Enhancing coastal areas governance for sustainable tourism in the context of urbanization and climate change in eastern Thailand

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Abstract

Coastal areas in the eastern sub-region of Thailand, a popular destination in Southeast Asia, are facing rapid tourism-related urbanization and associated consequences of environment and climate change (CC). Thus, this study aims to analyze the relationships between tourism, coastal areas, the environment, and CC in the context of tourism urbanization; and recommend strategies for enhancing the governance of coastal areas. Three popular destinations were selected as study areas, Koh Chang, Pattaya, and Koh Mak. Group discussions, questionnaire surveys, interviews, and observation were used for primary data collection together with secondary data. The results show that the development of these destinations has been incompatible with the coastal environment and CC patterns. Rapid urbanization from tourism development is the main driver of environmental changes and makes the areas vulnerable to CC-related risks. While water scarcity and pollution are found the most critical environmental issues of the destinations, coastal areas are negatively affected in terms of increased air and water pollution and resource degradation. They have also been exposed to different CC-related problems while the risks of accumulative impacts of both environment and CC have not been adequately recognized or addressed. Although some measures have provided synergies of improved environment and increased climate resilience, possible conflicts and gaps were also found. Public infrastructure integration and optimization to enhance coastal areas’ environment and climate resilience are suggested.

Keywords: Climate change; Coastal urbanization; Environment; Governance; Infrastructure and services; Sustainable tourism

1. Introduction

The United Nations World Tourism Organization (UNWTO, 2015) indicated that there has been a steady rise in tourism recently, now accounting for 9% of global GDP. The Asia-Pacific region has seen the highest growth (9%) in international arrivals in 2016, followed by Africa (8%) (UNWTO, 2017). Thailand, a Southeast Asian country where the tourist arrivals were the seventh-highest in the world in 2013 (MOTS, 2015), has seen the number of international tourists increasing continually, from 14 million in 2009 to 35 million in 2017 (MOTS, 2018). Tourism development not only leads to economic growth and the well-being of local communities, but also has an impact on the national and regional scales (Wongthong and Harvey, 2014). Coastal areas in eastern Thailand are popular tourist destinations and face rapid urbanization partly resulting from tourism development. They are also highly vulnerable to climate change (CC) due to their location on the Gulf of Thailand. Urban infrastructure systems are disrupted by climate extreme events such as roads and rails destroyed by coastal erosion and floods; and water supply system failures follows water availability (ONESDB, 2016).

The Intergovernmental Panel on Climate Change (IPCC, 2007) indicated that CC is already affecting Southeast Asia, which is one of the world’s regions most vulnerable to CC, especially tropical zones in coastal and urban areas. CC is now posing serious threats to millions of Thais, particularly those living by the coastal areas where tourism is popular (UNWTO-UNEP, 2008; Fernandino et al., 2018). Thailand has had no significant overall change of rainfall, but there has been an increase in the northeast and Gulf of
Thailand regions. In addition, the temperature has risen 0.95°C between 1955 and 2009, higher than world average of 0.69°C, and sea level in the Gulf has also increased 3–5 mm per year from 1993 to 2008 compared to a global average of 1.7 (±0.5) mm per year (Naruchaikusol, 2016).

Tourism growth in coastal areas has become the fastest-growing industry and reached its peak in recent decades, also becoming one of the biggest industries in the world (UNEP, 2009; Nara et al., 2014; Tang, 2015; Kurniawan et al., 2016; Schuhmann et al., 2016; Andres et al., 2018). However, tourism can be one of the key contributors to rapid urbanization, and contributing to CC and environmental impacts. With good planning and management, tourism can be a positive driver, creating benefits to destinations around the world (UNWTO, 2004, 2013). Evolution of green growth and infrastructures in terms of bridging urban development, environmental planning, climate change resilience, and disaster risk management is suggested to enhance livable cities. Examples of “green” infrastructure include green roofs and walls, urban forestry, green open spaces such as parks, wetlands, and green drainage corridors (ADB, 2016a, 2016b).

While coastal areas are suitable for tourism developments, at the same time these areas are considered hazardous locations threatened by CC (TIFS, 2010; Lemmen et al., 2016; NOAA, 2016). Potential impacts of CC on coastal systems can include: increased coastal erosion; more extensive coastal inundation; higher storm surge; increased loss of property and coastal habitats; increased flood risk and potential loss of life; loss of renewable and subsistence resources and tourism recreation; and damage to other infrastructure (McLean et al., 2001; Wong, 2014). Additionally, it is found that countries in the Gulf areas are the most vulnerable in the world due to projected temperature increases of 2—5.5°C coupled with a projected decrease in precipitation by the end of the 21st century (Lavieren et al., 2011). These can lead to shorter winters, hotter and drier summers, increased weather variability, and more frequent extreme weather events in coastal marine systems (Lavieren et al., 2011; IPCC, 2013). Some of the changes can be beneficial, in the form of economic growth and infrastructural developments leading to overall improvement in living standards (Andres et al., 2018). Nevertheless, pressures on coastal ecosystems, especially environmental degradation and pollution, could increase significantly in the coming decades due to this growth (Andres et al., 2017).

