

The Socio-economic Conditions of Fishers on Indonesia's Beeng Laut Island

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Abstract. This study aimed to determine the socio-economic conditions related to marketing margins of demersal fish in Beeng Laut Island, Sangihe Archipelago Regency, North Sulawesi Province, Indonesia, using survey methods with interview and questionnaire techniques. Most fishers on Beeng Laut Island have a primary school education, houses constructed using wood, and an age range of 20 to 30 years. Margin marketing demersal fish on Channel marketing III (P à Pp à Pe à Ka) and Channel IV (P à Pp à Rm à Ka) is inefficient due to the limited electricity supply. This has an indirect effect on fish quality due to a lack of readily available ice to handle catches. Increased demersal fish marketing efficiency may result in a significant revenue for fishers. Therefore, the government should boost energy availability to enable people create and purchase ice to aid with fish preservation. It should also establish cooperatives for fishers and provide alternative work, such as conservation activities or marine tourism development.

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1. Introduction

The marine and coastal environment is an important economic asset (Stabbings et al., 2020) because it is home to 60% of the world's population with high fishery productivity (Lakshmi & Rajagopalan, 2000). Sangihe Archipelago Regency and Tahuna are an integral part of North Sulawesi Indonesia. It is about 142 miles from Manado, the provincial capital of North Sulawesi, latitudes 2°4'13" – 4°44'22" north, and latitudes 125°9'28" – 125°56'57" east. East between Sulawesi Island and Mindanao in the Philippines (BPS Sangihe, 2014). Fishing production reaches 90% because the territory is mostly maritime (Anonymous, 2011). Moreover, the marine environment has become society's focus as an important source of livelihood. Coastal communities depend on fisheries and the marine environment, as most inhabitants on Beeng Laut Island are fishermen and reliant on seafood, as illustrated in Table 1. Fishermen feed the Central South Tabukan Subdistrict and Tahuna with demersal fish catches. Additionally, the island is bordered by coral reefs that support marine life and protect fish stocks, particularly those of highly sought-after demersal fish species such as grouper and kuwe. Demersal fish are commonly sold in restaurants, generating employment for both local residents and visitors through culinary tourism. Residents also rely on alternative sources of income, as illustrated in Figure 1.

According to Figure 1, housewives account for 45 percent of employment on Beeng Laut Island (IRT), followed by fishing at 41 percent. Housewives take care of domestic work and are active in marketing fish products to meet daily economic needs. According to Anna et al. (2019), the welfare of fishers and their families is lower than in other occupations.

Table 1 shows that 31% of the population in Beeng Laut Island did not finish Elementary school, while 25% have it.

This is mainly caused by the unavailability of Junior and Senior High School on the island, making children join their parents in fishing after finishing primary school. Also, some children help their parents sell fish catches in nearby traditional markets, such as Salurang, Manalu, and Kuma. Fishers' education level affects the marketing activities of their demersal fish catches.

The potential of marine resources and fisheries in Beeng Laut Island waters is considerable but underutilized due to various obstacles experienced by local fishers. The challenges include the low human resources quality and insufficient access to modern technology, equipment, and other supporting tools in maintaining the quality of their catch. Kalita et al. (2015) found that most fishers in Sungai Beki, Barpeta, and Assam are illiterate, dominated by men and married, aged 31-40 years, and work as farmers as their backup jobs. Furthermore, Hosain et al. (2014) found that most fishers in Jeleparan were married, children dropped out of school, and 56% borrowed money from moneylenders and 44% from NGOs. According to Ahsan et al. (2016), most fishers in Cox's Bazar area, Bangladesh, have poor socio-economic conditions, have zinc huts, 35% are illiterate, and 16% are only capable of writing names. Billah et al. (2018) examined the socio-economic life of fishers in the coastal area of Bhatiyari Chittagong, Bangladesh, and found that most of them have an Elementary school education and are Muslims, while the rest are Hindu and Buddhist. Momi et al. (2021) stated that Bangladesh's community-based fisheries management system is vulnerable and lacks resources. According to Johanson (2016), there is a significant difference between the mark-up added on the catch cost by wholesalers and retailers and the margin received by fisher. Therefore, this study aims to determine fishers' socio-economic conditions, market

