



CHAPTER 1: INTRODUCTION

1.1. Forests and forest management in Vietnam

1.1.1. Current state of forests

Vietnam is situated along the eastern coast of the Indochina Peninsula in Southeast Asia with the territory of 330 972 km² (FAO 2014; World Bank 2016). On the map, Vietnam is an S-shaped strip of land, elongating 1650 kilometres from the northernmost point to the southernmost point. The country's diverse topography consists of hills, mountains, deltas, the coastline and the continental shelf, reflecting the long history of geology and topography formation in a monsoon, humid climate with strong weather exposure.

For forest management, forests in Vietnam are classified according to forest functions: production, protection, and special-use, as defined by the 1991 Forest Protection and Development Law. *Production forests* are used mainly for production and trading of wood, non-timber forest products, and for purposes of protection and regulation. *Protection forests* are used primarily for protection of ecosystem services, natural disasters prevention, and environmental protection. Unlike production or protection forests, *special-use forests* are designated to the goals of nature conservation, the protection of historical and cultural relics, and environmental protection. (The criteria of this classification are shown in appendix 4).

In 2014, Vietnam had 13.8 million hectares of classified forests including over 6.7 million hectares of production forests (approximately 49%), 4.56 million hectares of protection forests (33%), and about 2.1 million hectares of special - use forests (15%) (MARD 2015) (table 1.1). The national territory under forest cover increased from 27.8% in 1990 (Vu et al. 2011) to over 40% at current time (MARD 2015) as a result of the expansion of forest plantations and regeneration forests in the past two decades (de Queiroz et al. 2013). However, most of this area is plantation forests accounting for about 26.8% of forestry land. Natural forest rehabilitation has grown rather slowly (Vu et al. 2011). Indeed, “natural forests” occupy 73.2% of the total forest cover, but mostly are naturally regenerated forests rather than pristine forests. Primary forests are estimated to represented just 1% of the total forest cover (de Queiroz et al. 2013). Nonetheless, Vietnam has established 128 protected areas accounting for 11.7% of the total forest area. There are 30 national parks, 60 nature reserves and 38 landscape protection areas in the special use forest system (FSIV 2009).

**Table 1.1: Forest composition in Vietnam, 2014, by type and use category (in ha)**

Forest land type	Total	By use category			
		Special-use	Protection	Production	Other
A. Natural forest	10 100 186	2 008 254	3 938 689	4 059 302	93 941
1. Timber forests	8 305 870	1 603 909	3 196 969	3 435 391	69 601
2. Bamboo forest	397 199	46 095	115 094	231 395	4 615
3. Mixed forest	658 294	136 398	210 097	303 964	7 790
4. Mangrove	33 441	973	30 985	1 325	157
5. Limestone forest	705 426	220 878	385 544	87 226	11 777
B. Plantation forest	3 696 302	76 878	625 848	2 692 621	300 973
1. Stocked forest ^b	2 034 212	56 206	412 352	1 416 555	148 098
2. Unstocked forest ^c	1 047 297	13 800	146 629	813 019	73 850
3. Bamboo	99 360	200	7 308	90 935	917
4. Industrial trees (e.g. rubber)	464 390	2 900	34 513	350 039	76 939
5. Mangrove	51 061	3 772	24 047	22 073	1 170
Total	13 796 506	2 085 132	4 564 537	6 751 923	394 914

a. With hardwood forest stock (diameter of breast height ≥ 10 m³/ha)

b. With hardwood forest stock (diameter of breast height ≥ 10 m³/ha)

(Source: (MARD 2015))

The biodiversity of the Vietnam's forests is ranked very high, both in the region and worldwide due to the geographic position, the complicated topography and climate condition (Vu et al. 2011; de Queiroz et al. 2013). The biodiversity in Vietnam's forests includes the variety of natural forest ecosystems and their diversified composition of plant and animal species. In terms of flora, the abundance of plant species has created great economic and scientific values with hundreds of trees for commercial timber production; at least 40 bamboo species having commercial value; and there are thousands of herbal plants and hundreds of discovered species for producing myrrh, tannin and oil (MARD 2006; Vu et al. 2011). Regarding the fauna, Vietnam's forests have quite rich species compositions and a high level of endemism compared to neighbour countries (Vu et al. 2011). Besides their diversified species, Vietnam's forests do also have diversified forest ecologies. Following their ecological characteristics, natural forests are classified into eight major forest groups (MARD 2006), including (1) Evergreen closed tropical rain forest, (2) Semi-deciduous closed tropical humid forest, (3) Evergreen broad leaved forests on limestone, (4) Natural needle leaved forests, (5) Dry dipterocarp forests, (6) Mangrove forests, (7) Melaleuca cajuput, and (8) Bamboo forests (Vu et al. 2011).



