Tourism Governance for Coastal Urbanization and Environment with Changing Climate on Koh Chang Island, Thailand

Sirinapha Srinonil, Vilas Nitivattananon*, Pornpol Noithammaraj, and Rachnarin Nitisoravut

Abstract— *Tourism is one of the world's fastest-growing sectors and considered a major contributor to environmental changes and vulnerable to climate change (CC). Koh Chang, one of the popular destinations in eastern Thailand is facing higher urbanization and vulnerable to CC and environment impacts resulted from tourism development. Therefore, this study aims to analyze relationships of tourism, environment, and CC in the context of coastal urbanization and recommend strategies for enhancing governance compatible with coastal environment and changing the climate. The study applied a mix of qualitative and quantitative methodologies. Primary data were collected basically through a semi-structured interview, stakeholder group discussion, questionnaire, and site observation, together with secondary data. The explored relationships prove that the tourism destination is developed in different directions. Lack of basic infrastructure has led to negative consequences between tourism growth and natural resources, and more vulnerable to CC. While the tourism sector faces mostly different CC-related impacts, their adaptation and mitigation practices are inadequate. To enhance the relationships, proper management of tourism infrastructure and services is suggested to increase urban resilience to CC and the environment. This study provides a framework for holistic urban governance with the importance of involving stakeholders that can be applied in other areas.*

***Keywords*— Climate change, coastal urbanization, governance, sustainable tourism.**

1. INTRODUCTION

Currently, tourism is the largest and fastest growing sectors compared to other sectors. This advancement reached 1.326 million of international tourist arrivals in 2017 (86 million more than in 2016) reaching US$ 1,340 billion of total international tourism receipts in the same year and forecasted to continue growing in international tourist arrivals approximately 3.8% per year for the period 2010 to 2020 (UNWTO, 2018). In addition, in 2018, the World Travel & Tourism Council [WTTC] (2019) reveals that, this sector contributes to 10.4% of global Gross domestic product [GDP] and 319 million jobs, or 10% of total employment. Thailand is one of the members of Southeast Asian countries where the tourist arrivals were seven highest of the world in 2013 (Ministry of Tourism and Sports [MOTS], 2015). The number of tourist arrivals currently have been increasing continually from 14 million in 2009 to 29.8 million in 2015 and reached 35.4 million in 2017 (Changed 8.6% from 2016) together with expected to reach 45 and 67 million in 2020 and 2030, respectively. (MOTS, 2015; UNWTO, 2018). However, with global challenges, it water found that although tourism benefits to national and regional economic growths, it is considered as contributor to environmental changes and vulnerable to climate change (CC) (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ], 2010).

Koh Chang Island, one of popular tourism destinations in eastern Thailand is the second biggest island after Phuket and becoming top ten of Thailand's tourism destinations as government tries to support as a popular international tourism destination. Koh Chang is now facing higher urbanization resulted from tourism development and vulnerable to CC and environmental impacts as its physical characteristics located on the Gulf of Thailand. GIZ (2010) indicated that the effects of CC are becoming and increasing concern in Koh Chang. For 1-meter sea level rise (SLR) scenario, Koh Chang has high potential to be affected by CC impacts such as coastal erosion, losing land, water runoff, flooding and intrusion. In addition, the understanding of interrelation between tourism and the environment is essential because the negative and positive impacts from environment can be induced by this sector, and good environmental quality of the destination is the tourist attraction itself.

Therefore, this study aims to analyze relationships of tourism, environment and CC in the context of coastal urbanization and recommend strategies for enhancing coastal tourism governance compatible with coastal environment and changing climate, for the case of Koh Chang Island, Thailand.

2. LITERATURE REVIEW

Coastal Urbanization and Tourism Development

Urbanization is the growth of cities and towns related to

S. Srinonil is with the Urban Environmental Management program, Asian Institute of Technology (AIT), P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand.

V. Nitivattananon is with the Urban Environmental Management program, Asian Institute of Technology (AIT), P.O. Box 4, Khlong Luang, Pathum Thani 12120, Thailand.

P. Noithammarajis with the Designated Areas for Sustainable Tourism Administration (Public Organization), P.O. Box 118/1, Tipco Tower, 30th -31st Floor, Rama 6 Road, Samsen Nai, Khet Phaya Thai, Bangkok, 10400, Thailand.