Environment and CC connect urbanization, and tourism is also an important element in both (UNWTO-UNEP, 2008). People in lower urbanized districts are more vulnerable since they have less capacity to cope with pollution and CC risks due to poverty and lack of awareness on the environment and changing variability (Tran and Nitivattananon, 2011). CREST (2012) indicated that large-scale of tourist developments have put increasing pressure on fragile ecosystems, especially in coastal zones. These impacts consist of destruction of local flora and fauna, pollution, introduction of invasive species, land erosion, and a conversion of public beaches into private ones. Those environmental impacts can be divided into three groups (Gouda, 2012): degradation of the natural composition of beach ecosystems, destruction the great part of marine environments and increased fragmentation between natural and developed areas.

In terms of governance, urbanization has been a part of economic growth, and contributes to CC and other global environmental burdens associated with high consumption levels. Local authorities that cannot provide appropriate basic infrastructure and services to urbanization will tremendously increase the impacts in urbanized areas, such as waste and wastewater pollution (Burak et al., 2004). In addition, inappropriate land-use planning has also created many problems of resource overconsumption (Tolba and Saab, 2009). To enable the creation of an urban environment for support to citizen’s needs, appropriate laws and regulations, effective political and administrative processes, and strong local institutional capacity are required (Bower and Turner, 1998). Integrated urban development can also enhance land use and balance urban environments as well (ADB, 2015). Urban governance delivers sustainable development when it is: environmentally friendly, participatory, accountable, transparent, effective and efficient, equitable and inclusive, and law-abiding (UN-Habitat, 2016).
However, tourism can play a significant role in addressing CC through two main strategies: mitigating measures, which tackle the causes of CC, such as renewable energy, environmental friendly infrastructure, and best practices in solid waste and water management; and adaptation measures to cope with its effects, such as constructing seawalls, planting trees, and building water storage for adaptation to erosion and the risk of storm surge, as well as drought (Becken, 2005; UNWTO-UNEP, 2008; CREST, 2012; Michailidou et al., 2016). These measures can be synergetic in addressing adaptation and mitigation, including urban greener, building insulation, water efficiency and storage, distributed and renewable energy systems (Sugar et al., 2013).

Interestingly, The Association of Southeast Asian Nations (ASEAN) Tourism Strategic Plan 2011–2015 was launched to make a greater contribution toward the ASEAN integration goal in the post-2015 decade of moving to an economic growth scenario that is more “inclusive,” “green,” and “knowledge-based” (ASEAN, 2015), and for over the next decade to the year 2025, ASEAN has released new plan heavily focused more on sustainable development in tourism sector named “The ASEAN Tourism Strategic Plan 2016–2025.” In response to these agreements and contribution to sustainable coastal tourism destination governance, this study was conducted to suggest a CC compatible/sustainable development policy for better coastal areas governance. It cross-cuts almost all the Sustainable Development Goals (SDGs) and especially ASEAN tourism and the environment as well as CC initiatives for the promotion of sustainable destinations and success in the long term.

The main objective of this study is to enhance the governance for better-balanced environmental policy and tourism in the context of rapid urbanization and CC that applies to coastal areas and islands affected by tourism development. The secondary objective is to assess the relationships of tourism, the environment, and CC in the context of coastal urbanization. The main questions to reach the objectives include: Are tourist resort areas developed in a sustainable way? What are the consistencies and inconsistencies between the pace of tourism development and current environmental situation and CC patterns in coastal areas? This research focuses on tourism urbanization in coastal areas through large-scale resorts and infrastructure implementation, confronted with CC and sustainable development. Three destinations were selected to reflect the most popular tourism destinations on the eastern Gulf of Thailand, including Koh Chang, Koh Mak and Pattaya.

2. Methodology

2.1 Research design and overall methodology

The conceptual framework developed for this study depicts the overall understanding for the relationships between tourism, coastal areas, and the environment/CC in the context of urbanization. It is obvious that the vast numbers of tourists visiting coastal areas could push coastal areas as tourism urbanization resulting in significant changes on environmental dimension when environmental service provision in urban areas such as water supply, drainage, waste treatment are not adequately developed following urbanization (Somayyeh and Faraji, 2010; Wu and Tan, 2012; CREST, 2012). In addition, coastal areas would suffer more when negative effects are induced by CC-related events such as extreme storms, droughts and sea-level rise. However, tourism can contribute to CC mitigation and CC adaptation as well as coastal environmental protection through their practices (Becken, 2005). From this, the tourism development can produce vulnerability of the region by natural resource degradation and climate risks. The need to understand the relationships for coastal areas governance especially in urbanized tourist resort areas is then intense. This research thus has put “governance” as a core research concept.

The overall methodology to achieve the research objectives is presented in Fig. 1. For the secondary objective, investigation of current situations of tourism, the environment/CC, and coastal areas was
conducted for analyzing relationships among those elements. Then, these explored relationships contributed to the main objective, which identifies and proposes enhanced governance for coastal tourism urbanization of the study areas.

