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Comparison of general guidelines creation in selected tropical and subtropical forests using examples from Vietnam, Indonesia and Turkey

Master's thesis

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DECLARATION

I hereby declare that the following thesis entitled "Comparison of general guidelines creation in selected tropical and subtropical forests using examples from Vietnam, Indonesia and Turkey" is my own work and all the sources have been quoted and acknowledged by means of complete references.

Prague, April 2016

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Dominika Anderová

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ABSTRAKT

Přeměna bohatě strukturovaných lesů v plantáže rychle rostoucích dřevin a olej produkujících rostlin, je často diskutovaným tématem, ve spojení s udržitelností a zachováním biodiverzity v tropických a subtropických zemích. Cílem diplomové práce "Porování tvorby rámcových směrnic hospodaření ve vybraných tropických a subtropických lesích, za použití příkladů z Vietnamu, Indonésie a Turecka" je ohodnocení rozvojových projektů, které byly navrženy a realizovány pro tři tropické a subtropické státy, Vietnam, Indonésii a Turecko. Součástí projektů jsou rámcové směrnice hospodaření, které jsou nástrojem diferenciace produkce podle místních přírodních podmínek. Rámcové směrnice hospodaření řeší hlavní problém v těchto zemích, a to přeměnu bohatě strukturovaných lesů na plantáže rychle rostoucích dřevin a olej produkujících rostlin. Za pomocí metody SWOT byly rozvojové projekty pro zmíněné tři země porovnány a ohodnoceny, a to v následujících kritériích: hospodářský soubor porostů, diferenciace v rámcových směrnicích hospodaření a jejich obsahu, udržitelnost žádoucí biodiverzity v rámci produkce kvalitního dříví. Výsledky, za prvé, ukazují, že navržené rámcové směrnice hospodaření pro všechny tři země, zajišťují permanentní produkci dříví, přirozenou obnovu lesů a zachování jejich biodiverzity, tedy tři nejdůležitější principy udržitelného lesního hospodaření. Za druhé, silné stránky projektů, realizovaných v Indonésii a Vietnamu odhalují, že tvorba smíšených porostů z části napomáhá redukovat lesní plantáže, udržuje biodiverzitu a zajišťuje budoucí produkci kvalitního dříví. Navrhovaná řešení přispívají k zlepšení environmentální politiky těmito dvěma zmíněnými atributy. Zajišťují také finanční příjem farmářů z lesů, včetně lesních plantáží, pracovní příležitosti pro místní obyvatelé a komunity, v dřevovýrobě či jiné lesní produkci. Naproti tomu, metoda SWOT, v současně navrhovaném projektu národního parku v horách Küre, tedy v Turecku, by mohla přispět k úpravě doposud navržených směrrnic hospodaření pro místní lesy.

České metody hospodářské úpravy lesů mohou být využity z hlediska dlouhodobého plánování lesů, a zároveň upravovány podle místních přírodních podmínek. Jejich hlavní výhodou je dlouhodobý pohled do budoucnosti, díky kterému se můžeme vyvarovat některých problémů, negativně ovlivňujících lesní ekosystémy, například nedostatku biodiverzity.

Klíčová slova: hospodářský soubor porostů, obmýtní doba, obnovní doba, lesní typy, zachování biodiverzity, bohatě strukturované lesy

ABSTRACT

Conversion of the rich-structured forests into plantations of the fast-growing species and oil-producing plants is widely discussed topic in relation to sustainability and maintenance of biodiversity in tropical and subtropical countries. Goal of the following diploma thesis "Comparison of general guidelines creation in selected tropical and subtropical forests using examples from Vietnam, Indonesia and Turkey" is the evaluation of existing proposed projects in three countries, Vietnam, Indonesia and Turkey. Apart of those projects are the general guidelines which are formed as a tool for differentiation of production according to natural conditions. The general guidelines also solve the main problem in such countries which is conversion of existing rich structured forests to plantations, either created by FGT ´s or oil producing plants. With the help of SWOT analysis, the developing projects were compared and evaluated in the following criteria: management set of stands, differentiation in general guidelines and their content and maintenance of desirable biodiversity within the production of valuable timber. The results firstly show that proposed general guidelines for all three countries assure permanent timber production, natural regeneration and their biodiversity maintenance, the most important principles of the SFM. Secondly, presented strengths of the projects implemented in Indonesia and Vietnam reveals that formation of the mixed stands slightly reduce plantations, maintain biodiversity and assure future valuable timber production. Proposed solutions contribute to an improvement of the environmental policy by two previously mentioned attributes. Also they maintain farmer ´s income from forests including present plantations, provide job opportunities in the wood and non-wood production for local residents and communities. On the other hand, the SWOT analysis in the currently proposed project of the national park in Küre mountains in Turkey, contributes to modify designed effects of the general guidelines to the local forests.

Czech methods of forest management planning can be used as a sufficient method for long-term planning and modified within its modification according to other natural conditions. The main advantage is long-term view to the future, which help us to avoid certain problems having negative impact on the forest ecosystems, such as lack of biodiversity.

Key words: management set of stands, rotation cycle, regeneration period, forest types, maintenance of biodiversity, rich structured forests

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TERMS AND ABBREVIATIONS

Terms	Description
ATSC	Australian Tree Seed Centre
CP	Cutting percentage
EAC	East-West Center expertised
FAO	Food and Agriculture Organization of the United Nations
FGT´s	Fast-growing trees
FHT	Forest habitat types
FM	Forest Management
FT	Forest types
FWI / GFW	Forest Watch Indonesia / Global Forest Watch
ITTO	The International Tropical Timber Organization
MSS	Management sets of stand
MZe	The Ministry of Agriculture of the Czech Republic
NGO´s	Non- governmental organizations
NTFP´s	Non-timber forest products
RCFTI	The Research Centre for Forest Tree Improvement
SFE	State Forest Enterprise
SFM	Sustainable forest management
VIFORES	Vietnam Timber and Forest product Association
WRI	World Resources Institute
WWF	World Wildlife Fund

1. INTRODUCTION AND LITERATURE REVIEW

1.1. Introduction

Rich structured forests and their production are in peril. In favor of the agricultural land, the deforestation continues to go on. In the context of ever increasing human population, the demand for agricultural land goes up, leading to eradication of the natural forests (NATO, 2011). Even if the forests are being restored and degraded areas are re-forested, the result is a conversion to the plantations of fast-growing trees (FGT´s) which generate high profit. Unfortunatelly, the growth of these plantations is usable only for the paper, pulp and chipboard production (Lawson, et.al. 2014). These plantations do have a significant meaning, however, while the stocks of highly valuable species (noble hardwood) are dramatically decreasing, the demand for these species´s assortments is increasing (with the exception of the teak (*Tectona grandis*), which can grow in plantations). In result, the prices of noble hardwood are rising along the growing share of illegal logging. For instance, Vietnam has recently become one of the largest producers and exportes of the furniture, therefore the production of a quality timber needs to be secured. This is in direct conflict with the afforestation program in Vietnam, which favors FGT, in particular acacia (*Accacia spp*.) (McElwee, 2008). In countries like Indonesia, which was declared one of the ”hot spots“ given its biodiverzity, the rich structured forests are harvested for two reasons. Firstly it is the production of a high-quality product, secondly it is the conversion of these forests to plantations of oil-producing plants, palm oil in particular (Chrystanto, 2000).

Countries like Turkey that developed their forestry under an influence from Europe, focus their reforestation programmes on the creation of pine monocultures (*Pinus spp.).* Restoration, extension and intensive forestry in the forests with noble hardwood is still not solved. The only exception is teak. While intensive forestry in these forests could use common silviculture systems, such as the selection system or shelterwood system, it is the clear-cut systems which are preferred. In Vietnam, the protection of the rich structured forests can be solved naturally by announcement of new reservations or national parks. However, this system does not guarantee the rehabilitation of the timber from noble hardwood. On the contrary it might lower the living standards of the local residents and communes, which derive their livelihood from the natural resources,

including the timber. The prohibition of any harvest leads inevitably to anintensified illegal logging, due to increasing demand and the prices of this wood (McElwee, 2008).
Given its long tradition, the Forest Management (FM) in the Czech Republic has become one of the most elaborated sciences dealing with the current and the future production of the forest (Sequens, 2007). Due to long rotation cycle, FM faces a typical forest paradox,that is even if we create new forests today, the final production will be recognized in one century (Šálek, 2014). However, the socio-economic and natural conditions can dramatically change during this period. Increasing demand and gradual reduction of available resources will be more and more serious. That is why we should start focusing more on this problem, especially if the wood production is not the only function of the forest. At the same time, another objective of the rich structured forests is the maintenance of their production capacity and desirable biodiversity. The creation of multipurpose forests is of great value in central Europe, particularly in the Czech Republic. They are based on differentiation of management set of stands. Those depend on environmental conditions and are expressed by forest vegetation types. Unfortunately, global development goes hand in hand with establishment of the plantations of FGT´s which are suitable only for certain products, however they still threaten the original biodiversity (McElwee, 2009).
It is clear that critical evaluation of the forestry projects, such as the case studies which were either completed or just proposed, is needed. A critical evaluation would help in solving the alarming problems of tropical and subtropical forests. Another major issue is the effectiveness of the distribution of the development aid which often does not reach the most affected areas.

1.2. Literature Review

1.2.1. Definition of forest management and its creation

For many years the definition of the term forest has not been clear and comprehensive. There are a lot of differences among countries (Konijnendijk, 2005) therefore the definition of what is *Forest management* varies from country to country. According to Lund and Treue (2008) *forest* is defined as a land on which vegetations is dominated by trees, with more than 25% of canopy cover.

In another hand a *Forest type* (FT) can be generally defined as groups of forest stands according to the present vegetation cover. It is categorised by each country in a system suitable to its situation (The Montreal Process, 2015). FT are a flexible approach to collect and organise forest information in a given region, according to typology useful for understanding differences which are relevant to a specific application. That is why it is relevant to forest condition and Forest management planning as assessed by *Sustainable forest management* (SFM) indicators (e.g. growing stock, age structure, tree species composition).

Another important part of Forest management terminology is *Forest habitat type* (FHT) which is a basic item of differentiation of growth condition in forests and shortly it shows the potential forest vegetation which will appear on given natural condition after succession without human assistance (Šálek, 2014).

For the entire comprehension the role of SFM is to address deforestation or any other forest degradation while increasing benefits for people and for the environment. From the social perspective it contributes to livelihoods, generating the income and employment. From the environmental level it supports the important environmental services such as carbon sequestration, biodiversity, water and soil conservation (FAO, 2015). According to FAO Global Forest Resources Assessment (2010) sustainably managed forests play a vital part in sustainable development. It is due to reliability and up- to- date information on the forest resources states on area and its changes. Thanks to broad scale of variables such as growing stock, timber and non-timber products, carbon, protected areas, recreational usage of forests and other services, forests ´s contribution to national economies, it is hence to support decision-making for forestry policies, programs and sustainable development at all levels. FAO helps tropical and subtropical countries, in particular Vietnam, Turkey and Indonesia to overcome challenging disturbances such as forest degradation, deforestation, illegal harvests, overgrazing, unlimited burning by policy advice providing, capacity building through field projects, seminars, workshops. FAO is underlining the importance of SFM with crucial objective in helping these countries with assessments of their forest resources, defining elements of SFM and its monitoring of progress to it (FAO, 2015).

Forest management is a practical application of business methods and technical forest principles to operate forest resources. It is a conservation and regeneration of the ecological resources of a forest (Chiteculo, 2013) while maintaining its productivity.

Moreover, its success depends primarily on the sustainability of timber production (Amoah and Becker, 2009). The overextraction of wood resources, linked with clearing for agricultural purposes, unlimited burning and sometimes overgrazing, creates disorder which aggravate the well being of the forests. The main purpose of forest management is to prevent or stop this confusion and mess (Bellefontaine et al., 2000). This is expressed more clearly in the Spanish expression for it "*ordenacióndemontes*" which suggests the need to introduce 'order'. In Latin America the term *manejo* is more common however this word covers the idea of manipulation and management.

Forests are managed for multiple objectives; production of goods, soil protection, conservation of biodiversity, security of forest ecosystems, contribution to poverty alleviation and livelihood support (Chiteculo 2013, FAO 2000). It involves also the integration of the biological, social and economical aspects of the forest resource (FAO, 2010).

1.2.1.1. Definition of general guidelines for forest management

The development of comprehensive general guidelines for forest management is a core mandate of the SFM; it has been developed to help the forest managers to prepare and approve respectively forest management and timber harvesting plans.

According to Liberian Commercial Department of Forest Management Division (2006) the objectives of any guidelines for forest management are the following:

- Provide forest operators with a set of guidelines and standards to improve forest harvesting practices that improve the logging and reduce environmental impacts and contribute to the conservation of all forest through their wise use.
- Provide a framework for effective control of timber harvesting operation.

1.2.1.2. Management of forest stands

In order to manage forest benefits, foresters work with species succession. Meeting the management goals, forested stands must range in size from 3 to hundreds of acres. A forest stand is easily managed by allowing succeeding longer-lived climax species. If the site goal is late successional type cover, then the extent of disturbance should be minimized by not providing clear-cut or creating large gaps. Instead, for harvest, just individual trees are selected. Late succession can be modified by forest managers following by various ways: controlling species vigor and composition or controlling disturbances types or frequencies.

The basic presumption of silviculture is determined by these aspects:

- Partial cuts or any other disturbances that affect more than 30 % of the stands are used.
- To maintain pioneer species on the site, such can be aspen (Populus sp.), clear-cut creation is needed for new stand with young trees.
- To keep species that are specific, such as pine (Pinus sp.) or oak (Quercus sp.), shelterwood or partial cuts are used for removing groups of trees.

When it comes to succession and its encouragement, regeneration is always taken into account for foresters. Appropriate harvest regulation is selected. When the stand is not prepared to be renewed, it will be only thinned. On the contrary, the stand is regenerated through natural or artificial means (Liberian Commercial Department of Forest Management Division, 2006).