R. Nitisoravut is with the School of Bio-Chemical Engineering and Technology, Sirindhorn International Institute of Technology, P.O. Box 99 Moo 18, Km. 41 on Paholyothin Highway Khlong Luang, Pathum Thani 12120, Thailand.

*Corresponding author: V. Nitivattananon; Phone: +66-2-524-5601; Fax: +66-2-524-6380; E-mail: vilasn@ait.asia.

largely increased migration of rural people to city areas. Historically, there was only 30% of world population living in urban area in 1950, but now the number has been increased to 55 % in 2018 and projected to reach 68% by 2050 (United Nations, 2018). Asia and Pacific regions are experiencing the most rapid urban growth accounting for 50% in 2018. Between 1980 and 2010, the region's cities grew by around one billion people and will add another one billion by 2040. With in this number, urban population only in Southeast Asia (SEA) revealed that their population was only 18.5% in 1960s and reached to 44.1% in 2010, as well as forecasted to grow more than 60% in 2030 particulary in coastal zone particularly for the purpose of economic benefits such as coastal fisheries and tourism and recreation (Pelling and Blackburn, 2013; United Nations Human Settlements Programme and United Nations Economic and Social Commission for Asia and the Pacific [UN-Habitat and UN-ESCAP], 2015; International Human Dimensions Programme [UNU-IDHP], 2015; UN-Habitat, 2016a, UN-Habitat, 2016b).

In addition, transformation of coastal settlements due to tourism is the fastest growing resulting in high population pressure due to rapid urbanization processes. It has reached its peak in recent decades compared to other tourism industries, and also becoming one of the biggest industries in the world and 277 million jobs for the global economy in 2014 (United Nations Environment Programme [UNEP], 2009; Nara et al., 2014; Tang, 2015; Kurniawan et al., 2016; Schuhmann et al, 2016; Andres et al., 2017; 2018). As a hub of trade and coastal environment and climatic characteristics are attracting tourists to travel to the regions, sub-regional areas are important on coastal tourism.

Coastal tourism Associated with Environment and CC

Although, coastal regions have been considered as a growing demographic concentration and promoted as the majority of economic-tourism led activities of many countries, with its close connections to the environment and climate itself, tourism is considered to be a highly climate and environment-sensitive economic sector similar to agriculture, insurance, energy, and transportation (UNWTO-UNEP-World Meteorological Organization [WMO], 2008;; Center for Responsible Travel [CREST], 2012; Wu & Tan, 2012; Bujosa et al., 2015; Tang, 2015; Li et al., 2016; Andres et al., 2017; 2018). Consequently, tourism urbanization in coastal areas lead to rich natural resources being under very strong pressures which can be divided into three groups: degradation of natural composition of ecosystems, destruction the great part of marine environment and increased fragmentation between natural and built areas (Burak et al. 2004; Gouda, 2012).

In terms of CC, it is now exacerbating the vulnerability of human settlements globally, especially in developing countries where the rapidly increasing urban density in many Asian countries lying on coastal plains. (Marshall et al., 2009; UN-Habitat, 2016c). It was observed that SEA is already affected by CC and this change was projected to increases of 2 to 5.5^{o}C coupled with a projected decrease in precipitation by the end of the 21st century (Asian Development Bank [ADB], 2009; Lavieren et al., 2011; Intergovernmental Panel on Climate Change [IPCC], 2013). Coastal resources are being affected by a number of consequences of CC including higher sea surface temperatures, changes in precipitation patterns and coastal run-off, SLR, changes in storm tracks, frequencies, and intensities (United Nations Framework Convention on Climate Change [UNFCC], 2011; McLean et al., 2001; Wong, 2014 UNFCCC, 2018). Regarding these challenges, responding of coastal urban governance in the context of tourism development is urgently required to make the tourism city more resilient and sustainable in long term.

Tourism Associated with Environment and CC

The understanding of the coupling relationship between tourism and the environment is important due to the complex interaction in environmental effects induced by tourism. Tourism environmental context is the tourist attraction itself as certain climatic characteristics are marketed to be the main reason for the tourists to travel to the regions e.g. coastal areas (Tang, 2015). Somayyeh and Faraji (2010) indicated that the tourism has a multitude of impacts, both positive and negative on the environment. Tourism sector has the opportunities to create profits on the environment by environmental protection and conservation as ecotourism. Nevertheless, it covers many tourist activities that can lead to adverse environmental effects which it relies on.

