Exploring Indigeneity of Inland Waterway Transport (IWT) in Asia: Case studies of Thailand, Vietnam, the Philippines, and Indonesia

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Abstract: River-based cities are now capitalizing on the potential of their bodies of water to serve as critical transportation networks to complement land-based transport. For these cities, their water tributaries have historically served as commuter rivers to accommodate indigenous, inland water transport modes (IWTs). Despite its potential to support local economic development, scholarly literature on IWTs has remained fragmented and scant. This paper redresses this gap by exploring IWTs in four developing country-cases in Southeast Asia, to gain a better understanding of their role, function and use within the overall transport system. Using a case study approach, this paper starts by formulating an indigenous IWT framework. This framework is then used to assess IWTs. Results have shown that the levels of indigeneity of IWTs may provide important insights to inform the development of IWTs as a crucial component in developing an integrated, sustainable transport system in cities in developing Southeast Asia.

Keywords: Indigenous transport, Inland Water Transport, Inland Waterways, Sustainable Transport

1. INTRODUCTION

Inland waterway transport (IWT) is considered as a low cost water-based transportation alternative to ferry people and goods along an inland waterway (UNECE 2011). While a number of Asian countries including the Philippines, Viet Nam, Thailand and Indonesia are now recognizing IWT's potential as a competitive alternative to road and rail transport, IWTs remain under-exploited (ADB 2013). While on the one hand, IWT offers a sustainable and environment friendly transport alternative, on the other hand, IWT continues to face many challenges in its development (ADB 2013; UNECE 2011). These challenges vary, from water pollution problems, to safety issues and to the lack of financial support from the government. For example, river pollution in the Mekong Delta (Viet Nam) prevents vessels from physically transporting goods to Ho Chi Minh City (Thanh 2005). Tanaboriboon et al. (2005) stated that the ageing IWT infrastructure along the Chao Phraya River Express in Bangkok serves as an operational safety hazard, which contributes to the declining passenger numbers. In Banjarmasin, Indonesia, the locally known riverboats i.e. kelotok/jukung suffer a decreasing number of passengers as a result of the lack of government support in providing sufficient facilities (Sari 2008). Even moreso, the Pasig River Ferry Service in Manila, Philippines, was eventually terminated due to the enormous financial loss in its operations (Salaverria 2011; ADB 2013), recently the system has been re-opened, currently being operated under new management (Calleja 2014).

IWTs, which may be categorized as informal transport modes, also embody indigenous
and traditional traits. Because of this, they have been praised as ingenious and most resource efficient types of transport (Cervero 2000). However, the current discourse on indigenous transport has mainly focused on land-based examples, leaving out other contexts, such as transport in inland waterways. For many communities in the developing world, IWTs remain a competitive transport alternative especially in areas devoid of land-based transport (ADB 2013). In Vietnam, IWT is perceived as a means of transport as well as a status symbol (Palmer 2003). In Indonesia, IWT is considered as a form of indigenous transport, Mawardi (2012) pointed out that, at present, kelotok/jukung is still used by and remains an integral part of indigenous communities in the island of Kalimantan. For example, for the Dayak people, it is still mostly used for social and trade purposes. Moreover, current kelotok/jukung is shown to have been derived from ancient IWTs that originated in the early Stone Age. While it is clear that IWTs take on important roles and display indigenous attributes, no comprehensive analysis of indigenous attributes of IWTs has yet been undertaken to date.

To address this gap, the key aim of this paper is to explore the role of IWTs in Southeast Asian developing countries. Through an exploratory analysis of current and relevant scholarly literature on indigenous transport and IWTs, this study addresses the following three objectives: (1) Identify indigenous attributes of IWT through the development of an indigenous IWT Framework; (2) Evaluate indigenous qualities of IWTs in selected case studies through the application of the Indigenous IWT Framework; and (3) Enhance our understanding about the role of indigenous IWTs though cross-case analysis of IWTs. The outcomes of this study will contribute to an improved understanding of IWT, especially with respect to its indigenous qualities, which will have important policy implications for sustainable transport in developing Asia.

The remainder of this paper is structured in the following manner: section 2 discusses the current state of research on indigenous transport and IWTs, and paves the way to the development of the indigenous IWT Framework; section 3 explains the methodological design while Section 4 and 5 describe the results and findings, including the cross-case analysis, and culminates with Section 6, the conclusion and further studies section.

2. LITERATURE REVIEW

This review aims to articulate the current scholarly work dealing with indigenous transport and IWTs resulting in the development of a conceptual framework.