1.1.2. Forest management system in Vietnam

Administratively, the forest management system in Vietnam is stratified into four levels, which are (1) central/national level, (2) provincial level, (3) district level, (4) commune level (see table 1.2). The tasks of government agencies and ministries in these different levels are regulated in a legal framework defined by Decree 23/2006/NĐ-CP. Tran et al. (2005) showed two basic kinds of institutions in the management system “*directing organizations*” and “*implementing organizations*”. The directing organizations establish general or on-paper plans while the implementing organizations including professional or special institutions practice the plans that the directing organizations appointed. It means that at the same level of the management system, the directing organizations have a slightly higher position and direct the implementing organizations. All administrative levels are under the control of the state (directing organizations).

Table 1.2: Different organizations of Vietnam’s forestry and forest land management system

Level	“ <i>Directing organizations</i> ”	“ <i>Implementing Organisation</i> ”
The 1 st level: Center	Government and National Assembly	Ministry of Agriculture and Rural Development (MARD) Director General of the Vietnam Forestry Administration (VNFOREST) Ministry of Natural Resources and Environment (MONRE)
The 2 nd level: Province	Provincial People’s Committee (PPC)	Department of Agriculture and Rural Development (DARD) <i>Division of Forest Protection</i> <i>Division of Forests</i> Department of Natural Resources and Environment (DONRE)
The 3 rd level: District	District People’s Committee (DPC)	Forest Protection Station Division of Agriculture and Rural Development Division of Natural Resources and Environment
The 4 th level: Commune	Commune People’s Committee (CPC)	Forestry and Agricultural staff Land management staff

(Source: Tran et al. 2005; Pham et al. 2011)

Below the commune level is the informal system of villages or hamlets that combine households in a single village which are led by the heads of the villages who are important connectors between national laws and existing customary law. The local organizations (such as associations of farmers, veterans, women, elderly, youth, etc.), groups of local households, particular households and individuals are the forestland recipients and directly work on protecting, conserving, and developing the allocated forests (Tran et al. 2005).



1.1.3. Forest development in Vietnam

Vietnam is a repository of global biodiversity, but also still contributes to the heavy losses of biodiversity that are caused by illegal trade and consumption of wildlife as well as forest degradation. To respond to the forest degradation and the serious decreases of forest cover to the lowest level in 1990, the Government has paid much attention to the development of forest resources and biodiversity conservation since then. Besides restricting the forestry sector, a series of laws and legal documents was promulgated relating to forest management and development, in which the Government gave high priority to forest rehabilitation. Vietnam also participates in most international agreements and conventions relevant to biodiversity and tropical forest conservation.

Concurrently with the efforts to develop forests and forestry, the Government focused on the socio-economic development for mountain communities, especially minority ethnic people, whose livelihoods depend on the forests and whose living standards are low. The policies of forest land allocation have given the rights of decision and management to local people motivating forest owners to use forest land in a sustainable way, increase forest-related income and support environment protection (Bui 2006). Land allocation also contributed to the sedentary livelihood for shifting farmers and reduced slash and burn forests for cultivation (Castella et al. 2006). Vietnam has received many financial and scientific supports from international and non-government organization for the conservation of biodiversity and forests (de Jong et al. 2006; Vu et al. 2011), of which, the protected area system has received the majority of investment (Vu et al. 2011).

1.2. Mountain forests and their relevance for local people

1.2.1. Mountainous areas and people in Vietnam

Vietnam has 63 provinces and cities, 19 of which are highland and mountainous provinces and other 23 provinces have mountains (CEMA 1998). Mountain areas occupy three quarters of Vietnam's territory. The Northern Mountains include the Northeast region, formed primarily by uplifted limestone ranging in altitudes, from 300 to 700 meters and the Northwest complex, dominated by the steep topography of the Hoang Lien mountain range, with the highest point, Fan Si Pan (3143m). The Truong Son range runs along the country's western border with Laos. Its complex geology gives rise to a diverse landscape and ranges mostly between 500 and 1500 meters. The Central Highlands, also known as *Tây Nguyên*, consist primarily of a series of plateaus and hills ranging in elevation from 500 meters to 1500 meters. These mountainous areas that comprise 90% of national forest land, over 70% of plants and animals species and over 90% of precious species, provide water, hydraulic power, timber, fuel wood, wild species, medicinal plants and many minerals for the whole country (Vo 2001; Vu 2001).



