Project "Sustainable Urban Tourism through Low Carbon Initiatives: Experiences from Hue and Chiang Mai"

AN INVENTORY OF GREENHOUSE GAS EMISSIONS FROM TOURISM RELATED ACTIVITIES IN HUE CITY, VIETNAM

Prepared by the Department of Environmental Science
College of Sciences, Hue University

April 2012

TABLE OF CONTENTS

ACKNOWLEDGMENTS

We have made every endeavour to finish this report. However, it would not have been possible without the kind support and help of many individuals and organizations. We would like to extend our sincere thanks to all of them.

We are highly indebted to Asian Institute of Technology (AIT) for their frequent supervision as well as for providing necessary information and guidance in completing the report.

Our thanks and appreciations also go to Hue City People's Committee and its Center for International Co-operation in supporting us to make an inventory of GHG emissions for all of tourism related activities in the city, and to our colleagues and our students who have willingly helped us out with their abilities.

We would like to express our gratitude towards hotels, restaurants, tour operators, tourist transport companies and other entities engaged in Hue City's tourism for their kind co-operation which helps us in completion of related data collection.

ABBREVIATIONS AND ACRONYMS

ADEME	French Agency for Environment and Energy Management
GHGs	Greenhouse Gases
HEPCO	Hue Urban Environment and Public Works State Co., Ltd.
Hue City PC	Hue City People's Committee
HUEWACO	Thua Thien Hue Water Supply and Construction Company
MONRE	Ministry of Natural Resources and Environment
JBIC	Japan Bank for International Cooperation
N/A	Not available
NGOs	Non-Governmental Organizations
NTP	National Target Programme
OVOP	One Village, One Product
R & D	Research and Development
Thua Thien Hue PPC	Thua Thien Hue Provincial People's Committee
UNESCO	The United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

EXECUTIVE SUMMARY

This report is made to briefly introduce some general information of Hue City and to provide an inventory of GHG emissions of Hue's tourism related activities in 2011. To the latter end, fifty entities of different scales, which are engaged in tourism, have been selected for the data collection with structured questionnaires and face – to – face interviews. The multi-site inventory approach shows that among four sub-sectors of Hue tourism, the 'transport of tourists' accounts for the largest share in terms of GHG emission (367,686.4 tons of CO2 equivalent). For the site inventory which regards the whole tourism sector as a single site, the final data analysis reveals that of Hue tourism's activities, the 'travel', particularly 'travel by all tourists to Hue', is the largest contribution (373,303 tons CO2 equivalent) to the total GHG emission. The report also attempts to give some explanations for such analysis outcomes and propose, on the basis of these findings, a couple of low carbon emission options while creating more decent jobs for the local population. These initial mitigation options include the restoration and promotion of previous tours by means of cyclos and bikes, R & D of urban green tourism, reduction of home to work travel by employees, source separation of solid waste by hands in hotels and restaurants, promotion of the well-known vegetarian diet of Hue, diversification and of locally-made products in the short term and development of OVOP movement in the long term.

I. INTRODUCTION

1.1. Information about the city

Hue City is best known as the capital of the Nguyen Dynasty which lasted from the beginning of the 19th century to the middle of the 20th century. The Complex of Hue Monuments was recognized by UNESCO in 1993 as the World Cultural Heritage. Located in Central Vietnam, it is the sixth largest city after Ho Chi Minh, Ha Noi, Hai Phong, Da Nang and Bien Hoa cities. An urban development plan designed to turn Hue into a metropolis is being implemented, raising expectations of its further population growth in the future.

Geographical characteristics

Hue City is formed in a narrow strip of delta, just a few miles inland from the East Sea (South China Sea). With the total area of 71km^2, the city is divided into two major areas: northern and southern parts of Huong River (refer to the administrative map of Hue City in Figure 1.1).

The topography of northern area of Huong River is even and flat. Located in this area, the citadel has a pretty low elevation: from +1.8 to +3.5 m. The elevation of some other locations in this area is less than +2.0m, so they are frequently inundated in the wet season.

The elevation of southern area of Huong River varies significantly and averagely ranges from +2.5 to +7.5m. Particularly, some hills have an elevation of +12.0m to +18.0m. The elevation of some rice fields, lakes and ponds, however, is less than +1.5m.

In general, most of central urban area of Hue city has rather low elevation, which is a disadvantage for natural drainage (Thua Thien Hue PPC, 2007a).

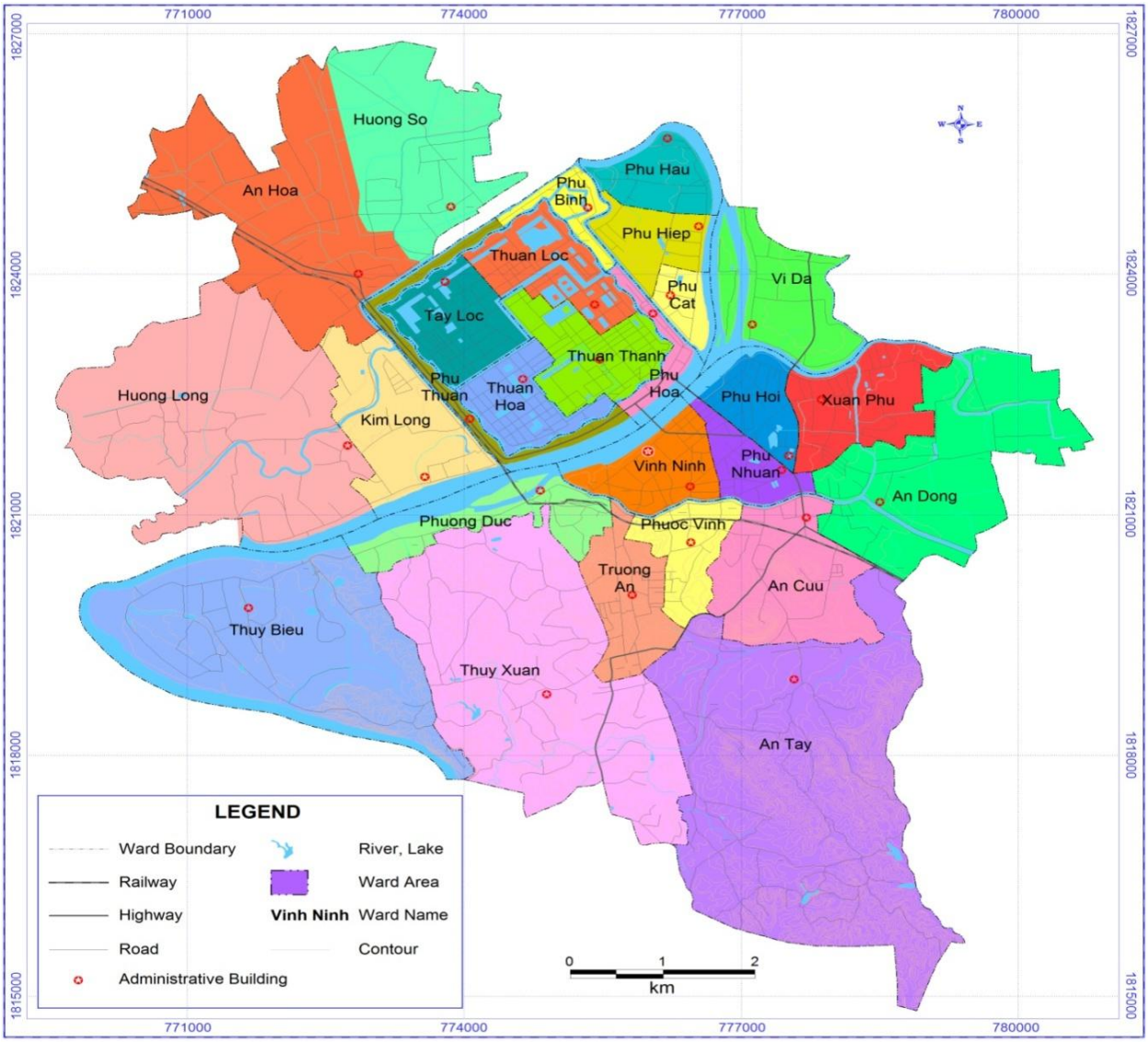

Figure 1.1. Map of Hue City with 27 administrative units

Demographic characteristics

The national census conducted in 2009 shows that the total population of Hue City was 337,506 in 2009 and increased to approximately 339,000 in 2010. The population density has been increasing year by year due to the increase of Hue City's population. In 2010, it was 4,762 persons/km^2. The natural population growth rate has recently tended to decrease: 1.2% in 2005, 1.1% between 2006 and 2008, 1.04% in 2009 and 1% in 2010. The household size is higher in some areas with low income, such as the new

resettlement areas for boat people. On average, the household size of the city is 5 persons.

Socio-economic situation

Economic development

The city has maintained its high economic growth with an average growth rate of 13.7% between 2004 and 2011. The economic mechanism continues to develop towards the paradigm "Tourism –Services – Trade". In 2011, this paradigm accounted for 71% of the total GDP of the city. The industry and agriculture sectors represented 27.9% and 1.1% respectively.

The average income per capita in 2011 was $1,350 US, a double increase as compared to that of 2004. The average growth rate of income per capita was 20%/year from 2004 to 2011.

