

# **Solutions to Protect the Tourism Environment in an Binh Islet, Vinh Long Province**

**Nguyen Diem Phuc**

*Vinh Long University of Technical Education, phuc\_nguyendiem@vlute.edu.vn*

## **KEYWORDS**

tourism, environment protection, islet, province.

## **ABSTRACT**

The objective of this study is to present a group of solutions in order to protect the tourism environment in An Binh Islet, Vinh Long province, Vietnam. Although Vietnamese law has very complete regulations on environmental protection in the tourism sector. But for Vinh Long, it seems that this is still a very new issue. In the tourism planning of Vinh Long province for the period 2011 - 2020, the issue of tourism environment is only mentioned in a very general way: developing tourism products on the basis of exploiting the potential of existing tourism resources, promoting rapid economic growth, and at the same time focusing on environmental protection, biodiversity, protection, promotion and preservation of national traditions.

## **1. Introduction**

Vinh Long is the only province in the Mekong Delta that is not adjacent to the sea, has no forests and does not have rich mineral resources. With its central location in the region, Vinh Long is surrounded and deposited with alluvium all year round by two large rivers, the Tien River and the Hau River, with a dense system of rivers and canals. Therefore, the typical ecosystem of Vinh Long province and An Binh Islet is the agricultural garden ecosystem and the estuary ecosystem.

Since 2011, Vinh Long province implemented a planning of craft village space associated with environmental protection, focusing on the province's strengths.

Hence author choose this research topic:

**SOLUTIONS TO PROTECT THE TOURISM ENVIRONMENT IN AN BINH ISLET, VINH LONG PROVINCE**

## **2. Methodology**

Author has Applied the following main methods: DPSIR process, method of calculating tourism capacity and integrating tourism environmental protection with the socio-economic development planning of An Binh island.

This is an analytical model to evaluate a production system based on a close Cause - Effect relationship, used in analyzing the current state of the problem and proposing solutions to improve the problem, which can be widely applied in many fields of development research, such as assessing the current state of the environment, evaluating the development of production systems, including Tourism

The content of the process includes 5 steps:

- Analysis of the Control Force (D).
- Pressure on production systems (P).
- Current status of production systems (S).
- Analysis of the impact of the production system on the economy - society and environment (I).
- Response - proposing solutions to improve the situation (R).

## **3. Main findings**

3.1 Potential for tourism development in An Binh Islet:

3.1.1 Characteristics of ecosystems.

Vinh Long is the only province in the Mekong Delta that is not adjacent to the sea, has no forests and does not have rich mineral resources. With its central location in the region, Vinh Long is surrounded and deposited with

alluvium all year round by two large rivers, the Tien River and the Hau River, with a dense system of rivers and canals. Therefore, the typical ecosystem of Vinh Long province and An Binh Islet is the agricultural garden ecosystem and the estuary ecosystem.

Each ecosystem has different typical products, thereby forming different culinary cultures.

### 3.1.2 Characteristics of production systems.

An Binh Islet or 'con' as the locals often call it with an area of over 6,000 hectares is the result of the accumulation over time of alluvium from the Mekong River flowing from upstream to downstream. Therefore, the fertile and rich land is favorable for the growth and development of many types of fruit trees, ornamental plants... with more than 50% of the land area used for agricultural production [source: synthesis of socio-economic reports of 4 communes in An Binh island], creating a lush garden area, attracting tourists to visit and enjoy. An Binh is a land specializing in growing longan and other fruit trees such as rambutan, durian, orange, tangerine, plum, lemon...

### 3.1.3 Social and Humanistic characteristics (culture and history) have the potential to attract tourism.

Cultural and historical characteristics in An Binh island include existing human resources in An Binh island and the main resources that can attract tourists to Vinh Long province.

Vinh Long has 3 ethnic groups living: Kinh, Hoa and Khmer; the traditions and cultural customs of each ethnic group have diversified the culture and created a unique identity for this place.

#### 1.3.1 Historical and cultural relics

In the area of 4 Cu Lao communes, there are 25/260 relics of Vinh Long province including architectural works of communal houses, pagodas, temples, shrines built under the Nguyen Dynasty that have been restored and preserved to this day, architectural works specific to each religion: Buddhism, Cao Dai, Protestantism... (see table 2.4 Historical and cultural relics in An Binh island, appendix 1).