2.1. Inland Water Transport

Because interest in IWTs is just emerging, only several yet fragmented discussions are starting to develop around the crucial and sustainable role of IWT in different parts of the world. Jorgensen et al. (2011) empirically determined that ferry operation in Norway holds an important role in formulating regional policy as it stimulates annual welfare generation for commuters and as it contributes with social surplus. Baird and Pedersen (2013), on a different location, ascertained that IWT in Scotland produces far less CO$_2$ than road transport, hence, they suggested that environmental aspects should be seriously considered in developing broader transport system. As promising as IWTs may appear, its development heavily relies on business model that can financially support and sustain its operation. A perfect example on this matter is Brisbane’s famous CityCat. Sipe & Burke (2011) explained that the only downside in the ferry service’s operation is the fact that it accounted for high level of state subsidy. It is clear from the review of relevant literature that scholarly work in the area of
IWT is emerging yet no study has yet articulated on the social and cultural practices associated with IWT and its possible indigenous qualities to better understand its role in supporting development of cities, particularly in developing Asia.

2.2. Indigenous Transport

The discourse on indigenous transportation was first offered by Robert Cervero in a 2000 United Nations Centre for Human Settlements (Habitat) publication on informal transport. In this document, he briefly described the traditional and vernacular characteristics of informal transport modes in countries such as the Philippines, Viet Nam, Thailand, and Indonesia, alluding to their innate indigenous qualities. Indigenous qualities as manifested by how people utilized these various modes, including the trolley taxis, locally known as skates, the traditional minibuses, jeepneys in the Philippines, the informal tricycles in Indonesia known as becaks, among others, reflected the unique social and cultural transport as well as travel practices in each city or country. Some implicit qualities that were alluded to when describing indigenous quality of this transport were: (1) resource efficient, (2) affordable, and (3) niche serving. Furthermore, Cervero (2000) further added that indigenous modes also exemplified (4) adaptive to technology. Despite the fact that indigenous transport are assumed to contribute to negative externalities such as unsafe practices and traffic congestion, these modes address a particular market demand, hence, (5) demand responsive. Other researchers have also discussed in Indigenous transport such as Mateo-Babiano et al. (2011, 2013), presenting a comprehensive discussion of indigenous transport types in various study cases of Bandung (Indonesia), Davao (the Philippines), Delhi (India), and Dhaka (Bangladesh). While the research elucidates a set of indigenous mode attributes i.e. offering flexible routes, compact in size to support its maneuverability, depicting cultural values, and promoting equity in mobility, the discussions mainly focused on land-based indigenous modes. More recently, Guillen, Ishida and Okamoto (2012) provided a different dimension of indigeneity of transport mode, mentioning that these modes are (6) domestically innovated, (7) small-scale, and (8) privately operated. Other studies while they did not explicitly use the term indigenous transport to describe their work, provide an implicit assumption of the modes’ indigenous qualities (see for example, Cervero 1991; Ames, Mateo-Babiano and Susilo 2015; Mateo-Babiano et al. 2011; Mateo-Babiano et al. 2013; Joewono and Kubota 2005; and Pariyo et al. 2011).

2.3. Conceptual Framework

Based on the previously identified qualities of indigenous transport, a framework was developed to better structure the concept of indigenous transport. The framework’s 7-identified indigenous qualities are then classified into more general attributes.

![Figure 1. Indigenous qualities classification](image_url)
3. METHODOLOGY

3.1. Study sites

Guided by a systematic review of relevant literature, this study examined IWT in four selected areas in Southeast Asia’s developing countries: Bangkok (Thailand), Mekong Delta (Viet Nam), Manila (the Philippines) and Banjarmasin (Indonesia) (Figure 1). These sites were chosen due to the fact that each hosts a number of inland waterways utilized for transport (CIA 2011), availability of resources, also given their different locations and levels of urban development, it is consequently interesting to compare the indigeneity of IWT between urbanized areas (i.e. Manila and Bangkok) and less urbanized ones (Mekong Delta and Banjarmasin).

Manila, the capital city of the Philippines, is one of the sixteen cities that comprise the national capital region known as Metro Manila (ADB 2012a). According to the Philippine’s National Statistics Office (2010), it has a population of at least 1.6 million. Bangkok, the capital city of Thailand, since the 1960s its area has rapidly extended from 6km2 to 1500km2 at present with an approximate population of 7 million (BMA cited in Mateo-Babiano 2012). Mekong Delta is considered as the country’s rice basket located in the southern part of the country (Vu 2011) with a population of approximately 17.33 million. JICA (2000) describes, unlike urban areas in the central and northern part of the country, Mekong Delta is a configuration of smaller urban centres i.e. major local and provincial centres. Banjarmasin, is the capital of the South Kalimantan province in Indonesia accommodating approximately 615,570 individuals (www.banjarmasinkota.co.id). The following section describes the different IWTs in the four study sites (Figure 2).
3.2. Systematic review of relevant IWT literature

The paper employed a systematic review of literature to summarize current research evidence in two thematic areas: IWT and indigenous transport. By searching several key databases (e.g., ISI Web of Science, Science Direct, J-stage which includes the EASTS online journal), ATRI: Australian transport index, and Transportation research information services, comprehensive searches were undertaken on all records in peer reviewed publications meeting the inclusion criteria (i.e. search terms “indigenous transport”, “inland waterway transport”, and “ferry”) resulted in 32 articles for analysis. All databases were available through the University of Queensland online library. By using the indigenous transport framework, reviewers critically appraised each included literature to advance a clearer understanding of the four case IWTs. Manual searches via the Google scholar website were also undertaken to be able to identify non-refereed reports, unpublished thesis, news media reports and more obscure but relevant grey literature.