Industrialization

Hue City is successfully maintaining its pretty high level of industrial growth. In 2011, the total production value of the city was estimated at 3,286 billion VND, an increase by 16.5% as compared to that of 2009.

Between 2005 and 2009, the number of employees working in industry sector increased by 13%. The total production value increased approximately 84%. However, the number of production entities increased only by 1%.

There is an industrial park located in the South of the city, which is known as Huong So Craft Village and Industrial Complex. By now, Huong So industrial park has totally 39 enterprises and 40 projects in operation.

The number of trained workers in industry sector is approximately 65%. According to Hue City PC (2010), there need to employ more 1,703 workers in 2011.

Social issues

At present, there still exists a slum at Phu Binh ward in Hue city. It is considered a "slum" because of its community's miserable living conditions such as small houses but large scale families, poor conditions of sanitation, low income, and so on. The slum consists of 115 households with 783 persons, accounting for 0.23% of the total population of Hue City. The slum community has settled down there over the past 25 years and has now only 12 public toilets (Health Station of Phu Binh Ward, 2010).

In 2010, the ratio of poverty and para-poverty household (based on the national standards) was decreased to 2.8% and 4.82% respectively. Averagely, these ratios reduce from 1 to 2%/year.

Between 2004 and 2010, the city generated more than 64,000 employments for its residents. On average, over 10,000 job opportunities are offered every year. The ratio of trained labours has increased year by year. The number of labour entitled to 3-month training accounts for 67%.

More than half of population has no religion (accounting for 52.8% of the total population). The proportion of population broken up into religions is as follows:

+ Buddhism: 42.5 %

+ Catholicism: 4.4%

+ Cao Dai (originated from Vietnam): 0.06%

+ Protestantism: 0.03%

+ Not defined: 0.03% (Hue City's Office for Statistics, 2011)

Tourism development

Being considered the most important economic sector, however, the tourism sector of Hue City is facing some challenges. The turn-over of the tourism mainly comes from the hotels, restaurants and travel while the shopping and entertainment services only account for 10% of the total (Thua Thien Hue Provincial Department of Culture, Sports and Tourism, 2010). This means that these services of Hue City are still in very poor conditions.

The Hue music performance on dragon boat is the only attractive entertainment service which be held at night, but on the condition that this activity must be ended prior to 10 p.m. Hue City has also set up some night towns associated with some festivals. However, the only night town which still exists is located on Nguyen Dinh Chieu Street. Some tours to traditional craft villages have been in place, but the locally-made products are not diversified and attractive enough to generate sufficient incomes for local people. For example, many tourists fail to purchase the miniature of Hue Royal City or statues of Nguyen Dynasty's Kings because these products are not locally produced and therefore unavailable for sale.

Despite the poor services of shopping and entertainment, the number of tourists coming to Hue have been continuously increasing over the past several years (except 2009), and is expected to keep going up in several years to come (Please refer to Table 1.1. for further information).

Table 1.1. Number of tourists in Hue City

Year / **Tourists**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Number of tourists	**967,210**	**1,171,700**	**1,388,610**	**1,296,100**	**1,451,630**	**1,590,900**
Vietnamese	625,999	600,100	684,714	734,530	844,030	888,900

Year / Tourists	2006	2007	2008	2009	2010	2011
Foreigners	341,211	571,600	703,896	561,570	607,600	702,000
Number of staying days	**1,828,026**	**2,202,700**	**2,810,056**	**2,615,000**	**2,932,140**	3,261,345
Vietnamese	1,126,798	1,122,300	1,386,846	1,492,300	1,716,150	1,822,245
Foreigners	701,228	1,080,400	1,423,210	1,122,700	1,215,990	1,439,100

(Source: Hue City Office for Statistics, 2011)

Notes: The official number of tourists coming to Hue City in 2011 is not available at this moment. The above mentioned numbers of 2011 are estimated by Thua Thien Hue Provincial Department of Culture, Sports and Tourism.

Infrastructure & urban services

Public transport service

The public transport service is not well developed in the city. This is simply because of the small size of the city. The only public transport currently available is a bus network with the number of 27 buses servicing on 9 routes connecting Hue city with other districts in the province.

Electricity

The electricity supplied for Hue City is taken from the national 500 kV grid. In general, the sufficient supply of power is secured in the city. However, the electric outage occurs from time to time in dry seasons due to droughts which cause a shortage of water to operate hydroelectric plants in the North of the country.

Public water supply

Thua Thien Hue Water Supply and Construction Company (HUEWACO) is responsible for supplying the public water to Hue City. The service area coverage of HUEWACO in the City is 100%, and the population coverage is 99%. The HUEWACO's water leakage and non-revenue water in 2010 are 12% and 22.5% respectively (HUEWACO, 2011).

Generally speaking, water supply in Hue City has met all water use demands in terms of quantity and quality and is well planned for the city's future development. HUEWACO has shown their good practices, good service and high operation efficiency. The quality of HUEWACO's public water meets the National Technical Regulation on drinking water quality (QCVN 01:2009/BYT). In 2009, HUEWACO declared the safe drinking water in the whole of its service area and was recognized by WHO as a safe drinking benchmark in Southeast Asia.

Sewerage and drainage network

A combined system consisting of concrete pipes, rectangular culverts, soil ditches, canals and rivers has been used for collection of both wastewater and storm-water in Hue city. The system, with a total length of 208 km and 9,500 manholes, is in poor service: low coverage rate, old construction and overloading. It only covers more developed wards in the center of city. Due to the old age and small capacity, overloading often occurs in the rainy season (HEPCO, 2007).

At present, there is no any treatment plant for the city's wastewater. A very small part of domestic wastewater is pre-treated with septic tank or simple settling tank and then discharged into the surroundings. Most of wastewater is directly discharged into rivers, lakes, etc. For example, along the Huong River's bank, there exists more than 50 points of discharging domestic wastewater into the river (HEPCO, 2007).

The project “Hue City Water Environment Improvement”, which is financially supported by JBIC, aims to enhance Hue City’s sewage treatment capacity and reduce flood damage by improving the sewerage and drainage systems. In the first phase (2008-2016), the project targets to the southern part of Huong River (new urban areas) and includes the construction of a municipal wastewater treatment plant with capacity of 20,000 m^3/d. In the second phase, the treatment plant located in southern part of Huong River will be upgraded to 40,000 m^3/d and a collection and treatment system will be constructed in the northern Huong River (HEPCO, 2007; Thua Thien Hue PPC, 2007b).

Solid waste management

According to HEPCO (2011), the total amount of waste generated in Hue city is about 210 tons/d. The generation rate of waste including commercial waste, construction waste, etc. is about 620 g/cap/d. For household waste only, the generation rate was 259 g/cap/d (Thanh *et al.*, 2010). In the whole city, the source separation of waste is not in place yet. The amount of waste collected is about 190 tons/d in 2010. It means that the collection rate is around 90%. However, this rate may be higher (up to 95%) in some central urban areas.

In 1999, Thuy Phuong Sanitary Landfill was opened to receive the solid waste from Hue City. Located about 12 km south of the city, the landfill has a total capacity of 1.2 million tons of waste and is divided into two sites; the first was closed in 2007, and the second is designed for operation duration of 8 to 10 years. The landfill has a leachate collection and treatment system. Leachate is treated with a system including anaerobic, facultative and aerobic ponds. The treatment capacity of the system is about 100 m^3/day. However, the treatment efficiency of the system is still very low, so it needs to be upgraded.

As Thuy Phuong Waste Processing Plant has been in stable operation since 2007, waste collected in Hue City has no longer been landfilled totally. At weekend, all waste is sent for landfilling because the waste processing plant is closed. On weekdays, waste is

conveyed to the plant and less than 10% of the remainder from processing line is sent for landfilling (Thuy Phuong WPP, 2010). For the whole process of solid waste collection and treatment in Hue City, please see Figure 1.2.

