar Island. Cultivators in Katchal, Little Nicobar, and Great Nicobar also have to contend with crop-raiding by the endemic Nicobar Long-tailed Macaque (*Macaca Fascicularis Umbrosus*) (Pal *et al.* 2018).

Coconut plays a central role in Nicobarese culture and homesteads, in addition to being the archipelago's main export. Coconut and pandanus drupes are an important part of Nicobarese food culture, providing food, cooking oil, and cooking fuel despite alternatives such as rice, cooking oil, LPG, and kerosene stoves. Their persistence is partly due to their relevance in society as more than an economic commodity. Coconuts play a significant role in ceremonies marking all phases of life—birth, coming of age, marriage, death, and afterlife. They are also an important source of livestock feed, chiefly for poultry and pigs, which in turn are also important for cultural practices. This affects coconut trade volumes from Nicobarese plantations, as the other cultivator communities (in Great Nicobar) do not have similar demands on their output. A sub-community of tenant cultivators in Great Nicobar has increased the fruit and vegetable exports from Campbell Bay port in recent years and made the island a regular supplier to Car Nicobar.[13] Meanwhile, coconut cultivators in the revenue areas of Great Nicobar have found an alternative to making copra—they sell coconut to a small-scale coconut processing unit set up in a revenue village in 2011. This unit produces dry coconut powder using dehusked

[13] Imports of agricultural inputs also increased in the post-tsunami period (see Appendix, Figure A1).

coconut drupes and ships a steady monthly production to Port Blair in cargo ships.

While post-disaster recovery seeks to prevent any further loss of lives (with a focus on rescue and relief), subsequent redevelopment aims to remedy losses to livelihoods and assets through redevelopment (Roy 2008). Infrastructural development, however, has had a mixed impact on agricultural livelihoods. It has led to increased availability of farm labour and tenant farming and addressed logistical bottlenecks such as last-mile connectivity to plantations and frequency of shipping services. The expanding infrastructure has simultaneously resulted in revenue area cultivators moving out of agriculture and into civil contract works. As has been seen elsewhere, through the stages of recovery and redevelopment, political actors find opportunities for gaining or losing political legitimacy and effecting transformative changes to local economies (Oliver-Smith 1996). Transformative changes are limited by institutional capacity and mediated through historical contingency and the resilience of the local culture (Hunter 2016).

The nature of key material exports has shifted; for example, the main type of coconut export from Campbell Bay port in Great Nicobar Island has changed from copra to desiccated coconut powder since 2011–12, and this shift is not reflected in the otherwise declining copra exports (see Figure 7). As it takes approximately twice as many coconuts to produce copra compared to desiccated coconut powder, the establishing of the industrial unit reflects a value addition to the coconut supply chain. Processing increases the shelf-life of, and adds value to, the coconut, whether processed manually into copra or at an industrial scale into desiccated coconut powder. Furthermore, the industrial unit has a consistent supply for cargo vessels vis-à-vis copra traders, which is important for the supply chain and ensures regularity of cargo vessels to Campbell Bay.

Reconstruction efforts were not spread evenly across the islands. There is a historical contingency to the metabolic build-up of materials flows for development at certain ports, such as Car Nicobar and Campbell Bay (Singh 2003), and development interventions after the tsunami have further emphasized this trajectory. Several key elements of trade that were historically insignificant in the Nicobar Islands have gained prominence in the post-tsunami years, and many of these changes, such as infrastructure development, have qualitatively transformed production practices and trade on the islands. Along with the cultural transformation of the Nicobar Islands, observable in the disintegration of the *tuhet* system and the influx of consumer durables, mobile telecommunication, and internet services, these changes in production practices and trade have led to a reconfiguration of

ecology–society relationships on the islands. Overall, these changes signal a socio-economic transformation underway in the Nicobar Islands and merit further investigation.

This study is a methodological exploration of the response of local or regional economies to environmental disturbances and identifies structural changes brought about by disasters. In situations where conventional economic analysis may be difficult, an approach encompassing physical trade can provide insight into social and ecological systems, especially where valuation is problematic. The valuation of environmental goods and services compresses complex and interrelated attributes of the environment into simplified monetary metrics and results in the loss of information that is non-randomly distributed in society (Vatn and Bromley 1994).