Table 1. Break down of Population by Education Level in Beeng Laut Island

Education Level	Number of people	Percentage (%)
Finished elementary school	35	25
Not Finished Elementary School	45	31
Finished junior high school	15	11
Not Finished Junior High School	25	17
Senior High School	20	14
Diploma III	2	1
Bachelor degree	2	1
<i>Total</i>	144	100

*Source: Beeng Laut Island’s Office, 2019

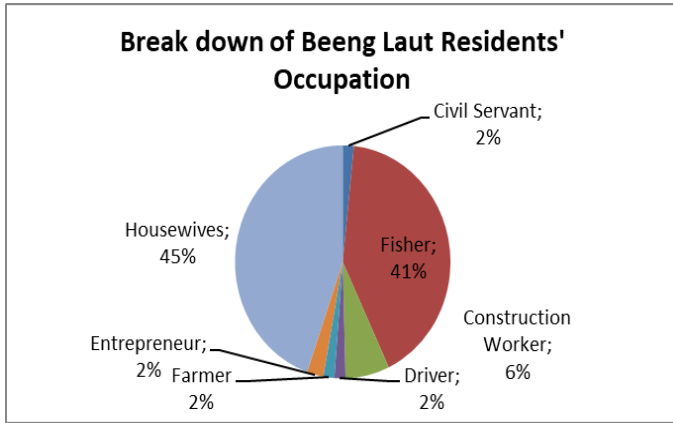


Figure 1. Break down of Beeng Laut Residents’ Occupations (by percentage)