Fig. 1. Research methodological process

2.2 Study areas

The study areas are popular coastal destinations in the eastern sub-region of Thailand, where the climate is under the influence of the northeast and southwest monsoons from May to October. In terms of CC, there is clearer variation in precipitation with increases in the average rainfall and change in monthly rainfall distribution from the past (HAII, 2012). Water shortages and droughts in this region are also caused by this variation (HAII, 2012). The sea level has also increased, as mentioned in Section 1. Pattaya, Koh Chang, and Koh Mak, as shown in Fig. 2, are selected as study areas as they are urbanized and promoted as international tourism destinations by the central government as Designated Areas for Sustainable Tourism Administration (DASTA), which were established with the aim of promoting sustainable tourism in Thailand. Pattaya is a big coastal city in Chon Buri province, while Koh Chang and Koh Mak Islands belong to Trat province, which is 310 km from Bangkok and 240 km from Pattaya. Koh Chang and Koh Mak are the islands with marine and terrestrial ecosystems. In addition, Koh Chang was declared a national
park, which can contribute to conservation as well. Pattaya, on the other hand, is a coastal city with less forest but many attractive tourist activities.

The forest areas of this sub-region are decreasing as a result of deforestation and the building of roads. In addition, there is growing demand for water for the tourism sector in the region. The total raw water supply is limited to 167.18 million m$^3$ per year, while the demand is 200.61 million m$^3$ per year (HAII, 2012). Furthermore, this region, particularly Chonburi province, has been promoted and included in the Eastern Economic Corridor Development Plan under the scheme of Thailand 4.0 policies aiming to drive the country’s investment in uplifting innovation and advanced technology for the future.

![Fig. 2 Regional map with study areas (Source: http://www.kohchang.se/kartor/gulf/)](image)

2.3 Data collection and analysis

Primary data were collected during December 2016 to February 2017 through semi-structured interviews, group discussions, questionnaire surveys, and observation. Local authorities and tourism service operators were interviewed, and other key tourism stakeholders including tourism-related clubs, accommodation associations, tourism service operators, and others were invited to group discussions.

For identifying the sampling size of the questionnaire survey, we used purposive sampling method by focusing on resort accommodations with 20 rooms and up as criteria. Moreover, this type of resort accommodation is more interesting and innovative for assessing the environmental measures and investigate options to cope with CC issues. Thus, a hundred questionnaires were targeted to survey the three areas; however, there were only 37 resort accommodations allowed by the resort owners or managers to conduct the survey, which were 30, 4, and 3 samples for Koh Chang, Pattaya, and Koh Mak, respectively. In addition, secondary data were collected through various official documents, research reports, and literature review.

The quantitative data collected from questionnaire survey were analyzed in the way of descriptive statistics through frequency, means, standard deviation and percentage by using SPSS program. Tourist flow and
baseline GHG emission conducted by secondary data were used to assess the emission trend. The qualitative data from interview, site observation and stakeholder group discussions were used to describe the tourism situation related environment and CC in studied areas. Stakeholder analysis was also utilized to assess the roles, needs and concerns in coastal tourism governance.

3. Results

3.1 Tourism urbanization and coastal areas development

Recently, tourism development of the study areas has resulted in significant urbanization, with the attendant higher growth rates of population and tourists. As presented in Table 1, visitors in Koh Chang and Pattaya increased about 8% per year during 2006–2015, while Koh Mak saw an annual average increase rate of 23.5%. In terms of population, although the population in Koh Chang and Koh Mak have higher annual average increase rate than Pattaya with 3.2% and 2.9% respectively; the total population of Pattaya (as well as tourists) are the highest compared to Koh Chang and Koh Mak in 2016.

Coastal area development has not been compatible with the tourism growth. Koh Chang has more than a total of 200 resort hotels, with limited land area that can be utilized. In addition, environmental infrastructure and services have not been developed appropriate to its high growth. There is only on-site waste management and local public transportation provided to the city. Land-use planning also has not been set up in this area. In addition, Koh Mak has only 44 resorts with 5 local families holding more than 90% of the total island area. These local landowners can help prevent external investors and make Koh Mak less urbanized as well. Land-use planning and zoning also have been not implemented on this island yet.

Pattaya, also as a port city, with its hubs of transportation, long beaches and shorelines (15 km) as well as islands close by, have attracted many people to work and visit. In 2016, Pattaya had approximately 2437 existing tourist accommodations. In terms of urban environmental infrastructure, local government is able to provide different kinds of basic infrastructure and services, except local public transportation. Thus, within the highly growing trend, it is challenging for local authorities to manage their coastal areas to be consistent with their urbanization and tourism development.

Table 1 Tourism urbanization characteristics of selected areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Total area (km²)</th>
<th>Population 1994</th>
<th>Population 2005</th>
<th>Population 2016</th>
<th>Annual increase (%)</th>
<th>Tourists/visitors 2006</th>
<th>Tourists/visitors 2015</th>
<th>Annual increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koh Chang</td>
<td>210.0</td>
<td>4116</td>
<td>5499</td>
<td>8087</td>
<td>3.2</td>
<td>644,866</td>
<td>1,117,276</td>
<td>7.9</td>
</tr>
<tr>
<td>Koh Mak</td>
<td>14.0</td>
<td>325</td>
<td>401</td>
<td>521</td>
<td>2.9</td>
<td>70,725</td>
<td>145,583</td>
<td>23.5</td>
</tr>
<tr>
<td>Pattaya</td>
<td>208.1</td>
<td>68,364</td>
<td>95,486</td>
<td>117,371</td>
<td>2.5</td>
<td>6,114,947</td>
<td>9,849,940</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Note: Number of tourists/visitors, including both domestic and foreign. Annual increase for population was average value calculated from annual data.
Source: MI (2017); TAT (2017)

3.2 Coastal areas development with CC/environment

In terms of coastal environment, coastal areas development in Koh Chang has produced environmental impacts. One of the most critical issues is water pollution due to uncontrolled wastewater discharged from tourist accommodations, also as a result of no central wastewater treatment plant.
The second is waste management that needed to improve the system processes, particularly the collection phase that releases wastewater and air pollution along the collection points and roads. Other pollution issues (including air and noise pollution) are much less common.