1.2.1.3. Forest management planning

Forest management planning is a process that helps foresters to identify the resources and opportunities. It is a mean to enhance what can be done to increase the profit and protect the values of the forest. Aspects include wildlife, recreation, aesthetics, timber, livestock and others (Perez and Kuhns, 2012). However, the first step in the process of forest management planning is to determine where you want to be in the terms of forest resources and properties. Today the involvement of people living in surrounded areas into the management planning is widespread. The involvement of local communities as well as the state in forest management is now an important principle of tropical forest policy and practice, and a major component of most international forestry aid programmes (Brown, 1999). The participatory approaches vary with regard to the extent of power sharing and this power sharing is represented by the states forest administrations and forest-adjacent people engaged on the elaboration of a management plan (Toft et al., 2015).

There are six steps used in order to develop a forest management planning.

1. Seek for the professional assistence
2. Determine the goal
3. Inventory
4. Schedule activities
5. Implement the activities and monitoring the goal

6. Review the plan every few years (generaly once per one decade) and update it when necessary

Apart of the participatory approach of forest management, there is a decentralized forest management approach which promote a route to forest resource conservation and poverty alleviation in developing countries. This approach assess triple objective of (i) forest conservation, (ii) improvement of livelihoods and (iii) promotion of good governance (Lund and Treue, 2008). In terms of forest conservation local communities can manage and conserve natural resources better than efficient managers and centralised agencies (Agrawal and Yadama, 1997). Good governance is in this case understood as forest management related processes of decision-making and the processes by which such decisions are implemented (or not implemented) at the village level.

1.2.2. Classification of forest and its general characteristics

Forests shall be divided into three classes according to their prevailing functions, in particular into protection forests, special purpose forests and commercial forests.While in commercial forests, wood production is the prevailing function, remaining two categories have different ones. As production forest perform other functions of the forest, the wood producing function can be also important in the category of protection forests or special purpose forests, understandably. The main difference between protection and special purpose forests is the core of their existence. Protection forests are based on objectively given natural conditions, thus they cannot be applied from a subjective perspective. Natural conditions are given typologically, i.e. on the basis of FT or by forest position in the case of stands at the upper limit of the forest. Special purpose forests are determined by the will and needs of society, from the subjective perspective accordingly. While natural conditions do not change or they change very slowly, the will and interest of society can be changed very quickly. Protection forest categories involve forests, that are either production, neither special purpose forests. Protection forests are classified in accordance to Section 7 of the Forest Act no.289/95Coll.

Art. 7

Protection Forests

1) The following forests shall be included in the class of protection forests:

a) forests at exceptionally unfavorable sites (debris, stone seas), sharp slopes, ravines, unstable sediment or sand, peatland, spoil banks or spoil heaps etc.),

b) high-elevation forests below the boundary or wooded vegetation protecting forests situated lower and forests on exposed ridges,

c) forests in the dwarf pine vegetation zone.

2) Forests shall be included in the protection forest class on the basis of the decision of a state forest administration body made at the suggestion of the owner of the forest or on its own initiative.

Special function forests are classified according to Section 8 also of Forestry Law no.289/95Coll.

Art. 8

Special Purpose Forests

1) Special purpose forests are forests which are not protection forests and are situated:

a) in zones of hygienic protection of water resources of 1st degree,

b) in protection zones of natural healing and table mineral waters,

c) on the territory of national parks and national nature reserves.

2) The class of special purpose forests can be also applied to forests in relation to which a general interest in the improvement and protection of the environment or any other valid interest in the fulfillment of non-wood-producing functions of the forest is superior to the wood-producing functions.

These include the following forests:

a) forests in the first zones of protection country areas and forests in natural reserves and at sights of natural interest,

b) spa forests,

c) suburban forests and other forests with an increased recreation role,

d) forests serving the purposes of forestry research and forestry education,

e) forests with increased functions in the area of soil protection, water protection, climate or landscape formation,

f) forests necessary for the preservation of biological diversity,

g) forests in recognized hunting areas and separate pheasantries,and

h) forests where important public interest calls for a different method of management.

For the explanation of some of the points mentioned above, it is important to note that the spa forests are located in the immediate vicinity of spa and serves forest and recreation of patients. Their structure is usually similar to forest park. These forests must not be confused with forests of protective zones of natural healing and table mineral water (see the letter b, section 1 of Special puprose Forests) In forests with enhanced soil protection, the windbreaks are included and the forests needed to preserve biological diversity involve genetic base (Šálek, 2014).

1.2.2.1. Forest in temperate zone

The temperate zones can be found on the Earth's surface in the regions located between the Tropic of Cancer and the Arctic Circle in the Northern Hemisphere and the Tropic of Capricorn and the Antarctic Circle in the Southern Hemisphere. The area is between the north and south latitudes of 23.50° and 66.32° (Ciesla, 2002). The major part of this zone represents diverse ecosystems of conifers mixtures, broad-leaved evergreen and broad-leaved deciduous trees. According to latitude, temperature, moisture and elevation, the distribution of these forests and trees is defined.

In the Northern and Southern Hemispheres, there are a number of distinct plant communities or biomes whose distributions are further defined by temperature and moisture. Many attempts have been made to classify the forest regions of the world (Bailey, 1996). According to Ciesla (2002) temperate (broad-leaved) forests are composed of temperate mountain forests (120 million ha), temperate continental forests (260 million ha) and temperate oceanic forests (30 million ha).

1.2.2.2. Forests in tropical zone

The tropical forest zone consists of 1.76 billion ha, divided into six ecofloristic zones such as the tropical rain forests, the moist deciduous forests, the dry zone, the very dry zone, the desert zone and the hill and mountain forests. Some of these zones are described below.

Tropical rain forests occur in areas characterized by more than 2 500 mm of annual rainfall. They are evergreen and rich in terms of tree composition. More than half the world's 718.3 million ha of the rain forests are found in Brazil (41 %) and Indonesia (13 %). Rain forest composition and structure vary with distance from the rivers and ocean, geographic position and altitude.

Moist deciduous forests are located in those areas with annual rainfall of 1 000 to 2 000 mm annually. Forest structure diverse on distribution and the amount of rain, the soil type and the length of the dry season. Generally speaking the present forest type is less diverse than the rain forest. Some of the trees dominating in a given ecofloristic zone may lose their leaves towards the end of the dry season.

Dry zone forests can be found in tropical areas specified with rainfall ranging from 500 to 1 000 mm per year. They are dominated by thornland, shrubland, savannah or other woody vegetation. They tend to be fragile and are easily degraded. African continent is typical for its occurrence. The forest type are represented by oak *(Quercus sp.)*, mesquite *(Prosopis sp.)*, Pinyon-juniper woodland (*Juniper sp.)*, maquis and acacia *(Acacia sp.).*

Tropical upland forests are forests above 800 m and include cloud forests (montane rain forests) loaded by mosses and lichens species more than lowland rain forests. The upland zone covers the Vietnam, Himalayas, parts of Myanmar, Thailand, the highlands of Mexico and other states in Central America, the Andes, the highlands of Ethiopia and mountains around Lake Victoria (FAO, 1994).

1.2.2.3. Soils of tropical rainforests

Rainforests are fragile habitats grew on the soils poor in nutrients. The bedrock in many tropical countries is very old and weathered for millions of years, resulted in minerals and nutrients depletion. The typical soil types underlying rainforests are mainly represented by oxisols and ultisols, comprising about 43 %. They are generally low in fertility. Another 40% create variably fertile soils, suitable mostly for agriculture activities. However many of them are low in pH, phosphorus or physical structure. On the other hand they can be high in salt or aluminium content, therefore they are acidic. Rainforest is typicaly defined by great soil variability within a relatively small unit of area, implicating various vegetation types which differ in nutrient availability and concentrations or water retaining.

Essential elements such as calcium and potassium are leached out by the heavy rainfall, further reducing soil nutrient levels. Hence rainforest is highly dependent on nutrient recycling, contained mainly in vegetation and not in the soils, unlike temperate forests. Plenty of tree species are evergreen, dropping their leaves infrequently, that is why the soils are low in litter content. Leaves and dead plants are rapidly decomposed by microbial activity. Nutrient cycle is then very fast. Plants recycle 60% to 80% of

nutrients and in the case of essential elements (calcium, posphorus), almost 100% of the minerals are recaptured from the soil by the roots of the trees (Rainforest Conservation Fund, 2016).

1.2.2.4. Forests in subtropical zone

Subtropical zone spreads among the tropical zone and the temperate zone (25° to 40° North and South latitude). Average temperature range from 20 to 35°C. Summer is characterized by tropical temperature, winter is non-tropical. Extreme temperature, strong precipitation (up to 2000mm) and drought in some regions form, much like tropical forests, several ecozones (see Figure 1).

Odstraněno:

Mediterranean-Type Subtropics

Tree growth is restricted due to winter climate which has a rainy season (stating 5 humid months with precipitation between 600 and 900 mm) and hot summers, therefore precipitations are irregularly distributed. Evergreen sclerophyllous shrub formations (*Quercus ilex, Olea europea*) dominate the vegetation. This ecozone occurs in the coastal strips in California, Central Chile, the Cape region, Southeast Brazil, South Australia, on the western side of the continents, and in the Mediterranean zone of Europe.

Subtropical Arid lands

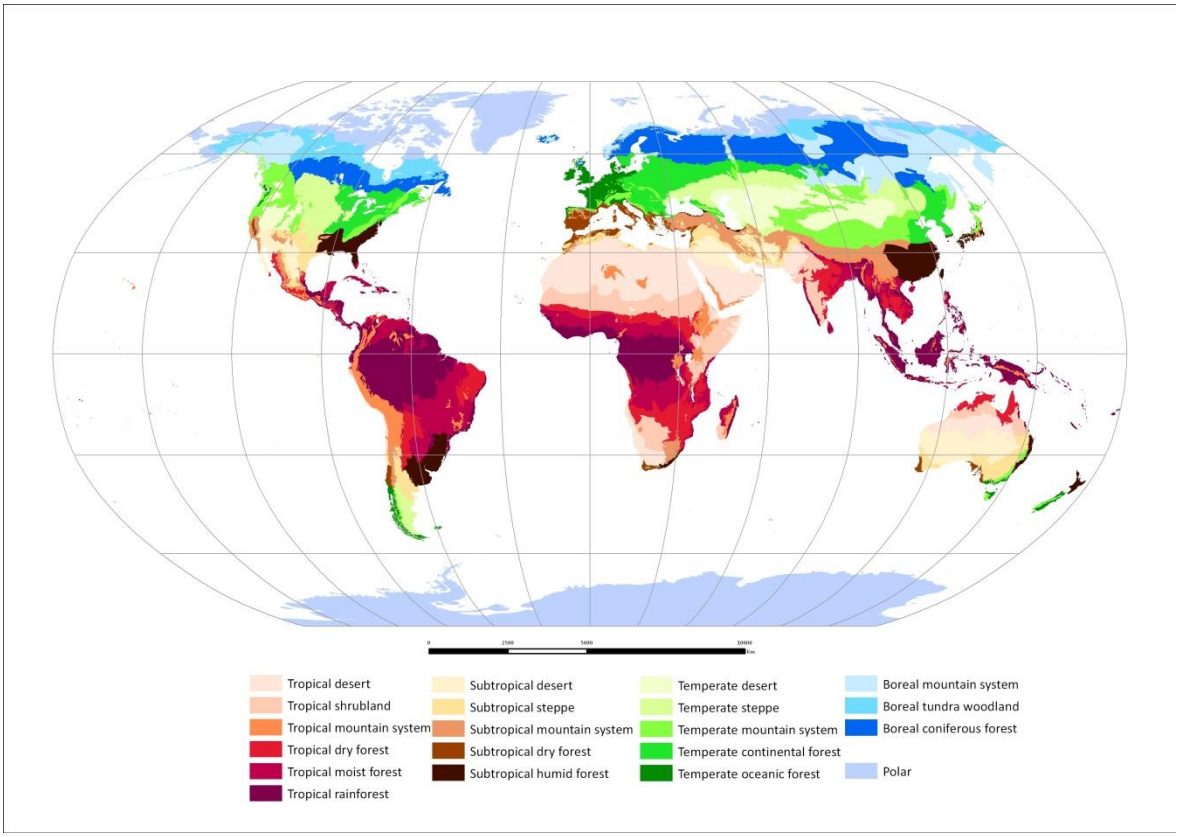
The vegetation embraces all transitional forms from pure grassland to tree stands (tropical thorn savanna, subtropical thorn steppes and grassland). Plants are well adapted to dry conditions (leaf fall, thorns formation, succulence, barrel-shaped tree species of the *Adansonia).*The tropical dry regions occur out of agricultural humid-arid boundary, and inside of them, human pressure often results in more or less pronounced process of desertification. Forestry activity is limited to the fodder trees and shrubs cultivation (FAO, 2016).

Humid Subtropics

Within the humid subtropics, the singular regions are distributed through the eastern parts of five continents. That is Brazil, the southeastern part of South Africa, Australia, USA, southeast China, and south Japan. Due to monsoon effects with a pronounced humidity in summer near the coastline, an east-west asymmetry is observed. The vegetation cover is represented by evergreen rain forests, followed by semideciduous and deciduous dry forests to the west (laurel forests), sometimes accompanied by conifers, such can be *Araucaria sp.* or *Podocarpus sp.* (reffered to coastal mountainous

rain forest in south Brazil). Australia is typical for the occurrence of *Eucalyptus sp.* Large forest areas have been lost and converted into agricultural areas. The southeastern USA and southern Brazil is exemplary in vast forest plantation activities (FAO, 2008).

Figure 1 Map of the vegetation zones, Source: (FAO, 2010)



1.2.3. Forest management inCzech republic- situation,history, and legal status

Czech Republic is covered by 33 % of forest land which make about 2, 651, 206 ha of woodlands (eAGRI, 2014). The principal share of forests in Czech Republic is owned by the state which represents 61.5 % and Municipalities forest representing a 17 % of share in woodland ownership and private owners a 19 % share. A total area of woodland owned by the Czech Republic about 1,340.8 thousand ha is administered by "Lesy České republiky " (Forest of the Czech Republic), 125 thousand ha by "Vojenské lesy a statky ČR " (Army Forests and Estates of the Czech Republic), 6 thousand by the Office of the president of the republic and 95.6 thousand ha are administered by Správy národních parků (National Parks Administration).