3.3. Cross case analysis of indigenous IWT

The derived indigenous IWT framework was used to frame the cross-case analysis of the four IWTs. The aim of this analysis was to examine similarities and differences in indigeneity of the four systems. Results are provided in tabulated format.

4. RESULTS AND FINDINGS

4.1. IWT in Bangkok, Thailand

Chao Praya River that flows through Bangkok has been a strong proof that inland waterway is an integral part in the city’s early urban morphology. The River holds an important role as the initial point of its development and facilitated trades. Hence, starting off as a small fishing village, Bangkok then evolved into an important trading settlement (Mateo-Babiano 2012). Bangkok was known as the “Venice of the east”; rivers were widened and dredged, new canals were dug to facilitate transfer of agricultural produce to Bangkok and market goods to outer cities and hinterlands, thus indicated that waterways were the dominant option for travel. Unfortunately, many canals have been converted not only to roads, but also to housings and market areas (Hossain & Iamtrakul 2007). Luckily, the Chao Phraya River and its tributaries of smaller rivers and the remaining canals are still as an alternative transport route today, even though their existence is far from being a solution to the city’s current transport problem. Iamtrakul et al. (2013) disclose that given the gruesome situation of Bangkok’s traffic, even the implementation of IWT along Chao Phraya River and its tributaries is too much an expectation to solve the land traffic problem. Therefore, the authors furthermore suggest an integrated transport system approach as the appropriate solution.

Currently, there are three types of IWT with different sizes and purposes running within Bangkok. These are: 1) Express boat service which plies along Chao Phraya River connecting Nonthaburi and Rajburana through Bangkok through four different routes identifiable by different flag colours; 2) Ferry boat provides a river crossing access; 3) Long tailed boat (rua hang yao) plies along khlongs (canals) of Pasicharoen, Phrakanong, Lad Phrao, Padung Krung Kasem (Tanaboriboon, 1993; Tanaboriboon, Hanaoka and Iamtrakul, 2005).

Various reports reveal that Bangkok’s IWT has shown a decline in passenger numbers. On a daily basis, Santoso et al. (2010) calculate that approximately 35,000 to 40,000
passengers commute using the express boat service, meanwhile Tanaboriboon, Hanaoka and Iamtrakul (2005), citing the Thai Marine Department, show that during 1999 to 2003 there was a decrease in the number of passenger from approximately 80,000 to approximately 75,000 for the express boat service, approximately 25,000 to approximately 15,000 for the long tailed boat, and from less than 220,000 to approximately 205,000 for the ferry boat services. However, Santoso et al. (2010), reveal that despite losing a generous amount of passengers throughout the years, locals, nowadays, still consider travel time, comfort, travel cost, and environmental impact as reasons for choosing express boat service over other means of transport. The locals’ appreciation on travel time and comfort is understandable given it allows faster access through the city for it does not have to ply along traffic congested roads. Fare-wise, express boat service also costs more reasonably, charging only a minimum fare of 9 Baht (approximately $0.30), in comparison with the fare for a non-air-conditioned bus of 7 Baht ($0.24). Currently, the express boat is publicly operated by Chao Phraya Express Boat Co., Ltd., a concession from the central Marine Department, operating based on fixed routes and schedules (Santoso et al. 2010). While Tanaboriboon (1993) finds that the operation of IWT was entirely private without government intervention in early 1990s, this shows that the government has shown better consideration in developing IWT in recent years.

The long tailed boat, on the other hand, is still being operated privately by individuals cruising along different canals (Pitt n.d.). Natively known as rua hang yao, it operates longer hours, typically from 5.30am to 11.00pm daily. Compared to express boat service, the long tailed boat charges more expensive fares within the range of 10 to 20 Baht ($0.34 to $0.67). Also, it has been pointed out that safety issues are still present and has not been sufficiently addressed. Despite many issues and challenges surrounding Bangkok’s IWTs, these canal boats are still the preferred para-transit mode connecting journeys of Bangkok’s population (Santoso et al. 2010).

4.2. IWT in Mekong Delta, Viet Nam

World Bank (2006) acknowledges the great potential of Viet Nam’s IWT. However, there is an imbalance in funding allocation from the central government that prefers to allocate higher investment toward land transport infrastructure development. IWT passenger volumes in Viet Nam have shown a decreasing trend from 17.3% in 1999 to 13.3% in 2005 as a proportion of total domestic passenger transport share (World Bank, 2006). Nevertheless, while it still remains significant, consideration in developing the infrastructure or the system is still not apparent (ADB 2012b).