5. CONCLUSION

The relief, reconstruction, and redevelopment efforts following the tsunami have resulted in unprecedented changes in the Nicobar Islands, and our analysis of physical exports and imports points towards a transformation of the Nicobar Islands' economy since 2004. In the post-tsunami period, imports were predominantly for relief and redevelopment. Thereafter, the quantum of material imports stabilized. The resulting infrastructure and consumption patterns are shaping the new development trajectory of the islands. The metabolic impact of these new developmental trajectories is indicated by the substantial imports of and dependence on fossil fuels and construction materials from the mainland. We therefore argue that the development policy and imports in the post-tsunami period have qualitatively transformed production practices and trade in the islands.

The primary exports from the Nicobar Islands are (cultivated and harvested) natural resources from the agricultural and marine sectors and building materials such as rocks briefly permitted for quarrying on Great Nicobar Island. While the physical trade balance reflects changes on a regional level, it masks economic disparities across different island groups and categories of imports and exports. The post-tsunami relief, reconstruction, and redevelopment reinforced historical development trajectories of ports and islands in the Nicobar group.

The limitations to production on these islands, posed by protected forests, protected areas, and tribal reserves, are manifestations of legitimate considerations for conserving the environment and indigenous tribal cultures. Consequently, economic development is only seen in certain sectors, such as in the increasing material exports from the marine, agricultural, and stone-quarrying sectors. Furthermore, we see that the nature and value of the key material exports from Great Nicobar Island

have changed; for example, the primary coconut product exported has changed from copra to desiccated coconut powder. This new value chain excludes Nicobarese cultivators, and thus the politics of this redistribution needs further examination.

In this paper, we investigated the transformational impact of the earthquake and tsunami of 2004, which includes the event itself as well as the relief, rehabilitation, and redevelopment efforts in the years that followed. The social and ecological embeddedness of production and trade in the Nicobar Islands was severely impacted by the 2004 disaster and subsequent interventions. Aid and imports in the post-tsunami period have eroded Nicobarese kinship systems and have physically modified the production systems into new metabolic regimes that critically depend on imports from mainland India.

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REFERENCES

Ansink, Erik. 2010. "Refuting Two Claims about Virtual Water Trade." *Ecological Economics* 69(10): 2027–2032. https://doi.org/10.1016/j.ecolecon.2010.06.001.

Baldacchino, Godfrey, ed. 2018. *The Routledge International Handbook of Island Studies: A World of Islands*. Oxon: Routledge. https://doi.org/10.4324/9781315556642

Botzen, WJ Wouter, Olivier Deschenes, and Mark Sanders. 2019. "The Economic Impacts of Natural Disasters: A Review of Models and Empirical Studies." *Review of Environmental Economics and Policy* 13(2): 167–188. https://doi.org/10.1093/reep/rez004.

Cabinet Committee on Economic Affairs. 2017. "Cabinet Approves Closure of Andaman & Nicobar Islands Forest and Plantation Development Corporation

Limited (ANIFPDCL), Port Blair." New Delhi: Press Information Bureau, Government of India. https://pib.gov.in/newsite/PrintRelease.aspx?relid=170013.

Census of India. 2011. "Primary Census Abstract Data Tables for Andaman & Nicobar Islands." http://www.censusindia.gov.in/.

Chandi, Manish Mathai. 2016. "Constancy and Change: Disturbance to Natural Resources, Sharing Mechanisms and Control: A Study of Natural Resource Management in the Nicobar Islands." PhD Diss., Manipal University.

Dagar, HS, and JC Dagar. 1986. "Some Observations of the Ethnology of the Nicobarese with Special Reference to Cocos Nucifera Linn." *Journal of the Bombay Natural History Society* 83(2): 306–310.

de Molina, Manuel González, and Víctor M Toledo. 2014. *The Social Metabolism: A Socio-ecological Theory of Historical Change*. London: Springer. https://doi.org/10.1007/978-3-319-06358-4.

Dhingra, Kiran. 2005. *The Andaman and Nicobar Islands in the Twentieth Century: A Gazetteer*. New Delhi, India: Oxford University Press.

Directorate of Economics and Statistics. n.d.-a. "Basic Statistics 2016–17." Accessed 6 Nov 2017. http://andssw1.and.nic.in/ecostat/basic_statistics1617.php.

———. n.d.-b. "Basic Statistics 2018–19." Accessed 10 June 2020. http://andssw1.and.nic.in/ecostat/basic_statistics1819.php.

———. n.d.-c. "Basic Statistics 2019–20." Accessed 27 May 2021. http://andssw1.and.nic.in/ecostat/basic_statistics1920.php.