Mountainous areas are also the habitats of about 25 million people (Le 2001). More than 10 million mountainous residents (over 13%) are estimated to be ethnic minorities, representing 75% of the 53 ethnic minorities population in Vietnam (World Bank 2009). Living in complicated and diversified terrains, the mountainous population in Vietnam has some main features of residential distribution. Ethnic diversity is usual in many mountainous communes or districts (Le 2001; Ngo 2001). Mixed ethnic residence creates cultural exchanges and influences. However, each ethnic has developed in specific geographic areas. For example, *Viet Bac* (in the Northeast) is the residential place of the Tay and the Nung; The Central Highland is the main habitat of the Kho Me and the Nam Dao. Another important feature of ethnic people's distribution is that the development of each ethnic group is related to determined ecological spaces, called "*ethnic ecology*" (*sinh thái tộc người*) (Ngo 2001). Certain minorities, like the Tay, the Thai, the Nung, and the Muong in particular, more commonly live in the valleys within the mountain areas, and thus, have greater access to flat land and to reliable water supply. Other groups, such as the Mong and the Dao in particular, are often associated with higher altitudes and more mountainous slopes (Le 2001; Ngo 2001; World Bank 2009).

Distribution of many minority ethnic groups and sub-groups with their specific social and cultural features adapting to their natural living environments creates cultural diversity for mountainous areas in Vietnam. Cultural variety is represented through traditional social structures (like family, lineage and parentage, village, cultural landscape, etc.), physical and spiritual life, languages, traditional knowledge, adaptive strategies, social institutions, ethical norms and beliefs (Ngo 2001). The culture differences between ethnic groups create also the differences in economic development and integration (Le 2001). Some ethnic groups (especially groups of less than 1000 people) still depend on self-sufficient cultivation methods while some others adapted to new developments as in the lowland areas.

1.2.2. Forest dependency

There is rich evidence in the literature concerning the relations between forests and people. The forests provide multiple products and benefits such as land for cultivation, food, materials, medicine, etc., which are important for day-to-day living. Humans, especial forest people, exploit these products to meet essential parts of their nutritional, energy, and primary health needs and use them in different ways such as direct consumption, inputs for agricultural production, and materials for house construction. Doubtlessly, the forest is a key element of the habitat and of the social and cultural structure of those living within it. For example, the Khasis in India consider forests and every part of their natural produces as the central place into the sanctum of the Khasi religious rites, rituals and social ceremony besides being useful in their daily needs (Shangpliang 2010). Thus, the forest is also a dominant factor that shapes the physical



materials, the economic circumstances, and the spiritual life of the people who are living in or close to it. Vice versa, local people's culture have powerful influence on forests and forestry development as well (Jamieson et al. 1998; Le 1999; Rambo and Tran 2001; Vuong 2012).

The existence of productive edible and medicinal species in the forests is a pillar for human health protection. Forest foods are additional nutrient sources of diets or do meet dietary shortfalls during particular seasons and during emergency periods such as floods, famines, droughts or wars (Byron and Arnold 1999). In the process of adaptation and independence on forests for sustenance since a long time, indigenous people have accumulated a wealth of indigenous knowledge. The Yanomami in Brazil, as a good example, shares extensive ethno-botanical knowledge of forest species and their uses for food, drugs, body adornment, constructions, etc. (Milliken et al. 1999). The ethnic people in Vietnam's mountainous areas also own a treasure-trove of local knowledge, in which knowledge of medicinal plants and traditional disease treatment is the most conspicuous.

The forest-people relations are usually manifested in human's dependence on the forests which differs among forest users based on the engagement of forests and their communities (Byron and Arnold 1999). The forest dependency ranges from choices of economics (for both livelihood and income) (Sato 2000) to non-monetary benefits (cultural or spiritual elements) (Byron and Arnold 1999). The dependency levels reply on different factors that are usually interlinked, such as the ability of accessing markets or forests; the wealth of households (poor or non-poor); good roads; etc. One evidence is that poor people depend more on forest products as a source of income than others, because they have limited opportunities (land, capital, accessibility) to generate income and secure food (Sato 2000; Kalaba et al. 2013a).