Forest management plan in CR is a mandatory document for forest management to be treated for a period of 10 years usually. Historically, the forest management adjustment in Czech Republic (Czech Kingdom and Moravian Margraviate) was founded in the

18th century in the context of reforms of Maria Theresa. The state of the forests in that time could not answer to increasing needs of society and was functioning within unregulated management (Šálek, 2014). It was necessary to fulfill the increased demands of the emerging industry, therefore, the management in Czech Republic focused on growing conifers which in terms of management plans better fulfilled the increment of timber harvesting.

The need for forest management plans was mainly due to the long production period, the average rotation now in the Czech Republic is 114.5 years, which means that all growth forests were created more than a century ago in the times of the emperor.

According to information from the forest management plan which is decisive in determining the amount of extraction possibilities, the total stock of wood is some 672.9 million m^3. The average stock per one ha of woodland is 259.3 m^3. The stocks of wood in forests in the Czech Republic continue to increase in total. The Czech Republic is in the 2nd position in Europe in terms of wood stocks per 1 ha and in 6th place in terms of annual increment per 1 ha. This fact proves the massive production capital of the forests in the Czech Republic (eAGRI, 2014).

Each forest planning and not only in the creation of its forest management planning (FMP) must answer six basic questions: Where? When? What? How? How much? And Why? Where means where we work. When we get to the results or when we will do the forest operations. What we want to achieve. How we got achieved targets. How much answers the questions of quantification (how much expenses, how much cubic metres, how much seedlings etc.). And probably the most important question why tries to find the optimal solution.

The creation of forest management planning includes three important parts:

1. Text part
2. Management book
3. Forest maps

The frame for forest management planning is forest management unit (forest management area which is subject to an upper limit of 20,000 ha.

If some property exceeds this limit, it is necessary to create more forest management units. In This case in the Czech Republic it is applicable only for state properties (Lesy CR, Military Forests and National Parks). Within Forest management units it is

necessary to divide the forest into four level of units: compartment, subcompartment, stand, substand. The compartment should not exceed an area of 150 ha. It is formed due to organizational issues and easy orientation.

1. The subcompartment should not exceed an area of 30 ha. The panels are made on the basis of similarity of natural and management conditions with a view to gradually achieve a uniform way of management.
2. The stands hould not be less than 0.2 ha, unless it is a forest owned by different entities. In practice, the vegetation appears in the forest management organ which distinguishes the individual property within the component.
3. The substand should not be less than 0.04 ha. For forest management plan it is the basic framework for describing and planning interventions on decennium. The boundaries of the vegetation may change during the development of the forest.

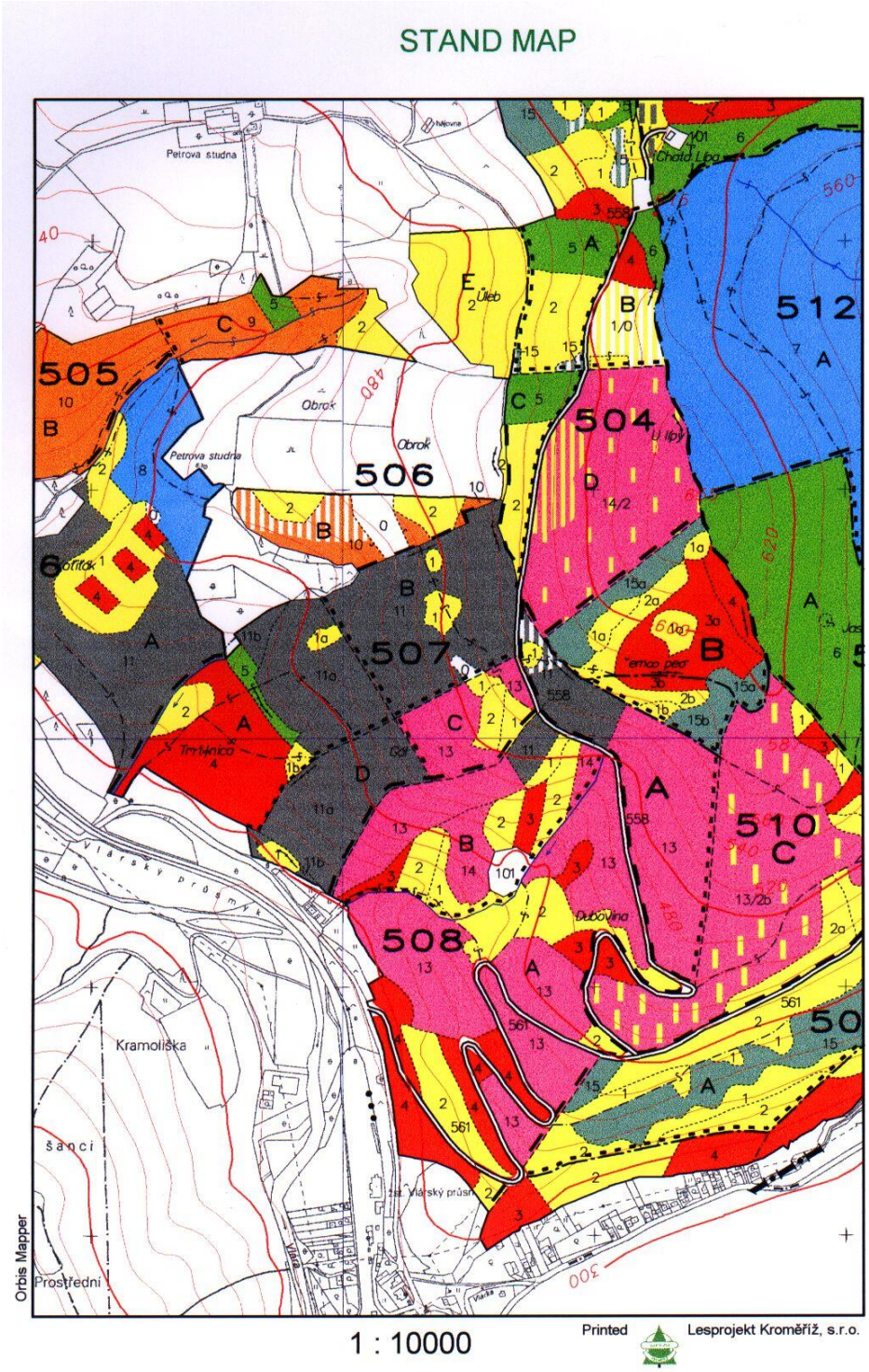
The plans contain provisions binding and recommendatory. The mandatory provisions of the plan are the maximum total amount of logging and minimum share of ameliorating and stabilizing tree species to restore vegetation. The forest owner has the right to partially cover the increased costs of planting the minimum proportion of ameliorating and stabilizing tree species. For state forests and woodlands owned by municipalities is also the mandatory provisions of the minimum area of thinning in forests under 40 years of age (Degree No. 289/1995). Legal entities and individuals for which they have been approved plans are required to comply with their mandatory provisions. The costs of management plans are covered by the forest owners (Šálek, 2014).

An integral part of plans are maps, basically four types of maps such as stand maps (see figure 2), outline maps, logging maps and forest habitat type maps. In comparison with tropical and subtropical countries one must admit, that the Czech method of forest management is very detailed because every substand is described from its structure, stock volume and age. In addition, age plays the most important role for forest management in the Czech Republic excluding the selection silvicultural system, However selection system is very rare in the Czech Republic.

If we compare the Czech methods and other methods of forest management and it was said, that the Czech method is very detailed and not so suitable for other natural and

socioeconomic condition, we can admit that a part of Czech method is very useful for all forest management systems in the world. It is called frame planning, so we establish basic decision for *Management set of stand* (MSS) such as rotation cycle, regeneration period, target tree species composition, sylvicultural systems, recommendation for regeneration, tending, forest protection, forest harvest etc. MSS are tool of diferentiation. They include the stands growing on the same or similar natural condition which are defined by FHT or soil types. Shortly, different forests grow on lowland and mountains, waterlogged soils and poor soils etc.

Figure 2 Stand map, Source: Šálek, 2014



1.2.3.1. Harvesting plan

Harvesting plan deduce, and reasonably determine the amount maximum to be harvested based on valid period management plan. The amount of timber to be extracted is determined by the Degree No.84/ 1996 of forest management planning

under Ministry of Agriculture. The basic principles of harvesting which determine the amount of harvest must:

- correspond to the actual increment and this must not exceed
- ensure the equability and permanence felling
- secure the continuity maximum felling
- secure the improvement of forest conditions and the performance of other functions of forests

There are two timber-harvesting indicators for harvest scheduling in Czech Republic that are implemented in Czech forestry legislation. These express the maximum possible final cut. One of them is known as the cutting percentage (CP) and it determine the percentage of harvest for each mature age class depending on rotation and regeneration period (Marušák et al., 2015). The final cut by CP is calculated by multiplying the CP value (4 – 100 %) by the volume of age class. In addition, the CP indicator is static, incorporating planning for one decade only, without the option to account for harvesting possibilities over a longer time period and does not consider the special possibilities of harvesting.

Another harvest indicator is theoretical clearing which is more important for forest management in tropics and subtropics. It comes from the main principle of forest magement which is equability of forets production (harvest). Taking into consideration the management area and average rotation cycle one can calculate the area for one decade which theoreticaly should be regenerated. In the Czech Republic the theoretical area is multiplied by average stock volume of mature stands (per ha) because the harvest indicators are expressed in cubic metres (Šálek, 2014). However in tropical forests only the area suffices. Coming to the history, theoretical clearing was the first harvest indicator which was used for forest management in now developed countries. As this indicator depends on age (rotation cycle) is proper determination of rotation cycle is very important. For determination we use two criteria. The first criterion is increment and the second criterion is timber quality. In rich tropical forests the timber quality is more important and vice versa in forest plantations formed by the fast-growing species, the maximum increment is the basic criterion. Since this study deals with evaluation of frame planning in tropical countries, establishment of rotation cycle is absolutely important for diferentiation of management. The main problem is that no relevant data

for calculation of increments in rich forests are in disposition. Thus the determination of rotation cycle is found out according to the empirical data and local experiences because they give us the age necessary for achievement of required quality. As age is the most impotant factor (excluding selection system) the age becomes a decisive factor for diferentiation of management. If we want to maintain multifunctional rich forest in tropics and subtropics, we have to assure the highest quality as much as possible.

1.2.4. Global perspective of Plantation forestry

1.2.4.1. The status of plantation forestry

Plantation forestry is a worldwide growing form of forest management. Ever since it provide an array of benefits (Moore, 1999), planted forests had represented a common management of land use for many centuries. While plantation forestry is historically common in many countries, the development of globally extended plantation properties and the establishment of large-scale planted area is a new world phenomenon (FAO, 2009). Nowadays, plantation forestry occupies approximately 6-7% of the global forest area, in particular covering about 264 million ha with a constant increase in all regions ever since 1990 (Masiero, 2014). During the last decade area of plantation forests has increased by 5 million ha per year in average. The largest plantations coverage in East-Asia, North America and Europe reaches 75% altogether from global planted forests. According to FAO (2010), due to China, East Asia forms 35% of the total land. Especially in Asia producing wood for local consumption remain important. FAO (2007) has suggested 50% contribution of plantation forestry to wood production and Buongiorno (2012) has suggested another 32% of contribution to wood production for industrial purposes. Anticipated forecasts made by Carle and Holmgren (2008) have revealed estimates make up to 80% by 2050.

In forestry or nature conservation disciplines and their studies, there are often occuring certain convergencies in positive and negative effects of plantation forests in terms of conservation biodiversity of the natural forests. Likewise with empirical and theoretical study done by Pirard, Secco and Warman (2016). The authors came with the conclusion of reduced natural forests degradation associated to forest plantation expansion, however increased deforestation of natural forests due to low market value of the timber from plantation forests, on the other hand.

Learning from the hypothesis that forest plantations have helped to maintain natural forests biodiversity, it is not suprising to say that it has a long line of perceptions

throughout the literature sources. Foresters in the early twentieth century were approaching the potential of high productivity plantations to mitigate pressure on natural forests in order to advanced other non wood values (Bennett, 2010). Sedjo has also defended this idea for several decades (Sedjo and Botkin, 1994). In more early decades the hypothesis has been expressed through national forest policies where policy makers have become aware of the restrictions of their natural forests to satisfy needs for timber. They had supporting view in the matter of expansion of the plantations as a form of opportunity to alleviate pressure on natural forests (Bull et al., 2006). This hypothesis has been promoted by great expansion of the global plantations. The volumes of the timber from plantation forests have been increasing throughout the past few decades (FAO, 2010 and Brown, 2000). Jürgensen et al., (2014) came with the statement that 33 % of the global industrial roundwood were produced in forest plantations in 2012.

What is the real reason for decline of natural forests? There is so-called forest transition theory (Pirard, 2016) reflecting how high forest cover countries, over a period of time, has continuously transfer to increased or decreased deforesting places to plantation estates. This theory can be followed from various paths and some of them insisted on the distinction between a forest transition due to economic development or due to forest resources scarcity (Rudel, et. al., 2005). However, plantation establishment may take a "gap-filler" role in terms of levels contributing to the rapid decline of natural forests due to low timber quality.

Of course there is a big inequality and difference between having plantations filling a gap once resources have been depleted to a great extent or having plantations anticipating this scarcity and substituting source supply. That is why explanations for plantations always take economic, political and social forms.

1.2.4.2. Negative impacts of plantations on the livelihood of communities

Giving only certain point of view that plantations have helped to reduce degradation of natural forests, we need to take a look to the other sites of plantations. In the following chapter it is obvious how forestry plantations with wood for industrial purposes may have not only economical but also environmental consequences. Study made by Pamela McElwee (2009), indicate how reforesting programs can harm sustainable livelihood of

poor communities. However this study tries to at least eliminate disadvantages of plantation forestry, not by their drastic limitation though.