———. n.d.-d. "Earth Quake Shocks Magnitude of > 5.0 and Felt Shocks in A&N Islands." Accessed January 29, 2018. http://andssw1.and.nic.in/ecostat/Earthquake/Earthquake2004.pdf.

———. n.d.-e. "Statistical Handbook on Andaman District and Nicobar District 2005–2006." Vol 13. Port Blair, India: Directorate of Economics and Statistics, Andaman and Nicobar Administration.

———. n.d.-f. "Transport Statistics 2003–2004 to 2005–2006." Vol 11. Port Blair, India: Directorate of Economics and Statistics, Andaman and Nicobar Administration.

Dittrich, Monika, and Stefan Bringezu. 2010. "The Physical Dimension of International Trade. Part 1: Direct Global Flows between 1962 and 2005." *Ecological Economics* 69(9): 1838–47. https://doi.org/10.1016/j.ecolecon.2010.04.023.

Dittrich, Monika, Stefan Bringezu, and Helmut Schütz. 2012. "The Physical Dimension of International Trade, Part 2: Indirect Global Resource Flows Between 1962 and 2005." *Ecological Economics* 79 (July): 32–43. https://doi.org/10.1016/j.ecolecon.2012.04.014.

Fischer-Kowalski, Marina, and Walter Hüttler. 1998. "Society's Metabolism: The Intellectual History of Materials Flow Analysis, Part II, 1970–1998." *Journal of Industrial Ecology* 2(4): 107–36. https://doi.org/10.1162/jiec.1998.2.4.107.

Grolemund, Garrett, and Hadley Wickham. 2017. *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*. Sebastopol, Canada: O'Reilly.

Hassan, MM. 2010. "Rehabilitation of Agricultural Activities in Tsunami Affected Areas of Andaman and Nicobar Islands." In *National Workshop on "Coconut Based Farming System in Andaman and Nicobar Islands"* (pp. 126–128), edited by MA Salam *et al*. Port Blair, India: High Value Agriculture Development Agency.

Hsiang, Solomon M. 2010. "Temperatures and Cyclones Strongly Associated with Economic Production in the Caribbean and Central America." *Proceedings of the National Academy of Sciences of the United States of America* 107(35): 15367–15372. https://doi.org/10.1073/pnas.1009510107.

Hunter, Janet. 2016. "Earthquakes in Japan." *Modern Asian Studies* 50(1): 415–435. https://doi.org/doi:10.1017/S0026749X15000219.

IPCC. 2007. "Summary for Policymakers." In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by Martin L Parry, Osvaldo F Canziani, Jean P Palutikof, Paul J van der Linden, and Clair E Hanson, 7–22. Cambridge: Cambridge University Press.

Man, Edward Horace. 1886. "A Brief Account of the Nicobar Islanders, with Special Reference to the Inland Tribe of Great Nicobar." *The Journal of the Anthropological Institute of Great Britain and Ireland* 15: 428–51. https://doi.org/10.2307/2841823.

Martinez-Alier, Juan, and Klaus Schlüpmann. 1987. *Ecological Economics: Energy, Environment and Society*. Oxford: Basil Blackwell.

Mimura, Nobuo, Leonard Nurse, Roger F McLean, John Agard, Lino Briguglio, Penehuro Lefale, Rolph Payet, and Graham Sem. 2007. "Small Islands." In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by Martin L Parry, Osvaldo F Canziani, Jean P Palutikof, Paul J van der Linden, and Clair E Hanson, 687–716. Cambridge: Cambridge University Press.

Ministry of Home Affairs. 2006. "Annual Report 2005–06." New Delhi, India: Ministry of Home Affairs.

Moran, Daniel D, Mathis C Wackernagel, Justin A Kitzes, Benjamin W Heumann, Doantam Phan, and Steven H Goldfinger. 2009. "Trading Spaces: Calculating Embodied Ecological Footprints in International Trade Using a Product Land Use Matrix (PLUM)." *Ecological Economics* 68(7): 1938–1951. https://doi.org/10.1016/j.ecolecon.2008.11.011.

Myers, Norman, Russell A Mittermeier, Cristina G Mittermeier, Gustavo AB da Fonseca, and Jennifer Kent. 2000. "Biodiversity Hotspots for Conservation Priorities." *Nature* 403(6772): 853–858. https://doi.org/10.1038/35002501.

Oliver-Smith, Anthony. 1996. "Anthropological Research on Hazards and Disasters." *Annual Review of Anthropology* 25(1): 303–328. https://doi.org/10.1146/annurev.anthro.25.1.303.