1.2.3. Forests and local peoples' livelihood

Forest resources are essential for the livelihood of people in rural mountainous areas. Hunting and gathering forest fauna and flora as a food source are basic livelihood strategies for populations living within forests like the Yanomami in the Brazilian Amazon (Milliken et al. 1999) or the Khasis in India (Shangpliang 2010, 2013) that have retained predominantly subsistence and self-reliant ways of life. Shifting cultivation in the cleared forest and the bush fallow has been recognized as a basic transition of forest-dependant livelihoods (Sunderlin et al. 2005), supplemented by gathering and hunting (Byron and Arnold 1999). Forests also generate income for local households from selling forest products. About 200 million people in the Asia-Pacific region are estimated to depend on NTFPs for their income and subsistence needs, including medicine, food, fuel and construction materials (FAO 2010). Forest-related income may contribute considerably to the total income of households, like in Stung Treng province, Cambodia (Bühler et al.



2015) or in Chilimo, Ethiopia (Mamo et al. 2007). According to the Forestry Science Institute of Vietnam (FSIV), forest-related income accounted for 10-20% of the total income of rural households in 2009, most of them belonging to ethnic minorities. Income from NTFP may also reduce idiosyncratic shocks and seasonal food stresses for rural households in Miambo, Zambia (Kalaba et al. 2013a, 2013b). By functioning as a source of livelihood diversification, forests help has contributed considerably in poverty reduction (Wunder 2001; Sunderlin and Huynh 2005; Sunderlin et al. 2005; Mamo et al. 2007; Lee et al. 2009; World Bank 2012).

1.2.4. Forests and the poor

In the tropics, extensive forest areas often coincide geographically with the large number of poor people that depend on forests for their livelihoods (Wunder 2001). Vietnam is not an exception concerning this correspondence between the poverty at district level and areas of remaining natural forests (Sunderlin and Huynh 2005). The mountain areas are living places of most poor people in Vietnam with high poverty proportion. The people here are facing many difficulties of households' economic development. Household's income from forest products are low because the private-managed forests are just small area and have not much valuable forest products. Other activities like forest protection contracts and plantation of commercial forests, etc. have not produced considerable income for the mountainous people in compared with agricultural cultivation (Sunderlin and Huynh 2005). Only adequate benefits will motivate the local people to protect and develop the forests.

However, the lifestyle based on the forest exploitation of many indigenous people has been formed since a long time. This lifestyle can only meet the people's demands as long as the natural resources are plentiful. If they get scare, due to internal or external increase of demands, this will easily become "*poverty trap*" perpetuated by "*nature-dependant-thinking*" of mountainous residents, which is still quite popular in many upland and remote areas in Vietnam (Vuong 2012).

1.2.5. General socio-economic development in mountainous area

In general, the socio-economic conditions in Vietnam's mountainous areas have been developed considerably in recent years; however, they still lag behind other regions. The share of agriculture and forestry still dominates the economic structure in rural mountainous areas (Chu 2001; GSO 2012). Agriculture and forestry are considered to be important sectors in mountainous areas, however sustainability of these economic sectors has strong interrelations with the forest resources that are being degraded and the environment dependence of people (Chu 2001). Vietnam has achieved remarkable economic growth and poverty reduction during the past two decades (World Bank 2012), however, the number of poor households in highland areas is still high and based mainly



on ethnic minorities (ADB 2006). Constituting less than 15% of the total national population, ethnic minority people in Vietnam represented 47% of the total poor and 68% of the extreme poor in 2010 (World Bank 2012).

Infrastructure improvements as a result of the 135¹ program and the program of Hunger Eradication and Poverty Reduction investments opened access to social services and markets for the mountainous people, especially ethnic minorities in geographically remote areas (World Bank 2009). The expansion of road systems, electricity network, healthcare system, and schooling has dramatically increased the number of ethnic households with access of these services. The development of rural infrastructure created favourable conditions for facilitating production, accessing outside markets, attracting investors to mountain areas and resolving many social and economic issues. However, there are still many villages and communities where roads, electricity and schooling has not yet reached. While nationally more than 95% of the rural villages had access to the electricity grid in 2011, only 89.19% of the rural villages in the Northern Mountains did (GSO 2012).

1.3. The ecosystem service concept and its application

While most ecological researches focused on the natural ecosystems without explicit attention to human impacts on the biotic world (Liu 2001), like other living organisms, *Homo sapiens* has to be considered as part of the global ecosystems and has - directly or indirectly - affected almost every corner of the earth, through various activities (Liu 2001; MA 2005d; Liu et al. 2007). Humans have always extracted and benefited from ecosystems, using water, food, medicines, and materials etc. for their living. They developed techniques and mechanisms to adjust to specific ecosystem conditions. On the other hand, they influenced and changed site conditions and processes of nature that they depend on. While human demands for natural resources grew, and human technologies to exploit them improved, human interventions tended to reduce or threaten the capability of ecosystems to meet all these demands (MA 2005b).