Palmer (2003) describes Viet Nam’s IWT holds a prominent role for the lower income household communities within the Mekong Delta. Specifically, the research suggests that local communities use traditional boats on daily basis to conduct typical trips such as accessing schools, marketplaces, villages, health facilities, and even to travel to other cities. Also, boats provide poor people access to employment possibilities.

Despite limited government support on traditional transport modes, locals seem to have no other option when it comes to travelling. There is social acceptance of IWTs by the populace, especially those living in the lower Mekong Delta area (Vu 2011). IWT is utilized for private purposes, and some, rented out by poorer families for public transport. Pilkington (2004) finds that most of these households utilize their boats every day to market their agricultural produce, including rice, coconuts, pigs, turtles, and snakes on floating markets along the river. Palmer (2003) investigates that the traditional wooden boats are even considered as a social status symbol. Families opt to invest in additional boats for family
members to symbolize the increase of income.

Most of the xuong nowadays are motorized, whereas a few are still non-motorized. The mechanization of the xuong has been improved prevalently among its owners as a result of the positive growth of agricultural economy. Palmer (2003) explains that petrol engines are found on lighter and faster passenger boats, whereas diesel engines on bulkier boats intended for commodity mobility. Locals are aware of imported motors/spare parts; however, locally developed ones are more preferable due to their inexpensiveness. It is therefore agreeable that boats in the Mekong Delta holds indigenous characteristics because of their homegrown nature and technology adaptation.

4.3. IWT in Manila, Philippines

Given the Philippines’ archipelagic nature, IWT appears to be a crucial component in the country’s overall transport system. Nationally, there are approximately 1,300 ports with about 1,000 government-owned ports and the rest are owned and managed privately. However, despite its continuing growth in population and economy, passenger traffic on interisland movement shows a decrease by 13% between 2003 and 2008, partially due to maritime accidents happening at an average high of 160 incidents annually. This is attributed to human error (24%), natural forces e.g. bad weather and typhoons (36%); and other reasons such as insufficient vessel traffic management, outdated navigational infrastructure, and poorly maintained vessels (ADB 2012a). Interisland ferry services have also been introduced to accommodate domestic passenger movements, e.g. the roll-on roll-off (ro-ro) ferry service. This service is considered a success as it brings many benefits such as a more efficient way in transporting goods, allowing vehicles to drive onto and off the ferry without undergoing loading and offloading procedures (ADB 2010). The utilisation of IWTs is, however, decreasing given the presence of alternative transport options as well as the rapid development of air travel in Philippines.

In contrast, the IWT in urbanized Metro Manila faces a different challenge. Manila’s IWT was intended to offer relief from the congested traffic on the roads and highways. At least, three public transport ferry services were launched to cruise along the Pasig River, the main river that passes through the metropolitan region, namely: the Magsaysay Lines (in the 1990s), Starcraft Ferry (in 1996), and the Pasig River Ferry Service (in 2007). Unfortunately, each service was not sustained and eventually did not survive. A number of reported reasons ranging from environmental water pollution to the lack of government support were identified illustrating the complexity of managing IWTs, especially in the case of Manila. Magsaysay Lines was operated between 1990 and 1991. As the initial IWT in Manila, it faced a number of challenges, including the extensive growth of informal riverbanks settlements, water pollution caused by rubbish and debris, terrible odour, as well as water lilies that prevented the fleet to sail in appropriate speed. This period of time was highlighted as the lowest condition of Manila’s water environment, Pasig River was declared biologically dead. However, with the assistance from international development agencies such as the Danish International Development Agency (DANIDA) and ADB, the Pasig River was gradually rehabilitated.

As the river’s environmental quality improved, another ferry service was introduced in 1996 as a means to mitigate traffic congestion. Thirty units of catamaran fleets were utilised, installing air-conditioning system to make travel more comfortable, and expanding the seating capacity to 30 people each. It operated along a slightly longer route (from Bambang in Pasig City to Escolta) in Manila. However, a year after its launch, the service was closed in 1997.
Water lilies, water pollution problems as well as informal squatter settlements along the banks were cited as the reasons for this service’s demise.

In 1999, the Pasig River Rehabilitation Commission (PRRC) was founded aiming to restore the city’s famous river to its once pristine condition, to be used for transport, recreation, and tourism purposes. A number of projects were implemented, including the re-launching of the Pasig River Ferry Service in 2007. Using a similar yet much bigger type of catamaran vessel, the ferry could accommodate about 150 seating capacity. Unlike the former services, the latter was also improved with on-board entertainment, air conditioning, and toilets. Stations to this service were also facilitated with toilets, improved ticketing system, waiting seats, and security guards. The route was also the longest, stretched from Plaza Mexico in Manila to Naggayong in Pasig City.