Pal, Arijit, Honnavalli N Kumara, Partha Sarathi Mishra, Avadhoot D Velankar, and Mewa Singh. 2018. "Extractive Foraging and Tool-aided Behaviors in the Wild Nicobar Long-tailed Macaque (Macaca Fascicularis Umbrosus)." *Primates* 59(2):

173–183. https://doi.org/10.1007/s10329-017-0635-6.

Patankar, Vardhan, Elrika D'Souza, Teresa Alcoverro, and Rohan Arthur. 2015. "Erosion of Traditional Marine Management Systems in the Face of Disturbances in the Nicobar Archipelago." *Human Ecology* 43(5): 697–707. https://doi.org/10.1007/s10745-015-9781-x.

Pelling, Mark, Alpaslan Özerdem, and Sultan Barakat. 2002. "The Macro-economic Impact of Disasters." *Progress in Development Studies* 2(4): 283–305. https://doi.org/10.1191/1464993402ps042ra.

Pelling, Mark, and Juha I Uitto. 2001. "Small Island Developing States: Natural Disaster Vulnerability and Global Change." *Environmental Hazards* 3(2): 49–62. https://doi.org/10.1016/S1464-2867(01)00018-3.

Planning Commission. 2008. "Andaman and Nicobar Islands Development Report." New Delhi: Academic Foundation.

R Core Team. 2018. "R: A Language and Environment for Statistical Computing." Vienna, Austria: R Foundation for Statistical Computing. https://www.r-project.org/.

Rajendran, CP, Kusala Rajendran, R Anu, Anil Earnest, Terry Machado, PM Mohan, and Jeffrey Freymueller. 2007. "Crustal Deformation and Seismic History Associated with the 2004 Indian Ocean Earthquake: A Perspective from the Andaman–Nicobar Islands." *Bulletin of the Seismological Society of America* 97(1): 174–191. https://doi.org/10.1785/0120050630.

Rajendran, Kusala, CP Rajendran, Anil Earnest, GV Ravi Prasad, K Dutta, DK Ray, and R Anu. 2008. "Age Estimates of Coastal Terraces in the Andaman and Nicobar Islands and Their Tectonic Implications." *Tectonophysics* 455(1–4): 53–60. https://doi.org/10.1016/j.tecto.2008.05.004.

Ramanamurthy, MV, S Sundaramoorthy, Y Pari, V Ranga Rao, P Mishra, M Bhat, Tune Usha, R Venkatesan, and BR Subramanian. 2005. "Inundation of Sea Water in Andaman and Nicobar Islands and Parts of Tamil Nadu Coast During 2004 Sumatra Tsunami." *Current Science* 88(11): 1736–1740.

Ramani, Venkat Ramanujam. 2010. "Gifts Without Dignity? Gift-giving, Reciprocity and the Tsunami Response in the Andaman and Nicobar Islands, India." PhD Diss., University of Cambridge.

Ramanujam, Ramani Venkat, Simron Jit Singh, and Arild Vatn. 2012. "From the Ashes into the Fire? Institutional Change in the Post-tsunami Nicobar Islands, India." *Society & Natural Resources: An International Journal* 25(11): 1152–1166. https://doi.org/10.1080/08941920.2012.669516.

Reddy, G Prakash. 1982. *Scarcity and Survival: A Study in Culture Ecology of Chowra Island in Nicobar Archipelago*. Delhi, India: D. K. Publications.

Relief Commissioner. 2005. "Memorandum on Earthquake/Tsunami Damages." Port Blair, India: Andaman and Nicobar Islands Administration, Government of India.

Roy, JK, and BC Roy. 1969. "Food Sources, Dietary Habits and Nutrient Intake of the Nicobarese of Great Nicobar." *Indian Journal of Medical Research* 57(5): 329–33.

Roy, Tirthankar. 2008. "State, Society and Market in the Aftermath of Natural Disasters in Colonial India: A Preliminary Exploration." *Indian Economic and Social History Review* 45(2): 261–294. https://doi.org/10.1177/001946460804500204.

Royle, SA. 1989. "A Human Geography of Islands." *Geography* 74(2): 106–116.

Saldanha, Cecil J, ed. 1989. *Andaman, Nicobar and Lakshadweep: An Environmental Impact Assessment*. New Delhi: Oxford & IBH Publishing Co.

Sankaran, Ravi. 2005. "Impact of the Earthquake and the Tsunami on the Nicobar Islands." In *The Ground Beneath the Waves: Post-tsunami Impact Assessment of Wildlife and their Habitats in India (Vol. 2: The Islands)*, edited by Rahul Kaul and Vivek Menon, 10–77. New Delhi, India: Wildlife Trust of India.