In Northern Vietnam large green lands of bare hills targeted for reforestation with aim to improve livelihood to the poorest in rural areas. A major goal of these reforesting programs transform bare hills into smallholder forestry plantations to meet both environmental and economic benefits. Rather than supporting natural regeneration, the reforestation projects focused most to establishing new plantations. One outcome is replacement of various, but often degraded native flora by monocrop exotic tree plantations. These lands already harbored many species used by local communities. The bare hills were economically important to poor households and to women collecting non-timber forest products there (NTFP´s). However bare hills are privatized and turned into smallholder plantations, so the poor have no substitution for lost of NFTP ´s income. Yet there has been a little research in Vietnam on environmental and social impacts of reforestation projects. Similar process has been observed in China where low-diversity monocultures are not equivalent to high natural forest.

Another piece of evidence how plantations have devastating effects can be observed in the uplands of Southeast Asia. The unrestricted expansions of rubber plantations has been emerged and observed by East-West Center expertised leadersip (EAC, 2016). A member of EAC Alan Ziegler from the National University of Singapore considerate in his article about rubber plantations, that as rubber is largely feeding China ´s tire manufacture industry, the plantations are tremendously expanding. It has been estimated more than 500,000 ha have been already converted to rubber in the uplands of China, Vietnam, Laos, Cambodia and Myanmar, Ziegler reports. The fact that by 2050, the area of land with such a farming systems could be more than doubled therefore extensively reducing biodiversity and also have severe consequences on the water resources. What kind of farming systems are rubber plantations associated to? Shifting cultivation, often reffered to slash-and-burn farming system, widely blamed for tropical deforestation. What is more real threat is commercial agriculture. Perception about shifting cultivation in negative way effecting forest degradation and loss, has forced government to control it through bans, forest reserves declaration, crop substitution or monetary incentives, yet such of policies have not always improve environment. In fact government sometimes provides just excuse for the large commercial cultivation development. In case with rubber, environmental consequences are alarming. Erosions

and increased stream flows on the steep slopes are huge risk for landslides. Cultivation on the steep slope is performed without any conservation method. Hence as hill slope is gradually converse and is neighbouring road building, the risk of landslides is huge. Cash crop irrigation during dry season dessicated water streams and use of fertilizers and pesticides for commercial agriculture has reduced quality of water.

One of the most realistic approach and alternative to face and solve such an environmental issues is agroforestry practice. These production systems would provide a good balance between economic return and environmental sustainability for the long-term perspective. Diversified agroforestry systems should be then promoted, where rubber and oil palm, the cashcrops, can play important role, however such plants should not been planted in large monocultures.

1.2.5. The potential and role of Agroforestry

According to Lojka (2006) agroforestry have high potential to improve and increase farming systems productivity and sustain cash crop production. As the most traditionally used shifting cultivation system with prolonged fallow period are no longer feasible in the tropics, agroforestry systems can partly simulate the structure and also processes of natural forest vegetation. Agroforestry alternative is considered as promising tool in contrast to short-fallow shifting cultivation. The main role lies in soil management, including erosion control, maintenance and soil fertility improvement. The service functions of agroforestry from farm level perspective are improvement of microclimate, fencing or demarcation of boundaries. Another service functions take into account reduction of wind speed, shade, animal fodder, weed control or fencing.

1.2.5.1. The most common practice used in Agroforestry

The shifting cultivation has been largely used in world for hundreds of years. As the oldest system practiced in Africa, South America, Oceania and Southeast Asia, occupies lands of about 30 % of the soil in the world. In another words, 300-500 million ha in the tropics is cultivated by this technique and 7 % worldwide from 7 bilions makes its own living. It is a rotational system in which land under natural vegetation is cleared by slash-and-burn method, cropped for 2-3 years and then left while natural vegetation can regenerate. Regeneration phase is known as the fallow and traditionally last for 10-20 years. Nowadays, to accomplish entire length of fallow is no longer possible as population densities increased. Primary and secondary forests are usually slashed and burnt for their nutrients accumulated in wood biomass. Usually, 20 year fallow of

secondary forest would be needed to restore soil fertility for another 2 or 3-year cropping. But for cash-poor farmers to wait such a period of time is impossible, therefore shorten the fallow to 5 or less years. Such a reduction with little or no use of fertilizers effects arable land by weed invasion, incomplete regeneration, soil degradation and decreased crop yields. Crucial merits causing problems of shifting cultivation are linked to population increase, immigrating peasants and disappearing forest resources (Lojka, 2006). There are also another agroforestry techniques emerging throughout the world, such as plantation crop combination mainly practiced by smallholders, home gardens, taungya, improved fallow and others.

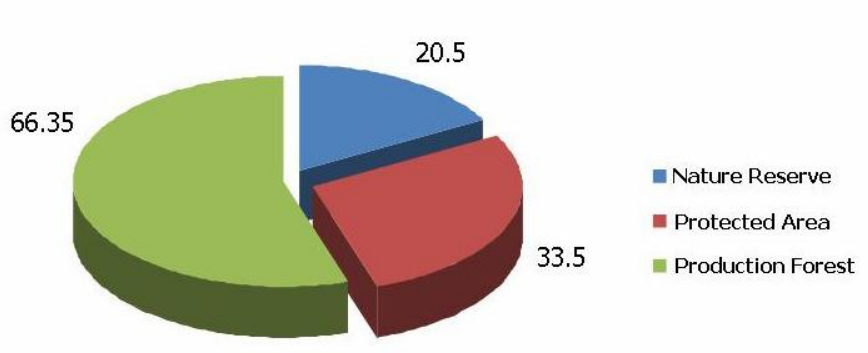
Present studies dealing with forest plantations revealed certain negative impacts which can be more serious for the future of forests than one has considered so far. To improve the forest plantation benefit, more comprehensive studies are needed. Yet, a main limitation of these studies, role of policies and institutions behind market drivers, are not taken into account. Therefore there is a need for integrated policy which approaches to both natural and plantation forests . As mentioned above, explanations for plantations always take economic, political and social forms. Hence, on the one hand, highly productive forest plantations can play an important part in rapid global deforestation likewise they can be harmful to forest ecosystems. To find an equilibrium among those cases, solutions are critically to be sought.

1.2.6. Forest management in Indonesia- situation, history, and legal status

1.2.6.1. Forest resources

Nowadays total land area under forest consists of 136.88 million ha or 71.20 % in Indonesia. The area under forest management is approximately 120 million ha having classified into three categories, such as: protection, conservation and production (see figure 3) The extent of production forest is 66.5 % and it is used for the timber and non-wood production. Conservation forest is 20.5 %, earmarked for the ecosystems protection, including its biological diversity. The protected forest has 33.5 % (Ministry of Forestry, 2009) and designed for erosion control, watershed management and the wildlife conservation (Suhardi, Faridah, 2002).

Figure 3 National Forest Area ´s, Source: Ministry of Forestry, Republic of Indonesia, 2009



The state-owned forestry companies and private sector established approximately 2.5 million ha of plantation forests, represented by *Tectona, Elaeis spp., Accacia spp., Albizzia spp., Gmelina spp.* and also *Eucalyptus spp.* Only oil palm plantations stretch across 6million ha or 1 million ha of teak forests spread over all Indonesia. The teak plantations have been managed since the last century. Timber plantations are intensionally set up to produce wood for pulp and for constructions. Forests intended for plantations spread over 1.3million ha and these forests, outside of forest area, fall within the classification as privately owned forests (Ministry of Forestry, 2003).

Ever since forest sector have been much affected by corruption of political and economical system, weakness of forest governance, law enforcement, illegal logging, forest fires, encroachements and excessive logging practices, degradation of forest resources and deforestation seems to be nowadays crucial more than ever before.

1.2.6.2. History of The forest cover changes

The estimated deforestation rate had varied from 700,000 to 1 million ha per year during the mid 1980s. Critical evaluation of the Indonesian forestry sector found out that deforestation cannot be blamed by a single factor but was instead due to conflict between commercial logging and shifting cultivation, widely practiced in Kalimantan. The most proximate threat to Indonesia ´s forest resources was government propagation of domestic timber processing, meanwhile the transmigration programme is considered as a threat to the forests for a long-term.

Indonesia's Transmigration Program is one of the largests in the world. Initially originated under Dutch colonial rule since early 20th century, taken over by the Indonesian Government, characterized by three main goals, pointed to:

1. move millions of local people from densely populated interior islands (Bali, Java, Madura) to the exterior islands, less densely populated to achieve more equal demographic development
2. reduce pressure on land in inner islands and contributing to the development of outer islands
3. alleviate poverty by providing land and new job opportunities to form income for landless poor settlers

However programme has received much of the critics, arguing that considerable resources have been wasted in resettling people that have not been able to cope with even subsistance level of living. Having mentioned one of the programme aims, extensive environmental damage and eradication of tribal people has been assigned as main problems (The World Bank, 2012). Project planners expected most of the income generated by households by farming practices (treecrops, annual crops). Although it did not develop in the settlements as projected because cropping and yielding of annuals were much lower than estimated. The reasons for that were family labor shortages, lack of experiences, low service support and animal traction. Therefore soil degradation, erosion and low market of crops disadvantaged settlers to develop their lands. On some islands the program has collapsed and ended by red massacres, when natives attacked newcomers. Victims are around tens of thousands estimated.

Perhaps, from the national level, the most negatively appreciated was the combination of factors that caused a loss of biodiverzity and large deforestation. These factors has included transmigration sites, areas of treecrops, logging concessions or timber plantations.

When a numbers of development projects were prepared and implemented in selected places, the legislation did not consider the impact of accumulation of these projects on forests. A requirement that there should be a provision to be considered once many of development projects accumulated to forest areas, it was introduced in the Spatial Use Management Act of 1992. Indonesia owns national guidelines for the forest protection, yet still available maps are not accurate enough to implement the guidelines effectively. New maps with spatial planning are nowadays being drawn individually by provinces to be in harmony with the Spatial Use Management Act of 1992.

Land clearing has failed in compliance with the guidelines established at appraisals of the development projects. Slopes with more than 8 % have been cleared and trees were bulldozed in waters, so the erosions were markable. No settlers had the option to take care of forest lands and no attempts were made to harvest the commercial timber because it was left burned in the fields. This situation were continuing in 1993. Until 1997 deforestation rate was 1.7 million ha/year (FWI/GFW, 2015).

In 1997 Indonesia was struck with very bad El Niño event. Resulting fire season could be compared to the season of 1982-1983 where rainforests of Borneo were burned to estimated 5 million ha and East Kalimantan was hit the hardest. In 1997 thousands of agricultural fields were converted into burns on Borneo, Kalimantan and Sumatra (Schindler, 1998). During late 1997 collapse of the currency and the banking system disintegration forced the people to make wildlfires that do not contributed to any preservation of the indonesian ´s rainforests. Anyhow since the crisis 1997 the state re-asserting. The increased importance was ascribed to timber industry and large textile exports had contributed to well-being as it provided a lot of working opportunities (The World Bank, 2012).

1.2.6.3. Loss of primary forests after year of 2000

Too many undergone studies has shown, though too long hidden, Indonesia is the world ´s fastest deforesting country, with its rate overtaking Brazil. New analysis of Researchers from the University of Maryland in cooperation with World Resources Institute, published in *Nature Climate Change* in 2014 has revealed Indonesia loosing its primary forests, as the most biodiverzity-rich type ecosystem, at a stagerring rate(Margono et al., 2014). From 2000-2012 loss was more than 6 million ha of primary forest. These analysis are showing how deforestation is getting worse as 47,600 ha of primary forest are lost every year. The most frequent places where deforestation mostly occurs are wetlands, from which greenhouse emissions from peat soil are affected. Notably the most loss of pristine primary forests occuring within the zones restricting forest clearing and these are protected forests, national parks and areas under moratorium.

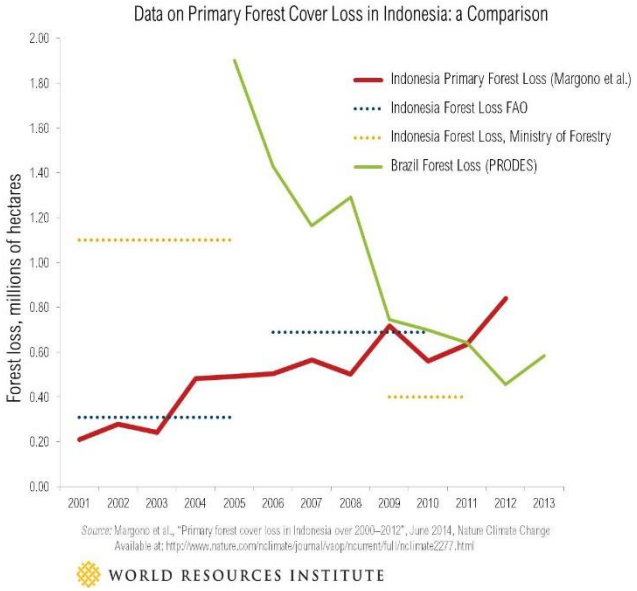
According to a report by Suhardi (2002), the loss of forest land in Indonesia from 1982-1990 showed that over the eight year period Java lost about 90.5 % of its forest cover, while the figures for Sumatra are 59 %; for Nusa Tenggara 74.4 %;

Kalimantan 38.8 %; Sulawesi 49.6 % resulting in the Indonesia average forest loss of 54.4 % excluding Maluku and Papua .

The interest in planting oil palm has become rampant and most of the Districts showed interest in converting forest land to oilpalm plantations. Rubber plantations in some areas have also become very important but oilpalm seems to be the most preferred species throughout the state.

In Figure 4 we can see the comparison of forest loss among data presented by FAO, Ministry of Forestry, PRODES agency of Natural Resource and Belinda Margono. Presented figure shows tree cover lost during 2001 to 2012. Tree cover includes industrial plantations, natural disturbances and human-induced forest loss. Key findings made by Margono (2014) shows that 16 million ha of this tree cover was lost during twelve years.