The relation between CC and tourism can be divided into two-folds which are CC posing impact on tourism sector and the activities generated by tourism contribution to CC (GIZ, 2010). In 2005, global tourism emissions are estimated to emit 4.9% of the world's emissions. If no comprehensive emission reduction measures, the sector will be emitted and get 2.5 folds by the year 2035 (UNWTO-UNEP-WMO, 2008). Moreover, CC will put the significant effects on the distribution of existing tourist flows by changing their demand of seasonal volumes of attractive places (Bujosa et al., 2015). There are necessarily two strategies which can be utilized to address the impacts of CC which are mitigating and adaptation measures. Mitigation tackles the causes of CC such as renewal energy use, best practice in solid waste as well as maximizing in local products for food in accommodation, while adaptation copes with its effects such as constructing seawalls, planting trees or building owner water storage for adaptation to erosion and the risk of storm surge, as well as adapt to drought of tourist accommodation (Becken, 2005; CREST, 2012; Nitisoravut et al., 2013; Nitivattananon et al., 2015; Michailidou et al., 2016).

3. METHODOLOGY

Research design and overall methodology

This study applied a research mix of qualitative and quantitative research method. A governance framework was developed with associated indicators for measuring relationships among tourism urbanization, environment and CC, and coastal areas development and management.

It is clear that tourism activities need attractive natural resources and clean environment in order to facilitate and drive local and national economies. But, as already well known, tourism can affect both positively and negatively the environment and CC. Negative effects are even enhanced when considering CC issues.

Tourism activities can contribute to CC in terms of Greenhouse gas (GHG) emissions, and CC can affect tourism by climate-related hazards like increasing precipitation, temperature and SLR. The need for coastal areas governance, especially in tourist resort areas, is intense. Thus, realizing the relationships and good governance are important responding to social, economic and environmental sustainability for the tourist destinations.

An overall methodology to achieve the research objectives was developed to investigate the relationships. The specific processes of methodology were determined and conducted consisting of: 1) exploring existing tourism, environmental and CC situations in study area, 2) exploring tourism sector contributing to CC and environment and vice versa, 3) investigating local authorities' management responding to those explored coastal environment and CC, and 4) exploring their responding to CC and environmental impacts of tourism sector. Then, the results would be analyzed to investigate relationships to contribute to identifying and proposes enhanced governance for coastal tourism urbanization of the study areas.

Study areas

The study areas are focused on Koh Chang Island as given in Fig. 1, a popular coastal destination in eastern sub-region of Thailand where its climate of the whole region is under the influence of the northeast and the southwest monsoons in the months of May to October. The dry and cold seasons are between October to February. Koh Chang belongs to Trat province, which is 310 km from Bangkok and 240 km from Pattaya. Its total area is approximately 210 sq. km with more than 70% of the areas belonged to National park (Williams and Sirithorn, 2011). This destination was also declared as the special areas for sustainable tourism under the responsibility of Designated Areas for Sustainable Tourism Administration (DASTA) established by central government to develop tourism in order to promote sustainable tourism destinations in Thailand.

For focused areas, White Sand beach, Klong Proa beach, Kaibae beach and Bangboa bay were selected as specific studied areas due to high density of tourism urbanization; economic hub; popularly attractive places; and high exposure strain coastal environment, and to be affected by CC related impacts. Only Bang Boa bay represents the less tourism urbanization and tourism infrastructure.

Data collection and analysis

Primary data were collected basically through semi-structured interview, stakeholder group discussion, questionnaire survey and site observation together with collecting available secondary data of various official documents, research reports and literature review. Local authorities and tourism service operators were interviewed, and other key tourism stakeholders including tourism related clubs, accommodation sector, tourism service operators and others were invited to group discussions.

For questionnaire survey, this study used semi-structured-guided questions approach based on selected indicators following conceptual framework. The targeted sample group focuses on medium and high scales enterprise (resort/ hotel accommodations) due to more impacts, interesting and innovative to assess environmental measures and investigate options to copes with CC and environmental issues. In which, there are registered 67 out of 189 accommodations are followed these criteria according DASTA's database. With a purposive sampling method, sampling size in this study is determined by 30 accommodations in selected beaches which close to 50% of the passed criteria accommodations.