Sato, Misato. 2014. "Product Level Embodied Carbon Flows in Bilateral Trade." *Ecological Economics* 105 (September): 106–117. https://doi.org/10.1016/j.ecolecon.2014.05.006.

Schaffartzik, Anke, Andreas Mayer, Simone Gingrich, Nina Eisenmenger, Christian Loy, and Fridolin Krausmann. 2014. "The Global Metabolic Transition: Regional Patterns and Trends of Global Material Flows, 1950–2010." *Global Environmental Change* 26(1): 87–97. https://doi.org/10.1016/j.gloenvcha.2014.03.013.

Schandl, Heinz, and Anke Schaffartzik. 2015. "Material Flow Analysis". In *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)*, edited by James D Wright, 760–764. https://doi.org/10.1016/B978-0-08-097086-8.91060-2.

Sehgal, Shaina. 2021. Putting Nicobar Islands on the map: Intersections of colonial knowledge, trade and colonisation. *Indian Journal of History of Science*. https://doi.org/10.1007/s43539-021-00002-4.

Sekhsaria, Pankaj. 2021. "Green Panel Allows Great Nicobar Plan to Advance." *The Hindu*, May 9. https://www.thehindu.com/sci-tech/energy-and-environment/green-panel-allows-great-nicobar-plan-to-advance/article34521310.ece.

Singh, Simron Jit. 2003. *In the Sea of Influence: A World System Perspective of the Nicobar Islands*. Lund, Sweden: Lund University.

Singh, Simron Jit, Clemens M Grünbühel, Heinz Schandl, and Niels Schulz. 2001. "Social Metabolism and Labour in a Local Context: Changing Environmental Relations on Trinket Island." *Population and Environment* 23(1): 71–104. https://doi.org/10.1023/A:1017564309651.

Singh, Simron Jit, and Ramani Venkat Ramanujam. 2010. "Exploring Ecologically Unequal Exchange Using Land and Labor Appropriation: Trade in the Nicobar Islands, 1880–2000." In *International Trade and Environmental Justice: Toward a Global Political Ecology*, edited by Alf Hornborg and Andrew K Jorgenson, 19–48. Nova Science Publishers, Inc.

n.d. "Status Report of Permanent Shelters in A&N Islands." Accessed November 8, 2014. www.and.nic.in/shelterP/islandwise.

Stratford, Elaine, ed. 2017. *Island Geographies: Essays and Conversations*. New York: Routledge. https://doi.org/10.4324/9781315686202.

Thakkar, MG, and Bhanu Goyal. 2006. "Historic Submergence and Tsunami Destruction of Nancowrie, Kamorta, Katchal and Trinket Islands of Nicobar District: Consequences of 26 December 2004 Sumatra–Andaman Earthquake." *Current Science* 90(6): 989–994.

Tripathi, Punam. 2018. *The Vulnerable Andaman and Nicobar Islands: A Study of Disasters and Response*. New Delhi: Routledge India. https://doi.org/10.4324/9781351059473.

Vaidik, Aparna. 2010. *Imperial Andamans: Colonial Encounter and Island History*. London, UK: Palgrave Macmillan. https://doi.org/10.1057/9780230274884.

Vatn, Arild, and Daniel W Bromley. 1994. "Choices Without Prices Without Apologies." *Journal of Environmental Economics and Management* 26(2): 129–148. https://doi.org/10.1006/jeem.1994.1008.

Würtenberger, Laura, Thomas Koellner, and Claudia R. Binder. 2006. "Virtual Land Use and Agricultural Trade: Estimating Environmental and Socio-economic Impacts." *Ecological Economics* 57(4): 679–97. https://doi.org/10.1016/j.ecolecon.2005.06.004.

APPENDIX

The Port Management Board records the commodities imported and exported at revenue ports using a standard national template (48 commodities in 23 categories). These were revised into seven analytical categories, i.e., construction materials, agricultural commodities, food stuff, general cargo, petroleum, oil, and lubricants (POL) products (including petroleum crude), scrap items, and others, as per Table A1.