Figure 4 Comparison of various data obtained regarding to Development of primary forest loss during 2001-2013, Margono, et. al (2014)



1.2.6.4. Importance in the reduction of the primary forests loss

There is much work to be done. As a one of the biggest world ´s greenhouse gas emitters, large problem of clearing belongs to the peat clearance for agribusiness activities. Livelihood of people relied on forests can be fatal. Therefore forest moratorium (further described below) is a promising tool to curb deforestation.

The study mentioned above, drives to the point of need to do much more to convert forests into change. Following informations provided are particular recommendations for country to enforce:

- **Laws and regulations.** Study shows the most primary forest loss, 40 % in particular, is occuring within regions where clearing is prohibited. The whole country and governments should investigate the places of illegal clearing and involve responsible parties.
- **The size of Forest Moratorium for including all primary forests**. The protection currently do not distribute into degraded areas, as considered, due to small-scale logging activities. 90 % of primary forest loss happen within degraded areas yet they are still highly appreciated for carbon storage and biodiversity.
- **Cooperation among ministries and agencies within natural resources sector.** Is itsuch a ministry of agriculture, forests, mining and district, provincial and national governments. This would make sure all stakeholders within forestry sector are planed on the same goals
- **Land-use planning.** To expand agriculture into degraded lands, nor to indigenous primary forest (WRI, 2014).

Forest Moratorium as Indonesia‘s commitment to enforce Forest Management

This conservation scheme has the following aims:

- To curb deforestation and strengthen forest governance sector
- To achieve higher social and ecological benefits by: classifying lands, defining areas for logging and oilpalm development, using forest data to promote proper decision-making.

Forest Moratorium already helped to increase the importance of national forest sector. However two crucial findings are yet vague:

- **1st finding is that Moratorium is not understood well by key-decision makers**. Would be effective only if it is well monitored, understood and enforced at the local level as administrative and regulatory authorities are decentralized to district level.
- **2nd finding is that Moratorium should speed up the progress.** Still according to Researchers from the University of Maryland in cooperation with World Resources Institute, who has found a visible progress, the limitations are bounded to provinces selected as pilot sites by indonesian government, likewise in Central Kalimantan. The majority of pilot governance programs are

concentrated in three districts only, out of 412 districts,whereas these districts fall within moratorium too. Hence governance activities should be scattered through all country (WRI, 2014).

Deforestation in Indonesia is nowadays the most widely discussed environmental issue. Unfortunatelly its dynamic development has caused and still continue to bring unhappy scenarios for its precious environment. Supply of high-quality timber has been continuously decreasing and therefore its demand will be increasing. The consequence will be applied to the rise of illegal logging. The solution is to create near-natural rich forests and the differentiation of production. Existing strategies are leading only to illegal loggings and corruptions, whatever laws and moratoriums are appropriate.

Regulations implemented by government are generally accepted. However the capacity to enforce them, remains still a little.

Review throghout the single pieces of literature on indonesian deforestation reveals confusion in primary reasons of this serious environmental issue. The knowledge base of the subject is insufficient due to lack of appropriate or reliable primary data in terms of deforestation rate and causes of changes in forest cover.

Some of the studies blame Transmigration Program as the main contributor of deforestation, another studies name different causes, such as illegal logging, timber plantation, oil palm production, mining or forest fires.

The definition of deforestation and degradation of the rainforests in Indonesia should be more clarified as the cooperation among stakeholders in forest sector would improve in terms of the future development. Indonesia can learn from forest conservation leaders, such as Brasil, and follow similar trend. Ever since satellite and various monitoring systems, enforcement in law or also financial incentives were reinforced in this country, its deforestation rate has rapidly decreased.

1.2.7. Forest management in Turkey - situation, history, and legal status

1.2.7.1. Forest resources

Forest area of Turkey covers approximately 20.7 million ha, which makes about 27 % of the total land area. The land can be divided among three phytogeographic zones, such as Euro-Siberian, Mediterranean, and Irano-Turanian regions with all native species. Almost 3,000 of Turkish flora species are considered as endemic and 90% of the forests

are natural by its origin (Atalay and Efe, 2010). It is well known Turkish forests hosts flora of great medicinal, ornamental or aromatic importance (World Bank, 2007). In addition to natural forest development, human activity has been a very important part in determining the forest cover and structure. Turkey and its history ranging to the settlement of many human civilizations, from 7500 BC and belonging first known urban city of Catalhoyu k to the Troy, Roman, Byzantine, Ottoman or other great empires. Several cultures have occupied lands and took advantage of forest resources. Nearly 50% regarded to status degraded. The coniferous tree species of great importance include Turkish pine (*Pinus brutia*), Austrian pine (*Pinus nigra*) although the largest forest area is covered by oaks (*Quercus* spp.) including evergreen oaks. Exotic species are planted in plantations due to its growth potential, these species include maritime pine (*Pinus pinaster*) or Douglas-fir (*Pseudotsuga menziesii*). High forests, generated from seed resources, create in total 72.9 %, whereas 42.2 % are productive and the rest degraded. Coppice forests number 8 % productive out of 27.1 %, dominated by oak. With famous status of the largest European producer of sawn hardwood, Turkey takes pride also as a major importer of logs and newsprint, from the Russian Federation and Ukraine (Zengin et.al., 2013).

One of the poorest residents recruit is represented by 7 million forest villagers living in 21,000 settlements adjacent to forest, completely depended on its resources, hence Turkish forestry is led by social goals to sustain these lives. Regulated forest laws support these villagers by providing firewood and round wood for constructions at subsidized prices. The public access to the fruit, mushrooms and wood withdrawal. In addition, villagers also have rights to be employed in afforestation, thinning and harvesting operations (Gunes, 2001).

Estimates has revealed over 17 millions of m^3 fuelwood from state forests consumed annually and when compared to 8,4 million m^3 of fuelwood sold by State Forest Enterprise (SFE) to forest villagers, 8,7 million m^3 is evidently seen as illegal, constituting almost 100 % of wood provided by SFE to forest villagers annually (Turker, 2012).

In terms of forest composition and structure, Turkish forests are very diverse. Dominating tree species are spruce, pine, fir, beech, alder, oak, hornbeam and walnut, grown in both managed and primary mixed forests. Forest management plans are managed, giving the fact half of rural population of the whole country lives nearby the

forests and are heavily depended on its resources. The country has distinct biogeographic regions with its own natural ecosystems, including Caucasian mountain mixed temperate rain forests and alpine ecosystems of the North East Black Sea Coast, grasslands of the Central Anatolian plateau, Mediterranean and European regions. They include perhaps the largest primary alluvial and cypress forests. Approximately 80 % is managed for production of timber, 16 % create conservation area and protection forests. However only 48 % of forest is productive, the remaining 52 % are degraded forests or eroded lands. In addition 4 % allocated to conservation of biodiversity, e.g. protected areas, nature conservation areas, national parks, nature monuments, gene conservation forests, seed orchards. In general, almost 92 % are natural forests and the rest (8 %) generating plantation forests occurring on open places of forests and degraded areas. The productive forests at higher elevations are dominated by coniferous species and by broadleaved species at lower elevations (FAO, 2012).

Over time, historical findings have revealed that degradation of the forest areas has started already 4,000years ago (Rotherham, 2006). In addition wildfire, harvesting, war, agriculture or exploitation of industrial timber had contributed to today ´s declined forest area. In the course of time, civilizations have been heavily using the land, forests are nowadays considered poor in structure and stocking and rehabilitation is therefore needed.

Majority of the forest areas are regarded as public property, technical abilities of forest managers are limited and forest planning which is centralized, is guided to create plans for every enterprise forest area. Forest management planning nowadays needs to maintain productive ecosystem processes and also needs to address various uses forest villagers demanding. Forest plans, even privately owned lands must be recognized and addressed by law. Although conflicts do emerge in development and implementation of the plan due to issues of land tenure.

1.2.7.2. History of forest tenure and its structure

Forest ownership has confusing history full of complexities. Ottoman Empire, lasted from 1299-1922 was the period with the most free, completely unlimited access of public to forest lands. People could cut the trees and graze their animals anywhere. During 1870 the first protection and management was enacted. Further in 1923 Forest Code was enacted in order to prevent degradation more deeply. In addition private forest estates larger than 3 or 5 ha were nationalized during 1945 and also 1950

respectively. The new Forest Code practiced to this very day was enacted in 1956 Landownership is currently divided into three parts: state, private and public legal entities different than the state. Almost 100 % of forest area is managed and owned by the state because privatization is perceived negatively for not even SFM but public benefit including (Gunes, 2001). Approximately 25 % of private owned forests are missing cadastral surveys, that are not completed yet therefore borders with ownership are not clear (World Bank, 2007). Thus forest managers must face landownership disputes (Dölarslan, 2009). The reason behind failure of cadastral surveys completion are forest villagers. However what can be taken as interesting fact is that fast-growing plantations of poplar (*Populus* spp.) and stone pine (*Pinus pinea*) are taken by law as farm forests rather than forestland, thus not subject to state control, however contributing by 18 % to total wood production (Gunes, 2001). Owners, ownerships boundaries and goals in forest management are not clearly recognized, thus forest plans are subject to conflicts (Zengin and Yesil, 2013).

1.2.7.3. Forest Threats

Wildfire is one of the most destructive factor disturbing character and the structure of the forests.

1993-1997 was the period with more than 2,000 fires frequently occurring and affecting area about 20, 800 acres (General Directorate of Forestry, 2013). Accidental of those fires created by tourists, in particular, consists of 53 % and are considerable causes of forest degradation, along the coastal areas. Another 13 % of fire are created by forest villagers. Perhaps it is a mark of protest to the land closure for reforestation or another activity. 20-24 % of fires are reasoned doubtfully (Avci et al. 2014, General Directorate of Forestry 2013). According to the forest law, forest grazing of animals is strictly prohibited, yet it is also the threat to forest structure and character, however still practiced by certain forest villagers. Due to lack of extension area of total pasture land (only 3.7million acres) for animals, grazing requirements are met only in forest. Even though there would be efforts to control grazing, improve fodder production or any stall feeding practices, it would mismatch traditional grazing and economy. Grazing is a serious threat, not only to the forest damage, in terms of forest regeneration sites, but also to degraded forest areas, primarily on slopes which are steep and susceptible to

soil erosion susceptible. In areas where extreme erosions occur, clearcutting is prohibited, thus uneven-aged forest management prevails.

Among other important causes of degradation and decrease of productivity of forestlands are illegal logging and intervention for farming practices (Zengin and Yesil, 2013).

1.2.8. Forest management in Vietnam- situation, history, and legal status

1.2.8.1. Actual state, history and development of forests in Vietnam

In 1943 Vietnam had 14.3 millions of ha of natural forests according to the findings, representing the forest area by 43 %. A large part of forest area in Vietnam was degraded, deforested or destroyed by herbicides and other toxic substances in the second half of the 20th century. In 1987 thus for this reason Vietnam entered into a national reforestation program. However in 1990, the area covered by forests decreased to 9.18 million of ha representing only 27.2 % of the total land area. Between 1980 and 1990 Vietnam had lost in average 1 thousand ha of forest per year. Since 1995, thanks to forest restoration and forest plantations establishment, forest lands began to increase again. In December 2006 the total forest area was 12,873,850 ha which corresponded to 38 % of the country's total area. The share of natural forest was formed by 10, 410,141 ha and 2, 463,709 ha were created by plantations. According to the classification of use, forest production occupied 5,402,172 ha, forest protection occupied the area about 5, 268,789 ha and protected areas had 2,202,888 ha of the land area (FAO, 2009). In recent years the forest sector was strongly promoted by the Government of Vietnam by implementation of developmental projects for the purpose of reforestation and afforestation of million ha of land (McElwee, 2009). Despite the total area has increased in the last twenty years, mostly stands in the form of plantations were grew up. In 2010 forest plantations framed roughly a quarter of the forest area, yet only 1 % of the total area was considered as primary forest. The rest is regenerated to the natural forest. In 2011 the forest area was estimated to 39, 7 % (FAO, 2009). In 2012 Vietnam had 15,8 milion of ha of forest area. Roughly 10,3 mil.ha of this total land area is formed by natural forest, 2.9mil.ha create plantations, 630 thousands ha are rubber plantations and 1,12 mil.ha are considered as forested lands. The largest supplies of wood plantations are located along the coastal areas, that is North-East, North and South

area respectively (see figure 5). These three areas are considered as the main material suppliers in paper industry, production of synthetic boards and chips (Dung, 2015).

Lately the forest plantation area has been increasing, however quality remains low and the average stock of timber in a mature plantation is estimated only around 80-90 m^3 / ha (FAO, 2009). Nowadays Vietnam has about 16.2 million ha of the forested land, of which 12.6 million ha is actually covered by forest (VIFORES, 2014). More than 6 million ha of the land is threatened by potential fire to the pines, bamboos, eucalyptus vegetation's and regenerative tree species. During the last decade, the wildfires had affected in average 16 thousand ha per year. According to data from Department of Forest Protection, there have been occurrence of more than 47 thousands of wildfire and they destroyed more than 633,000 ha of young forests, in the last 40 years. Mangrove forests were also destroyed, which were consequently converted to aquaculture.

1.2.8.2. Vietnam ´s Call for Trees

By the 1980 ´s Vietnam had to deal with difficulties of large deforestation. The main causes were use of herbicide Agent Orange during the 1960 ´s and 1970 ´s US war with the communist Viet Cong and poverty of people derived from this war. An immense amount of timber was needed for reconstruction of the state and thus overharvest resulted. From a landmass adding of about 30 million ha, during 1943 had Vietnam 14.3 million ha of forest; 42 % of this area was destroyed in the period to 1995. Since 1980 ´s Vietnam has been implementing a major reforestation program. With the help of Australian research, by 2012 Vietnam ´s wooded land had increased to 13.7 million ha, where native forests remained had been protected and treeplantations supply timber and its processing mainly for furniture- export industry.This was dramatic turnaround. According to Dr. Harwood, having a lead role in Australian Tree Seed Centre (ATSC), who involved in collaborative project supplying Vietnam by Australian trees seeds in 1993, Vietnam ´s local tree species were slowly growing and were hard to establish them on sites that experienced severe degradations. Therefore during the mid of 1980 ´s the Vietnamese were evaluating suitable alternative tree varieties for wood production on short rotations on degraded sites. Australia supplied Vietnam by several species of Acacia.