Grasping this potential, travel agencies have begun to exploit them to serve tourism. When tourists come to An Binh island, in addition to the main types of tourism: Homestay, eco-tourism, sightseeing tourism... tourists can also meet the spiritual tourism needs of domestic visitors, and for international visitors, the need to learn about the multicultural and multi-religious land of the Mekong Delta in general and Vinh Long province in particular is met.

#### 3.1.3.2 Traditional occupations and craft villages

Vinh Long is a province in the Mekong Delta region with a history of nearly 300 years of exploration. Since the mid-17th century, a class of Vietnamese residents from Dang Ngoai settled down by reclaiming land and forming residential communities. To serve the needs of daily life, people began to exploit aquatic products, produce agriculture, and handicrafts began to appear. Up to now, many occupations have become means of earning a living for local people and forming craft villages and hamlets.

As of 2012, Vinh Long has 23 recognized craft villages including: the craft village of growing and spinning the core of the bamboo, the craft village of weaving water hyacinth mats, the craft village of making rice paper, the craft village of producing bricks and pottery, the traditional craft village of producing pickled cabbage, the craft village of making spring rolls in Cu Lao May scattered in the districts of the province... Currently, Cuu Long Tourism Joint Stock Company has cooperated with the brick and pottery craft village along the Co Chien River to bring international visitors to visit. The remaining craft villages mainly serve the rural industries in the province.

In the An Binh Islet area alone, there is a traditional craft village of ornamental flowers and seedlings in Phuoc Dinh Hamlet, Binh Hoa Phuoc Commune. The craft village has 151 households specializing in growing and supplying bonsai and ancient bonsai.

#### 3.1.3.3 Activities, culture and festivals

##### Houses

Vinh Long in general and An Binh island in particular are one of the areas of the South known as "garden area", "river area with sweet fruits" with many old houses with beautiful architecture built from the second half of the 19th century to the first half of the 20th century by several large landlord families: Pham, Nguyen, Dong, Le...

Houses in Cu Lao are all garden houses, with traditional house types: Dinh-shaped houses, Nhi-shaped houses,

the most popular is the three-room, two-wing house combined with French architecture, creating a unique feature in the hearts of tourists.

Most of the families living on An Binh island are Confucian scholars, civil servants, retired teachers. Their lifestyle creates simple, thrifty, easy-going, hospitable people.

In the house, the Vietnamese people's belief in worshipping ancestors, grandparents, and parents is the most prominent. Therefore, "a worship space" is a very solemn place: carved into a gilded lacquer board placed on a high ceiling or in some houses there are 3 carved gilded lacquer panels (or inlaid with mother-of-pearl) with parallel sentences attached to the column body...

#### □ Cultural activities

The cultural life of the people of Cu Lao impresses visitors: weddings on the river; various types of village parties; fishing boats, nets; various types of fishing; traditional forms of wet rice; farming, floating markets, folk entertainment games: moon-watching, kite flying, fishing, rowing, amateur music, rowing, performing plays, singing, kite flying, walking on monkey bridges, smashing pots and many other folk games ... □ Festivals

Festivals in Vinh Long are very rich, taking place all year round at communal houses, pagodas, temples ... But most of them are concentrated in Vinh Long city and neighboring areas: Festival of the tomb of Ong Thong Che Dieu Bat in Tra On (January 3, 4 of the lunar calendar), spring festival at Van Thanh temple (TPVL, February 2 of the lunar calendar), his death anniversary at That Phu temple (May 13 of the lunar calendar) ....

In Vinh Long, although the Khmer people make up a small proportion, this place still has a strong Khmer cultural tradition and festivals: Cholchnamthmay festival (April 13th), Dolta festival (August 29th - September 1st of the lunar calendar), Okombok festival (October 15th of the lunar calendar) ... □ Cuisine

The dishes show the simple nature of the Western region but are no less attractive with dishes such as: alum fish often cooked with salt or fried with lemongrass and chili or fish used to cook sour soup: basa fish, cotton fish, sea bass ... grilled snakehead fish, fried elephant ear fish wrapped in rice paper, braised linh fish with sugarcane, coconut snail spring rolls, banh xeo ...

Regarding fruits, Vinh Long is famous for Nam Roi Binh Minh grapefruit, Tam Binh orange, My Hoa rambutan ...