After that the questionnaires would be analyzed mainly in statistically and quantitatively together with statistically and qualitatively supporting from those other kinds of primary data collection as mention above together with secondary data collection.

4. RESULTS

State of Coastal Areas Interconnected With Tourism Growth and Urbanization

Koh Chang has various kinds of natural resources range from forest ecosystems, marine ecosystems, mangrove forests, waterfalls as well as white beaches. These resources are abundant and plentiful as a result of more than 70 % of these areas are located in and managed by National Park. Currently, this pleasant nature based destination becomes as one of most popular coastal tourism places of Thailand due to supported by local, regional and national policies. From the year 2010, there were only 400,000 tourists visiting this island and closed to 1 million visitors in 2013. In 2015, the total tourists visiting Koh Chang accounted for around 1,500,000 visitors. The residents of the island also followed the trend of tourists. It was doubled increasing to reach approximately 8,000 citizens in 2015 compared to 1994. Although tourism provides significant economic development for this island and region, Koh Chang nowadays has not been set up land use or urban planning to support tourism urban growth. This is leading to urban sprawl/expansion with non-direction by tourism development. Populated & urbanized resort areas are linear pattern along the shoreline and roads because of the high slope in topography of Koh Chang in almost areas while plain areas only close to the beaches.

Coastal Area Management Shaped by Environment Situation and CC

Nature of the coastal areas currently poses positive impacts on tourism development; however, tourism development in Koh Chang is likely to produce negative trend to environment as a result of no provided basic infrastructure from local governments (municipality).

With no central wastewater, environmental problems from tourism development is critical issue on coastal areas as each tourism accommodation has to manage wastewater by themselves leading to illegal wastewater discharged to environment particularly into sea. Municipality also does not have technologies and equipment to address the pollution. They investigate the problems only when they get complaints. Moreover, water supply is also the critical issue of this island as not provided to this tourism city similar to wastewater treatment. Each accommodation and household normally uses underground water and harvest water from rainfall, waterfalls, groundwater as well as rivers or ponds by themselves. When drought season comes, tourism areas will buy raw water from private companies inside and outside the island. Local residents and other public organization affected by water shortage in drought season will be given water supply remedies from municipality instead. For waste management, the performance of managing is still doing well. Waste can be collected nearly 100% every day and most of them are transferred to mainland. For transportation, private or tourists cars are allowed to drive on the island. There is traffic congestion only festival duration and long weekend. This problem is caused by private ferry business that is not enough for demanding in transferring car crossing between island and mainland. Public cleaning is also not enough as lower workers per population and tourists (per polluters).

In terms of CC, it is found that the coastal areas are likely to be vulnerable to the impacts through natural disasters, shoreline erosion, drought, landslide, flooding, extreme events/ heavy storm and sea level rise as they have been indicated to occur every year. However, some causes of water degradation of coastal areas can come from limited sources and management of water together with population and tourist growth. No provided drainage systems in highly urbanized beaches also normally cause flooding during extreme events and monsoon seasons. Nevertheless, there are some efforts to conserve and protect coastal environments, as well as respond to CC induced impacts from various local government authorities such as DASTA (established 3R programmes and support waste transferring and disposal center as well as promoting low carbon hotels), municipality (conserve forest and reforestation, shoreline erosion protection by concrete wall, and budget remedies for recovery when extreme events occur and destroy some stuffs), and Koh Chang National Park (provide public knowledge on environmental conservation and protection, arrange zoning for use of natural resources such as protected areas, buffer zones, tourist activity zone, snorkeling zone etc.). These measures are more on environmental and CC adaptation while mitigation measures have been found less taking into account for coastal areas management.