Although with significant tourism urbanization of the study areas, coastal areas development and CC/environment tend to have negative relationships. A lack of basic urban and environmental infrastructure and services to support rapid growth make these cities, particularly Koh Chang and Koh Mak, facing critical environmental issues. However, Pattaya is different from those two islands in terms of environmental management, as basic infrastructure and services are publicly provided. Besides, these three destinations have faced different kinds of CC. Most measures responding to CC of respondents need more sustained practices, as the current ones are focused more on economic purposes than CC mitigation and adaptation.

However, the national park responsible for part of Koh Chang areas has a relevant plan. They have arranged a zoning system for buffer zones, protection zones, activities, and tourism zones for environmental protection and conservation in their responsible areas. Thus, the major environmental issues on Koh Chang are mainly caused by unsupported and inappropriate basic urban infrastructure management including lack of environmental monitoring and law enforcement, which are also part of the summary of group discussion with key stakeholders of Koh Chang presented in Box 1.

Box 1 Summary of group discussion with stakeholders of Koh Chang in 2017

- Currently, ecosystem of Koh Chang is abundance and diversity due to more than 70% of this areas belonged to Koh Chang National Park. A zoning system for buffer zones, protection zones, activities or tourism zones for environmental protection and conservation was arranged by this authority.
- In terms of environment, a critical concern is wastewater because there is no central wastewater treatment plant provided. The tourist accommodations need to manage wastewater by themselves before discharging it into the environment. This leads to illegal wastewater directly discharged into the sea. Currently, the municipality is trying to construct a wastewater treatment plant but it is still in the process of selecting a location because the municipality does not have their own public land, and most public lands are under the management of the national park.
- For water supply, there is no public water supply provision to tourist areas. Each tourist accommodation normally uses underground water and rain harvesting. Local authorities only provide water supply remedies for their responsible areas. Private sector needs to rely on their own sources by collecting raw water from waterfall and buying water from private providers both inside and outside the island.
- The landscape of the island is not aesthetically pleasing, with irregular patterns caused by inappropriate tourism development plans. The streetlights are not sufficient for travel at night. Moreover, the participants also indicated that traffic jams during the high season using cars on the islands is common.
- The main issues related to CC are climate variability, water scarcity, flooding, and shoreline erosion. Normally, there are 2 seasons on the island, the rainy season (8 months) and summer (4 months), but due to climate variability (since 3–5 years ago until now, 2017), the temperature has been rising and the seasons are more varied throughout the year. This uncertainty affects outdoor activities and tourism businesses such as outdoor restaurants and concert festivals in the summer season. Boating activities are no longer allowed due to the inappropriate environment.
- Shoreline/beach erosion is getting worse year after year. Landowners need to adapt themselves by constructing land prevention wall to prevent the land loss by waves and sea-level rise. However, the wall could still be destroyed by wave currents during the monsoon season and will need to be regularly repaired.

Koh Mak has only a waste management problem. More tourists visiting Koh Mak have created more concern about waste due to increased amount of waste but no increase in loading capacity. Other environmental impacts are not the main issues, although there is no public service supported due to less urbanization. Meanwhile, Pattaya city, the most urbanized of the three cities studied, is facing environmental pollution from its rapid growth. Traffic congestion is the main cause of air pollution due to the lack of local public transport systems. Moreover, the city has also been facing water pollution due to higher water consumption and wastewater treatment plants that are now over capacity. For waste
management, Pattaya has contracted a company to dispose the waste at source. Thus, there are fewer waste problem cases in this area.

In terms of CC, these tourism destinations, particularly Koh Chang, are vulnerable and already affected by CC-related impacts. As Koh Chang is mostly mountainous, with high slopes and monsoons every year, the effects of these natural disasters are mainly flash floods and landslides. Without a proper sewage system, it can be a cause for more severe of urban flooding, as rainwater cannot be suddenly drained to the sea. Beach and shoreline erosion also happens in Koh Chang. Every year, land is lost to sea-level rise. However, the impacts have been reduced by the construction barrier walls (sponsored by the landowners).

Additionally, the island also faces a critical water shortage problem during the drought season due to the local government’s inability to provide water and water catchment to support higher tourism urbanization. Koh Mak is near Koh Chang but faces fewer hardships. This is because Koh Mak has low coastal development, leading to fewer opportunities for those kinds of impacts. However, landslides are a problem in Koh Mak due to changed cultivation practices and prolonged or heavy rains washing out the steeply sloped areas. In addition, Koh Mak has seen some effects of sea-level rise and shoreline erosion, but not critical than water scarcity. Pattaya has faced the fewest problems related to CC as a result of its geography with less mountainous areas, but it still has significant shoreline erosion, and flood and drought events on its more compacted urbanization and hence more water demand.