Regarding drinks, people always pay attention to the "cool" factor such as Siamese coconut, pennywort, root juice, tragacanth gum or cotton wool...

### 3.2 Proposing solutions to protect the tourism environment in An Binh islet.

Although Vietnamese law has very complete regulations on environmental protection in the tourism sector. But for Vinh Long, it seems that this is still a very new issue. In the tourism planning of Vinh Long province for the period 2011 - 2020, the issue of tourism environment is only mentioned in a very general way: developing tourism products on the basis of exploiting the potential of existing tourism resources, promoting rapid economic growth, and at the same time focusing on environmental protection, biodiversity, protection, promotion and preservation of national traditions.

To protect the tourism environment in An Binh islet, the author proposes a number of solutions as follows:

#### 3.2.1 Tourism planning must take into account tourism capacity.

Including the most effective social capacity (Cxh) and ecological capacity at the tourist site and area as the basis for tourism planning and tourism investment. This solution is proposed based on two bases:

- The results of calculating the effective social capacity and ecological capacity at An Binh island (calculated in chapter 2). In the tourism development plan of Vinh Long province to 2020, with a vision to 2030, the tourism development target is set for tourism in the whole province but there is no mention of the tourism zoning target in places with potential for tourism development in the province. In fact, the focus of tourism development in Vinh Long province is in An Binh island (attracting 90% of tourists to Vinh Long).

- The potential for tourism development in tourist areas in the whole province of Vinh Long [25]. In addition to An Binh Islet in Long Ho District, Vinh Long Province also has tourist areas that can be exploited for tourism:

- Quoi Thien Tourist Area in Vung Liem District

- Luc Si Thanh Tourist Area in Tra On District
- My Hoa Tourist Area in Binh Minh District

Based on the above two bases, in the coming time, Vinh Long can completely exploit tourism to become a key economic sector as the province's goal has set out, while ensuring effective capacity in An Binh Islet area, contributing to sustainable tourism development.

### 3.2.2 Solution Orientation for integrating Environmental Protection for tourism into socio-economic development planning of Cu Lao An Binh

- •Infrastructure system:
  - Road traffic needs to complete inter-commune roads with solid asphalt concrete structure, creating conditions for domestic tourists to access tourist attractions by road. The connecting roads between tourist attractions in the clusters of houses need to be paved with crushed stone and gravel to avoid mud in the rainy season.
  - Dredge canals, creating conditions for easy traffic, especially in the dry season.
  - Build piers and tourist boats at the tourist ferry terminal of Vinh Long province and An Binh island area to ensure safety and aesthetics.
  - Power supply system: Ensure the electricity needs of people in general and tourism businesses in the area in particular, need to light up the roads leading to tourist attractions and buffer zones to ensure security, order and social safety.
  - Water supply system: Providing tap water to meet the daily needs of each household, especially tourism businesses. Ensuring that 100% of tourist attractions are provided with tap water, meeting the needs of use.
  - To implement the above two solutions, in the short term, there needs to be cooperation between the functional agencies of the two provinces of Vinh Long and Ben Tre. In the long term, Vinh Long needs to build a power grid to supply An Binh island to ensure the daily needs of the people and also contribute to the development of the province's tourism industry.
  - Drainage system, environmental sanitation: There needs to be a long-term plan for wastewater and waste treatment. The main waste collection system is located in public areas: households, businesses, ferries, markets, etc. Then, the waste is classified into decomposable types that are buried on site, non-decomposable types that need to be collected, processed and recycled according to the instructions of the Department of Science, Technology and Environment of Vinh Long province.
- Infrastructure - technology:
  - Entertainment: Complete construction of sports areas, commune central markets, cultural houses, conferences, seminars, design of yachts for tourism... In the immediate future, it is necessary to complete the construction of commune central markets. In the planning, it is necessary to pay attention to the space for selling local souvenirs, satisfying the shopping needs of tourists. It is necessary to link with craft villages in Vinh Long province, creating a focal point for supplying handicrafts, exporting goods on the spot for international visitors.
  - Invest in developing means of transport for tourists, encourage tourism businesses, especially accommodation businesses, to invest in purchasing high-speed cruise ships and river yachts to serve tourists visiting the river route connecting with localities inside and outside the province.
  - In addition, the planning needs to pay attention to the issue of building an anti-erosion embankment system in the area that is currently taking place.