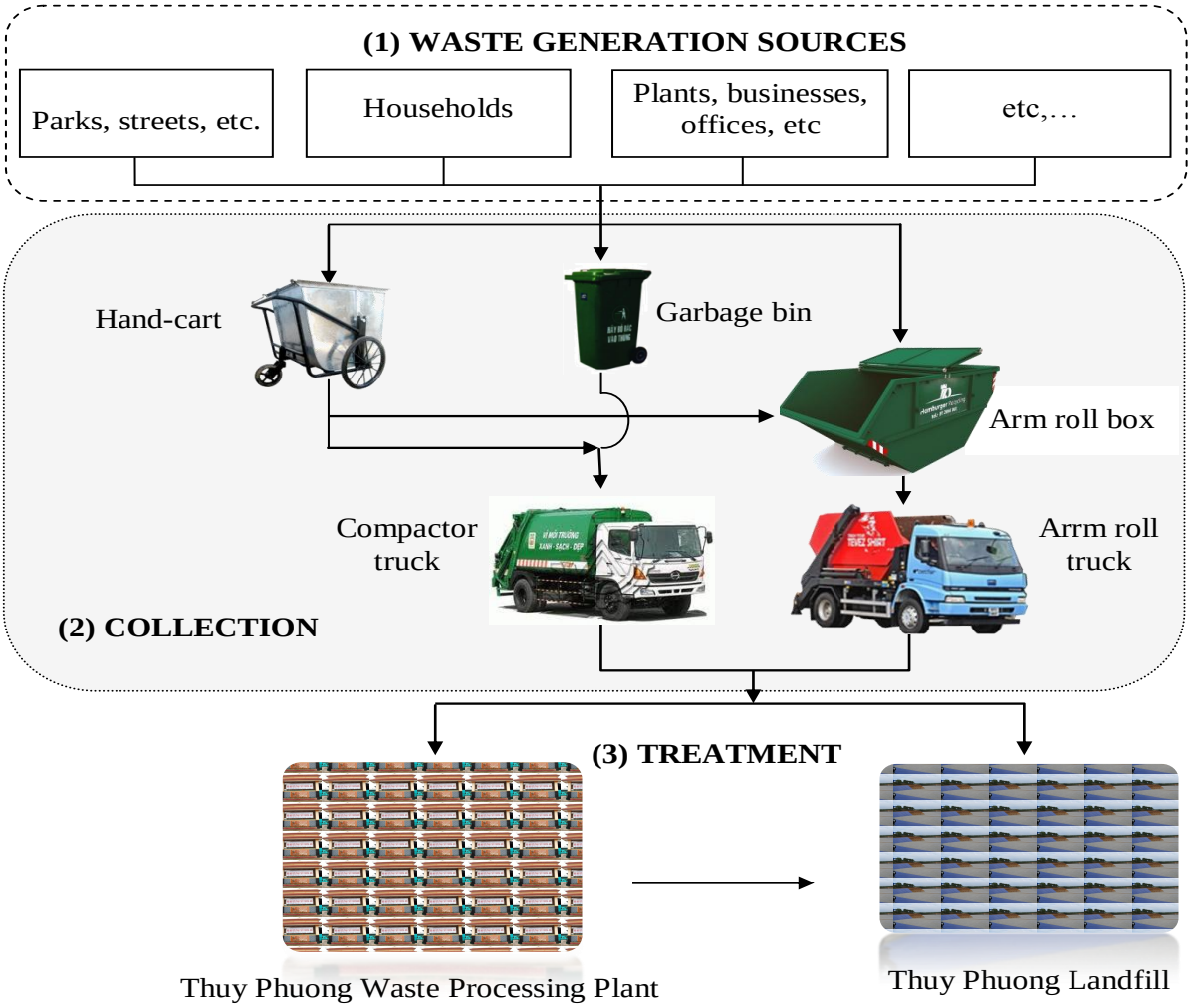

Figure 1.2. Flowchart of solid waste collection and treatment in Hue City

Funding for environment and sanitation issues

The current funding for environment and sanitation issues are being used mainly for sewerage. Until now, there have been a number of international organizations assisting Hue City in these issues, such as Swiss Agency for Development and Cooperation (SDC), French Syndicate for the Paris Built-up Area Drainage System (SIAAP), Japan International Cooperation Agency (JICA), Japan Bank for International

Cooperation (JBIC), International Association of Francophone Majors (AIMF), etc.

SIAAP has been assisting Hue in dredging Ngu Ha canal, improving the operation performance of biological ponds at Thuy Phuong landfill and the wastewater treatment in several areas of Hue city, etc. JICA has supported Hue to improve its water environment and wastewater treatment. AIMF has assisted Hue in some projects of wastewater treatment and social welfare facilities.

For the public water supply, all aspects related to construction, operation, maintenance, repair parts, etc. are favourable in the city thanks to both technical and financial supports from France, Japan and Asian Development Bank.

Some low carbon initiatives at the city level

Hue City is one of the cultural and tourist centers of Vietnam, so the environmental protection is a critical mission of the city to lure more tourists and ensure its long lasting creditability. The city has initiated some following campaigns to promote a low carbon society:

- Promoting a low carbon tourism such as setting up some pedi-cab tours around the city, which bring benefit to about 230 full-time and 270 part-time cyclo drivers, reserving Nguyen Dinh Chieu street for pedestrians, etc.

- Increasing the greenery of the city from 2.5 to 7m^2/per capita by 2020.

- Having recently constructed a new administrative center with an area of 18,660m^2. When finished by the end of 2011, the center can accommodate most of the administrative units of the city. In addition to reducing land area and construction areas for offices, internal roads and parking lots, the center is expected to reduce the GHGs released by travel of administrative staff from one unit to another for related administrative works.

- Promoting the cleaner production in the industry sector.

Development challenges and limitations

Sanitation constraints

Huong River proves to be an excellent water source for water supply. However, some challenges in its water quality might occur when a couple of upstream dams and reservoirs come into operation.

Present drainage and sewerage system is in poor service: low coverage rate, old construction, overloading, etc. The development of this system seems to be much dependent on external resources such as loans, technology, human resources, etc.

Solid waste management has some advantages such as high collection rate, high capacity of landfill and recycling facilities. However, the city is encountering some constraints such as poor fundamental data for its management and prediction, limited public awareness on waste recycling, improper leachate control, etc.

Household sanitation is generally in good practice with high percent of population being able to access sanitation facilities. However, there is a weak linkage between household and public sanitation systems (for example, people build their own toilet and on-site treatment system without a good guidance or understanding about the public sewer system near their house). A good care of sanitation facilities (e.g. toilet, septic tank) does not often receive much concern.

Collection of sludge (from sewer) and septage is well done, but little attention is paid to their treatment.

Management aspect

According to Hue City PC's report in 2010, the city authority's management is not effective and comprehensive enough, especially in light of the urban management. There

is an overlapping in the management mechanism, decentralization and assignments between the province and city, and between the city and wards.

Human resource aspect

The city is lack of a think-tank as well as informed and experienced officials for urban development and management. A part of the city's management officials is not qualified for the requirements of the modernization and industrialization process of the city. In addition, the improper and unfair employment policies have drive many qualified and high quality officials away from important management positions.

Financial aspect for environment and sanitation

The financial source for environmental protection of the city is provided by the State's annual budget. This source is directly entrusted to the environment and sanitation bodies such as Hue City Office of Natural Resources and Environment, HEPCO, etc. The total amount of money disbursed for environment and sanitation issues is 42.95 billion VND in 2010 and 75 billion VND in 2011. However, these amounts are considered insufficient to meet the actual needs of the city. As a result, Hue City' policies on fund raising are to take most advantage and to make the best use of the state's budget, domestic and international financial supports such as ODA via various types of BT, BOT and BTO. The contribution and involvement of communities and business circle of the city will be promoted. Additionally, the investment capital will be set as a priority for environmental protection sectors.

1.2. Management structure of the city

Administrative Structure

Like other cities in Vietnam, the highest government agency in Hue is the People's Council which is elected by its residents. This is the local unit of the state power

representing the will, aspirations and mastery of the people. The People's Council is responsible for making development policies of the city and has a Standing Committee made up of the Chairperson and his/her deputies, who are elected from among the representatives in the People's Council. The Standing Committee has a number of functions, including representing the People's Council when it is not in session.

The People's Council appoints a People's Committee, which acts as the executive arm of the city government and is responsible for formulating and implementing policies made by the People's Council. Both People's Council and People's Committee are expected to be subordinate to the provincial and central government.

The People's Committee has a President and a Vice-President and several ordinary members. Under the direct control of People's Committee, there are a number of offices, professional units, wards and organizations established to deal with specific issues of the city (hereafter called Municipally Governed Units or MGUs). Figure 2 shows the administrative structure of Hue City Authority.

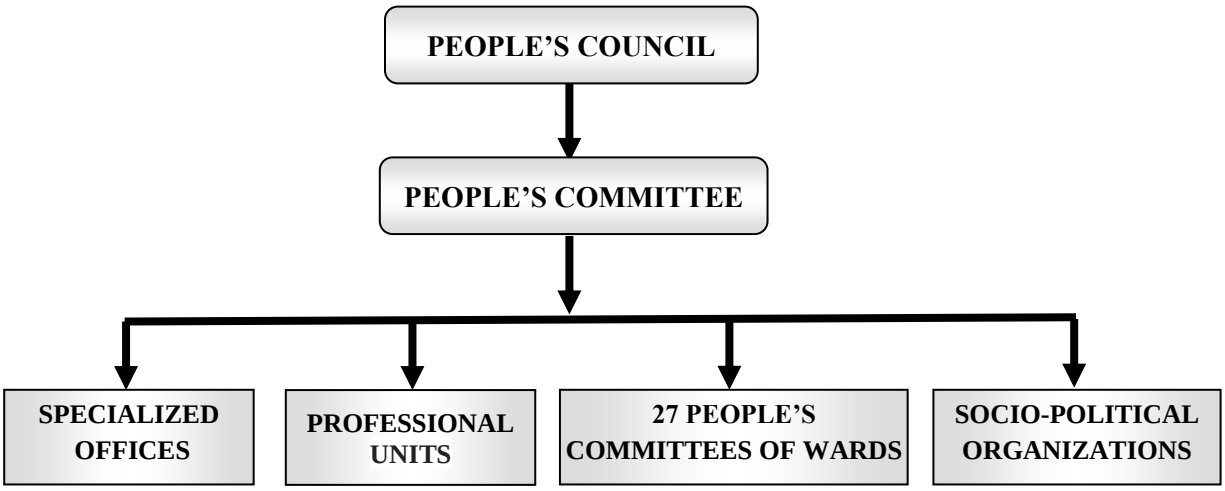

Figure 1.3. The administrative structure of Hue City Authority

Management of the urban infrastructure and services

The management of the urban infrastructure and services in the city is undertaken by some bodies belonging to the Thua Thien Hue PPC or Hue City PC such as HEPCO, HUEWACO, Provincial Department of Transport, etc.