Furniture industry is crucial to Vietnam, earning more than $3.9 billion annually, importing more than three-quarters of the industry ´s log requirements and Acacia plantations play a role in replacing some of these imports. Nowadays Acacia trees cover

is approximately 2% of the land surface in Vietnam. About half of plantations is cultivated by smallholder farmers, counting to 10 million tonnes of wood a year to saw and woodchip mills. The mills provide job and business opportunities that benefit to rural development. Naturaly, there are certain advantages Acacia provides, such as prevention of soil erosion, it is a stepping stone for rehabilitation of the land which was formerly a native forest fixation of atmospheric nitrogen, therefore improving soil for the next crop. It is also easy to cultivate and it growth is fast so it brings benefits to smallholder farmers in 6-10 years. However Acacia timber serves only for cheap parts of furniture such as chipboards or fiberboards.When Vietnam has started evaluating Acacia tree species, it contacted the ATSC to access seed collections. Among the main selected species were *A. auriculiformis* and *A.mangium.*

Between 1993 and 2004 ATSC has supported two projects named 'Seeds of Australian trees' and 'Domestication of Australian trees' in order to support technical capacity building in Vietnam and promote the selection and provision of Australian tree germplasm. The Research Centre for Forest Tree Improvement (RCFTI) has contributed by establishment of breeding populations and seed orchards of Acacia species (*A. auriculiformis*, *A. mangium*) from which improved seed were gained, thus it provided a basis for hybrid breeding, but already occured in Vietnam. Ever since the trees are grown not only on degraded lands and that they are unsuitable for agriculture activities, plantation forestry it provided as a cash crop for marginal land. The government reports has published average annual productivity of Acacia plantations with 20-25 m^3 of wood per ha. The faster growth of hybrid species can be harvested 2-3 years earlier than non-hybrid species. Acacia species has helped Vietnam to transform bare hills into forested land, moreover they were attractive for smallholder farmers with no arable land, as they were grown acacia on the hilly slopes with degraded soil. Just after 5-7 years, it was estimated Acacia plantations can earn farmers in Vietnam to $2000 from sales of wood from 1 ha of plantation. In turn it costs approximately $500 to establish and manage acacia stands. Poor rural communities livelihood had improved (Braidotti, 2013).

2. AIMS OF THE THESIS

The MSc Thesis goal was to evaluate already created general guidelines which were used within project of developing forest projects or within preparation of joint projects regarding to creation of management sets of stands, basic decisions and differentiation of management. The MSc Thesis proposes a differentiation of forest management which would not only help to mitigate the two controversial human interventions, such as commonly practiced forest plantations and forest mismanagement. But also alleviate exploitation of unique and rich structured natural forests, significant for their valuable sources of timber.

Principles of sustainable forestry, such as permanent production, regeneration and biodiversity conservation were taken into account.

3. METHODS

For the purpose of this MSc Thesis, three projects which contain the differentiation of management, were selected. The first two projects were designed, implemented and approved. The third project is in the stage of proposal for cooperation. The first project Rehabilitation and Sustainable Development of Forest in Phong My Commune in Vietnam (see figure 5) reffered to degraded forests and the vegetation growth on degraded areas in central Vietnam, ranged from coastal lowlands to the first mountain ridges towards the Vietnamese-Laotian border. The second project, this time in Indonesia (see figure 6), called Rehabilitation of the Tondano Lake Area, cover the north-eastern province of Sulawesi island and its aim is to control the erosion on the fragile soils and improve forestry and agroforestry techniques. The third project which is proposed at the moment, involves the management in the buffer zone of national park Küre Mountains (thus in Turkey, in the transition between temperate and subtropical forests. The selected methodology is the comparison of all three mentioned projects in terms of creation management sets of stands, differentiation in general guidelines and their content, maintenance of desirable biodiversity within the production of valuable timber from these forests. Individual projects are compared not only among themselves, but also with the methodology of creation of management sets of stands and general guidelines in the Czech Republic. Method of formation and content of general guidelines will be labeled as value 100 (100%), the other projects will be evaluated the same way as the methods of creation and content of general guidelines, however not from the point of view of its own creation, but how they were fulfilled. Comparison of the three projects will be build upon the content of general guidelines, respectively how individual chapters were fulfilled, what the core of differentiation of forest management is, and how the current, locally used methods of forest management were modified. Furthemore, how these modified general guidelines will reflect in the creation of the future forests, mainly from the two perspectives- production and non-production. Production aspect is further divided into production of timber and non-timber products. NTFP ´s were not quantified, neither in the case studies with few exceptions. Another criterion of comparison is fulfillment of the owner wishes. Respecting the owner wishes is one of the most crucial aspect for the creation of the future forests (Šálek, 2014).

Figure 5 Project area in Vietnam, MZe, 2010

Figure 6 Project area in Vietnam, MZe, 2010

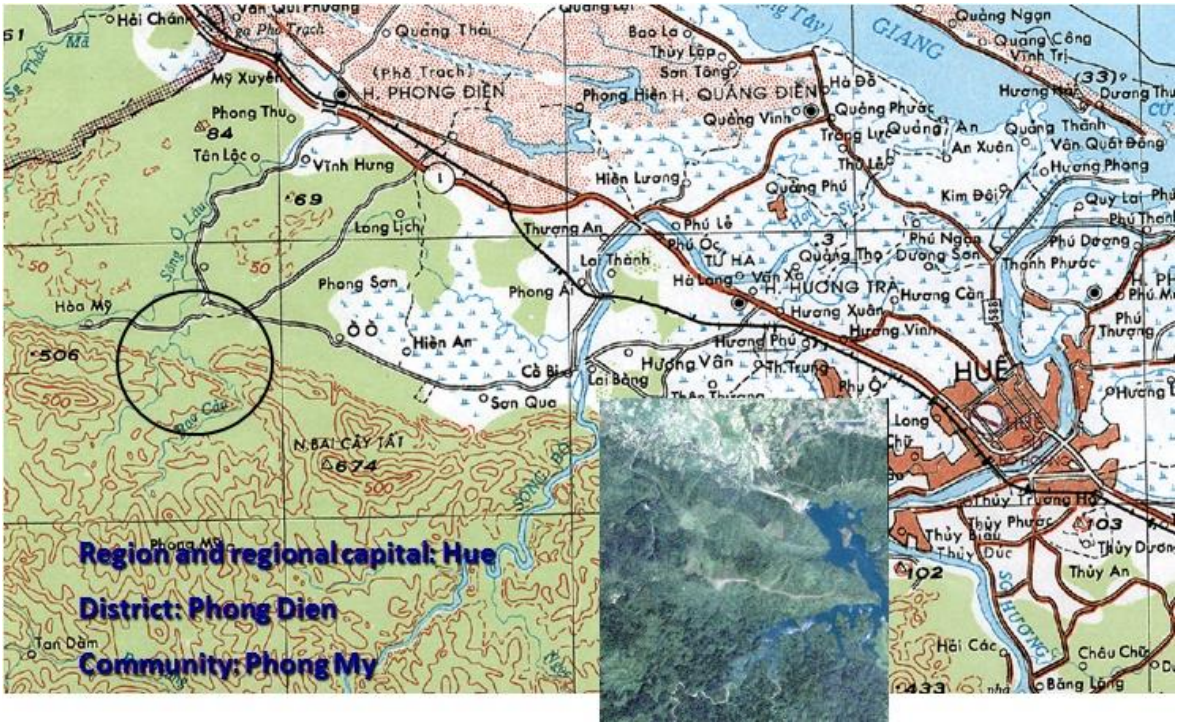


Figure 7 Project area in Indonesia, MZe, 2011

Location of North Sulawesi

Figure 8 Conversion of original growth to plantations of Acacia (Vietnam- Phong My commune), MZe, 2010

Figure 9 Structure of the dipterocarp forest (Indonesia, North Sulawesi), MZe, 2011

Figure 10 View on the fir forest(Abies bornmuelleriana) in mixture with beech (Fagus orientalis), in favor of Kastamonu University, 2014

Figures from Vietnam and Indonesia were part of the projects output, which were provided with favor of MZe (The Ministry of Agriculture of the Czech Republic). Figure from Turkey was gained based on my personal communication with Kastamonu University.

4. RESULTS

4.1. SWOT analysis

Basically for the project evaluations SWOT analysis was selected. However in the literature sources there is a lack of criteria of project evaluation, for instance, McElwee (2009) evaluated large Vietnamese program for reforestation on bare hills and she used her own criteria without quantification. Therefore I create an auxilliary table which shows several criteria in easy evaluations "yes or not".

General guidelines includes (whether or not):

- Forest habitat type (soil type)
- Forest type
- Differences in soil types
- Present vegetation cover
- Target tree species composition
- Rotation cycle
- Regeneration period
- Non-timber production
- Forest functions
- Forest protection
- Reccomendation for tending and harvest

Above mentioned criteria are only auxilliary because the approach for three projects were different. Thus mine method for evaluation is the SWOT analysis which is broadly used for project evaluation. The SWOT analysis consists of four main criteria:

- Strengths-internal characteristics providing an advantage
- Weaknesses- internal characteristics giving disadvantage compared to others
- Opportunities-external elements that can be used to its advantage
- Threats- external elements that could cause difficulties (Bizsol, 2016)

Identification of SWOT´s finds to be very useful tool for informing about following steps in planning to achieve desired objective. Decision makers are those to consider whether desired objective is obtainable or not (Hill and Westbrook, 1997).

4.1.1. SWOT Vietnam

Strengths

- solves the lack of valuable timber production
- maintains the biodiversity
- only slightly reduces present practice of plantation creation
- only slightly reduces the income from plantations to farmers
- is feasible due to spatial arrangement (technical feasibility for planting)
- forms mixed stands
- utilizes relation and competiveness between tree species
- enables agroforestry practices
- covers forest functions and non-timber production
- fulfills the criteria for sustainable forestry, such as permanent production, regeneration and maintenance of biodiversity

Weaknesses

- present FT instead of FHT are basis for forest differentiation
- differences between protection and production forests were given by local authorities before creation of general guidelines
- forest functions, forest protections as well as non-timber production is expressed only as a list of items without details and quantification
- soil investigation was neglected; all area was covered only by one soil type
- slope steepness was not taken in consideration
- spectrum of target tree species is limited

Opportunities

- to calculate production in near and long horizons
- future harvest of valuable timber will replace the loss of such timber production coming from present forests (no one cares of regeneration of valuable tree species except teak)
- enables future natural regeneration (investment saving)
- blocks the present strategy practice slash-and-burn
- shows differences of production for future market
- forms one of the best practice

- the system can be modified in the future either for agroforestry or according to changes of conditions

Threats

- lack of seedlings coming from nurseries
- generally lack of reproductive material
- forest policy (local, regional, state) preffering fast-growing plantations
- lack of farmers awareness about future production
- permanent use of practice slash-and-burn which destroys also long growing tree species (forest fires)

4.1.2. SWOT Indonesia

Strengths

- shows clear differences between two forest categories (forest production, forest protection)
- solves the lack of valuable timber production
- maintains the biodiversity
- only slightly reduces the income from plantations to farmers
- is feasible due to spatial arrangement (technical feasibility for planting)
- forms mixed stands
- enables agroforestry practices oriented to high production in all spectrum of crops (spices, corn, vegetable, coffee,etc.)
- is based on soil types
- gives the clear difference between production and protection forests
- utilizes relation and competiveness between tree species
- controls the erosion on fragile soils
- fulfills criteria for sustainable forestry
- recommendations are divided into basic and alternative

Weaknesses

- present FT instead of FHT are basis for forest differentiation
- differences between protection and production forests were given by local authorities before creation of general guidelines

- forest functions, forest protections as well as non-timber production is expressed only as a list of items without details and quantification
- all area was covered only by one soil type
- spectrum of target tree species is limited
- only timber production is taken in consideration, no other forest functions

Opportunities

- to calculate production in near and long horizons
- future harvest of valuable timber will replace the loss of such timber production coming from present forests (no one cares of regeneration of valuable tree species except teak)
- enables future natural regeneration (investment saving)
- blocks the strategy practice slash-and-burn
- shows differences of production for future market
- forms one of the best practice
- the system can be modified in the future either for agroforestry or according to changes of conditions
- use the present gaps in forests in buffer zones (tree cover naturally spread on former agricultural land)

Threats

- environmental policy preffering plantations of oil-producing plants
- lack of seedlings coming from nurseries
- generally lack of reproductive material
- forest policy (local, regional, state) preffering fast-growing plantations including oil-producing plantations
- lack of farmers awareness about future production
- permanent use of practice slash-and-burn which destroys also long growing tree species (forest fires)
- natural disasters (erruption of volcanos)

4.1.3. SWOT Turkey

Strengths

- present FHT are basis for forest differentiation

- solves the lack of valuable timber production
- maintains the biodiversity
- only slightly reduces the income from plantations to farmers
- only slightly reduces present practice of plantation creation
- is feasible due to spatial arrangement (technical feasibility for planting)
- forms mixed stands
- utilizes relation and competiveness between tree species
- fulfills criteria for sustainable forestry

Weaknesses

- slope steepness was not taken in consideration
- only timber production is taken in consideration, no other forest functions

Opportunities

- to calculate production in near and long horizons
- enables future natural regeneration (investment saving)
- blocks the present strategy practice slash-and-burn
- the system can be modified in the future either for agroforestry or according to changes of conditions