### 3.2.3 Solution to control the number of tourists (not exceeding the capacity of tourism)

- Quickly plan tourist spots and areas with potential for tourism development in the province. Vinh Long has 260 historical relics including architectural works of communal houses, pagodas, temples, shrines built under the Nguyen Dynasty that have been restored and preserved to this day. In addition, the unique culture of the three ethnic groups Kinh, Hoa, Khmer... can be fully exploited for tourism.
- To implement the above solution, Vinh Long needs to quickly deploy the construction of the Hau River tourist route to extend the length of stay of tourists, increase tourism revenue while ensuring the capacity of An

Binh Islet. The Hau River tourist route takes the two tourist areas of My Hoa - Phu Thanh as the central area and at the same time orients the local people to develop local specialties, exploiting tourism combined with craft villages. If the Tien River route is an extended tourist route of the Mekong sub-region and an extension from Ho Chi Minh City to Cambodia, the Hau River route attracts visitors from Can Tho City and Can Tho Port. This solution is proposed based on the socio-economic development orientation of Vinh Long province to 2020, with a vision to 2030 of Vinh Long province. In particular, the focus is on combining with Can Tho city to form a key economic driving force of the Mekong Delta region along with the potential for tourism development on the Hau River tourist route.

- The primary goal is to extend the length of stay, increase the spending level of tourists instead of the target of increasing the number of tourists annually. This is a sustainable development trend in countries with developed tourism industries in the world, which ensures growth in tourism revenue while still ensuring economic efficiency when having to serve a larger number of visitors and at the same time limiting negative impacts on the environment. To effectively implement this solution, it is necessary to research the psychology of each tourist market and the level of tourist satisfaction based on existing tourism products and reasonably exploit the potential for tourism development in the locality.

#### 3.2.4 Environmental Monitoring Solutions for Homestay Tourism (main type of tourism) applied to An Binh Island;

- Encourage business households to register for environmental records. EIA reports, conduct periodic comprehensive inspections of tourism businesses, especially homestays in An Binh Island. Avoid the current situation of prioritizing only a few large-scale tourist destinations.

- Encourage saving fuel sources used in tourism: Use natural energy sources (solar energy), reuse wastewater reasonably and hygienically by using vegetable washing water to wash dishes, bowls or mop floors, do laundry and finally use it to water plants.

- Apply tourism environmental management programs, Vietnamese legal regulations in the restaurant and accommodation sector. Although Vietnamese law has very complete regulations on environmental protection in the tourism sector. But for Vinh Long, this seems to be a very new issue. In fact, An Binh Islet in particular and Vinh Long Province in general have not yet applied legal regulations and programs on environmental protection in tourism activities. To develop sustainable tourism in line with the tourism industry's orientation until 2020, Vinh Long needs to apply environmental protection programs for accommodation, restaurants and tourism transportation: Green Lotus, Vietnamese legal regulations: Environmental Protection Regulations in the Tourism Sector, Food Hygiene and Safety Regulations... - Limit the number of visitors to An Binh Islet: Based on the social capacity and effective ecological capacity of An Binh Islet (calculated in Chapter 2). The increasing number of tourists will lead to the overexploitation of tourism resources to meet the needs of tourists: consumption and use of energy sources such as water, electricity, coal, firewood; enjoying the unique features of the destination... leading to the degradation and depletion of resources including typical species for the production of souvenirs and specialty dishes. In addition, the increase in the number of visitors also causes waste overload at tourist destinations, leading to environmental degradation.

Next: Environmental management solutions for Homestay tourism (main type of tourism) on An Binh island.

- Waste management: There needs to be a long-term effective solution. Waste must be collected and classified, easily decomposable waste can be buried or composted as fertilizer for plants, and difficult-to-decompose waste needs to be collected and treated appropriately. It is thought that if there is a garbage collection service on the shore, there should also be a barge to collect garbage on the river. Tourism businesses also pay taxes to the state, so they also have the right to enjoy such public services.

- Clean water and environmental sanitation: It is necessary to mobilize all people in the Cu Lao area to regularly clean the environment, solve the fishing bridges, especially the houses on stilts along the river. The biggest difficulty is to coordinate with the people in the upstream areas of the river as well as the investors of the factories towards non-polluting production. If only one province in the upstream is greedy for profit and produces according to the Vedan model, the downstream will die. Therefore, it is necessary to commit to the inter-provincial authorities along the Tien River - Hau River to contribute to the development of sustainable tourism.