The distribution of public water in Hue City is undertaken by HUEWACO. This state-owned company, Ltd. is supplying water to both urban and rural areas in the whole province. The total number of HUEWACO's plants is 16. Of which, 3 plants, namely Quang Te I , Quang Te II and Da Vien, are located in Hue city. At this moment, the total amount of water supplied by 16 plants is 142,000m^3/d (HUEWACO, 2011). Three plants located in Hue city is producing approximately 114,500 m^3/d (Da Vien: 12,000 m^3/d, Quang Te I: 20,000 m^3/d, Quang Te II: 82,500 m^3/d). The total number of employees working for HUEWACO was 427 in 2010.

The public environmental sanitation and public lighting service in the city are undertaken by HEPCO. With a total number of 735 employees in 2010, HEPCO is responsible for the following particular urban issues:

+ Management, collection, transport and processing of urban wastes such as solid waste, night soil and sewage sludge.

+ Management and maintenance of the sewerage and drainage network, canals, ditches and lakes, pavement system, lighting system and decoration on streets of the city.

+ Management and maintenance of cemeteries and undertaking the burying service.

At present, the domestic wastewater management is the responsibility of HEPCO, but the wastewater charge is collected by HUEWACO, and the monitoring of wastewater is conducted by Thua Thien Hue Environmental Protection Agency. Thus, there is an overlapping in the management of wastewater in Hue city.

There is also a number of NGOs engaged in the environment and sanitation issues of the city, such as Netherlands Development Organization (SNV) on bio-gas and environmental sanitation, JICA on wastewater treatment, Nordic Assistance to Vietnam (NAV) on climate change, etc.

The Provincial Department of Transport is responsible for public transport service. As mentioned above, the public service in Hue city is not well developed due to the small size of the city.

Tourism governance organizations and their responsibilities

All aspects related to tourism in Hue City are under the control of Department of Culture, Sports and Tourism (refer to Figure 1.4 for the structure of this department). For the management of tourism sector only, the department consists of 2 offices and 1 center as listed below:

Tourism Development and Planning Office

This office is responsible for assisting the department's director in the governance of tourism development planning, domestic and international investments, resources management and product development in Thua Thien Hue Province.

Tourism Management Office

The Tourism Management Office takes responsibilities of assisting the department's director in the governance of tourism accommodation services, travel, guiding and interpretation, tourist transport services and other services associated with tourism in Thua Thien Hue Province. In addition, the office is in charge of the governance in tourism statistics, report on tourism criteria and information as stipulated by the government.

Center for Tourism Promotion and Information

This center is responsible for assisting the department's director in the tourism promotion and propaganda; guiding and supporting organizations as well as individuals engaged in tourism sector as to domestic and international promotion of tourism and implementation of target programs and missions on the provincial tourism development.

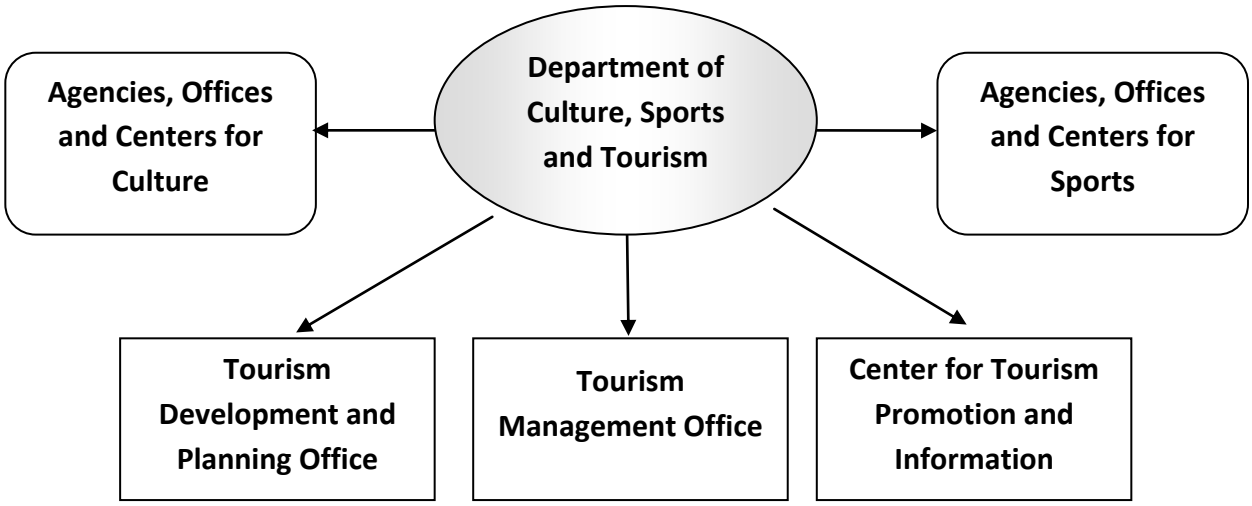

Figure 1.4. The structure of the Department of Culture, Sports and Tourism

1.3. Rationale and objective of the study

In Hue City, tourism and services are considered to play a leading role in the local socio-economic development. Whilst making great efforts to promote tourism, Hue City's Authority and its citizens have been always committed to the environmental protection as well as the climate change adaption and mitigation.

The main objective of this study is to use Bilan Carbone tool developed by ADEME to analyze GHG emissions of tourism related activities in Hue City. The final outcomes of this analysis are expected to provide foundations for identifying some follow-up GHG mitigation options in the tourism sector while creating more jobs for local people.

1.4. Methodology of the study

Fifty entities engaged in Hue tourism sector, which include 18 hotels, 18 restaurants, 6 tourist transport companies and 8 small businesses catering for tourists were selected for data collection with structured questionnaires. There are two criteria set for the selection: Firstly, the selected entities need to be in different scales and different sub-sectors, so that they adequately represent all major activities of the total number of 266 tourism entities in the city. Secondly, the selected entities should be more likely to become potential boundary partners in the second step of the project, i.e. the follow-up workshop on the mitigation actions of GHG emissions and job creation for local people.

Five young staff and five senior students of the Department of Environmental Science, Hue College of Sciences were designated to collect data from the tourism units (Please refer to Appendix A for survey tourism units). They are divided into five groups with a ratio of 1 male: 1 female each. The survey questionnaires were delivered to the survey entities 1 week beforehand, so that they have enough time to fill in the requested survey information. However, almost all entities were too busy to have a look into the questionnaire; accordingly, the survey staff had to spend much time to collect data from such entities, especially from tour operators.

All survey data were processed with MS Excel, which were done by the young staff of the Department of Environmental Science, Hue College of Sciences. The data were broken up into 4 groups, namely hotel, restaurant, tour-operator and tourist transport company, then were summarized in a separate sheet of general statistics. Finally, the GHG emissions analysis with Bilan Carbone tool was made on the basis of this general statistics (Please refer to the attached files).

II. SECTORIAL RESULTS OF THE STUDY

2.1. Multi-site inventory of GHG emissions produced by Hue tourism

For the multi-site inventory of GHG emissions, the data collected from fifty tourism entities were first grouped into four sub-sectors, namely 'hotel', 'restaurant', 'transport of tourists' and 'other activities', then were converted to the corresponding data of 265 entities as illustrated in the following example:

- *Total electricity consumption of the sub-sector A = (Total number of survey entities in sub-sector A) x (Average electricity consumption of a survey entity in sub-sector A)* *(1)*

- *Total electricity consumption of the sub-sector B = (Total number of survey entities in sub-sector B) x (Average electricity consumption of a survey entity in sub-sector B)* *(2)*

- *Total electricity consumption of the sub-sector C = (Total number of survey entities in sub-sector C) x (Average electricity consumption of a survey entity in sub-sector C)* *(3)*

- *Total electricity consumption of the tourism sector = (1) + (2) + (3)*

The 'hotel' and 'restaurant' cover emissions from electricity and fossil fuel consumption, food consumption, waste generation and other materials used within their premises. The emissions from the 'transport of tourists' take account of the travel of visitors within Hue city boundary and the travel of visitors to the city from outside. The 'other activities' include GHG emissions not covered by the 'hotel', 'restaurant' and 'transport of tourists'. Thus, the Bilan Carbone inventory of multi-site approach shows the outcomes of GHG emissions not only by sources of emission, but also by type of tourism business in Hue city.

Table 2.1 provides a summary of GHG emissions from Hue tourism's sub-sectors. In the event the international travels of tourists are included, the Bilan Carbone inventory of multi-site approach shows that the 'transport of tourists' contributes most to the total GHG emission of Hue tourism (74.7%). The 'hotel' and 'restaurant' are the second and third contribution, representing 17.3% and 5.1% respectively, and the 'other activities' account for only 2.9% (see Figure 2.1).