People and their surrounding natural environment interact reciprocally and form complex feedback loops (Liu et al. 2007). In the human - nature relationship, both human and nature do adapt or re-adapt to their mutual changes. Thus, it is necessary to study not only the biosphere and physical environments, but to include human societies with their direct and indirect impacts (Rambo 1980) in order to clarify the human - ecosystem interactions and to manage the social-ecological systems sustainably.

During the past two decades and based on conceptualizing *ecosystem services* (ES) by researchers like Costanza et al. 1997; Daily 1997; Shelton et al. 2001; Nasi et al. 2002

¹ Program of socio-economic development for difficult minority ethnics and mountain areas



and others, the significance of ecosystems for human well-being has gained rapidly increasing political and scientific attention. The Millennium Ecosystem Assessment (MA), a scientific program commissioned by the United Nations in 2001, involve over 1300 experts from 95 countries (Fisher et al. 2009; Meijaard et al. 2011). Originally defined as “the benefits people obtain from ecosystems” (MA 2003 based on Daily 1997 and Costanza et al (1997)), ES includes provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits (figure 1.2). In this respect, the concept offers a framework for considering the provision of life-support and life-fulfilment to people by nature (Cork et al. 2001). Since then the term “ecosystem service” has been used, discussed, completed and redefined with an exponential increase in scientific paper (Fisher et al. 2009).

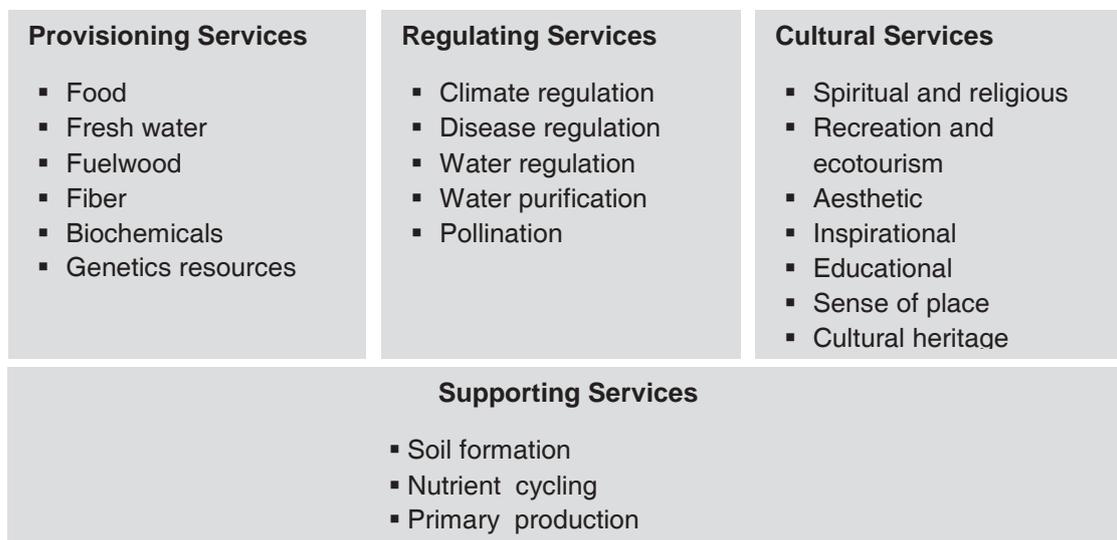


Figure 1.1: Ecosystem services categories (Source: MA 2003)

In any case, the ES conceptual framework emphasizes the linkage between ecosystems and humans, in which human well-being is at the centre focus concerning the assessment of ecosystem services and benefits. Thus, the ES conceptual framework emphasizes on:

- Ecosystem´s functioning and use potential (ES supply)
- ES demand and access of different stakeholders
- Realised benefits and respective beneficiaries
- Impacts of human activities on ecosystems and ecosystem change
- Direct and indirect drivers of change concerning natural conditions, ecosystems, landscapes etc.
- Relevance of ecosystem changes for people and societies
- Spatial localisation and illustration of ecosystem services supply, demand and flow on different scales or for different ecosystem types



A multiple assessment of the human-ecosystem interactions may:

- (1) demonstrate the relevance of ecosystems and their biodiversity for the quality of human life
- (2) improve the awareness of the dependence of humans on nature and
- (3) illustrate the importance for nature protection and sustainable use.