Table A1: Categories of Exports and Imports Used in the Data Analysis

No.	Commodities (PMB data)	Categories (PMB data)	Revised categories
1	Petroleum crude*	Minerals	POL products
2	POL products	Minerals	POL products
3	Thermal coal*	Minerals	Others
4	Cooking coal*	Minerals	Others
5	LPG	Minerals	LPG
6	Bitumen	Minerals	Construction materials
7	Others*	Minerals	Others
8	Cement	Building materials	Construction materials
9	Cement clinkers	Building materials	Construction materials
10	Timber	Building materials	Construction materials
11	Timber products	Building materials	Construction materials
12	Sand	Building materials	Construction materials
13	Stone products	Building materials	Construction materials
14	Others	Building materials	Construction

No.	Commodities (PMB data)	Categories (PMB data)	Revised categories
			materials
15	Rice	Food grains	Food stuff
16	Sugar	Food grains	Food stuff
17	Wheat	Food grains	Food stuff
18	Pulses	Food grains	Food stuff
19	Iron ore*	Ores	Metals
20	Feldspars*	Ores	Metals
21	Others	Ores	Metals
22	Fertilizer finished	Fertilizers	Others
23	Rock phosphate*	Fertilizers	Others
24	Fertilizer raw material (excluding rock phosphate)*	Fertilizers	Others
25	Sulphur*	Fertilizers	Others
26	Others*	Fertilizers	Others
27	Liquid ammonia*	Chemicals	Others
28	Phosphoric acid*	Chemicals	Others
29	Other chemicals (solid and liquid)*	Chemicals	Chemicals
30	Liquor	Chemicals	Liquor
31	Fruit and vegetables (dry and liquid)	Fruit and vegetables (dry and liquid)	Agricultural commodities
32	Edible oil	Edible oil	Food stuff
33	Hard brigated iron*	Iron steel	Others
34	Finished steel	Iron steel	Others

No.	Commodities (PMB data)	Categories (PMB data)	Revised categories
35	Machineries	Machineries	Construction materials
36	Other metal products*	Other metal products	Others
37	Salt	Salt	Food stuff
38	Tea	Tea	Food stuff
39	Coffee*	Coffee	Food stuff
40	Oil cake*	Oil cake	Others
41	Frozen shrimp	Frozen shrimp	Food stuff
42	Rubber	Rubber	Agricultural commodities
43	Copra	Copra	Agricultural commodities
44	Betelnut	Betelnut	Agricultural commodities
45	Others (not specified above)	Others (not specified above)	Others
46	Logs	Logs	Construction Materials
47	Scrap items	Scrap items	Scrap items
48	General cargo	General cargo	General cargo

Commodities with an asterisk (*) indicate negligible physical imports or exports in the dataset.

We calculated a linear interpolation (i.e., a simple average) for missing values for Figure 3 and Figure A1, indicated by the dotted line in both series.

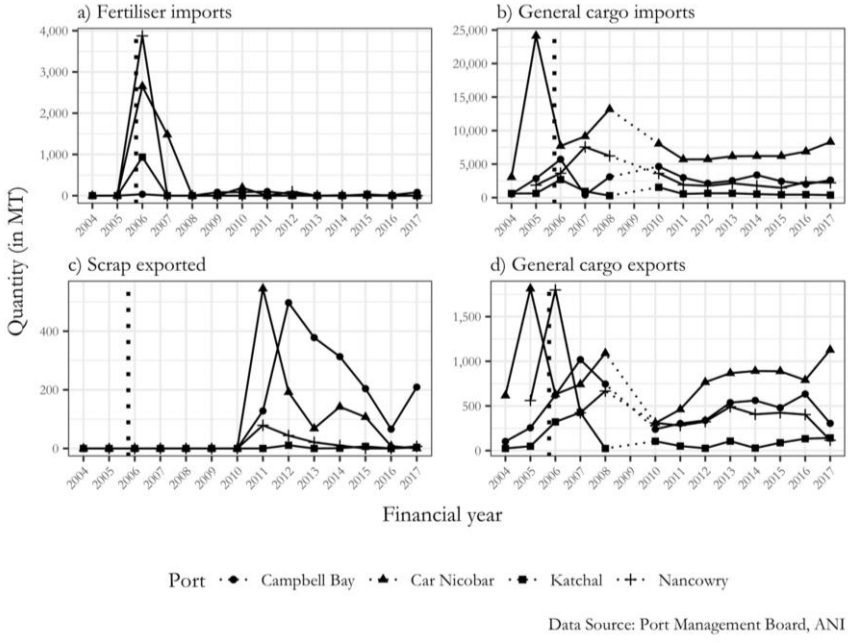

Figure A1: Select Physical Imports and Exports in the Nicobar Islands (2003–04 to 2016–17)