Tourism Development Status Implication with CC and Environmental Situations

It was revealed that the tourism sector currently faced many environmental and CC related problems. With limited support of basic environmental infrastructure by local authorities, the results show that water degradation or water scarcity is the most impact faced by tourism accommodations. Moreover, lack of raw water is a very critical issue for these areas as higher tourism growth. In addition, another significant issue is inappropruate wastewater management without central wastewater treatment provided. This issue results in illegal discharging from some accommodations causing seawater and beach pollution of the coastal areas. The beach affected severely by wastewater is White Sand as this beach is most compacted urbanization with tourist accommodations and service providers. From the field survey, there are 19 out of 25 accommodations who have installed their own wastewater treatment system, while 6 accommodations have not installed and others not responded. Air pollution (dust) is also affecting tourism accommodations as there are many of them continuing constructed in this area and air pollution from transportation within the island. The waste management impact is found to be low for resort accommodations.

In terms of CC, tourism sector showed experiencing with CC related impacts every year. As can be seen in Fig. 2, drought is the most critical issue as 21 out of 30 accommodations indicated they confronted with drought. The subsequent problems are flooding, shoreline erosion, extreme storm and SLR accounting for 15, 13, 11 and 9 resorts, respectively. For landslide, there are total 7 out of 30 accommodations affected. There are some adaptation and mitigation measures already implemented to their resort areas Mitigation measures also are practiced in certain level and more on saving their money in reducing electricity use. Figs. 3 and 4 give information on how accommodations could reduce the impacts from CC related hazards by adjustment (adaptation measures) and how accommodations contribute to climatic change by reducing emissions of greenhouse gases (mitigation measures). The results show that green area is the most favorite practice of adaptation measures accounting for 25 resorts and 27 out of 30 resorts using energy saving equipment is the most popular practice of mitigation measures from tourism accommodations.

For GHG emissions from tourism development in Koh Chang, GIZ and DASTA (2009) indicated that emission per tourist and day on Koh Chang accounting for 15.96 kg/day. The main sources of emission of this area come from hotels (58%), followed by restaurants (27%), boat traffic (10%) and another operator (5%). In terms of potential GHG emission reduction of tourism in Koh Chang, community-based low carbon tourism (CB-LCT) was carried out by DASTA in this designated area as a practical model to promote environmentally sustainable tourism. The result shows that CB-LCT in Koh Chang has potential to reduce this emission; however, different mitigation measures in different CB-LCT resulted in different emission reduction (Nitivattanon et al., 2015)

5. DISCUSSIONS

Relationships of Tourism, Environment and CC in the Context of Coastal Urbanization in Koh Chang

The explored relationships among tourism, environment and CC as well as coastal areas prove that the tourism destinations have been developed in different directions from its coastal environment and CC patterns. Although, local authorities, Koh Chang National Park as well as DASTA and others have some certain levels of environmental conservation and protection, tourism urbanization development of the study area is likely to produce more negative effects to the coastal environment.

In terms of coastal environment, it is evident that individual environmental management in tourism sector is putting the stresses on environment of coastal areas both resource consumption and pollution generation. The most critical issue of coastal environment created by and also is affecting tourism development is water shortage. These factors with CC can be assumed to have a substantial impact on the coastal water resources and significantly emphasized that tourism city is highly vulnerable on their economies.

Environmental pollution of coastal areas is also subsequent serious problems of this tourism destination. The beach and marine ecosystems have already been struggled with water pollution created by tourism sector. Although, municipality regulates to install wastewater system at source by tourism accommodation businesses, wastewater management at individual resorts still results in illegal discharge or improper treatment. It also proves that local government such as municipality and resort itself have less environmental awareness. Therefore, existing tourism development in Koh Chang with higher growth of tourists and population is important driving force of coastal environmental degradation especially water resource usage and water pollution.

Climate-induced environmental changes are found to have potentially negative impacts on tourism sector in Koh Chang. This sector is currently facing CC related impacts especially extreme hazards, drought, flooding, SLR and beach/shoreline erosion. Drought issues is affecting tourism city, especially more adverse in 2016 due to low annual precipitation with less raining days. Department of Groundwater Resources (2010) had survey amount of available ground water and concluded that higher population and tourists of Koh Chang have significantly destroyed groundwater resources. Flooding is also the annual critical climate related issue as this geography is located in the Gulf of Thailand and inevitably experience with monsoons. However, not only climatic induced problems, flooding is caused by various non-climatic drivers. Human-induced problem factors can be assumed to create critical flooding to tourism destinations due to change in storm water flow. For SRL, perceptions of both local authorities and tourism sector especially resort accommodations pointed that the areas are being treated by SLR. Now they have already adapted to this problem by construction both concrete and stone walls for prevention of damaging their areas.