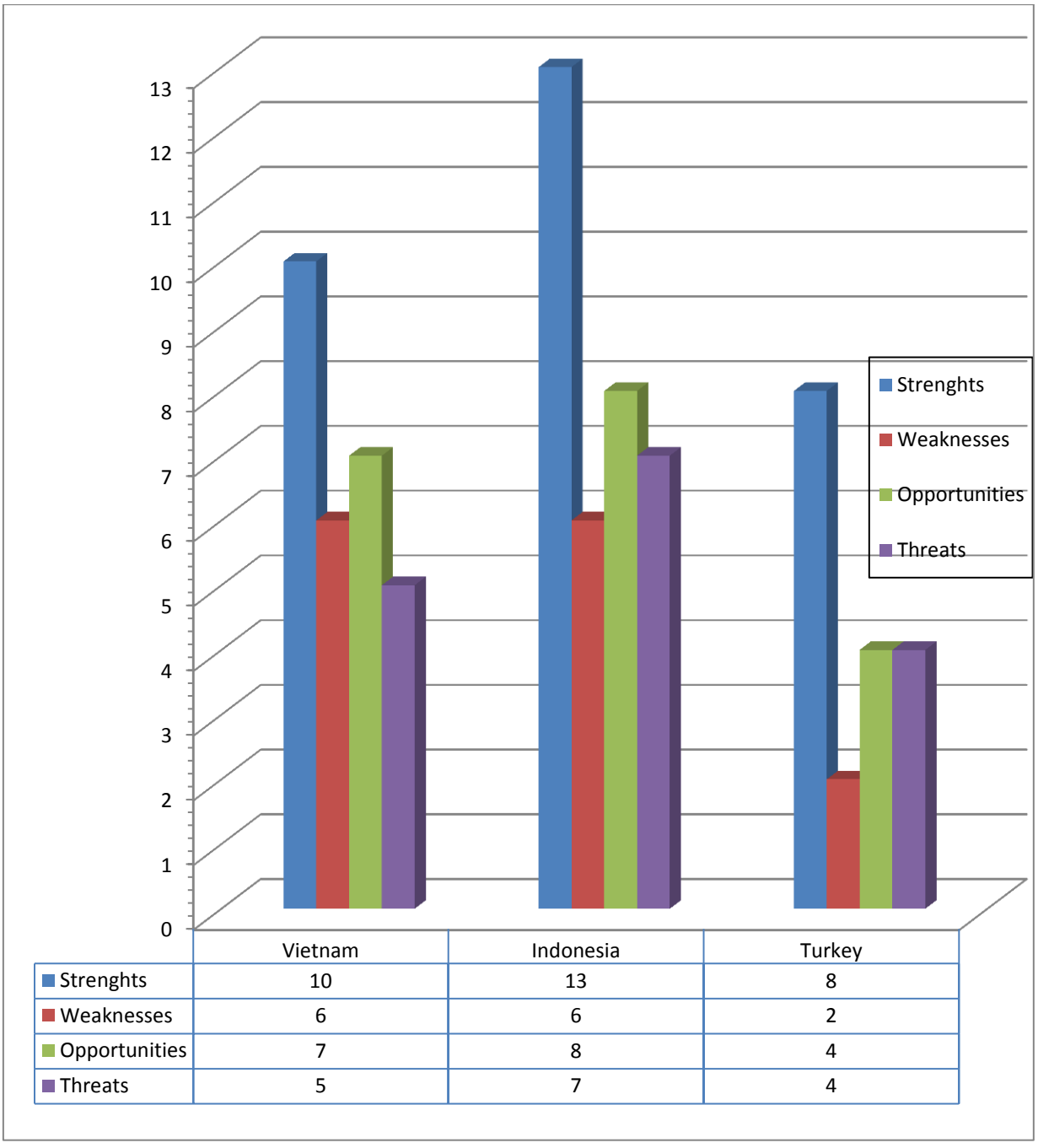
Threats

- generally lack of reproductive material
- forest policy (local, regional, state) preffering fast-growing plantations
- lack of farmers awareness about future production
- permanent use of practice slash-and-burn which destroys also long growing tree species (forest fires)

SWOT forms very important part of evaluation but it is only one part of evaluation because there are differences between criteria (Strengths, Weaknesses, Opportunities and Threats) from their importance. Talking about sustainability, one of the most important thing we have to take in consideration is biodiversity maintenance. If the present status of commercial forestry is oriented to monocultures, bringing only less valuable timber assortments, we should focus on retention to mixed forest connecting advantages of fast growing plantations with advantages of slow growing tree species which brings more valuable timber. Moreover such mixed forests maintain biodiversity

more than monocultures and in addition, they allow natural regeneration after one rotation cycle and differentiation of production. So three examples given in this study fulfills this criterion of biodiversity. Economical proposes are also important, local residents must have stable and undisturbed income from the forests, thus we cannot refuse fast growing plantations completely. Naturaly there are differences among our three examples. Monocultures in Vietnam are based on planting non-native tree species, mainly acacia hybrids. In Indonesia their present forestry in the province North Sulawesi is oriented to monocultures of native tree species, such as *Paraserienthes falcataria* and *Michelia cempaca.* The reason of differences between examples from Vietnam and Indonesia can be explained by the different soil types. While in central Vietnam the main soil type is skeletal lithosol, poor of nutrient content, the soil types in North Sulawesi are very deep volcanic soils, rich of nutrient. Structure of forests in north Turkey is closer to the structure of forests in central Europe. However pine monocultures are also preffered instead of mixed forests.

Figure 11 Comparison among the results from the SWOT analyses of the developing projects, source: own



	Vietnam	Indonesia	Turkey
Strenghts	10	13	8
Weaknesses	6	6	2
Opportunities	7	8	4
Threats	5	7	4

In the presented graph, it is evident that Rehabilitaion of the Tondano Lake Area in North Sulawesi (Indonesian project) brings the most strenghts in its implementation. Regarding to the one of the aims of this MSc thesis (mitigating forest plantations and forest mismanagement) the strengthts of this project shows that created general guidelines take into account all three principles of SFM. Such as permanent production, regeneration and biodiversity maintenance. The positive finding above the project Rehabilitation and Sustainable Development of Forest in Phong My Commune in

Vietnam compared to Indonesian project, is that opportunities and weaknesses revealed by the SWOT analysis, occur roughly on the same level. The most threats reflects Indonesian project, perhaps because Indonesia faces weak environmental policy. In this case, forest policy prefers short-term financial profit from plantations instead of long-term production perspective. Thanks to the present positive, negative and challenging sites of the project in Turkey which involves the management in the buffer zone of the national park Küre Mountains, the findings can be used for a modifying some proposals involved in the project, before implementation. For instance, to count on its opportunities and on their help to modify the effect of the general guidelines according to the natural conditions. Such the best practice could save investments for the forest regeneration (use of natural forest regeneration) or modification of the proposed general guidelines for the future alternative practices of forestry and agroforestry.

4.2. Samples of the general guidelines in Vietnam, Indonesia and Turkey

Hereby provided the samples of the general guidelines created for the projects in Vietnam, Indonesia and Turkey, respectively (Table 1, 2, 3)

Table 1 Example of the General guidelines from the project Rehabilitation and Sustainable Development of Forest in Phong My Commune in Vietnam, Source: MZe, 2010

Forest type	**RT production**

Admin. District	Phong Dien	**Community**	Phong My
Forest management area		Phong My	
Forest category	production	**For. type**	Forest plantation
		Code	RT

Investigated main types of soil	Skeletal lithosols

Tree species composition	
present	optimal
Acacia breed 99%	*Acacia* breed
Syzygium szemaoense 1%	*Hopea odorata*
	Madhuca hainanensis
	Chukrasia tabularis
	Dipterocarpus alatus

	Khaya senegalensis
	Aquilaria crassna
	Xylia xylocarpa
	Sindora tonkinensis

Tree species composition	
present	optimal
Acacia breed 99%	*Acacia* breed
Syzygium szemaoense 1%	*Hopea odorata*
	Madhuca hainanensis
	Chukrasia tabularis
	Dipterocarpus alatus
	Khaya senegalensis
	Aquilaria crassna
	Xylia xylocarpa
	Sindora tonkinensis

Recommended sylvicultural system	note
selection	
clear cut	
shelterwood	
clear cut with reserve trees	

Tree species composition for forest regeneration			
Tree species	%	No of seedlings per ha	note
Acacia breed	90	1667	Spacing 3x2 m
Noble hardwood	10		
Hopea odorata		625	Spacing 4x4 m
Madhuca hainanensis		625	Spacing 4x4 m
Chukrasia tabularis		625	Spacing 4x4 m
Dipterocarpus alatus		625	Spacing 4x4 m
Khaya senegalensis		400	Spacing 5x5 m

Aquilaria crassna		833	Spacing 4x3 m
Xylia xylocarpa		625	Spacing 4x3 m

Rotation cycle	Regeneration period	Note
5 (7)	1	Lines or groups of noble hardwood 40

Principles for planting	Planting in lines, 8 lines with acacia and 2 lines with noble hardwood. It is recommended to leave some trees on area before afforestation for assurance of shade, mainly in case of *Aquillaria´*s planting
Principles for tending	Noble hardwood must be tended (oppressed acacias must be removed or some individuals with the worse shape)
Principles for major harvest	Clear cut of acacia lines

Non-wood production

Type	Note	Type	Note
bark		bamboo	
resin		fruit	
latex		flowers	
medicinal plants		fodder	
leaves		**<u>others</u>**	Source of reproductive materials

Other forest function	Note
Water management	
Erosion control	
Soil improvement	
Wildlife	
Biodiversity	
<u>Social (job opportunities)</u>	
Fishery (water reservoirs in forests)	
Tourism	

Forest Protection	Note
<u>Leaf-eating pests</u> (in future forests)	Individuals of *Aquilaria crassna* are fatally infested by caterpillars, mainly the individuals growing in open

	space directly under sunbeams
Wood-eating pests excl. termites	
Termites	
Fungi	In case of timber harvest it is necessary to transport the timber from the wood as fast as possible because of infestation risk
Fire	
Wind	
Landslides	
Erosion	
Illegal harvests	

Table 2 Example of the General guidelines from the project Rehabilitation of the Tondano Lake Area, North Sulawesi, Source: MZe, 2011

Land units	Coastal Plain
Descriptions	Sandy coastal beaches, dunes and plains
Soil types	Alluvio-marine medium to coarse Fluvisols and Entisols
Max. slope gradient %	5
Management set of stands	Sandy sites on lowland
Forest category	Protection
Code	11

Target tree species
Casuarina equisetifolia
Cocos nucifera
Terminalia catappa
Melaleuca quinquenervia
Santalum album

Variation from model	Note
Movable sandy dunes	Pure plantation of *Casuarina equisetifolia*

Recommended silvicultural system	note
selection	
clear cut	
shelterwood	In case of presence of *Santalum album*
clear cut with reserve trees	

Basic and variations	Rotation cycle	Regeneration period	Note
Casuarina	40	10	Protection forests on sandy dunes rotation cycle 60-80

Table 3 Example of the General guidelines from the project Forest habitat typology in Küre mountains and general guidelines for forest management, Source: Kastamonu University, 2014

1AD	Acid evergreen oakwood
Target tree species	Quercus sp. (evergreen) 30, Ceratonia siliqua 20, Castanea sativa10, Pinus brutia20, Quercus pubescens10, Fraxinus sp.10, bushes+
Rotation cycle	60
Regeneration period	20
Silvicultural system	Clear cut, clear cut with standards
Possible coppice forest	In understory for forming two storied stands where Pinus and part of Castanea will be in upper story like standards and other tree species in lower story from sprouts.
Management	

Following Table 4 shows the sample of the general guidelines for the Czech Republic.

Table 4 Sample general guidelines in the Czech Republic, Source: Šálek, 2014

Number of target management set	Target management set of stands:					Area	
25	RICH SITES IN LOWER ALTITUDES *claystone, sandstone, clay soils, loess loam, cambisol, brown forest soil*					ha	%
Sets of forest habitat types :	1H, 1D, 2S, 2B, 2H, 2D, 1P	*Main tree species:*	OAK, BEECH (PINE)	*allochthonous tree species.(max.%)*	LARCH 5-10, DOUGLAS FIR + - 4, GRAND FIR +- 2, SPRUCE +		
BASIC TARGET TREE SPECIES COMPOSITION:	OAK6, BEECH2, HORNBEAM1, LARCH1, BASSWOOD MAPLE, ELM, ASH, CHERRY, WILD SERVICE, HEDGE MAPLE, BIRCH, PINE, DOUGLAS FIR, GRAND FIR						

LAW DIRECTION (law No .289/ 1995)			*BASIC ECONOMIC RECOMMENDATION (rule No. č.83/ 1996 Sb.):*	
maximal area of clear cut : (§31,odst.2)	*max. width of clear cut : (§31,odst.2)*	*time for established plantation: (§31,odst.6)*	*minimal rate of soil improving tree species % :* (Enclosure No.4 to rule No.83 /1996)	*Soil improving species :* (Enclosure No.4 to rule No.83 /1996)
1 ha	2x average height	7 years	20	BEECH, BASSWOOD, HORNBEAM, MAPLE, ASH, ELM, FIR, GRAND FIR, CHERRY, WILD SERVICE, DOUGLAS FIRE, HEDGE MAPLE, OAK
RECOMMENDED TIME for established plantation:	7 years			

RECOMENDED NUMBERS of bareroot planting stock thous. items/ ha :									
OAK	BEECH	BASSWOOD	MAPLE	ASH	GRAND FIR	PINE			
10	5	5	5	4	2	8			

Silvicultural system:	*Silvicultural system:*
high forest, coppice forest, coppice-with-standards	regeneration by strip (rs), regeneration under a shelterwood (rsh), regeneration by clear-cutting (rc) and their combination
Adequately decreased rate of soil improving species in case of incidental felling: -	

STAND TYPE:	251 -SPRUCEWOOD (undesirable)		253 – PINEWOOD		255 – OAKWOOD	
BASIC ECONOMIC RECOMENDATIONS rulel.No.83/96	*Rotation period*	*Regeneration period*	*Rotation period*	*Regeneration period*	*Rotation period*	*Regeneration period*
	100	20	110	20	140	30
	Beginning of regeneration	*Silvicultural system*	*Beginning of regeneration*	*Silvicultural system*	*Beginning of regeneration*	*Silvicultural system*
	91	rs, rc	101	rsh, rc	121	rs, rsh
Alternative TARGET TREE SPECIES	PINE 6, OAK 2, BEECH 1, BASSWOOD 1, HORNBEAM, LARCH, MAPLE, ELM, DOUGLAS FIR, GRAND FIR		PINE 6, OAK 2, BEECH 1, BASSWOOD 1, HORNBEAM, LARCH, MAPLE, ELM, DOUGLAS FIR, GRAND FIR		OAK 7, BEECH 2, BASSWOOD 1, HORNBEAM, LARCH, MAPLE, ELM, CHERRY, HEDGE MAPLE, WILD SERVICE	

Site class	OAK 24-26	PINE 22 - 24	OAK 24-26
Possibility of natural regeneration:	oak - average. spruce – bellow average	pine - bellow average	average
REGENERATION METHOD and commixture of species:	Fast conversion, strip cutting (clear cutting), facing wind and on shady part (moisture). outposted segments for BEECH, BASSWOOD, MAPLE, ELM. Interspersed species have to be used for natural regeneration, to let them as standards. Thinner parts for underplanting.	Fast conversion, strip cutting (clear cutting), facing wind and on shady part (moisture).. Possible shelterwood segments. Interspersed species have to be used for natural regeneration, to let them as standards. Thinner parts for underplanting.	Shelterwood regeneration if not possible so strip cutting or clear cutting. BEECH, BASSWOOD, MAPLE, ELM into outposted segments. For quality assortments it is necessary to have second story – underplanting in 40-60years. To keep standards of CHERRY, HEDGE MAPLE, WILD SERVICE, +LARCH.