Table 2.1. Summary of GHG emissions (in tons of CO_2 equivalent) from Hue tourism

	Hotel	**Restaurant**	**Transport of tourists**	**Other activities**
Energy use (electricity and fuel)	13,385.7	2,802.6	786.5	830.5
Non-energy use (refrigeration & fertilizer)	1,105.6	884.6	44.0	177.0
Inputs (materials, products and services)	7,849.3	2,803.2	112.4	448.4
Freight (transport of goods and materials)	35,758.6	11,919.7	7,912.9	2,979.7
Travel	14,228.4	212.5	357,217.4	5,960.4
Direct waste	1,876.2	892.0	86.9	118.7
Property (infrastructure and assets)	10,903.7	5,452.1	1,526.4	3,925.2
TOTAL	**85,106.9**	**24,966.2**	**367,686.4**	**14,440.9**

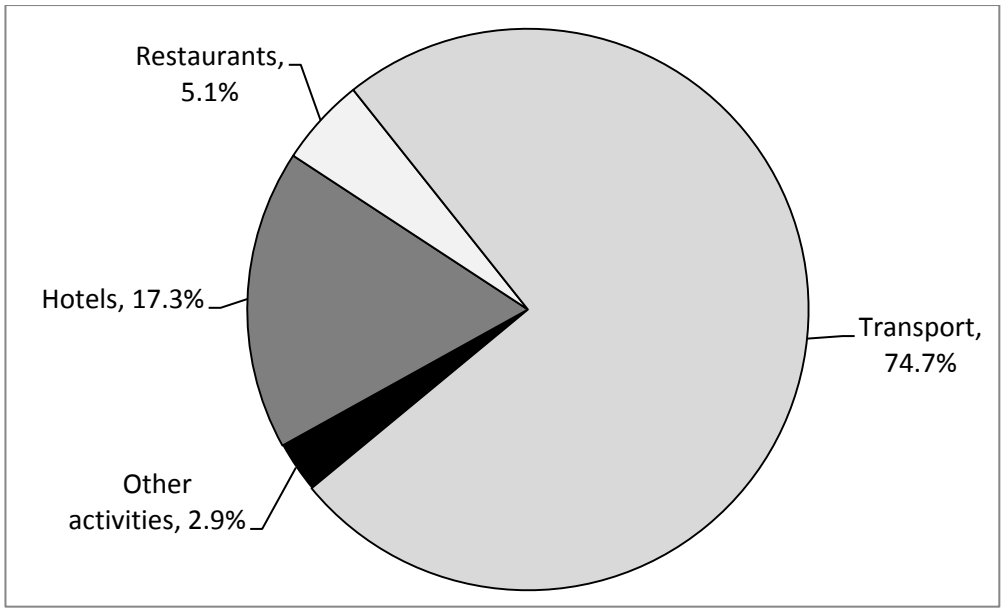

Figure 2.1. Proportion of GHG emissions by Hue tourism's sub-sectors

The Bilan Carbone analysis by Multi-site approach also shows in details the GHG emissions from the tourism sector categorized by sources of emission and by type of tourism business in Hue City (See Figure 2.2 and 2.3).

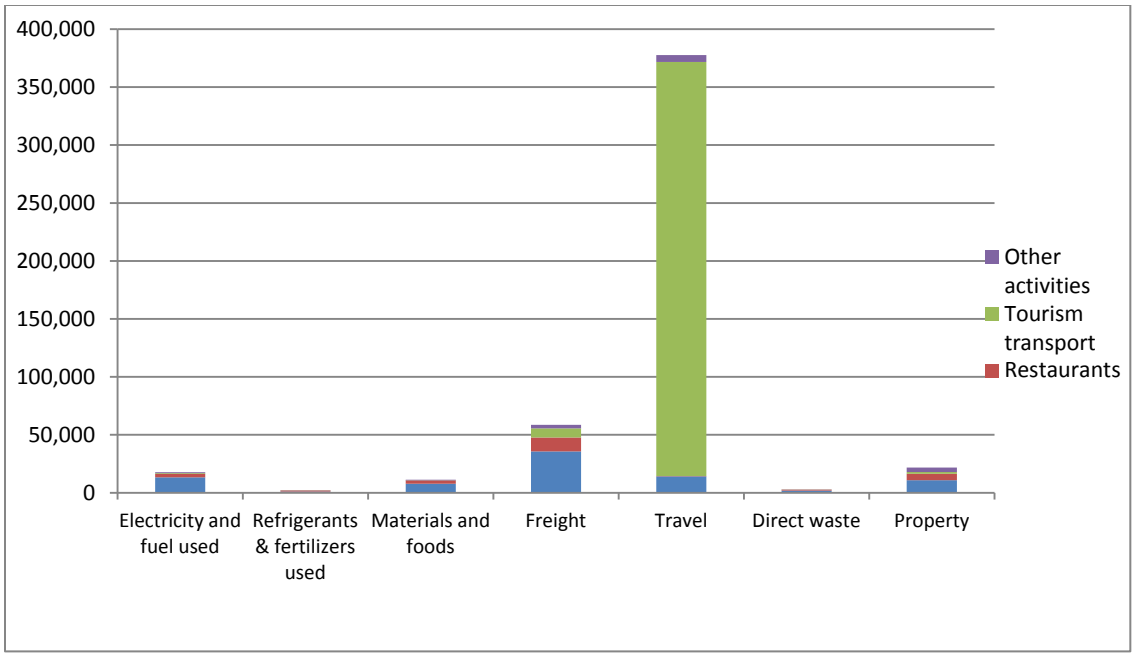

Figure 2.2. Summary of GHG emissions (in t CO_2 equ.) from the tourism sector categorized by sources of emission in Hue City.

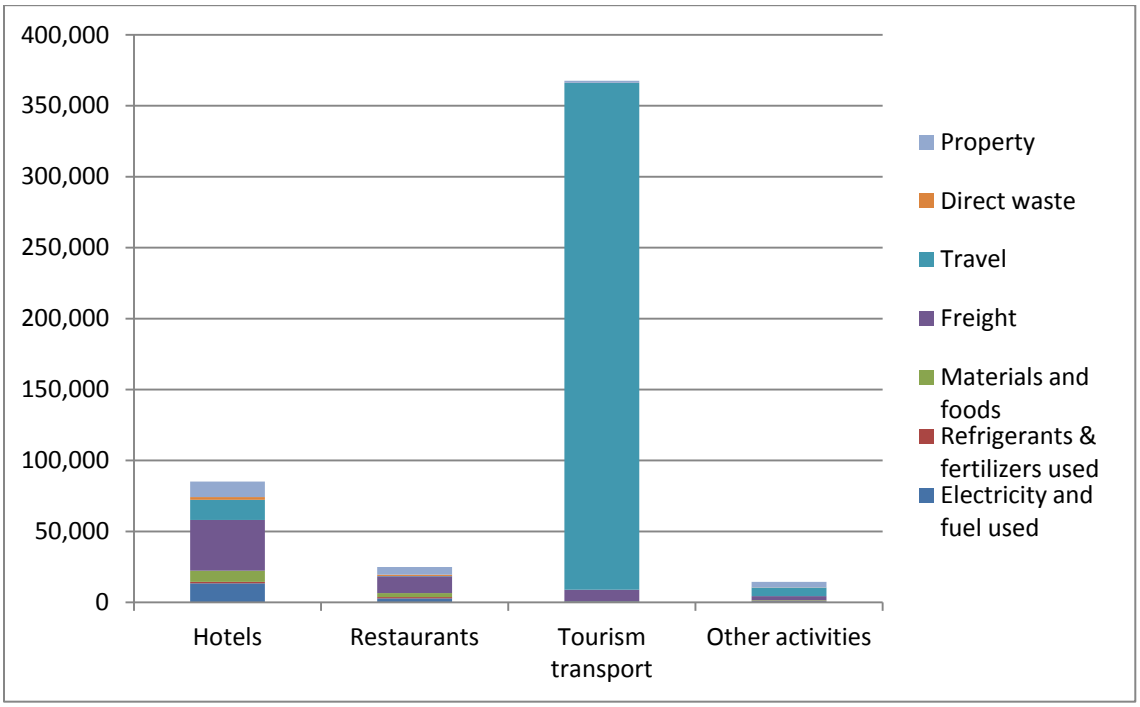

Figure 2.3: Summary of GHG emissions (in t CO_2 equ.) from the tourism sector categorized by tourism businesses in Hue City.

2.2. Site inventory of GHG emissions produced by Hue tourism

For the site inventory, the calculation of GHG emissions is carried out for the entire tourism sector. In case of being conducted without multi-site inventory, the site inventory approach is basically similar to that of territorial module which regards the whole territory as a single site.

2.2.1. Energy use

According to the survey, the total amount of electricity consumed by the tourism sector in 2011 is 28,443,327 kWh. For the fixed sources, some fossil fuels such as LPG, cooking coal, petrol and diesel oil were used by various tourism activities such as cooking, power generation in case of electricity outage, lawn and tree cutting, etc. The amounts of fossil fuels used in 2011 are shown in Table 2.2. Petrol and diesel were used for generators and cutters while LPG was used mainly for cooking.