In response to CC-related impacts, the local authorities of Koh Chang and Koh Mak prepare public warnings for extreme events, and provide services and restoration afterwards. There is no action to mitigate the impacts of droughts and shoreline erosion or sea-level rise, due to budget constraints and the lack of public lands on which to build infrastructure. The responding measures in Pattaya are different as the city has basic urban environmental infrastructure and services that can reduce the problems. Preventing floods is done by dredging the canals and providing sewage systems, and preventing water shortages is done by establishing water catchments. Walls to prevention shoreline erosion for the city also were built by the Marine Department of Thailand. Moreover, sand reclamation in beach areas also has been implemented as a result of sand losses in Pattaya.

For GHG emission reduction, DASTA, which is the government ministry responsible for these three areas, has been promoting low-carbon tourism destinations. Koh Chang has developed community-based tourism and promotes no-engine activities. In Koh Mak, DASTA has cooperated with the local tourism sector to promote “slow life” or low-carbon destinations. There are local regulations prohibiting cars or motorized (engine) on the island. Moreover, they are trying to promote yawl and bicycle activities. Some examples of low-carbon practices of Koh Mak are solar cell batteries in restaurant and organic vegetable farms.

Pattaya has been promoted as civilization or meeting, incentives, conferencing, and exhibition destination as a Greenovative city. The local government and DASTA are now trying to promote community-based tourism destinations and low-carbon activities with accommodations through environmental certifications, such as Green Hotels and Green Leaf. For these three cases, the initiatives can be adjusted to their specific circumstances.

3.3 Concerns of CC & environment on tourism resort areas and their responses

The environmental situation and impact of tourism varies depending the location and urban infrastructure. For natural resources, it was revealed that tourism sectors at Koh Chang rely on raw water from natural sources due to the lack of a central water supply. Approximately 70.0 % of tourist accommodations indicated that they use groundwater; in addition, 63.3% use water from mountain streams and 50% use rainwater. When drought season comes, they have to buy raw water from suppliers both on and off the island (10%). Tourist accommodations on Koh Mak also rely on rivers/ponds (33.3%) and groundwater (100%). For Pattaya, all accommodations consume water from water supply provided by local authorities.
and some hotels use both the service and ponds they dug themselves (16.7%). More than 56.0% of accommodations indicated that the most critical issue is water shortage, while the second and third are water pollution and air pollution, as named by 36.8% and 30.0%, respectively. Tourism accommodations in Koh Mak have experienced impact for ecosystem degradation approximately 33.0%. In addition, around 33.0% of accommodations in Pattaya are dealing with waste issues and are affected by air pollution (16.0%). This situation implies that tourism environments in Koh Chang are suffering negative impacts more than other places, as the island has limited public services support with high urbanization.

In addition, the accommodation sector of the three tourism destinations also is affected by CC. Fig.3 shows information about percentage of accommodations affected by CC-related events. Koh Chang has faced different kinds of CC-related impacts similar to other environmental problems. Drought is the most critical issue, impacting 70.0% of accommodations. Flooding is the next greatest concern, as there is no sewage system. Shoreline erosion is less critical as some accommodations are located far from the beach and some have built walls along the beaches. Accommodations in Koh Mak are affected by shoreline erosion and other events, including coral bleaching and rainfall variability. In addition, 50.0% of accommodations in Pattaya face flood and drought issues and other events (rainfall variability) followed by extreme storms (33.3%). In terms of responding to the environment and CC of tourist accommodations, tourist areas still have no concrete environmental conservation or protection practices. They only rely on services from the city authorities.

However, Figs. 4 and 5 provide feedback on how the accommodations can implement adaptation and mitigation measures. These measures can be categorized into two groups: construction- and behavior-based. Water storage and building green areas are common measures for construction-based, while awareness raising is a common measure for behavior-based for the three case studies.

The results show that on Koh Chang, increasing green areas is the most preferred practice of accommodations’ adaptation measures (such as shoreline erosion protection), as named by 83.3% of accommodations, followed by water storage (73.7%). While mitigation measures, 90% of accommodations using energy saving equipment is the most popular practice of them. On Koh Mak, the most popular adaptation measure is awareness-raising (66.7%), while popular mitigation measures are the use of solar cells and energy-saving equipment, promoting energy efficiency and waste separation at the source. In Pattaya, the most popular adaptation measures of accommodations are similar to Koh Chang’s, while popular mitigation measures are using energy-saving equipment, using key tags in tourist rooms and waste separation at the source. In addition, some strategies of adaptation and/or mitigation can be synergetic to reduce the causes and impacts of CC. However, not all strategies are complementary. Examples of positive synergies are reusing water/water saving and green areas/reforestation as well as awareness building; while the conflicts due to competition for resources use such as extracting water from natural resources for water storage in the dry season (which can affect the water table) and constructing walls for land protection from sea-level rise can increase ecosystem fragmentation/disconnection.
Fig. 3. Percent of tourism accommodations affected by climate change related impacts (based on questionnaire survey of resort accommodations in 2017).

Fig. 4. Percent of tourism accommodations implementing adaptation measures (based on questionnaire survey of resort accommodations in 2017).
4. Discussion

4.1 Situation of coastal area governance in the context of tourism urbanization and climate change

It is found that coastal areas are negatively affected by tourism development in terms of increased air and water pollution and resource degradation; meanwhile, these coastal areas face higher domestic water consumption and wastewater generation induced by the annual increase in tourists. In terms of CC, the coastal areas are already affected and their levels of severity also relate to rapid urbanization and appropriateness of urban infrastructure and services provided.