Identifying the relevant services provided by an ecosystem in a specific place and assessing both, their economic and non-economic values illustrates the importance of ecosystem for human well-being. Simultaneously, it contributes to raising human awareness of the human-nature reliance. Increased public awareness and appreciation of ES may also have the potential to change consumption patterns and the kind and quantity of goods and services demanded (Patterson and Coelho 2009). The evaluation and assessment of ecosystem services could also help to enhance sustainable management and conservation or acquire budgets from payments for ecosystem services (PES). PES are an attempt to harness market forces to provide ecosystem services, which is viewed as an innovative approach towards improving natural resource management and providing opportunities for enhancing incomes and livelihoods (Suhardiman et al. 2013).

The ES framework further pays attention to the direct and indirect drivers of changes in ecosystems to show that ecosystem protection and sustainable use are essential to maintain their potential and provide welfare on the long-term. By considering the dynamic interactions between people and ecosystems and understanding the causes of changes, the ES conceptual framework may provide essential decision-making support at all levels (Everard 2009; Lara et al. 2009; Smith et al. 2011) and lead to suitable strategies and interventions for sustaining ecosystem services for human well-being.

Due to all these advantages, the ES concept has been proposed or even launched as a meaningful framework for future natural resource management in many countries. For example, ecosystem services are supposed to provide useful information and to be relevant for policy and decision-making regarding forest conservation and management in Chile (Nahuelhual et al. 2007; Lara et al. 2009). The Australian Ecosystem Services Project applied the concept of ES on management of natural resources. From identifying the ES around Australia and analysing the ecological, social and economic problems and opportunities, innovative ways are explored to encourage investment in the full range of services for maintaining them (Cork et al. 2001). Incorporating the concept and language of ES in the US national forest management involves implementing a comprehensive strategy for evaluating, describing, and monitoring the outcomes of management over time and communicating it to the public (Kline and Mazzotta 2012). According to Smith et al. (2011), articulating forest service management objectives and accomplishments in terms of ecosystem services marks a shift in perspective and could provide the necessary information for forest managers to set of management activities to manage the ecological



functions and processes in addition to outputs. In so far, the ES framework is considered as a tool for guiding forest management, and better illustrate the concept for policymakers, managers, and potential national forest partners (Kline et al. 2013)

1.4. Ecosystem service - related researches in Vietnam

Human-ecology relations have been concerned in Vietnam since the late 1980s through the application of human ecology theory as a powerful conceptual framework for researches of tropical agroforestry ecosystems (e.g. Rambo 1980, 1983; Cuc et al. 1990; Jamieson et al. 1998) and rural resource systems analysis (Jamieson et al. 1998). Human ecology is based on the assumption that there are systemic relations between human society (the social system) and the natural environment (the ecosystem). These relations involve the ability of humans to obtain needed resources as well as the environmental impacts generated by human activities.

Recognizing the roles of forests and their biodiversity for human life, Vietnam has substantially increased its efforts in natural conservation and has thus received many supports and donations from international organizations. Despite increasing national and international attention, biodiversity in Vietnam still faces threats from deforestation and illegal trading. In 2007, a conference on: "Biodiversity and Human well-being", held by The Centre for Natural Resources and Environmental Studies (CRES), Vietnam National University, assembled scientists from northern Vietnam to discuss current issues of biodiversity as well as appreciate its relevance for human well-being.

To respond to global climate changes and forest degradation, Vietnam is one of the first countries piloting the Reducing Emissions from Deforestation and Forest Degradation program of the United Nations REDD and the REDD+ scheme, which continues expanding with enhancement of forest carbon stocks in developing countries. REDD+ activities are incorporated into forestry strategies. They are expected to provide financial incentives for environmental protection and to ensure co-benefits, such as poverty reduction, when combined with other Payment for Ecosystem Services (PES) schemes (Pham et al. 2011b).