Table 2.2. Amount of fossil fuels used by Hue tourism sector

Fuel type	Unit	Amount
Petrol	liter	18,233.1
Diesel oil	liter	39,085.9
LPG	kg	225,840.2
Coal	kg	78,971.1

Table 2.3 provides the results of Bilan Carbone inventory for energy. Within this use, the source of GHG emissions mainly comes from the purchased electricity with a contribution of 16,613 tons of CO_2 equivalent. The GHG emission calculation of electricity consumption is based on the fact that the emission factor of grid electricity in Viet Nam is estimated at 0.539 tons of CO_2 equivalent/MWh (MONRE, 2011).

Table 2.3. GHG emissions from energy use

	Tons of CO_2 equivalent	**%**
Fossil fuels used	1,192.5	6,7
Electricity purchased	16,612.9	93,7
TOTAL	**17,805.4**	**100**

2.2.2. Non-energy use

Two sources of GHG emission from non-energy use were identified including the leakage of refrigerants from air conditioners and the use of nitrogen-containing fertilizers. According to the survey, the total number of air conditioners used by Hue tourism sector is 10,350. Of which, the number using R-22 is 8,106, and the rest uses R-410a.

There are two kinds of fertilizer, namely N-containing and Urea, being used at some tourism entities with the annual amounts of 5,968 kg and 800 kg respectively.

The total GHG emission from non-energy use computed by Bilan Carbone tool are summarized in Table 2.4 with its majority falling in the leakage of R-22 (1,897 tons of CO_2 equivalent).

Table 2.4. GHG emissions from non-energy use

	Tons of CO_2 equivalent	**%**
Nitrous oxide	8.5	0.4
Kyoto halocarbons (R-410a)	305.8	13.8
Gases excluding. Kyoto (R-22)	1,896.9	85.8
TOTAL	**2,210.6**	**100**

2.2.3. Inputs

The inputs consist of materials (e.g. metals, plastics, glasses, paper, etc.), various products and office supplies, and services purchased by tourism entities. They spent money on purchasing incoming materials, stationery items, etc. The payments for such

services as insurance, consultancy, etc. are also included in this category.

In terms of GHG emission from the agricultural product, its inventory is made on the basis of meals. In general, most of employees working for tourism sector go home for lunch and dinner. Therefore, the total survey number of 6,933,395 meals in 2011 comes basically from tourists.

The GHG emission results of the incoming materials, products and services are listed in Table 2.5 with the largest emission found in agricultural products (9,912 tons of CO_2 equivalent).

Table 2.5. GHG emissions from purchasing materials, products and services

	Tons of CO_2 equivalent	**%**
Metals	72.6	0.6
Plastics	16.4	0.1
Glasses	27.0	0.2
Paper & cardboard	112.4	1.0
Building materials	218.9	2.0
Chemical products	762.1	6.8
Agricultural products	9,911.5	88.4
Office supplies	18.6	0.2
Insurance, advertisement, etc.	73.1	0.7
TOTAL	**11,213.2**	**100**

2.2.4. Freight

The results of using Bilan Carbone method for quantifying GHG emission from the freight (transport of goods and materials) in Hue tourism sector are shown in Table 2.6. The largest share in this domain is the outgoing road freight (24,840 tons of CO_2 equivalent), much higher than the internal road freight (13,400 tons of CO_2 equivalent) and incoming road freight (20,331 tons of CO_2 equivalent).

At present, some large scale tourism businesses like Huong Giang Tourist Joint Stock Company comprise a number of its subsidiaries such as Lang Co Resort, My An Hot Spring Resort, Huyen Tran Cultural Center, etc. which are located in Hue city's vicinity. Additionally, Huong Giang Tourist Joint Stock Company is doing some new projects e.g. Thuan An Resort, New Paradise Tourist Area, Thuy An Ecotourism area, etc. which require frequent freights of goods and materials. These realities help to explain, to some extent, why the outgoing freight accounts for the largest share of GHG emission in the domain of freight.

Table 2.6. GHG emissions from the freight

	Tons of CO_2 equivalent	**%**
Internal road freight	13,400.0	22.9
Outgoing road freight	24,839.5	42.4
Incoming road freight	20,331.3	34.7
TOTAL	**58,570.8**	**100**

2.2.5. Travel

According to the Bilan Carbone method, the travel by employees working in tourism sector and by tourists coming to Hue is broken up into three following sub-categories:

- Home to work travel by employees
- Travel by employees in the context of work
- Travel by tourists (both international and domestic) of all modes

The results of GHG emission inventory for the above sub-categories are shown in Table 2.7. For the travel by train, the emission factor of train in Thailand is used given that there is a similarity between trains in Vietnam and Thailand in terms of GHG emissions.

In this domain, the travel by tourists of all modes represents nearly 99% of GHG emission. This is understandable because the number of tourists visiting Hue has been rapidly increasing over the past several years and achieved the highest in 2011. In addition, a majority of tourists travel to Hue city by modes of inter-urban coach (54.2%) and plane (33.1%) (Hue city Office for Statistics, 2012). Such realities partly make the travel by all tourists become the largest contribution to the GHG emission in the domain of travel.

Table 2.7. GHG emissions from the travel

	Tons of CO_2 equivalent	**%**
Home – work travel by employees	3,481.6	0.922
Motorbike travel in the context of work by employees	9.5	0.002
Car travel in the context of work by	510.4	0.135

	Tons of CO_2 equivalent	**%**
employees		
Airplane travel in the context of work by employees	314.3	0.083
Subtotal	***4,315.8***	***1,143***
Travel by tourists of all modes	373,302.9	98.857
TOTAL	**377,618.6**	**100**

2.2.6. Direct waste

There are not any data available for the calculation of sewage generation from the tourism sector. It is therefore estimated from the water consumption data based on the fact that the amount of generated sewage is equivalent to 80% of the amount of public water used, and that the BOD_5 concentration of domestic sewage in Hue is 86 mg/L (Department of Environmental Science, Hue College of Sciences, 2011). According to our survey, the total amount of public water consumption in Hue tourism sector is approx. 1,860,500 m^3/year, and the BOD_5 load is estimated at 128,003 kg/year.

Table 2.8 reflects the results of GHG emissions of the direct waste generated by Hue tourism sector. The largest share of GHG emission in this domain is sewage. This is explainable since there is not any sewage treatment plant in the city. As a result, all types of wastewater are now being released directly into water bodies of the city. To make matters worse, the current price of public water charged for tourism sector in Hue city is the cheapest in the country (US$ 0.34/m^3 including the wastewater fee). Thus, there is a

lack of motivation for efficient use of public water. All these factors contribute to generate a large amount of wastewater from the tourism sector.

Table 2.8. GHG emissions from the direct waste

	Tons of CO_2 equivalent	**%**
Solid waste	799.8	26.90
Incineration	0.5	0.01
Waste recycled or recovered	1.1	0.03
Hazardous waste	0.2	0.01
Sewage	2,172.5	73.05
TOTAL	**2,973.8**	**100**

2.2.7. Infrastructure and assets

As per the Bilan Carbone method, the infrastructure and assets of tourism entities fall into four sub-categories i.e. building; infrastructure excluding building; vehicles, machines and furniture; and consumables of information technology. The results of GHG emission inventory for the infrastructure and assets are shown in Table 2.9. Among four sub-categories, the building is largest source of GHG emission representing 88.7% of the total GHG emission in this domain. This is simply because of the recent burgeoning tourism and hospitality in the city, which accompanied by a massive increase in construction of tourism facilities. At present, the number of hotels and restaurants

continues to increase year after year making the construction in tourism sector develop swiftly.

Table 2.9. GHG emissions from infrastructure and assets

Infrastructure	**Tons of CO_2 equivalent**	**%**
Building	19,345.0	88.71
Infrastructure excluding building	77.4	0.36
Vehicles, machines & furniture	1,886.3	8.65
Information technology consumables	499.3	2.29
TOTAL	**21,807.9**	**100**

Table 2.10 and Figure 2.4 provide a summary of the GHG emissions produced by Hue tourism sector. Three categories identified as the largest emission sources of GHGs are travel, freight, and infrastructure and assets. Of which, the travel contributes most (377,619 tons of CO_2 equivalent) to the total GHG emission. The second and third contributions are freight and infrastructure and assets with their share of 58,571 tons of CO_2 equivalent and 21,808 tons of CO_2 equivalent, respectively.