For response to CC, there are inefficient responding measures of public sector to the climate related issues. Municipality only takes response after disasters occurred. They provided only cost remedies to their residents affected by flooding and raw water distributed in drought season. There are generally practices in reducing GHG emissions from tourist accommodations such as using key tags and energy saving equipment in tourist roomswith limiated additional mitigation actions such as using solar cell and waste to energy projects for alternative energy. In terms of adaptation particular to drought and flooding, tourism sector normally uses raw water from underground and has adapted by installing water tanks, and in case of critical water scarcity, they take action by buying water from mainland or other private sector on the island.

Tourism Governance Issues Involving Coastal Development, CC and Environment Aspects with Proposed Strategies

It was found that less capacity and attention by municipality to manage their urban environment lead to ineffectiveness in conserving natural resources and protecting city's environment, and adaptation to CC. Institutional coherence is one of the best measures towards sustainable tourism governance. However, local governments themselves and partnership with private sectors are limited. Overlapped areas and responsibilities of local authorities with different coastal management purposes/strategies cause conflicts of urban development. For example, Koh Chang National Park's policy needs to protect and conserve environment and natural resources as much as possible in the same ways with fewer disturbances from human activities, while DASTA and municipality's policies are to enhance their citizen's livelihood and enable economic development in different ways on coastal areas including tourism development and infrastructure management. In addressing ways to deal with these challenges, a collaborative approach in working together of both private and public sectors is required at the local scale.

Based on analyzed groups and the roles of tourism stakeholders, it shows that Koh Chang municipality is directly key stakeholder in coastal tourism urbanization governance as they have high power and interests mainly responsible for urban development or implementing the policy and/or program on tourism advancement. In addition, Koh Chang municipality is needed to engage, consult and make stronger relationship which the National Park to enhance coastal tourism environemnt as the National Park has high power in coastal area management as most areas are under its autorization. As the National Park has low interest in tourism governance,municipality thus should keep this organization particpating and balancedin the coastal area management.

5. CONCLUSIONS AND RECOMMENDATIONS

Koh Chang with its location and environmental characteristics is marketed to be the main reason for the tourists to travel to the region. However, the relationship among tourism, environment, and CC, as well as coastal areas, proves that tourism destinations of Koh Chang have been developed in different directions. Unplanned urbanization with a lack of basic infrastructure leads to negative consequences between tourism growth and

natural resources, and also make coastal tourism urbanization more vulnerable to CC. Moreover, the tourism sector faces mostly different CC related impacts including extreme storms, sea-level rise, erosion, flooding, and drought. Drought and floods are still unclear and may be argued that they are caused by higher urbanization and demand with no infrastructure provision. In addition, CC adaptation and mitigation from the tourism sector require additional measures as there are only routine or general practices with economic incentives. In terms of governance, overlapped areas and responsibilities of local authorities without well collaboration and coordination cause conflicts and constraints of coastal areas governance.

o enhance the relationships, proper management of tourism infrastructure and services is suggested to increase urban resilience to climate-related risks, and enhance conserving coastal natural resources and protecting the urban environment. This study provides a clear framework for a holistic and anthropogenic risk management approach that also includes CC and urbanization into the approach for responding to natural and anthropogenic hazards in urban and peri-urban contexts. Developed indicators and methodology in this framework may be used as a coastal tourism guideline/tool for planning or developing strategies to manage their coastal areas towards sustainable development.

ACKNOWLEDGMENT

The authors would like to express the gratitude to the Royal Thai Government for providing fellowships for this research. The authors also would also like to thank the local government authorities Koh Chang National Park and other tourism stakeholders for the data and information they provided during the study period. In addition, we would like to thank Designated Area for Sustainable Tourism Authority (DASTA) of Thailand for facilitating field data collection.

REFERENCES

[1] Andres, M.D.; Barragan, J.M.; and Sanabria, J.G. 2017. Relationships between coastal urbanization and ecosystems in Spain. Cities 68: 8–17.

[2] Andres, M.D.; Barragan, J.M.; and Scherer, M. 2018. Land use policy urban centres and coastal zone definition : Which area should we manage ? Land Use Policy 71: 121–128.