*Beeng Sea Village Data Source, 2018

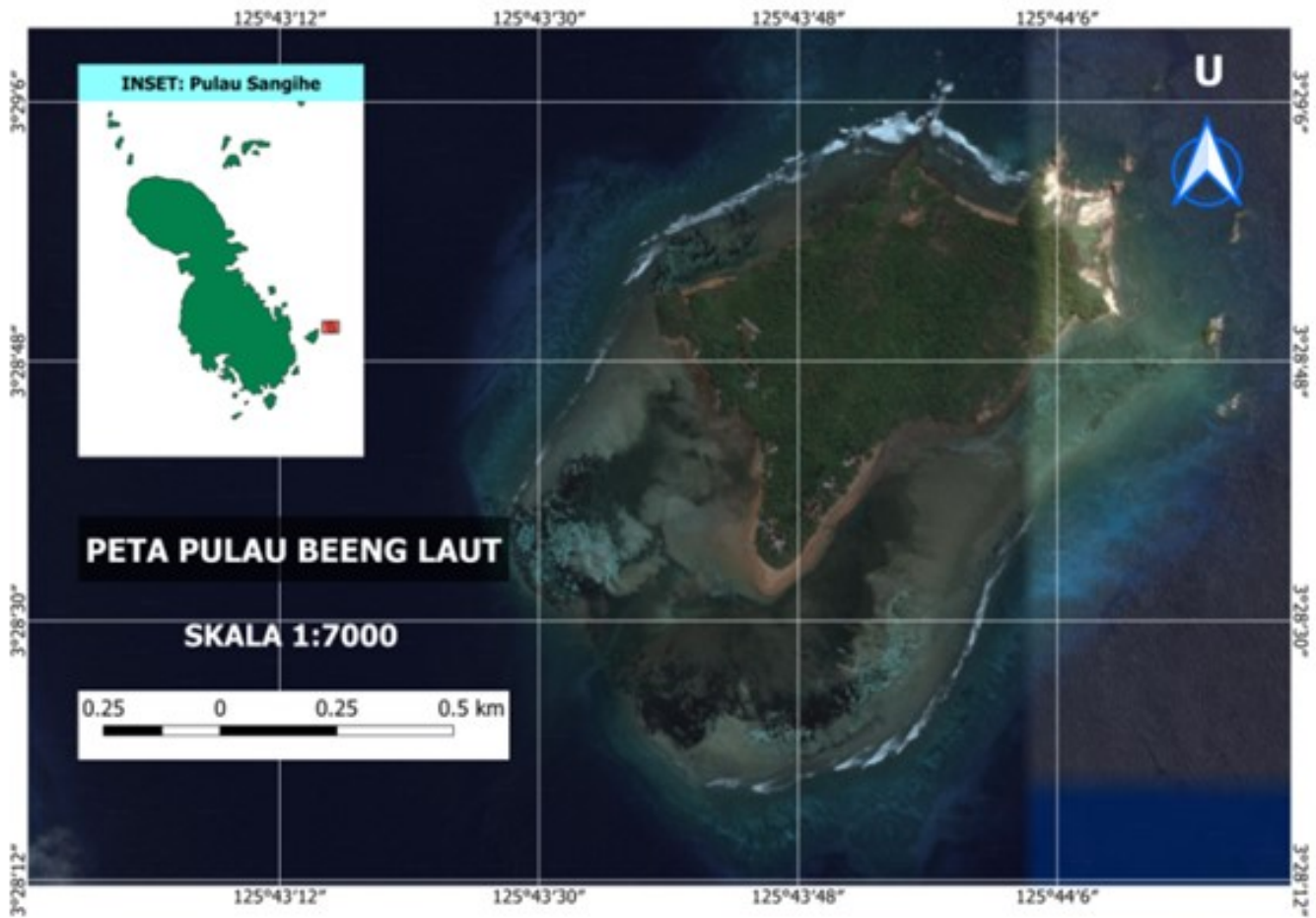


Figure 2. Study location

efficiency, and the commercial margins for the sale of demersal fish in Beeng Laut Island, Central South Tabukan sub-district, Sangihe Archipelago Regency, Indonesia.

2. Methods

Study Area

This study was conducted from April to December 2019 in Beeng Laut Island, Central South Tabukan Sub-district, Sangihe Archipelago Regency, North Sulawesi Province, Indonesia. The island is accessible by speed boat in

approximately 45 minutes from Salurang Village, which is reached by car in about 2 hours from Tahuna City. Figure 2 shows the location.

Methods of Data Retrieval

Data were collected through interviews and observations in the Beeng community. The interview was structured by questionnaires and conducted with 50 people. The primary data included the number of residents in Beeng Laut Village, boats, fishing equipment, the type of fish caught, the cost of going to sea, the fish selling price, and system share. The

data were obtained through observations and interviews with the village government and fishers on Beeng Laut Island. Additionally, secondary data were taken from local governments and literature, such as books, journals, and other sources.

Analysis

Data were analyzed using profit and loss calculation with the following formula.

$$\text{Profit} = \text{selling result} - \text{cost}$$

$$\text{Profit percentage} = \frac{\text{profit}}{\text{cost}} \times 100\%$$

$$\text{Loss} = \text{capital} - \text{selling result}$$

$$\text{Percentage loss} = \frac{\text{lost}}{\text{cost}} \times 100\%$$

The marketing costs and margins were analyzed by calculating the local market's cost, profit, and marketing margin. The marketing margin (*M*) is the price difference at the producer and consumer levels.

$$M_p = P_r - P_f$$

M_p = marketing margin,

P_r = Price at the consumer level,

P_f = The price received by the Manufacturer.

The marketing margin percentage was calculated by the following formula.

$$M_p = \left(\frac{P_r - P_f}{P_r} \right) \times 100\%$$

The accepted Manufacturer was calculated with the following formula.

$$F = \left(1 - \frac{M}{P_r} \right) \times 100\%$$

Where *F* = part received by the Manufacturer (Fisher). The marketing efficiency was determined by the low marketing margin percentage. Marketing was considered efficient when *F* > 50% and inefficient when *F* < 50% (Handayani and Nurlaila, 2011 Triyanti and Shafitri, 2012).

3. Result and Discussions

Beeng Laut Island Overview

The people living on Beeng Laut Island are predominately from Tenda Village in the Central South Tabukan Sub-district. They initially moved to this island while fishing overnight around Beeng Laut Island and later constructed residences for the increasing fishers staying on the island permanently. The island is included in the administrative territory of Beeng Darat Island, according to the Sangihe Islands Regent's Decree. However, it became Beeng Laut Island, on 9 March 2006. It is one of the islands in the Central South Tabukan Sub-district, with 49 families and a land area of about 88 acres. The entire boundary is formed by the Maluku Sea and surrounded by white sand beaches and coral reefs. The island covers 457 square kilometers, with a population density of 36.32 square kilometers and an overall population of 167 people.