Despite the better quality of fleets and service system, the service was not without any problems before indefinitely being suspended in 2011. Reportedly, the stopping of operation was due to the tremendous financial loss suffered by the operator. In addition, it was investigated that overlapping timetable between regular trips and river tour trips confused passengers therefore gradually shifted to different transport mode options. Lack of transparency was also mentioned in the audit finding, saying that not all of the revenue from ticket selling was reported to the PRRC (Salaverria 2011).

4.4. Indigenous IWT in Banjarmasin, Indonesia

South Kalimantan is considered the oldest island province in Indonesia, while also regarded as the island’s original water transport gate. According to authorized statistics, South Kalimantan’s ports ranked as the most active port nationwide in 2012, in terms of cargo load activities, outperforming Riau islands, despite its proximity to Singapore, East Kalimantan with its numerous mining areas, and Metropolitan Jakarta (refer to BPS - Statistics Indonesia (2012, p. 359). Goenmiandari (2010) finds the waterways in Banjarmasin held an important role in shaping its social and urban pattern. River oriented settlement configuration in Banjarmasin indicated that settlements were linearly developed along rivers with a particular standard of configuration; including a main building with its frontage facing the river, the provision of a landing dock for direct access, a spacious open space allowing social interactions, and finally a pool and a toilet at the back (Goenmiandari 2010). Barito River, its tributaries of Martapura River, and several canals also served as the main route to access further market destinations up to the area of Kuala Kapuas in the Central Kalimantan Province (Susilowati 2010). This justifies the important role of the waterways during Banjarmasin’s early stages. Nonetheless, as population and urban development increased, development has gradually moved away from rivers as well as people’s dependence on IWT system.

Studies by Trissan (2008), Parikesit, Kushari and Novitarini (2003), and Sari (2008) suggest that IWT could still increase its use especially in areas devoid of sufficient land transport infrastructure, if only it receives adequate government attention and support. Sari (2008) explores three adjacent suburbs of Sungai Bilu, Banua Anyar, and Sungai Jingah. Result shows a decrease in mode choice preference among IWT users: 25% decline in preference of using IWT to access workplaces; 10.5% decline to access markets and shops; and 8.9% decrease to access schools. In spite of these figures; however, IWT is still the primary mode choice for some water related activities, including visiting relatives and visiting floating markets. The type of passenger boat in Banjarmasin is known as kelotok, the motorized boats, and jukung, the non-motorized one. Manufactured using a local type of
wood known as Ulin, the boats are in general 13 metres long, 2 metres wide, and 0.6 metre deep drafted (Yuwo no cited in Trissan 2008). According to the local transport department, there are two registered routes for kelotok: Banjarmasin to Banua Anyar, and Banjarmasin to Mantuil (Sari 2008). IWT in Banjarmasin is also considered as a famous tourist attraction. Similar to Bangkok and Mekong Delta, the floating market is designated to be a main attraction especially for international tourists. While the city government claims to be supportive towards this activity, unfortunately, due to the decrease in the number of customers, many market sellers are starting to leave the water-based business.

Figure 3 (left to right). a) Bangkok’s ferry boat provides access to school; b) women commonly found navigating human powered xuong as a tourist attraction in the Mekong Delta; c) Manila’s Pasig River Ferry Service; d) Banjarmasin’s kelotok/jukung. Source: a) www.dreamstime.com; b) www.luxurymekongrivercruise.com, c) www.skyscrapercity.com; d) www.banjarmasin.tribunnews.com
5. CROSS-CASE ANALYSIS ON INDIGENOUS IWT FRAMEWORK

For the purpose of this research, it will then be the basis for the evaluation of the indigeneity of IWT in the study areas. Table 1 summarizes the attributes of indigenous transport with their corresponding characteristics.

Table 1. Indigenous transport conceptual framework

<table>
<thead>
<tr>
<th>No</th>
<th>Indigenous attributes</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Home-grown</td>
<td>Indigenous transport pertains to domestically innovated transport with an effective use of local resources (e.g. use of raw materials, infrastructure), and serves as a response to local demand market.</td>
</tr>
<tr>
<td>2</td>
<td>Locally operated</td>
<td>Indigenous transport pertains to modes that serve areas devoid of public transport, thus provides wider spatial coverage, often serving as para-transits, and complementing and/or supplementing other modes of transport.</td>
</tr>
<tr>
<td>3</td>
<td>Socially accepted</td>
<td>Indigenous transport pertains to modes which are affordable even for lower income households; benefitting vulnerable groups, e.g. elderly, women, and children; providing employment opportunities, i.e. small scale enterprises.</td>
</tr>
<tr>
<td>4</td>
<td>Culturally appropriate</td>
<td>Indigenous transport pertains to modes being a way of life for individuals within a community.</td>
</tr>
<tr>
<td>5</td>
<td>Adaptive to technology</td>
<td>Indigenous transport pertains to modes being dynamically adaptive toward advanced technology to response the market’s demand.</td>
</tr>
</tbody>
</table>