Vu (2006) mentioned the following environmental values and key ecosystem services of forests for Vietnam: watershed protection; biodiversity conservation; carbon sequestration and climate regulation; recreation and landscape amenity. Their option and existence values are represented by willingness to pay for ecosystem services. He also suggested that developing payment mechanisms would create an outlook for the management of forest environmental services. Payment for forest ecosystem services (PFES) has been developed since 2007 when Vietnam had chosen to develop a respective pilot project in two provinces, namely Lam Dong in the Central Highland and Son La in the North Mountains, funded by the United State Agency for International



Development (USAID). The payments were collected from hydroelectric power plants and water supply plants. It revealed that there are some shortcomings in the implementation process and benefit sharing mechanism (Hoang et al. 2008; Jourdain et al. 2009; Nguyen et al. 2013; Pham et al. 2013; Suhardiman et al. 2013), while the positive results from the pilot project show the possibility of implementing the program in more than 20 provinces. The payment scheme has been complimented and expanded to other ecosystems such as mangrove (see Kuenzer and Tuan 2013; McDonough et al. 2014; Orchard et al. 2015), marine and coastal (see Brown et al. 2008); while the program shall include other industries, such as ecotourism (Hoang et al. 2008). Overall, PES is considered as a potential economic tool and policy to raise financial supports for ecological restoration and conservation as well as local people's livelihood improvement. The Vietnamese Law of Biodiversity 2008 also mentions to these proceeds from biodiversity-based environmental services.

In addition, some further ES-related programs and scientific conferences have been activated just recently. The "Forest Certification of ES" project (ForCes) valued provisioning and regulating services in the Quang Tri and Ha Tinh provinces. SNV - Netherlands Development Organisation is the implementing partner for these two project sites over four years (2011 - 2015). The Southeast Asia regional training worked on the Economic of Ecosystems and Biodiversity on March 29-30, 2012 in Tam Dao; and the project of "Integration of ES in the process of decision making" was implemented by Institute of Strategy and Policy on Natural Resource and Environment (ISPONRE) for mangrove ecosystems in the Ca Mau province in 2011- 2014. This project is part of the "Project for Ecosystem Services" (ProEcoServ) launched in 2010 by the United Nations Environment Programme (UNEP) with funding from the Global Environment Facility (GEF). It is a global, four-year initiative that is researching how to integrate ecosystem assessment, scenario development and economic valuation of ecosystem services into national sustainable development planning, and decision-making. Integrating ES in mangrove management and conservation shall create chances for better generating and maintaining benefits of this ecosystem. It will also designs strategies of sustainable mangrove ecosystem management and conservation avoiding the cost caused by the losses of biodiversity and mangrove ecosystem services (Kim 2014). In April 2013, the Ministry of Natural Resources and Environment (MONRE) in collaboration with the People's Committee of Ca Mau Province and World Wildlife Fund (WWF) organized the 5th Forum in "Conserving Natural and Cultural Values for Sustainable Development in the Mekong Delta Region" under the theme of "Maintaining ecosystem services in Mekong Delta". It was part of a project to integrate ecosystem-based approaches to climate change adaption and to preserve biodiversity in Vietnam.

The trade-offs between ecosystem services and development have been discussed by some authors like (Le 2008; Hoang et al. 2009; Jourdain and Dinh 2010; Ayanu et al. 2011; Nguyen 2015) This topic was also discussed in a sub-committee on "Trade-offs



between conservation and development” in the fourth National Environment Conference in Hanoi in August 2015. Considering trade-offs between ecosystem services or between conservation and development need to be careful in decision-making to get the immediate benefits and long-term benefits.

1.5. Research motivations

The prospect of the ES concept as a mainstream in natural management at all levels of decision making has been predicted by de Groot et al (2010) and its application in forest management has been demonstrated in some countries around the world. Forest management for multiple function objectives is a current trend as a consequence of broadening social and environmental issues (Sayer et al. 2004). Besides concentrating on the integration of economic and ecological values, considering the social and cultural dimensions of ecosystem changes is essential for sustainable resource management (Burkhard et al. 2014; Retallack and Schott 2014).

The ecosystem services differ, not only between ecosystem types and locations but also vary over time (de Groot et al. 2002; Costanza 2008; Fisher et al. 2011), due to their differences in geography, relief, history and socio-economics patterns. These patterns will affect the ecosystem's functioning and use potential (ES supply), the appreciation and valuation by surrounding communities and the nature of related management challenges (Smith et al. 2011). Thus, the services delivered depend not only on the capacity of the ecosystem but on the demand of beneficiaries also. The integration of societal needs for goods and services in management strategies reveals the full application potential of the framework (de Groot et al. 2010; Chan et al. 2012).

In Vietnam, ES related researches and programs have increased only in the recent five years, most of them focusing primarily on the evaluation of some marketable goods that can undergo economic assessments such as: wood and NTFPs provision; water supply and regulation; climate regulation such as carbon sequestration; and landscapes and amenity for tourism. The non-marketable values of ES and the social and cultural factors behind, receive inadequate concerns, although the local socio-cultural features are considered and mentioned whenever the causes of deforestation and degradation are analysed. However, looking at the interactions between mountainous communities and forest ecosystem as mentioned in section 1.2 of this chapter, studying socio-cultural impacts and benefits of local communities is essential for sustainable forest development in Vietnam.