Social Conditions of Fishers in Beeng Laut Island

People on Beeng Laut Island exhibit high solidarity reflected in a cooperative cultural activity known as “*gotong royong*”, meaning working together for community benefit. The culture is evident while putting boats to sea, funerals and memorials, and other cultural and social activities.

About 60% of fishers are aged between 20 and 30, while 20% are 30-40 years old. This shows that the age range is productive.

Based on housing, 35% of fisher's houses are made of wood, while 15% are made of concrete. This welfare level shows fishers’ inability to build a good place to live.

Economic Condition, Fishing Equipment & Catch

Table 5 shows the number of fishing units. Powered and unpowered fishing boats are used to catch and harvest marine animals and plants (Manoppo, 2014). The vessels used in Beeng Laut Village include pump boats, outrigger boats (*pelang*), and Longboat (*pamo*).

A pump boat is a traditional *katir*, an outrigger-style boat with light bamboo or wood attached to the right and left side for balance. The boat is powered by an engine to catch pelagic fish species. The outrigger boat (*pelang*) is

Table 2. Break down of Population by age Distribution in Beeng Laut Island

Age group	Number of people	Percentage (%)
20 to 30 years	30	60,00
30 to 40 years	20	40,00
<i>Total</i>	50	100,00

*Source: Data processing, 2019.

Table 3. Break down of Population by Fisher’s Education Level in Beeng Laut Island

Educational Status	Number of people	Percentage (%)
No education	5	10,00
Primary school	30	60,00
Junior High school	10	20,00
Senior High school	5	10,00
<i>Total</i>	50	100,00

*Data processing, 2019.

manually powered using paddles while catching demersal fish and is not usually taken far from the shore. Moreover, Longboats (*pamo*) are *katirless* powered by an outboard engine, usually used to catch pelagic fish, and are operated by 8–15 people. *Pamo* is also used for transportation between islands for people and use gill nets to catch flying fish (*Decapterus sp.*).

The fishing equipment used by fishers is *Jubi* or traditional fishing capture, Bottom Gill Net, Handline, and *Bubu* (trap), as shown in Figure 3. According to Manoppo, 2014, the Gill Net is rectangular, where the number of net eyes towards the length is more than the inside direction or width. The net is made using multifilament and monofilament materials and works by blocking the direction of swimming fish, making them entangled in the nets.

The *Jubi* is the simplest fishing equipment used by fishers. It consists of arrows with a rifle stock made of wood acting as the handle and is used while diving in coral waters. Arrows are fired by removing the rubber flex made of car tires, while at the end of the rubber, a steel wire is fastened to act as a hook (Manoppo, 2014). The fishing rifle's wooden handle is 100 cm long, and the arrow is made of iron 150 cm long. Figure 3 shows the fishing devices used by fishers.

Alves et al. (2018) stated that traditional fishers with low fishing technology rely on climatic, oceanographic, and astronomical (ethnclimatology) conditions to determine the success or failure of their fishing activities. This is the case for fishers, where they pay attention to sea currents, tides, wind direction, and ocean swell heights before going to sea. It is critical to avoid bad weather and ensure worthwhile catches while fishing. Moreover, the technology of a particular fishing device is influential in determining successful fishing. According to Stephenson et al. (2017), an increase in the size of ships and engines and the use of fishing technology increase fishers' ability to catch fish even in poor weather. However, this is still impossible for fishers.

Examples of catches include Grouper, Snapper, Sand skin, Lencam, Kapasan, Buntana & Kaci-kaci, as shown in Table 7.

Law No. 45 of 2009 defines fisheries as all activities involved in managing and utilizing fish resources and the environment, including pre-production, production, processing, and marketing. Fish marketing patterns ranging from fishers as producers to end consumers pass through various channels (Haryanti et al., 2015). The marketing agency organizes the commerce activities or functions as the goods move from the manufacturer to the consumer. Fishers are the producers and carry out certain commercial functions to distribute their products to consumers (AM. Hanafiah and A.M Saefudin, 1986). Marketing is the most important activity in distributing and selling fish, making it a determining factor in sales activities (Hapsari, 2016). Figure

Table 4. Housing condition of fisher in Beeng Laut Island

Housing conditions	Number of people	Percentage (%)
Concrete	15	30,00
Wood	35	70,00
<i>Total</i>	50	100,00

*Data processing, 2019.