The development in coastal areas of Koh Chang, Koh Mak, and Pattaya is significantly driving coastal urbanization and is also the major source of the eastern regional and national economic development. However, with the rapid growth, tourist resort areas are developed in different directions and not in a sustainable manner. Tourism development in these areas is currently putting stress and pressures on the environment. The limited provision of urban infrastructure and services to the coastal tourism development of Koh Chang makes Koh Chang more vulnerable and sensitive to stress and shock from environmental impacts and changing climate. On the other hand, the tourist resort areas of Koh Mak, with no basic infrastructure or services provided by the city, similar to Koh Chang, are less concerned as it is not
currently over its carrying capacity of current environment. However, the annual increase in visitors to Koh Mak can lead to a similar trend as Koh Chang if no proper actions to cope with high urbanization rate are taken. For Pattaya, tourist resort areas are developed in appropriate ways but are somewhat different due to the rapid urbanization and limited carrying capacity of urban environmental infrastructure and services. However, although urbanization brings serious environmental challenges, McGranahan and Satterthwaite (2014) indicated that the right support of urbanization can be an important element of sustainable development. Nitivattananon and Sanguanduan (2013) discovered that there is high level of public acceptance for reusing water reused for various purposes; however, some using objectives have low level of public acceptance, including reusing water for laundry, mixing with raw water supply, and as hand washing. But any implementation of reused water as a part of water management of Pattaya is positive, so the city can leverage this public acceptance to contribute to proper strategies.

In terms of CC, it is found that coastal tourism developments of these three destinations have faced different kinds of CC-related impacts. The tourism sector in Koh Chang faces extreme storms, sea-level rise, erosion, flooding, and drought. Meanwhile, Koh Mak has experienced drought and shoreline erosion. Pattaya normally faces flooding, shoreline erosion and water shortage. These trends are compounded by the urbanization rate and CC-induced problems. In terms of responding to CC, Koh Chang and Pattaya are planning according to CC mitigation and adaptation. Their current practices require additional measures, as there are only routine or general practices with economic incentives, such as using energy-efficient equipment or building more green areas in tourist resort accommodations. In addition, Koh Chang and Koh Mak boast huge pristine forest areas, which have potential as carbon sinks (BU, 2009) and the tourism sector there has a high potential to promote low-carbon hotels toward sustainable tourism (Nitisoravut et al., 2014). In particular, Koh Mak has been promoted as a low-carbon destination with great collaboration among tourism sectors and local communities as well as DASTA and other local authorities. In addition, there is also some opportunity to harmonize the tourism development of Koh Mak and Koh Chang to be less vulnerable to CC such as linking tourism to “ecotourism” and creating initiatives synergies between the adaptation and mitigation measures (Becken, 2005). However, the actual reduction of carbon emission also depends on the cases and different tourism sectors and activities as well as mitigation measures (Nitivattananon et al., 2015).

4.2 Institutional and stakeholder gap analysis

Since most of the issues are related to institutional aspects, a gap analysis of institutions and stakeholders is needed to clarify the roles and responsibilities of related organizations. The institutional framework with roles and responsibilities of the areas is presented in Table 2. Municipalities sub-district Administrative Organizations (SAOs) and the city of Pattaya are the main authorities at the local level. However, their roles and responsibilities are more on “business as usual” and their local policies and legislations are still lack compatibility with climate-related disaster management. In addition, based on field investigations, there are some outstanding gaps or issues in governance of coastal areas, including lack of institutional capacities and overlapped responsibilities with limited institutional coherence. In terms of the institutional capacities, limited resources to carry out their tasks, together with an inadequacy of human resources as well as the level of knowledge and skills, create conflicts and constraints to balance their urban environment and climate-related disaster management. Despite the high risks associated with climate-led disasters found in these coastal areas, current local governments’ development strategies have not minimized this kind of impact. Without basic infrastructure and services provided to tourism urbanized areas, particularly Koh Chang and Koh Mak, the current individual wastewater practices of resort accommodations can disrupt the ecological processes of coastal areas, while consuming water resources is over the optimum level of natural resource availability.