- Food safety and hygiene: Connect with safe vegetable production facilities according to Vietgap and

Global Gap standards, food suppliers managed by the Department of Agriculture and Rural Development of Vinh Long province in Vinh Long province. Ensuring food supply, ensuring food safety and hygiene, reducing costs due to limiting the transportation process and reducing emissions also contributes to environmental protection. To implement this solution, there needs to be a connection between the Department of Agriculture, Forestry and Fisheries Quality Management, the Department of Fisheries under the Department of Agriculture and Rural Development of Vinh Long province and the Department of Tourism Management under the Department of Culture, Sports and Tourism of Vinh Long province in providing addresses and inspecting the quality of the above-mentioned safe vegetable production facilities.

### 3.2.5 Solution for training human resources on tourism environmental protection.

- Introduce and teach tourism environmental protection content in schools so that tourism workers and the younger generation have awareness of environmental protection. If tour guides regularly propagate to tourists to throw garbage in the right place, then each tourist will be aware of throwing garbage in the right place, which will also contribute to preserving and making the tourist destination cleaner.
- Promote propaganda and education to raise public awareness. For existing human resources including managers and direct service staff, short and long-term training courses on tourism environmental protection are needed, knowledge of ecology, environmental management, environmental economics, environmental law, etc. should be provided. Avoid the situation of exploiting existing tourism products to the maximum, making tourism resources vulnerable to encroachment.

To implement this solution, it is necessary to attach the responsibility of tourism to the community. In particular, tourism businesses are required to use energy-saving equipment, not discharge waste directly into the environment, use food produced and provided by local people... Only when the investment project brings benefits to the people, will the people invest in return such as upgrading their qualifications and knowledge to do tourism, produce tourism products to serve customers, and provide healthy services at reasonable prices.

## 4. Discussion and Conclusion

We propose a group of solutions as below:

1. An Binh Islet has advantages in location and tourism potential, playing an important role in the tourism development strategy of Vinh Long province. However, the issue of protecting the tourism environment here has not received due attention from the local community and there are still many shortcomings: electricity and water supply has not met the living needs of tourism businesses during the peak season; waste treatment at homestays and waterway tourism businesses has not been effective in the long term; food hygiene and safety has not been ensured; management is not strict; measures to propagate and educate environmental protection awareness...
2. The results of the research and calculation of the capacity of An Binh Islet show that: the social capacity is 420,000 guests, the maximum ecological capacity is 4,500 guests / day and night and the most effective ecological capacity at An Binh Islet is 2,812 guests / day and night.
3. Comparing the above research results with the number of tourists to An Binh Islet in the period of 2008 - 2012 shows that: in the past 5 years, the social capacity has exceeded 1.2 - 1.9 times; the maximum ecological capacity and effective ecological capacity have not been overloaded. In the coming time, with the tourism development target of Vinh Long Provincial People's Committee until 2020, the increase in tourists will cause overloading of the capacity in the Islet area (which attracts 90% of tourists to Vinh Long). This negatively affects the economic, social and especially environmental factors in An Binh Islet in particular and Vinh Long province in general.

To partly solve the above problems, the author has proposed specific and feasible solutions to protect the tourism environment of An Binh Islet in Vinh Long province. Although the solutions have investment, they still have certain limitations. We look forward to receiving contributions and guidance from teachers, experts and readers. Hopefully, the research results will contribute a small part to the overall development of An Binh island tourism and Vinh Long province.

### Acknowledgement

Thank you editor, friends to assist this publication.