4 shows the institutional marketing of demersal fish on Beeng Laut Island.

Marketing of fishery products includes activities from producers or the fish catchers, intermediaries, retailers, to consumers. Fishery products are easily damaged because 80% of the fish's body contains water, which bacteria easily enter and multiply. The products also vary widely in catch and require time and effort to be separated into marketable products. Furthermore, fishing is seasonal, and the catch depends on the weather, it takes much space and requires adequate means of transportation (Zainal et al., 2017). Most fishing catches on Beeng Laut Island are sold in Salurang Village. Figure 6 shows five commerce channels for fishing groups in Beeng Laut Village as follows:

Catches by the fisher (P) are brought to the Salurang market and sold directly to the final consumer (Ka) around the Central South Tabukan Sub-district.

The catch by (P) is sold to retail traders (Pe) in the Salurang market, then sold again to the final consumer (Ka).

The catch by (P) is sold to the collector trader (Pp) in Tahuna City, then on-sold to the retail trader (Pe) in Towoé market, and the final consumer (Ka).

The catch by (P) is sold to the collector, then to a restaurant entrepreneur or grilled fish restaurant (Rm) around Tahuna City. It is then processed into cuisine and purchased by the end consumer (Ka).

Where P = Manufacturer (Fisher/Catcher), Pp = Collector Trader, Pe = Retail Trade, Rm = Restaurant Entrepreneur, Ka = End Consumer. According to Selan & Nubatonis (2016), fishers perform sales functions as physical providers and market information. The retailers' marketing functions include purchasing, sales, storage, transport, processing, grading, and risk. One example used economics to calculate the high demersal fish margin as indicated by the grouper fish selling price, as shown in Table 5.

Marketing margin is the price difference between the price paid by consumers and that received by fishers (Selan & Nubatonis, 2016). The length of the short marketing

Table 5. Number of Boat units and Fishing Methods in Beeng Laut

Types of Boats	Amount	Percentage (%)
Pump boat	6	25,00
Outboard pump boat	10	41,67
Boat	6	25,00
No Boat	2	8,33
<i>Total</i>	24	100






*Source: Sub-District of Central South Tabukan in Numbers 2018

Table 6. Number of Fishing units

Types of Fishing Method	Amount	Percentage (%)
Trawler	-	-
Bottom gill net	2	5,13
Handline	18	46,15
Trap	15	38,46
Other	4	10,26
<i>Total</i>	39	100

*Source: Central South Tabukan Sub-District in Numbers 2018

Table 7. Demersal Fish Catch

Species	Indonesian Name	Pictures
<i>Epinephelus malabaricus</i>	Malabar Grouper	
<i>Variola albimarginata</i>	Grouper Scissors (Lyretail Grouper)	
<i>Cephalopholis miniata</i>	Sunu Merah (Red Coral Grouper)	
<i>Lutjanus malabaricus</i>	Red Snapper (Malabar Snapper)	
<i>Plectorhinchus vittatus</i>	Kaci – kaci (Indian Ocean Oriental Sweetlips)	

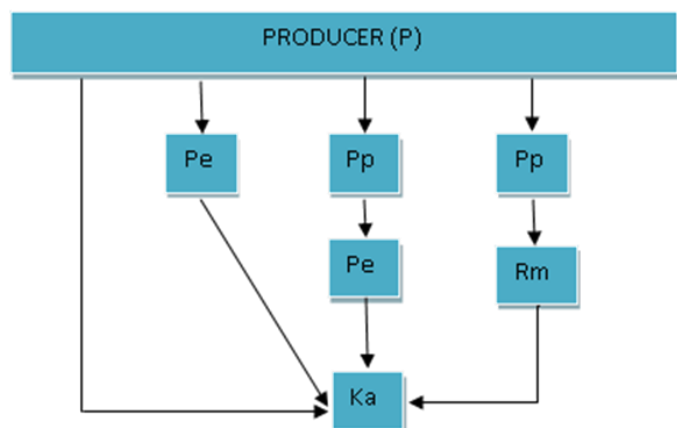


Figure 4. Marketing Trade Flow on Beeng Laut Island’s Fisher

channel affects the goods’ price to the final consumer (Hapsari, 2014). The parts received by the Manufacturer on Channels III and IV, which are $F = 37.5\%$ and $F = 30\%$, where $F < 50\%$ indicate inefficient marketing. According to Triyanti and Shafitri (2012), a higher marketing margin lowers the share received by the producer or fisher. A lower marketing margin increases the share received by the Manufacturer or fisher. Sarwanto et al. (2014) stated that Type 1 marketing channels (fishers – consumers) are the most efficient.