Table 2 Roles of local authorities of relevant authorities

<table>
<thead>
<tr>
<th>Agencies</th>
<th>Roles and responsibilities</th>
</tr>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Agencies</td>
<td>Roles and responsibilities</td>
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<tr>
<td>---------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>National level</td>
<td></td>
</tr>
<tr>
<td>Ministry of Interior (MOI)</td>
<td>The Ministry of the Interior has responsibility for local administrations, internal security, citizenship, disaster management, land management, issuance of national identity cards, and public works. Local governments are under the Ministry, which favors governing via central and provincial administration.</td>
</tr>
<tr>
<td>DASTA</td>
<td>DASTA was set up as a public organization, with the roles and responsibilities over sustainable tourism operation, through coordination for integrated administration of areas with valuable tourism resources, with more flexibility and promptness in operation than that of government agencies and state enterprises, as an important driving force in the administration of the country's tourism industry.</td>
</tr>
<tr>
<td>Ministry of tourism and transports (MOTS)</td>
<td>The Ministry of Tourism and Sports shall have the authority relating to promoting and developing tourism, sports, education, recreation industries, and other government services. The main responsibilities of the organization are the following: 1. Set policy and strategic plan for development in all levels that is in line with national development. 2. Promote, support, develop, and encourage implementation of tourism, sports, and recreation policy. 3. Efficiently integrate and manage, encourage participation from all sectors in the development of tourism, sports, and recreation of the country, as well as set a guideline for resource allocation to support all sections to ensure efficiency. 4. Develop infrastructure, as well as supporting factors in terms of tourism, sports, and recreation to ensure international quality and standard. 5. Develop management system, information system, and personnel in tourism, sports, and recreation to ensure competency.</td>
</tr>
<tr>
<td>Ministry of Natural, Resources and Environment (MONRE)</td>
<td>MONRE has as its vision “to return the natural environment to the Thai people and to work toward the incorporation of natural resources and the environment in the Government’s national agenda as these provide the basis for social and economic development.” Their major roles and responsibilities are to support proactive integration of the administrative management of natural resources, environmental protection, and biological diversity, based on the principles of public participation and good governance.</td>
</tr>
<tr>
<td>Regional level</td>
<td></td>
</tr>
<tr>
<td>Provincial Administration Organization (PAO)</td>
<td>In fact, PAO is also considered in the upper tier in the local structures. The PAO performs many functions on behalf of the national government (MOI) to support local administrations by constructing and maintaining local roads, providing water and other limited services to residents. Their roles and responsibilities are to accelerate the development of local administrations in the rural areas outside of sanitation districts (Sub-district Administrative Organization) and municipalities.</td>
</tr>
<tr>
<td>DASTA</td>
<td>Same as national level, with regional offices.</td>
</tr>
<tr>
<td>TAT</td>
<td>TAT under the MOTS was the first organization in Thailand to be specifically responsible for the promotion of tourism through marketing and public relations. Their main roles and responsibilities are to promote tourism, to accommodate tourists, and to maintain tourist locations and accommodations.</td>
</tr>
<tr>
<td>Koh Chang National Park</td>
<td>Koh Chang National Park is under Department of National Parks, Wildlife and Plant Conservation (DNWPC) of MONRE. DNWPC carried out missions on the conservation, promotion and restoration of natural resources, wildlife and plants in forest area for conservation by controlling existing protected forest areas to help maintain the ecological balance and the environment as well as biodiversity for watershed resources, habitats of wildlife, source of food, recreation and nature of the people.</td>
</tr>
<tr>
<td>Local level</td>
<td></td>
</tr>
<tr>
<td>Municipality</td>
<td>Municipalities occupy urbanized areas. They perform many functions to make their residents’ livelihood meet the living standard such as development of public infrastructure, promoting quality of lives, organizing their communities for orderliness and safety, development local economies, managing natural resources and the environment in their jurisdictions as well as promoting education, sport, cultures and local knowledge.</td>
</tr>
<tr>
<td>Sub-district Administrative Organization (SAO)</td>
<td>SAOs were established to serve areas outside of municipalities. They were designed to provide basic services and facilities, human resource development, and health care predominantly in rural village areas.</td>
</tr>
<tr>
<td>Pattaya city</td>
<td>Pattaya city is a self-governing municipal area. It was declared a Special Administrative Organization, which is another form of local administration organization due to high economic and social development. Their structure is based on the successful model of Bangkok as a unitary government. Basically, Pattaya city works similarly to other municipalities.</td>
</tr>
</tbody>
</table>

Source: MOTS; 2010; Choopen (2011); DNWPC (2015); MONRE (2016); DASTA (2019); MOI (2019); TAT (2019)
In addition, without support from regional and national authorities, provision of basic infrastructure and services in response to higher tourism-led urbanization of these tourism destinations remains one of the key barriers to coastal areas governance and development. However, Pattaya has a greater capacity for their areas governance because it was declared a Special Administrative Organization for self-governing municipal areas as a unitary government similarly to Bangkok, the capital city, as a result of high economic and social development.

Moreover, overlapped responsibilities and less institutional cohesion between different levels and units are creating some constraints, in particular, the overlapped responsibilities of local and regional authorities in Koh Chang, where different policy and role & responsibility directions cause ineffective efforts for urban development and limited proactive initiatives because most of public lands are under the management of the national park. While DASTA and municipalities’ policies are to enhance their citizen’s livelihoods and enable tourism-led economic development, the national park’s policy is to protect and conserve environmental and natural resources as much as possible. This issue reflects the cross purposes of the policy and institutional coordination of the area. Conversely, Koh Mak and Pattaya enjoy great support from DASTA, where they have fewer problems with overlapped issues due to clearer objectives and fewer local authorities involved. In addition, to enhance coastal areas governance, stakeholder analysis was conducted with results as given in Fig. 6.

\[\text{Fig. 6. Power and interest grid of stakeholders in coastal areas governance}\]

It can be seen (Fig. 6) that all local authorities are the key stakeholders, as they have high power and interests. DASTA and TAT have a high interest in tourism development but low power to enable initiatives. These two organizations should be kept informed and involved because they can be significant supporters for the proposed program or policy changes of tourism development. Tourist resort accommodations and local citizens are also important stakeholders; while they have low interest and power, the more powerful entities should consider their preferences, as they are significant groups driving local development. In the case of Koh Chang, its municipality is needed to engage, consult and make stronger relationships with Koh Chang National Park as it has high power in coastal area management as most of its areas under the Park. However, the Park has a low interest in tourism governance. The municipality thus should keep this organization involved and satisfied as much as possible.