Table 2.10. Summary of GHG emissions produced by Hue tourism sector

Sources	**Emissions (tons of CO_2 equivalent)**	**Share ranking of GHG emission**
Energy (electricity and fuel used)	17,805.4	4

Non - energy (refrigeration & fertilizer used)	2,210.6	7
Inputs (materials, products and services)	11,213.2	5
Freight	58,570.8	2
Travel	377,618.6	1
Direct waste	2,973.8	6
Property (infrastructure and assets)	21,807.9	3
TOTAL	**492,200.4**	

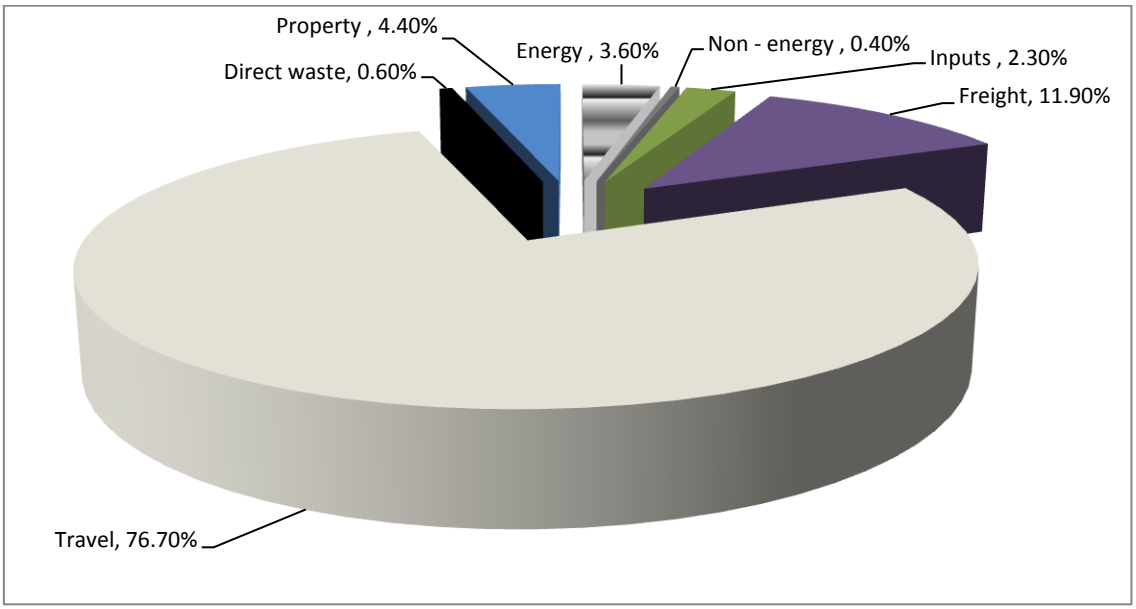

Figure 2.4. Proportion of GHG emissions produced by Hue tourism sector

Within the scope of the project *Sustainable Urban Tourism through Low Carbon Initiatives: Experiences from Hue and Chiang Mai*, the next important step for the city is

to prioritize, in consultation with boundary partners and relevant researchers, the potential climate change mitigation options based on the GHG emission inventory for Hue tourism sector. Hence, the above findings of two approaches, site and multi site Bilan Carbone analysis, are much expected to lay a scientific foundation for considering GHG emission mitigation options for Hue tourism in particular and for the city as a whole.

III. RECOMMENDATIONS

The Bilan Carbone analysis shows that among Hue City's tourism activities, the travel is the largest source of GHG emission. So, the city should set a priority to this sector while both considering climate change mitigation options in the tourism sector and creating more jobs for local people.

The first step needs to be done by the city is to prioritize, in consultation with boundary partners and relevant researchers, the potential mitigation options based on the basis of GHG emission inventory of the tourism sector. At the same time, the city should identify income generation, job opportunity and effect on gender equality in tourism sector while carrying out such potential mitigation options. To this end, due consideration should be given to the following initiatives:

- For the short term, the previous city tours like **"Impression on Green Hue City"** and **"Garden House"** by means of cyclos and bicycles need to be restored and promoted. To cater for this option, there needs to have more bicycle rental services in place and more cyclo drivers trained to provide a good tour service to tourists. As noted by many tourists, the cyclo groups in Hue City have so far proved to be good guides while they provide service. However, their English is still poor to have a good communication with foreign tourists. These tours would definitely create more jobs for both men in the city and the people living in "garden houses". At present, some owners of garden houses are setting up inside their house some businesses such as a small souvenir shop, a refreshment bar,

etc. However, this model of income generation for the owners of garden houses should be subsidized by the local government to ensure that they can make money when opening their garden house to receive visitors.

- **In the long term,** the development of an emerging trend of **eco-tourism in the city**, known as "**urban green tourism**" (UGT), is appropriate for such green, cultural and historical city like Hue. This type of tourism promotes environmental responsibility, local economic vitality, cultural diversity and experiential richness (Green Tourism Association, 2002). The UGT practices are now being explored in many cities around the world such as Victoria, Toronto, Sudbury, Rio de Janeiro, Jerusalem, etc. As more tourists learn more about these kinds of initiatives and demand greener options, supply will increase to meet this demand. A study conducted in 2002 by Toronto Urban Development Services on "*Urban Green Tourism: Industrial and Labour Market Opportunities in the Toronto Region*" shows that there are identified areas of opportunity and employment growth related to urban green tourism which include tour operation (packaging, guiding); environmental tourism; education and training; research and marketing; business development; sustainable travel with bike and walking trails; green accommodation and resource management.

- **According to our survey**, almost all of employees working in Hue City's tourism sector are now getting back home for lunch and dinner. This means that they drive their private cars or motorcycles to **go to work twice a day**, and this fact contributes to the higher GHGs emission of the travel sector. Thus, employees should be encouraged to stay at their working place by noon to reduce the home-work travel. If so, this initiative would provide more employments in the lunch box and refreshment services.

- Given that the source separation of solid waste has not been carried out in Hue City as a whole and particularly in the city's tourism sector, it should be done firstly in hotels and restaurants which are the major generation **streams of large amount of solid waste**. The source separation by hand would need more labours; thereby, creating more jobs for local

people. Not only does the source separation facilitate the 3Rs in the whole city latter on, which would help mitigate climate change, it also contributes to deal with the unemployment issue of the city for both men and women.

- As a major Buddhist centre with hundreds of temples and pagodas built in the early 20th century, Hue City is well-known for its **vegetarian foods**. In addition to its Royal unique cuisines, Hue vegetarian foods have brought great satisfaction to a lot of gastronomists from various countries. In light of environmentally friendly behaviours, it has often been claimed that avoiding or reducing meat consumption is beneficial to the environment, because it lowers GHG emissions and less land is used to produce alternatives. In other words, dietary changes to vegetarianism could not only create massive benefits for human health and global land use, but can also play an important role in future climate change mitigation policies. Therefore, another option to mitigate the GHG emission is to promote the vegetarian diet in the city's tourism sector. Vegetarian foods made locally will help both reduce their transportation from other provinces to Hue City and provide more jobs for local residents.

- Tourists to Hue City have always been complaining that there has been insufficient amusements as well as entertainments **serviced at night in Hue City**. At present, the city reserves a street, known as Nguyen Chi Dieu walking street, for the pedestrian only. This means that all types of vehicles are not allowed to enter this road. Just right here, a night market takes place every day luring a great deal of tourists. However, businesses and services here are still in poor conditions, and the locally-made products displaying here for sale are not diversified. Hence, in addition to the existing locally-made products such as conical palm hat made in Phuoc Vinh Ward, bronze casting made in Phuong Duc Ward, etc., there needs to develop some other ones to make the night market more appealing to tourists to the pedestrian road. In the long term, it is needed to develop craft villages in the form of well-known OVOP (One Village, One Product) movement for the promotion of both tourism and employment in some craft wards of the city. When

implemented, this movement would not only reduce the transport of goods to the city, but also create more jobs for local people.

- In general, cleaner production is applied not only to the industrial processes, but also to services and products, and the hotel sector is not exceptional. A recent survey conducted by the Department of Environmental Science, Hue College of Sciences shows that there exists a lot of **cleaner production opportunities** in the hotel sector of Hue City, which would help to save much electricity and public water. In Hue City, cleaner production has been applied to the industry sector, but still vacant in the tourism as a whole and particularly in the hotel sector. On the one hand, the promotion and implementation of cleaner production in the hotel sector of Hue City would definitely assist in the energy efficiency to cut down the electricity consumption. On the other hand, cleaner production leads to a net creation of jobs than end-of-pipe technologies. However, like other innovations, cleaner production tends to require higher qualification. Thus, the demand for skilled and high-skilled labour rises while the demand for unskilled labour decreases. It means that supporting cleaner production is not in conflict with labour market policy.

IV. CONCLUSIONS

In addition to the site inventory of GHG emissions, the multi-site approach is conducted to take a more in-depth look into the GHG emissions of each sub-sector of Hue tourism. The final GHG emission inventory based on Bilan Carbone® version 6 shows that of Hue tourism activities, the travel is the largest share of GHG emission (76.7%); and that among four Hue tourism's sub-sectors, the transport of tourists contributes most (74.7%) to the total GHG emission of Hue tourism. Some scientific and realistic evidences on the outcomes of GHG emission analysis are also provided with a hope of facilitating the next step to initiate some associated GHG mitigation options for Hue tourism. On the basis of these findings, the report also attempts to give some explanations for such analysis

results, put forwards some plans and propose some next steps to put into practice a couple of low carbon emission measures while creating decent jobs for the local population.