[3] Asian Development Bank (ADB). 2009. The Economics of CC in Southeast Asia: A Regional Review. Manila: Philippines.

[4] Becken, S. 2005. Harmonising climate change adaptation and mitigation: The case of tourist resorts in Fiji. Global Environmental Change 15(4): 381–393.

[5] Bujosa, A; Riera, A; and Torres, C.M. 2014. Valuing tourism demand attributes to guide CC adaptation measures efficiently: The case of the Spanish domestic travel market. Tourism Management 47: 233-239.

[6] Burak, S.; Dogan, E.; and Gazioglu, C. 2004. Impact of urbanization and tourism on coastal environment. Ocean and Coastal Management 47(9–10): 515–527.

[7] Center for Responsible Travel (CREST). 2012. Alternative Development Models and Good Practices for Sustainable Coastal Tourist: A Framework for Decision Makers in Mexico. Washington: DC.

[8] Department of Groundwater Resources. 2010. The project of evaluation potential groundwater resources and the feasibility study for the sustainable planning and development of groundwater usage in Koh Chang Island, Trat province. (in Thai).

[9] Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ]. 2010. Climate protection in tourism: A practical guide for mu Koh Chang designated area. GIZ, Bangkok: Thailand (in Thai).

[10] GIZ and DASTA. 2009 Baseline information document: Carbon footprint of tourism industry of Koh Chang. Climate Protection in Tourism [On-line serial]. Retrieved November 28, 2016 from the World Wide Web: http://www.dasta.or.th/attachments/article/1056/439-5550-3.pdf

[11] Gouda, E. A. 2012. Problems that impede sustainable tourism development in egypt. World Academy of Science, Engineering and Technology 71(11): 251–258.

[12] International Human Dimensions Programme on Global Environmental Change (UNU-IHDP). 2015. Coastal Zones and Urbanization. Summary for Decision-Makers. UNU-IHDP, United Nations Campus: Bonn, Germany.

[13] Intergovernmental Panel on Climate Change (IPCC). 2013. Glossary: Annex III in Climate Change 2013. Cambridge University Press, Cambridge, United Kingdom and New York, New York, p. 1447–1465.

[14] Lavieren, V.H.; Burt, J.; Feary, D.A.; Cavalcante, G.; Marquis, E.; Benedetti, L. et al. 2011. Managing the growing impacts of development on fragile coastal and marine ecosystems: Lessons from the Gulf. Hamilton, Canada.

[15] Marshall, N.; Marshall, P.; Tamelander, J.; Obura, D.; Malleret-King, D.; and Cinner, J. 2009. A Framework for Social Adaptation to Climate Change: Sustaining Tropical Coastal Communities and Industries. Gland, Switzerland.

[16] McLean, R.F.; Tsyban, A.; Burkett, V.; Codignott, J.O.; Forbes, D.L.; Mimura, N et al. . 2001. Coastal Zones and Marine Ecosystems. In Climate Change 2001: Impacts, Adaptation, and Vulnerability. Cambridge University Press, Cambridge: UK, 343-379.

[17] Michailidou, A. V.; Vlachokostas, C.; and Moussiopoulos, N. 2016. Interactions between climate change and the tourism sector: Multiple-criteria decision analysis to assess mitigation and adaptation options in tourism areas. Tourism Management 55: 1–12.

[18] Ministry of Tourism and Sports (MOTS). 2015. Thailand Tourism Strategies 2015-2017 [On-line serial]. Retrieved April 10, 2017 from the World Wide Web: http://www.mots.go.th/ewt_dl_link.php?nid=7114

[19] Nara, P.; Guan-Guay, M.; and Tsair-Bor, Y.P. 2014. Applying environmental management policy for sustainable development of coastal tourism in Thailand. International Journal of Environmental Protection and Policy 2(1): 19-23.

[20] Nitisoravut, R.; Sangsnit, N.; Dhiralaksh, J; and Nitivattananon, V. 2013. "Low Carbon Hotels towards Sustainable Tourism in Koh Chang and Neighboring Islands, Thailand". Proceedings of Int. Conf. on Green Growth in GMSARN International Journal 8: 125-134.