5.1. Indigenous IWT is a homegrown transport mode

The study sites accommodate a range of navigable waterways (CIA 2011), it is understood that IWTs existed originally as a response to their natural endowments i.e. Chao Phraya River in Bangkok, Mekong River in Mekong Delta, Pasig River in Manila, and Barito River in Banjarmasin. IWTs in Bangkok gave options to travel through khlongs and/or access the city centre with less traffic obstruction. In Mekong Delta and Banjarmasin, IWT functioned as a response to poor land transport infrastructure and remains a traditional transport mode to access markets, farmlands, and schools. Whereas in Manila, even though its IWT stopped operating in 2011, the Pasig River Ferry Service (PRFS) had been a means of mitigating traffic congestion on roads.

Using local timber as their raw material, xuongs, kelotok/jukung, long tailed boats are evident of a home-grown type of the IWTs in Mekong Delta, Banjarmasin, and Bangkok, respectively. Palmer (2003) observes that local timber and engines are used to build the xuong. A survey by Yuwono (cited in Trissan 2008) finds that a particular type of wood, known as Ulin, is used to assemble kelotok/jukung as it gains strength the more it interacts with water. Pitt (n.d.) discovers that local craftsmen use native woods traditionally known as Mai Takien Tong and Mai Yom Hom to configure the rua hang yao, the long tailed boats in Bangkok.

5.2. Indigenous IWT is a locally operated transport mode

As previously structured, the local operation quality of indigenous IWT is delineated as serving areas devoid of transport system, providing wider mobility coverage, functioning as
para-transit, and complementing and/or supplementing other transport modes. According to reports, areas around Mekong Delta in Viet Nam and Barito River in Banjarmasin, Indonesia, road infrastructures are insufficiently available, therefore, transport system is barely adequate. This circumstance, in a positive manner, promotes the utilization of IWT as mode of transport. In Banjarmasin, for instance, bridges are not provided for pedestrian and cyclist to cross the Barito River. Jukung is therefore filling the gap for this need (Sari 2008), thus, functions as para-transit mode to access other public transport. In Mekong Delta, IWT provides wider mobility coverage, for example to Ho Chi Minh (Thanh 2005), despite the government’s initiative to construct My Tho Bridge (Travel Mekong 2006). To encourage a maximum utilization of IWT, it would be better if environmental problems i.e. water pollution and sedimentation (Thanh 2005) was solved. In Bangkok, even though motorcycle taxis are prevalent, IWTs remain as a faster mode than those land transport (Santoso et al. 2010). IWT provides wider mobility access through khlongs, in fact, the express boat allows commuting from/to outer Bangkok. Thus, IWTs in Bangkok can also be considered as a para-transit mode. Unfortunately for Manila, given the PRFS terminated in 2011, IWT would have supplemented other transport modes and contributed to mitigating the ever jamming road traffic.

5.3. Indigenous IWT is a socially accepted transport mode

The socially accepted quality of indigenous IWT in this research is measured based on its affordability, ability to benefit vulnerable social groups e.g. women, elderly, and children, as well as ability to provide employment for lower income households. Santoso et al. (2010) find that the users of the express boat in Bangkok are satisfied with the set fares. Even though there is no empirical findings on the users’ preferences of long tailed and ferry boats, the social acceptance of these modes can be justified by judging at their benefiting vulnerable groups and provision of employment. Figure 3a provides evidence that the ferryboat benefit school children accessing schools. Tanaboriboon (1993) explains that the long tailed boats are privately owned and therefore function as a means of employment for lower income households.

Due to the limited information on the PRFS, aside from the fact that it had benefited students accessing education facility i.e. the Polytechnic University of Philippines despite its poor accessibility, lack of service consistency and frequency, also unreasonable fare (Clemente, Guevarra & Maynard 2009), the socially accepted quality cannot be sufficiently assessed. In Banjarmasin, even though kelotok and jukung are registered in the local transport department, public use operation is managed privately by at least 6% of the riverbank population, providing income for their owners (Sari 2008). From a user perspective survey, Sari (2008) points out that the majority user are men and children, meanwhile, women were found apprehensive accessing the boat due to inconvenience and safety issue. Furthermore, it was revealed that users were satisfied with its cheap fare of approximately not more than $0.30 per trip, and the faster travel time. Social acceptance can also be seen from how people perceive IWT. IWT in Mekong Delta is not only perceived as a means of transport, but beyond, a symbol of social status. Palmer (2003) explains that locals would invest some additional income in xuong. Poorer households, unable to afford such investment, make use of their boats as a source of income. They rent out their xuongs to tourists or casual river crossers.
5.4. Indigenous IWT is a culturally appropriate transport mode

Cultural appropriateness of indigenous IWT in this discourse is justified from its integration to the community’s way of life. Overall, the study sites support the development of inherent water culture, given their endowment of water bodies. Chansiri (1999) argues that the canal system in Bangkok has been an integral part of the community’s culture and tradition. Bangkok locals utilized the canals not only merely for transport, but also recreational (e.g. swimming and fishing) and traditional activities as well i.e. the Loy Kratong festivity.