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Websites:

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2. Hue City's Office of Education and Training: http://www.thuathienhue.edu.vn
3. Thua Thien Hue PPC: http://www1.thuathienhue.gov.vn

APPENDICES

A. List of survey tourism units

No	HOTELS (18 units)	No of labours	Potential boundary partner
1	Heritage	47	
2	Green	342	x
3	Festival	85	
4	Hoang Tuan	32	
5	Ngoc Huong	40	x
6	Camelia	150	
7	Dong Loi	25	
8	Ngu Binh	18	
9	Asia	105	x
10	Park View	145	x
11	Nguyen Hue	29	
12	Thang Long	11	
13	Hoan Cau	10	
14	Gold	12	
15	Bamboo	12	
16	Cong Doan	70	
17	Thanh Noi	48	
18	Queen	26	
	RESTAURANTS (18 units)		
19	Nam Chau Hoi Quan	92	x
20	Khong gian xua	25	
21	Nhat Phuong	10	
22	Green	32	
23	Dzach Lau	20	
24	Ong Tao 2	10	
25	Van Canh	15	
26	An Binh	7	
27	Bloom	9	
28	Tinh Lam Nhi	8	
29	Thai Son	7	
30	An Phuoc	20	
31	Temple	14	
32	Tinh Gia Vien	8	
33	Ong Tao 1	10	

34	Tan Huong Sen	20	
35	Quynh Huong	30	
36	Phuoc Thanh	41	
	TOURISM BUSINESSES (8 units)		
37	Huong Giang Travel	44	x
38	Viet Green Tourism	11	
39	Ha Noi - Viet Nam Tourism	11	
40	Tropical Tourism	2	
41	Viet Travel	7	
42	Hue Tourism	15	x
43	Vido Tour	15	
44	Green Travel	13	x
	TOURIST TRANSPORT (6)		
45	Tam Duc Company	22	
46	Phuong Ty Company	24	
47	Hue Tourist Transport Co-Operative	46	x
48	An Thinh Company	15	
59	Nhu Tu Company	8	
50	Van An Company	22	

B. Some pictures on tourism activities in Hue City

Night market on Nguyen Chi Dieu Pedestrian Street

A counter selling locally made products

Part-time cyclo drivers in Hue City

Full-time cyclo drivers in Hue City

C. Data collection form for Bilan Carbone analysis of Hue tourism

Hue City PC
Management Board of Sustainable Urban Tourism Project

DATA COLLECTION FORM FOR BILAN CARBONE ANALYSIS OF HUE TOURISM ACTIVITIES
(Data of 2011)

Code: ____

Notes:

- In case of no specific data, please provide an estimation

- No need to take into account the following circumstances:

** Machines, vehicles and furniture which have been in use for over 10 years*

** Construction establishments which have been in use for over 30 years*

General information

Name of tourism unit:

Number of staff and employees: ____ persons

Number of working day/week: ____ day

Name of informant: *Telephone number:*

1- Energy

1.1. Electricity consumption in 2011: ____ kWh (refer to the electricity invoice)

1.2. Fossil fuel used non-vehicle purposes (e.g. electricity generator, pump, cooking, etc.):

+Petrol ____ liter/year

+Diesel ____ liter/year

+LPG ____ liter/year

+Coal ____ liter/year

2- Excluding energy

Type of air-con:	Toshiba	Capacity:		HP	Quantity:	
Type of air-con:	Panasonic	Capacity:		HP	Quantity:	
Type of air-con:	Dawoo	Capacity:		HP	Quantity:	
Type of air-con:	Trane	Capacity:		HP	Quantity:	

Type of air-con:	LG	Capacity:		HP	Quantity:		
Type of air-con:	Sanyo	Capacity:		HP	Quantity:		
Type of air-con:	Carrier	Capacity:		HP	Quantity:		
Type of air-con:	Funiki	Capacity:		HP	Quantity:		
Type of air-con:	Samsung	Capacity:		HP	Quantity:		
Type of air-con:	Hitachi	Capacity:		HP	Quantity:		
Other types:		Capacity:		HP	Quantity:		

2.2. Use of nitrogen containing fertilizer

Type of fertilizer	Urea	Amount:		kg/year
Type of fertilizer	NPK	Amount:		kg/year
Other fertilizers		Amount:		kg/year

3- Consumption of materials and goods

3.1. Metal

Aluminium		kg/year
Steel or sheet metal		kg/year
Copper		kg/year
Zinc		kg/year
Lead		kg/year
Other metals		kg/year

3.2. Plastics

HDPE		kg/year
LDPE		kg/year
PET		kg/year
PS		kg/year
PVC		kg/year

3.3. Glass

Flat glass		kg/year
Bottle glass		kg/year

3.4. Paper and cardboard

Paper		kg/year
Cardboard		kg/year

3.5. Building materials

- Masonry wall in concrete blocks		m2			
- Terracotta monomur		m2			
- Plaster panels		m2			
- Concrete tile		m2			
- Cement		kg/year			
- Timber		kg/year	or		m3/year
- Emulsion gravel		kg/year	or		m3/year
- Bitumen		kg/year			
- Continuous reinforced concrete		kg/year			
- Others		kg/year			

3.6. Chemical products & synthetic fabrics

Chemical products		Lime	Quantity:		kg/year
		Insecticides	Quantity:		kg/year
		Soda	Quantity:		kg/year
		Acid	Quantity:		kg/year
		PPPs	Quantity:		kg/year
		Others	Quantity:		kg/year
Synthetic fabrics	Type:		Quantity:		kg/year
	Type:		Quantity:		kg/year

3.7. Agricultural products based on meals

- Total number of meals served for employees and tourists ____ meals/year

3.8. Purchase of stationery, IT and consumables, and services

- Stationery		VND/year
- IT and consumables		VND/year
- Advertisement fee		VND/year
- Insurance fee		VND/year
- Internet and telephone fee		VND/year
- Other fees:		VND/year

4- Freight

4.1.Internal freight

Total amount of petrol used for internal road freight: _____ litters/year

Amount of petrol used for internal rail freight: _____ litters/year

4.2. Outgoing freight

a. Road freight

Total amount of petrol used for outgoing road freight: _____ litters/year

b. Rail freight (tonnes.km)

Quantity of goods and materials: _____ tonnes/year Distance: _____ km

4.3. Incoming freight

a. Road freight

Total amount of petrol used for outgoing road freight: _____ litters/year

b. Rail freight (tonnes.km)

Quantity of goods and materials: _____ tonnes/year Distance: _____ km

5- Travel

5.1. Home to work travel by employees

Average distance between home and work _____ km

Average times of travel between home and work _____ times (normally 2 times)

Number of employees traveled by motorcycle _____ persons

Number of employees traveled by car _____ persons

Number of employees traveled by bus _____ persons

5.2. Travel by employees in the context of work

Type of travel:	Motorcycle	No of employees used:		Total distance:	km/year
Type of travel:	Car	No of employees used:		Total distance:	km/year
Type of travel:	Train	No of employees used:		Total distance:	km/year

Plain travel:

Short haul <1000 km	Total distance:		km/year
Average haul 1000-4000 km	Total distance:		km/year
Long haul >4000 km	Total distance:		km/year

5.3. Travel of tourists – all methods

Tourists by car	Total distance:		km/year
Tourists by interurban coach	Total distance:		km/year
Tourists by motorcycle	Total distance:		km/year
Tourists by plain	Total distance:		km/year
Tourists by other methods	Total distance:		km/year

6- Wastes

6.1. Solid waste:		kg/year
6.2. Incinerated waste:		kg/year
6.3. Fermentable waste:		kg/year

6.4. Recycled and reused wastes:

Metal:		kg/year
Plastics:		kg/year
Glass:		kg/year
Paper:		kg/year

6.5. Hazardous wastes:		kg/year			
6.6. Public water used:		m3/year	or amount of money paid:		VND/year

7- Infrastructure and assets

7.1. Building, method by surface area

Building 1		m2	year of construction:		
Building 2		m2	year of construction:		
Building 3		m2	year of construction:		
Others……		m2	year of construction:		

7.2. Miscellaneous infrastructures

Internal roadway

By bitumen	Length x width:			m x m	year of construction:		
By concrete	Length x width			m x m	year of construction:		

Car park

By bitumen	Length x width:			m x m	year of construction:		
By concrete	Length x width			m x m	year of construction:		

Building materials for miscellaneous infrastructures

Metal	Quantity		kg
Glass	Quantity		kg
Timber	Quantity		kg
Cement	Quantity		kg
Bitumen	Quantity		kg
Concrete	Quantity		kg
Quarry stone	Quantity		kg
Plastics	Quantity		kg

7.3. Vehicles, tools & machines, method by weight

Vehicles owned

- Weight:	< 1	tonnes	quantity:		year of purchase:	
- Weight:	1 - <3	tonnes	quantity:		year of purchase:	
- Weight:	3 - <5	tonnes	quantity:		year of purchase:	
- Weight:	5 - <7	tonnes	quantity:		year of purchase:	
- Weight:	≥ 7	tonnes	quantity:		year of purchase:	

Tools and machine

Type	Generator		quantity		tonnes	year of purchase:
Type	Pump		quantity		tonnes	year of purchase:
Type			quantity		tonnes	year of purchase:
Type			quantity		tonnes	year of purchase:

7.4. IT, method by units

Computer with cath. tube	Quantity		year of purchase:	
PC with flat screem	Quantity		year of purchase:	
Printer	Quantity		year of purchase:	
Photocopier	Quantity		year of purchase:	
Fax machine	Quantity		year of purchase:	

A lot of thanks for your kind co-operation