In summary, governance to deal with the continued growth in the coastal areas is challenging. Supporting local governance can be a key to ensure synergies for the sustainability of the local economy and coastal resources (Wongthong and Harvey, 2014; Satumanatpan et al., 2017). To enhance implementation for better-balanced environment and tourism in the context of rapid urbanization and CC, for Koh Chang, basic infrastructure and services are recommended for improving the coastal environment. Local
authorities responsible for coastal/urban governance need to engage and collaborate with the national park. Koh Mak needs to think more carefully about tourism development and use Koh Chang and Pattaya as case studies to make the best use of their development in the context of higher level, of tourism development and growing number of tourists. For Pattaya, the proposed strategies are to improve the capacity of the urban environmental infrastructure to cope with ongoing and future higher urbanization. In addition, Koh Chang and Pattaya can use Koh Mak as an example of how to respond to CC as well. Nature-based solutions and green infrastructure for building resilience in these tourism cities are suggested to promote ecotourism and sustainable tourism destinations in these study areas. In addition, cooperation among partnerships can be considered to help increase the knowledge, skills, and resource base (including financial) for achieving goals and maximizing benefits in the management or implementation of any plans, initiatives, or projects (ADB, 2016a, 2016b).

5. Conclusions and recommendations

The explored relationships among tourism, the environment, and CC, as well as coastal areas, prove that the tourism destinations in these areas have been developed in different directions from its coastal environment and CC patterns. Tourism development in these areas is currently putting the stresses and pressures on the environment. Coastal areas are negatively affected in terms of increased air and water pollution and resource degradation; meanwhile, these coastal areas face higher domestic water consumption and wastewater generation induced by the annual increase in tourists. Water scarcity and pollution are the most critical environmental issues of the destinations. In addition, they have also been exposed to different CC-related problems while the risks of accumulative impacts of both environment and CC have not been adequately recognized or addressed. Most of the current practices are autonomous or general with economic incentives and significantly required additional measures. Although some adaptations and environmental protection as well as mitigation measures are with synergies to improve environment and increase climate resilience, some strategies also pose negative consequences to the environment. In addition, the main gaps are also related to planned adaptation and mitigation measures requiring improved capacities of and collaborations with local and regional governments together with other tourism stakeholders, especially for long term and investing public infrastructure and services. Thus, to enhance implementation of more balanced environmentalism and tourism in the context of rapid urbanization and CC, the relevant policies should recognize the synergies between regional and local developments of the coastal areas and among local stakeholders/authorities, proper management of tourism infrastructure and services for urban CC resilience, and enhanced conservation of coastal natural resources and urban environment.

This study provides a systematic framework for analyzing holistic coastal urban governance, including CC, and an approach for responding to the challenging issues and global trends. The framework, as well as associated indicators and supporting methods, can be applied in further related research on rapid urbanization in the context of CC. In addition, knowledge obtained from the study may be used as part of the capacity-building processes of coastal areas with relevant urban and tourism stakeholders. “Problem tree” and “solution tree” approaches, together with capacity needs assessment for urban governance, are recommended in further study for in-depth problem and gap analysis. This would extend to an improved understanding of existing mechanisms of urbanization and governance in the context of CC among involved stakeholders and responsible agencies.

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Tourism Authority (DASTA) of Thailand, the local government authorities of Pattaya, Koh Chang, and Koh Mak, as well as Koh Chang National Park and other tourism stakeholders, for the data and information they provided during the study period.

Conflict of interest
The authors declare there is no conflict of interest.

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**Specific objective:** to assess the relationships of tourism, environment and climate change in the context of coastal urbanization

**Task 1:** Explore existing tourism situation on coastal areas and explore how the city develop their coastal areas to support tourism urbanization

**Task 2:** Investigate existing environmental and climate change on coastal areas, and city’s management

**Task 3:** Investigate environmental/ climate change impacts to tourism sector and responding from the sector

**Task 4:** Analyze relationships among tourism, environment and climate change

**Main objective:** to enhance the policies and implementation for better balanced environment and tourism in the context of rapid urbanization and changing climate that applies to coastal areas and islands marked by tourism development

**Task 5:** Identify and propose approaches for governance coastal tourism urbanization
<table>
<thead>
<tr>
<th>Power of stakeholders</th>
<th>Interest of stakeholders</th>
<th>Keep satisfied</th>
<th>Engage closely and influence actively</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Koh Chang National Park</td>
<td>Municipality</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Sub-district administrative organization</td>
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<td></td>
<td></td>
<td></td>
<td>Pattaya city</td>
</tr>
<tr>
<td>Low</td>
<td>←</td>
<td>Minimum effort</td>
<td>Keep informed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tourists</td>
<td>DASTA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tourist accommodation</td>
<td>Tourism Authority of Thailand</td>
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<tr>
<td></td>
<td></td>
<td>Local citizen</td>
<td></td>
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<tr>
<td>High</td>
<td>→</td>
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</tr>
</tbody>
</table>
Fig. 3. Percent of tourism accommodation affected by climate change related impacts.

Fig. 4. Percent of tourism accommodation implementing adaptation measures.

Fig. 5. Percent of tourism accommodations implementing mitigation measures.