Mateo-Babiano (2012) also explains that the endowment of Chao Phraya River promoted the development of a water culture, citing that ways-of-life revolved around the river and canals. Pitt (n.d.) adds that cultural depiction can also be seen as religious beliefs. Long tailed boat owners burn incense, adorn their vessel bows with arrangements of fresh flowers to pay respect to the Mae Ya Nang, their vessels’ spirit mother. In Banjarmasin, the Barito River and its tributaries i.e. Martapura River have accommodated the growth of such a “river culture” (Goenmiandari 2010). The existence of river has impacted proximate communities to orient their daily lives to water. Taylor (cited in Vu 2011) explains that in Mekong Delta, the locals perceive Mekong River as a gift from Gods, therefore, getting away from it is impossible despite the increasingly growing land transport infrastructure. Table 2 provides a summary of the culturally appropriate qualities of indigenous IWTs.

Table 2. Two descriptions of indigenous qualities of IWTs in the study sites

<table>
<thead>
<tr>
<th>Social acceptance quality of IWT in the study sites</th>
<th>Bangkok</th>
<th>Mekong Delta</th>
<th>Manila</th>
<th>Banjarmasin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fares given are reasonable in regards of its time efficiency and comfort. It benefits elderly, women, and children. A source of income for lower households who privately own and/or operate long tailed boats.</td>
<td>Xuong is also perceived as a status symbol. Lower income households rent out their boats to provide crossing access and river cruise tourist attraction. As part of locals’ culture, women and children are used to navigating xuongs.</td>
<td>Before it was terminated, the PRFC had benefitted locals, especially university students, even though the fare was considered too expensive.</td>
<td>Kelotok/jukung is considered a source of income for locals. It mostly benefits school students and tourist accessing the floating markets. Women are mostly apprehensive toward utilizing kelotok, unless those who are accustomed e.g. senior women.</td>
<td></td>
</tr>
<tr>
<td>Cultural appropriateness quality of IWT in study sites</td>
<td>Researches show that IWT has been an integral part of Bangkok locals’ way of life. Many recreational and traditional ceremonies are still held on the river. Religious practices are depicted through displays of ritual offering to the believed spirits.</td>
<td>Locals perceive the Mekong River as a gift from God, therefore, IWT is an integral part of the local’s culture and tradition.</td>
<td>No information related to the cultural appropriateness of IWT in Manila.</td>
<td>River culture has been developed to adapt with the existence of the rivers in Banjarmasin. Floating markets are portraits of the remaining traditional culture in present times. Traditional boat festivals are regularly held to support its tourism sector.</td>
</tr>
</tbody>
</table>
5.5. Indigenous IWT is an adaptive toward advanced technologies transport mode

The application of propeller engines, vessel designs, alternative materials, and electronic appliances are evident that in all case studies, it can be generalized that indigenous IWTs in the study sites are adaptive toward advanced technologies. Engines are used prevalently across study areas to support bigger capacity, access longer routes, and provide shorter travel time. The Pasig River Rehabilitation Commission required catamaran type of vessels as a qualification for the PRFS in Manila as it accommodates a big number of passengers. Pitt (n.d.) finds that the long tailed boats use engines with particular designs that meet the owners’ needs to ply their service along canals. It is also said that after the big tsunami that hit in 2001, fibre reinforced plastic (FRP) is used instead of wood, due to environmental threat of the decreasing amount of timber in the nation. Likewise, Mawardi (2012) reveals that in the last 50 years, builders have opted to utilize FRP, steel, or plywood as an alternative to the increasingly endangered *Ulin* timber. A study by Palmer (2003) explores that locals in Mekong Delta apply motor propellers to fasten their journeys, as well as Banjarmasin boat owners use diesel engines to render their services along or cross the Barito River (Goenmiandari 2010). To summarize the discussion, it can be generalized that IWTs in Southeast Asian countries hold attached indigenous qualities. Table 3 systematically shows the indigenous characteristics associated with the IWT modes in the selected study sites.