Wasak (2012) stated that fishers’ low income reduces their families’ welfare and diminishes the fishing economy. A lack of post-harvest infrastructure worsens the situation due to the distance between fishers and the end consumers (Jimenez et al., 2020). According to Zainal et al. (2017), fishery products are easily damaged because 80% of the fish flesh contains water into which bacteria enter and multiply. The products are also not uniform and require time and effort to sort the catch. Moreover, fishing is seasonal, the catch depends on the weather, and it takes much space, requiring adequate means of transportation or refrigeration. Fishers must buy ice from Salurang Village, about one hour away, while traveling using a boat with a 15-horsepower engine. The electricity supply is generated using solar power and only used for lighting purposes, increasing fishers’ operational costs. Therefore, the government should procure ice-making facilities to minimize the operation and expense for fishers.

Jacob & Rao (2015) stated that the Government’s policy is less applicable to traditional fishers because technology is enjoyed by modern fishers. According to Samian et al. (2015), fishing cooperatives significantly influence rural life. They also attract the attention of the Sangihe Archipelago Regency Government as a leading decision-maker for fishers

Table 5. Marketing Channels in Salurang Market

Marketing Channel	Marketing Agency	Volume (kg)	Selling price (Rp/ kg)	Purchase/ price (Rp/ kg)	Marketing margin (Rp/ kg)	Percentage of Marketing Margin (Mp)/ (%)	Share received by Fisher (F) (%)
II/ Second	Retailer	1	60.000	30.000	30.000	50	50
III/ Third	Collectors, Retailers	1	80.000	30.000	50.000	62,5	37,5
IV/ Fourth	Restaurant entrepreneur	1	100.000	30.000	70.000	70	30

living and working on small islands. Co-operative procurement could be used to build and improve fishers' economic fortunes of fishers. According to Remi & Oyewole (1992), cooperatives help increase a fisher's income and savings, enabling them to obtain new and better equipment for fishing. Sarapil & Wuaten (2017) stated that cooperatives help fishers manage their money.

Alternative livelihoods affect arrest efforts (Muallil et al., 2013; Freduah et al., 2017). According to Mari-Moroy & Ojeda-Ruiz de la Pea (2016), alternative livelihoods for local fishers are also possible through conservation programs for small pelagic fish stocks and turtles. This reduces a fisher's reliance on fishing, increasing their income and supporting sustainable fishery management activities. Ecosystem-based fishery management affects fishers' socio-economic status (Seug & Zhag, 2011). However, fishers on Beeng Laut Island have a low understanding of coastal ecosystem management (Sarapil & Kumaseh, 2019). According to Figuera-Zavala, et al. (2015), proper management strategies in biodiversity protection and conservation improves the fishing economy. Therefore, there needs to be guidance from the Government to introduce sustainable fisheries management.

Other alternative efforts are made to improve the fishing economy (Deswandi, 2017). Acquiring alternative skills help fishers during climate change (Shaffril et al., 2017), including the ventures discussed in this study. Additionally, integrated fishery and socio-economic policies and cooperation between related fields are necessary to achieve cross-Policy consistency (Zhao & Jia, 2020).

4. Conclusion

Most fishers on Beeng Laut Island have a primary school education, houses constructed using wood, and an age range of 20 to 30 years. Demersal fish marketing is inefficient due to the limited supply of electricity. Furthermore, Beeng Laut Island is far from the district capital, about 30 minutes while traveling by sea. Therefore, the government should increase the electricity supply to increase the demersal fish marketing efficiency. This would increase fishers' income and enable them to make ice for fish preservation. Additionally, the government should form cooperatives for fishers' families and provide alternative jobs, such as conservation activities or marine tourism that involves fishers or local people.

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