Local people lived within the context of a particular forest ecosystems for generations, thus the respective interrelations each represent a specific case of ecosystem services - well-being relation (MA 2005b). Local communities are considered as locally focused groups of civil society and as the managers of the local common property and natural



resources. As far as they are empowered, they are beneficiaries of forests, as well as forest managers to sustain benefits at the same time (Michon 2005). On the other hand, they also have to cope with the external impacts of the global and international and local changes which sometimes mismatch with their own valuation at local scale (Sayer et al. 2004). Thus, forest management should pay attention to the local human demands for FES. To communicate the concepts at the local scale, the ES concept should adapt to the local terms and conditions (MA 2005b). In addition, internal changes at the local scale do have impacts on the ES supply. The local demand for ecosystem services is often shaped by shifting socio-economic and political trends (Grêt-Regamey et al. 2012). The demand side in the ecosystem service framework needs to be sufficiently investigated (Burkhard et al. 2014) to support policy makers to respond to the local stakeholders (Casado-Arzuaga et al. 2013)

Keeping all these consideration in mind, the presented study focuses on local people's demands for forest ecosystem services and on drivers of changes that impact the forest - local people relationship in the Nghinh Tuong and the Vu Chan communes, as examples of two mountainous communes in the Northeast of the Vo Nhai district, Thai Nguyen province, northern Vietnam. These communes have protected forests that nowadays belong to the Than Sa - Phuong Hoang natural conservation area² (abbreviated TS-PH). The respective limestone forest ecosystem keeps a high level of biodiversity with many valuable species (TSPHMB 2012a; Nguyen 2014). However, the natural forests have degraded by activities of the communities living in and near the areas like hunting, logging, and shifting cultivation (Do 2012; TSPHMB 2012b; Nguyen 2014). The indigenous population consists of Tay and Dao ethnic minorities. Since time immemorial, they have extracted forest products for their welfare and have developed their own customs. The most important forest products are timbers for construction, fuel and cultivation tools as well as various NTFPs for medicine, handicraft, food etc. Most of them are poor, while economic effectiveness from agroforestry and plantation forests is still limited. Thus, managing natural forests for biodiversity conservation as well as maintaining the forest integrity are considered as an important issue.

1.6. Research questions and objectives

Objectives

The presented study serves theoretical as well as practical goals. It focuses on the socio-cultural aspects and their assessment within the Ecosystem Services Framework. More

² Than Sa - Phuong Hoang nature conservation area is a forest ecosystem on limestone which includes six communes (Than Sa, Thuong Nung, Sang Moc, Vu Chan, Nghinh Tuong, Phu Thuong) and Dinh Ca town.



precisely, it aims at identifying the local FES demands and the drivers of changes to support and optimize forest management and policy decision-making at the local scale.

This includes:

- To determine the demand of local people for forest ecosystem services and their changes in demands over time.
- To reveal their assessment of recent and former forest ecosystem service supply.
- To learn about the forest ecosystem services use and linkage to the local cultures.
- To analyse driving forces that might affect the local forest ecosystem services and people demands.
- To propose recommendations for appropriate sustainable forest management that meets the FES demands of the local people while respecting binding national and international conventions and obligations.

Research questions

More specific research questions are as follows:

- What do people demand from the local forests to fulfil their welfare (including their awareness and priorities)?
- How do local people assess the capacity of the local forests to provide services and its changes?
- What kinds of factors are influencing forest ecosystem services and local people's demands?

1.7. Research structure and contents

Making the attempt to apply the ES concept in to the assessment of local people's demand for forest ecosystem services and of identifying drivers of change in two mountainous communes in Thai Nguyen province, northern Vietnam, this study is composed of seven chapters.

The thesis begins with *Introduction*, which presents the underlying motivation, questions and objectives of the study. The following chapter, *Literature review and conceptual framework*, gives an overview of ecosystem system services and derives the theoretical framework for the research. The chapter also discusses the ecosystem services framework more in detail considering concepts, supply and demand side, drivers of changes, indicators and the goods and services of forest ecosystems. The conceptual research framework is based on accessing theoretical of forest ecosystem services and social demand, following the research questions and propositions. Chapter 3 introduces *the research area* with general descriptions of the essential natural and social-economic features as well as the forests in the study area. Chapter 4, *Methodology*, covers the identification of relevant subservices and indicators for the research issues and the