[21] Nitivattananon, V.; Nitisoravut, R.; Sangsanit, N.; Muongpruan, C.; and Kunkuamdee, P. 2015. Community-Based Low Carbon Tourism Development in Designated Areas for Promoting Sustainable Tourism in Transitional Developing Countries. Tourism and Travel Studies 2(15): 189-204.

[22] Pelling, M.; and Blackburn, S. 2013. Megacities and the Coast: Risk, Resilience and Transformation. Routledge: London.

[23] Somayyeh, A.; Faraji, R.A. 2010. The relationship between tourism and environment. Iranian Journal of Tourism & Hospitality 1: 37-49.

[24] Tang, Z. 2015. An integrated approach to evaluating the coupling coordination between tourism and the environment. Tourism Management 46: 11-19.

[25] United Nations Human Settlements Programme and United Nations Economic and Social Commission for Asia and the Pacific (UN-Habitat and ESCAP). 2015. The State of Asian and Pacific Cities 2015: Urban transformations Shifting from quantity to quality. London: UK.

[26] UN-Habitat. 2016a. United Nations Conference on Housing and Sustainable Urban Development (Habitat III) regional report for Asia and the Pacific: transformative urbanization for a resilient Asia-Pacific. United Nations [On-line serial]. Retrieved October 27, 2018 from the World Wide Web: http://habitat3.org/wp-content/uploads/regional-report-asia-and-the-pacific.pdf

[27] UN-Habitat. 2016b. 2016b. Urbanization and Development: Emerging Futures. World Cities Report 2016 [On-line serial]. Retrieved October 27, 2018 from the World Wide Web: https://unhabitat.org/wp-content/uploads/2014/03/WCR-%20Full-Report-2016.pdf

[28] UN-Habitat. 2016c. Urbanization and Development: Emerging Futures. World Cities Report 2016. Nairobi, Kenya [On-line serial]. Retrieved October 27, 2018 from the World Wide Web: https://unhabitat.org/wp-content/uploads/2014/03/WCR-%20Full-Report-2016.pdf

[29] United Nations Environment Programme [UNEP]. 2009. Sustainable Coastal Tourism: an integrated planning and management approach. UNEP manual on sustainable tourism. Sustainable Consumption and Production Branch: Milan, France.

[30] United Nations (UN). 2018. World Urbanization Prospects: The 2018 Revision. Economic & Social Affairs [On-line serial]. UN. Retrieved October 27, 2018 from the World Wide Web: https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html

[31] United Nations Framework Convention on Climate Change (UNFCCC). 2011. Fact sheet: Climate Change science – the status of CC science today [On-line serial]. Retrieved December 25, 2016 from the World Wide Web: https://unfccc.int/files/press/backgrounders/application/pdf/press_factsh_science.pdf

[32] UNFCCC. 2018. Adaptation in human settlements: key findings and way forward [On-line serial]. Retrieved October 27, 2018 from the World Wide Web: https://unfccc.int/resource/docs/2018/sbsta/eng/03.pdf

[33] United Nations World Tourism Organization (UNWTO). 2019. UNWTO Tourism Highlights: 2018 Edition. [On-line serial]. Retrieved June 20, 2019 from the World Wide Web: http://marketintelligence.unwto.org/publication/unwto-tourism-highlights-2018

[34] UNWTO, United Nations Environment Programme and World Meteorological Organization (UNWTO-UNEP-WMO). 2008. Climate change and Tourism: Responding to Global Challenges. UNWTO, Madrid, and UNEP, Paris.

[35] Williams, P.; and Sirithorn, S. 2011. Summary of transportation system in Koh Chang, Trat province. DASTA and GIZ. (in Thai).

[36] Wong, P.P.; Losada, I.J.; Gattuso, J.P.; Hinkel, J.; Khattabi, A.; McInnes, K.L. et al. 2014. Coastal systems and low-lying areas. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[37] World Travel & Tourism Council [WTTC]. 2019. Travel & Tourism Economic Impact 2019. [On-line serial]. Retrieved June 20, 2019 from the World Wide Web: https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2019/world2019.pdf

[38] Wu, P.; and Tan, M. 2012. Challenges for sustainable urbanization: a case study of water shortage and water environment changes in Shandong, China. Procedia Environmental Sciences 13: 919–927.