## References

- [1] Vinh Long Provincial Propaganda Department, Learning about Vinh Long culture, Ho Chi Minh City Literature and Arts Publishing House
- [2] Ministry of Natural Resources and Environment (2003), Regulations on Environmental Protection in the Tourism Sector, Hanoi.
- [3] Ministry of Natural Resources and Environment (2005), Decision approving the Eco-Label granting program, Hanoi.
- [4] Ministry of Culture, Sports and Tourism (2012), Decision on Issuing the Green Lotus Sustainable Tourism Label Criteria for Tourist Accommodation Facilities in Vietnam, Hanoi.
- [5] Ministry of Agriculture and Rural Development (2007), Regulations on the management of eco-tourism activities in National Parks and Nature Reserves, Hanoi.
- [6] Ministry of Justice (2005), Law on Environmental Protection, Hanoi.
- [7] Ministry of Justice (2005), Law on Tourism, Hanoi.
- [8] Ministry of Justice (2008), Law on Biodiversity, Hanoi..
- [9] Ministry of Health (2005), Regulations on food hygiene and safety conditions for business establishments, services, and catering services, Hanoi.
- [10] Directive of the Prime Minister, on the management and protection of rare and precious animals and plants, Hanoi.
- [11] Decree No. 57/2008/ND-CP of the Government, Regulations on management of marine protected areas of national and international importance in Vietnam, Hanoi.
- [12] Vinh Long Statistics Office (2011), Statistical Yearbook 2011, Vinh Long
- [13] Nguyen Dinh Hoe - Vu Van Hieu (2002), Sustainable tourism, National University Publishing House, Hanoi
- [14] Department of Natural Resources and Environment of Vinh Long province (2010), Report on the current state of the environment in Vinh Long province 2010, Vinh Long.
- [15] Department of Trade and Tourism of Vinh Long (2001), Detailed planning of tourist areas in Vinh Long, Vinh Long.
- [16] Le Van Thang (editor), Tourism and Environment, Hanoi National University Publishing House 2008.
- [17] Tran Duc Thanh (1999), Introduction to Tourism Science, Hanoi National Publishing House.
- [18] Truong Manh Tien (editor), Environment and Master Plan. National Political Publishing House, Hanoi 2002.
- [19] General Department of Tourism (2011), Green Lotus Sustainable Tourism Label for Tourist Accommodation in Vietnam, Hanoi - October 2011.
- [20] An Binh Commune People's Committee (2012), Socio-economic Report of An Binh Commune, Vinh Long.
- [21] An Binh Commune People's Committee (2010), Project on building new rural areas in An Binh Commune, Long Ho District, phase (2010 - 2020), Vinh Long.
- [22] People's Committee of Binh Hoa Phuoc Commune (2012), Socio-economic report of Binh Hoa Phuoc Commune, Vinh Long.
- [23] People's Committee of Binh Hoa Phuoc Commune (2010), Project on building new rural areas in Binh Hoa Phuoc Commune, Long Ho District, period (2010 - 2020), Vinh Long.
- [24] People's Committee of Dong Phu Commune (2012), Socio-economic report of Dong Phu Commune, Vinh Long.
- [25] People's Committee of Dong Phu Commune (2010), Project on building new rural areas in Dong Phu Commune, Long Ho District, period (2010 - 2020), Vinh Long.
- [26] People's Committee of Hoa Ninh Commune (2012), Socio-economic report of Hoa Ninh Commune, Vinh Long.
- [27] People's Committee of Hoa Ninh Commune (2010), Project on building new rural areas in Hoa Ninh Commune, Long Ho District, period (2010 - 2020), Vinh Long.
- [28] People's Committee of Vinh Long Province (2010), Master plan for socio-economic development of Vinh Long Province to 2020, vision to 2030, Vinh Long.
- [29] Institute for Tourism Development Research (2001), Vietnam's tourism environment and issues for sustainable tourism development, Hanoi.
- [30] Institute for Tourism Development Research (2000), Detailed planning of tourist areas in Vinh Long, Vinh Long Province.
- [31] Department of Policy Analysis. European Topic Centre on Water, European Environment Agency
- [32] Green Globe 21 Company standard for travel and tourism, [www.greenglobe21.com](http://www.greenglobe21.com)
- [33] Amanda Keir, Nicole L. Vaugeois, Dan McDonald (2008). A Participatory Rapid Rural Appraisal of Tourism Development. Presentation for the 2008 World Leisure Conference, Quebec City, Canada
- [34] Coccossis, H., Mexxa, A., Parpairis, A., and M. Konstandoglou (2001) Defining, measuring and evaluating Carrying Capacity. In European Tourism Destination. Atens Greece
- [35] Hens, L., (1998) Green Accounting, in "Tourism vs Environment, Free University in Brussel, Belgium
- [36] Peter Kristensen (2004), The DPSIR Framework. National Environmental Research Institute, Denmark.