<table>
<thead>
<tr>
<th>Indigenous quality</th>
<th>Attribute</th>
<th>Case Study</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Bangkok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long tailed boats</td>
</tr>
<tr>
<td>Indigenous transport is a homegrown transport mode</td>
<td>Effective use of local resources</td>
<td>■</td>
</tr>
<tr>
<td></td>
<td>Domestically innovated</td>
<td>■</td>
</tr>
<tr>
<td>Indigenous transport is a locally operated mode of transport</td>
<td>Serving areas devoid of proper transport modes</td>
<td>■</td>
</tr>
<tr>
<td></td>
<td>Serving as para-transits</td>
<td>■</td>
</tr>
<tr>
<td>Indigenous transport is socially accepted</td>
<td>Affordable</td>
<td>■</td>
</tr>
<tr>
<td></td>
<td>Benefiting vulnerable groups</td>
<td>■</td>
</tr>
<tr>
<td></td>
<td>Source of employment for lower income households</td>
<td>■</td>
</tr>
<tr>
<td>Indigenous transport is culturally appropriate</td>
<td>Supports the way of life of locals</td>
<td>■</td>
</tr>
<tr>
<td>Indigenous transport is adaptive toward technologies</td>
<td>Adaptive toward advanced technologies</td>
<td>■</td>
</tr>
</tbody>
</table>

Note: ■ applicable, ▬ inapplicable
The overall discussion on indigenous IWT in this research suggests that indigenous qualities found in previous studies with respect to indigenous land-based transport are also found in the discourse of IWT in the selected case studies. Judging on the outlined indigenous framework and detailed attributes within the discussion, it can generally be concluded that IWTs in Mekong Delta, Bangkok, and Banjarmasin each have the same attribute of indigeneity within its system. Qualitatively speaking, however, the indigeneity of IWT in Manila is to some extent less than its counterparts. Due to the limited information obtained with respect to the IWT in Manila during this study, its attributes of effectiveness of local resources, service areas, para-transit function, employments, and cultural values have not been sufficiently evaluated.

Referring back to the importance of indigeneity and based upon the findings on the IWTs in developing Southeast Asian countries, it can be qualitatively validated that indigenous attributes hold strong correlations to the sustainability of a transport mode. The research suggests that despite being domestically innovated, serving areas devoid of transport modes, being adaptive towards technology, it does not ensure an IWT to be sustainable apart from strategic managerial issues. However, being able to serve as a para-transit, affordable, benefiting vulnerable groups, promoting employment for lower income households, and supporting local cultures may provide better assurance.

6. CONCLUSION AND FURTHER STUDIES

Building on the original conceptualization of indigenous land-based transport advanced by Cervero (2000), this paper was able to explore the indigenous qualities of inland water transport systems in four case cities, establishing the important role they play in the overall transportation within the developing country setting. Historically, IWT has been a significant component of communities in Southeast Asia, given many of them are endowed with numerous navigable waterways. It is arguably important to recognize their existence to strengthen our understanding of their roles in the transport system and ensure a broader respect to local powers and cultural diversity. Current research justifies that IWTs in the study areas each holds crucial role in both the urban morphology and modern development as portrayed on their indigenous attributes, namely being home-grown, locally operated, socially accepted, culturally appropriate, and adaptive to technology. However, this research finds that despite these positive attributes, developing an IWT system must also address a number of shortcomings related to its operation, including significant financial support. As gleaned from Brisbane’s CityCat, farebox revenue may not meet the operating cost requirement. An obvious evidence of this is the suspension of the PRFS in Manila, which as of this writing has been made operational.

Through a systematic approach in exploring scholarly literature on IWTs, the initial process of the study was to structure an indigenous IWT framework, an important and significant contribution of this research, which collectively helped advance our understanding of transport mode indigeneity. This framework also proved useful in appraising indigenous qualities of IWTs in selected case studies. The investigation on four different developing city contexts was able to provide justification on the indigenousness of the selected case studies. It appears that, to a certain extent, IWT in Bangkok, Mekong Delta, and Banjarmasin are more indigenous than IWT in Manila, but would require further analysis and evidence.

The cross analysis on indigenous IWT qualities offers new strategic insights for achieving sustainable transport development. It can be qualitatively concluded that social acceptance of IWT, as an indigenous quality, strongly encourages sustainability as this will
result in better supporting communities through more affordable transportation and being a source of income for lower income families, thus, benefitting vulnerable groups. Also an important attribute in enhancing sustainability is the locality of its service as this entails better integration with the wider transportation system and complementing other transport modes.

We also found that users’ and operators’ behavior and travel practices may display indigenous qualities as well. However, this was not part of the objective of this paper but presents a way forward for this research. Next step for this study is to evaluate the indigenous values based on the operators’ and users’ perspectives in order to draw the actual demand as basis to further develop indigenous IWTs. In addition, a vital part is to better understand the public policies and governance arrangements guiding IWTs to determine the level of institutional and regulatory support.

Inland Water Transport offers an exciting policy opportunity of encouraging a modal shift away from road-based transport to inland waterways, generating a number of positive externalities on urban areas. Such policy decisions, however, must be enabled within a framework of a strong and supportive institutional mechanism as well as progressed as an important component of market-based city development intervention, for example, a ferry-oriented local economic development, to ensure its long term sustainability in addition to strategies in raising awareness about IWT and its multiple benefits, convincing users to patronize IWTs, thereby encouraging behavior change. This would be the bigger challenge.

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