4.3. Differentiation in the general guidelines and their natural conditions criteria presented in the developing projects

Table 5 Differentiation in the general guidelines and their natural conditions criteria presented in the developing projects, source: own

	Vietnam	Indonesia	Turkey
Forest habitat type	0	0	1
Forest type	1	1	0
Differences in soil type	0	1	1
Present vegetation cover	1	0	0
Target tree species composition	0	1	1
Rotation cycle	1	1	1
Regeneration period	1	1	1
Non-timber production	1	0	0
Forest functions	1	0	0
Forest protection	1	0	0
Recommedation for tending and harvest	1	0	0
Total	8	6	5

We can generaly admit that presented auxilliary table together with the SWOT analysis, proposed in this MSc thesis can be an effective tool which may contribute to the final decision making and future alterations of the forest management in the tropical and subtropical countries.

Nevertheless the weight of this criteria is different, too. From this point of view, the principles of creation seem to be inconsistent. Unfortunatelly basic items for

differentiation in Vietnam are FT, while in Indonesia soil types and in Turkey FHT. Soil types and FHT better show the potential vegetation cover fulfilling the forest functions the best. But in Vietnam, FT meaning the present forest cover are less inapropriate because they do not show the differentiations among the forest vegetation.

While Indonesian and Vietnamese general guidelines are roughly similar, the general guidelines from Küre mountains are different. First of all they are not so elaborated and they do not solve non-timber production, forest protection and other forest function. As they are close to temperate forests they corresponds better to the differentiation according to forest habitat typology. Actually the system of FHT is completely new, Küre mountains has no former forest habitat typology. This fact leaded to the situation pine is the most preffered tree species without relation to natural conditions. On the other hand buffer zone in a new established national park where the intensive forestry is allowed, enables the establishment of differentiation of production just according to natural conditions.

If I would connect the SWOT analysis to the auxilliary table (table 5) above which shows the differentiation in general guidelines and their content, we must admit that Vietnam had the most natural conditions criteria fulfilling the requirement for creation of the general guidelines, except the basic items for differentiations (FT). Yet Turkey is in the preparation phase, the negative side of the proposed project is that neither forest protection, either non-timber production is mentioned and recommendations for the tending and harvesting are very brief. In general, present situation, mainly in Indonesia linked with so far sufficient stock volume in the forests does not support ideas about future lack of valuable timber. Still, Indonesia exports, higher amount of timber does not matter from legal or illegal harvest. Nevertheless this situation cannot be the same forever and the projects, considering this fact can be successful from economic point of view in the future when the prices of valuable timber will be going up.

Comparing the proposed general guidelines in our projects with the general guidelines in the Czech Republic (table 6) we can admit that three proposed general guidelines reaches very good fulfilling of criteria for general guideline creation. Naturally, there are differences, mainly coming from different approach and different legislative. In tropical countries basically no limits for clear-cuts, no need for soil improving and re-enforcing tree species, etc. On the other hand we should take in our consideration non-

timber production, too. Unfortunately, non-timber production is missing in Indonesia as well as in Turkey.

4.4. Comparison of the proposed general guidelines in the three projects with general guidelines in the Czech Republic

Table 6 Comparison of the proposed general guidelines in the three projects with general guidelines in the Czech Republic, source: own

General Guidelines	Value %	Note
Czech Republic	100	
Vietnam	80	Basic FT (no FHT), sophistic recommendations
Indonesia	70	Only timber production, brief recommendations, only soil types
Turkey	70	Only timber production,very brief recommendations, new creation of FHT

5. DISCUSSION

First of all it must be stressed that examples described in this study are only attempts how we can contribute to solving of present issues in tropical and subtropical forests. Every day we can read and hear bad news about the situation in such forest types. Problems in tropical and subtropical countries, such as deforestation, illegal logging, loss of biodiversity, conversion to plantation, etc. and scientific articles dealing with loss of biodiversity in plantations appeared recently (McELwee, 2009, Šálek, 2014 et.al.). However there are only few plans which try to solve the problems in their basis. Just Czech projects try to find better solution. They solve serious problem in the future of which nowadays nobody take care. It is lack of valuable timber and differentiation of production. Differentiation of production is crucial for maintain a livelihood of the local residents and communities because it helps to get the maximal production (timber and non-timber) in quality and quantity for local residents and communities. That is why it involves different target tree species composition, rotation cycle, regeneration period, sylviculture systems, etc.

The problems in the tropics and subtropics with deforestation, land conversion into plantations, illegal logging, induce of forest fires, corruption in forest sectors are nowadays widely discussed. For instance in Vietnam, due to large rate of deforestation through illegal logging, numbers of afforesting programs were embarked (McElwee, 2009). This MSc thesis is largely focusing on these topics. The origin of mentioned environmental complications is rooted in poor living conditions of the millions of people living in the countryside, which livelihood depends on the forest resources. Like Indonesia, having more than 250 million of inhabitants of which 30 to 60 million people live in the forests (FAO, 2016).Therefore we must realize the value of the forest ecosystem and try to act accordingly. No doubts about irreplaceable role of forest governance in the forest management for the nation ´s supplies of the forest resources (FAO, 2001). Yet it still prevails in many countries, Vietnam, Indonesia and Turkey are no exceptions.

Illegal logging is posing a threat to the achievement of sustainable forest management in the tropics and subtropics. It is not a simple tool of criminality but a complex political and economic system involving multiple stakeholders. Its extent is not homogenous and its characteristics depend on the supplying markets, either at national or international level. The diversity represents the production and illegal timber trade suggests tools for

its controls. These tools are different for producing and consuming countries. Forest policies in the tropics spur medium/large timber producers to fulfill domestic demands. Due to high price of the timber in the international markets, logging companies sell the products preferably to Asian or Western clients. Therefore, domestic markets dominate low-quality timber products. They may be supplied by small producers and it is facilitated by small-scale logging titles which authorize citizens to logging, unfortunately of limited amount of trees. However, the problem is they are not adapted to the current needs of chainsaw millers and they are also requested by the administration in rare cases. That is why the domestic timber sector in tropical and subtropical countries stays informal. The chain in chainsaw milling operations involves actors varying from the tree owner to the end consumer. The process of chainsaw milling supply depends on status of chainsaw milling that is legal or illegal, the organization of production (individuals, enterprises or communities) and finally on the integration among the participants in the trade. The chainsaw milling teams has an operator and few assistants milling the lumber transport it to access roads or rivers. Operators work independently and they own their own equipment or owned by others. The wood is traded in the local markets or sold to the end customer. In local markets, a number of people are employed in further processing. Whole chainsaw process is financed by dealers from the urban centers. They trade lumber in the wood markets. Therefore, law enforcement agencies create a very important part in the whole supply chain, unfortunately through bribery. The State is then the main looser in this process, since it is not involved in land management plans and do not pay forestry or else taxes (Kishor and Lescuyer, 2012).

Talking about corruption, the forest sector in Indonesia is the most common sector where this practice occurs. For instance, Western countries demand proof their timber imports are legal. Fulfilling an agreement of Indonesia signed with European Union in September 2013, the country roll out a system in which logging companies hold government permits, are giving a certificate as a proof their timber is harvested in legal way. Unfortunately, governmental logging permits are often obtained by illegal means, where these permits are bought from officials with bribes, as mentioned before. Even forest sector is legally obliged to meet strict guidelines before permits being granted, such as carrying environmental impact assessment out and consulting communities being affected by their operations, permits are anyhow carried out despite no such

requirements are being fulfilled (Dewan, 2014). Only anti-corruption commission came with study where commercial value of illegal logging between 2003 and 2014 was estimated from 60.7billion to 81.2 billion US dollars (Transparency International, 2015). Indeed, current situation in Indonesia is not only regarded as serious but has an international dimension. As mentioned before, the government is trying to cooperate with international initiatives to reduce the trade in illegal timber. The recent economic crisis, forest fires of 1998/99, decentralization of government to district level and over capacity of domestic industry (the forests perceived as a vast resources in relation to industry capacity, focus on short term profit rather than sustainability) has contributed to confused situation providing opportunities for illegal logging (WWF, 2009).

Efforts to cut down illegal logging of forestlands in Turkey are blocked by lack of personnel and equipment. Turkey has almost 21 million ha of the forests and all of them are managed by The General Directorate of Forestry, thus state. Only 5887 of forest rangers are employed under this agency and each 3600 ha of forestlands is held by this forest ranger, monitoring and preventing illegal logging activities. However bad weather in winter makes forestlands inaccessible, thus rangers access forests by walk. Control of illegal logging is inefficient in such cases. Therefore this obstacle prevents protection and enforcement of law (Gunes, 2001).

Yeom and Chandrasekharan (2002) analyzed implications of illegal logging in the Indonesia, its impacts for the society and how to implement measures to achieve sustainable forest management. Hereby, a number of recommendations presented in the article, are provided.

Forest sector reforms (Law enforcement)

- To enforce institutional capacity to control forestry activities, which would promote the support of the poor peasants to live with forest in harmony;
- To propose punishments for companies without permissions to harvest;
- To detect the corruption within enforcement agencies (governmental and non-governmental agencies);
- To found anti-illegal force for reporting to the high authorities;
- To ban on log exports, not exceeding three years;
- To found a system of rewards to the poor peasants;
- To arrange the agreements with receiving countries to manage illegal log trade;

- To encourage alternative wood sources by participation of the people in the tree-planting and agroforestry;
- To remove subsidies that support malpractice;
- To promote small-scale forest-based enterprises
- To increase the rent of the natural resources (so called ,,*rent-seeking*,, and ,,*rent capture*[1]) linked with providing the information about the real value of the timber;

The causes of the low rent capture affecting the present situation:

- A lack of accounting forest resources
- A lack of system estimating forest values
- An under-estimation of the timber value – due to lack of the information provided by enforcement agencies
- Bans on log export in the past (in 2001) (ITTO, 2014) have contributed into none flow of information on prices of log in international markets to support the estimation of potential rent
- Lack of people ´s participation and public ignorance
- Complicated collection procedures of the information on timber value
- The consequences of the low rent captures:
- Government revenue loss
- Corruption
- Encouragement of the concessionaries (logging concession)
- Financial losses by wasteful and illegal logging
-

[1]**Rent-seeking*- is the seeking to grow up the share of existing valuable natural resources

**Rent-capture*- calculation of the real value of the timber, it is an indication for logging concession management, for instance during 1997-98 the rent capture in Indonesia created only30%;therefore concessionarries remained a lot of money (Yeom and Chandrasekharan, 2002)

Measures to improve the rent capture:

- To connect the charge of forest product into the estimation of the rent of the forest resources
- To differentiate the log charges by species, quality and location
- To establish the Framework for the forest revenue system (referring to the Forest sector reforms (Law enforcement))
- (Yeom and Chandrasekharan, 2002)

With regards to the article made by Yeom and Chandrasekharan, recommendation for a ban on log exports which do not exceed three years cannot be put in this simple way. Because the question is then, what would be the financial resources the local farmers would live from if the export would be prohibited? The more appropriate and realistic approach would be to recommend the export based on the amount of harvested timber. In terms of the increase the rent of the natural resources, it is always a question of the log prices and various middlemen, between the producer and the end user, which was already explained above. To conclude presented situation with the recommendation of the increase the forest rents, any administration measure may be not enough. However the effective recommendation would be firstly to improve the access of producers to the information containing estimations of the real timber price and secondly, the access of these provided information to the market and to the end users. Here, again, the role of the governmental and NGO ´s would be highly appreciated. More effective role of these agencies in the management of charges for forest resources would improve the access of producers to the market and to the end users.

The authors tries to resolve the adverse trend, however they solve the consequences instead of the reasons. In other words, they rather focus on ”*How*,” instead on “*Why*”. Provided literature sources should rather highlight that the forests should be restored by its original structure, no plantations, if recovered at all. The wood is a renewable resource, and we can use also natural rehabilitation. Moreover, thanks to the main importance of the forest management, the long-term view to the future, the problems of forests in the present situation (gradual exploitation of the quality timber supplies meanwhile increasing demand for them) can be at least mitigated. This is something what the Forest Management in the Czech Republic do understand.

There is enough literature available considering advantages and disadvantages of fast-growing plantations. One might think of advantages of plantations in the sense of their potential support to natural forest conservation. For instance Pirard (2016) call this statement in his article as a *plantation conservation benefit.* The problem is that disadvantages of fast-growing plantations are known but there are only a few studies and proposals how to restore forest with richer structure, how to create their long-term management, which benefits. And in which periods local residents and communities could await production and how the required differentiation should look. Evaluation of existing projects or their proposal can reveal their benefits and risks. Approximately half of the literature sources used in this study from which literature review extracts information are either of a discussion or descriptive statistics type. That means their value can be limited in providing new evidence in support of causative relationships. For example, it would be simplified to take into account one concrete demand and one given ratio of tree plantations expansion, and after deduce the area of natural forests that might save from conversion or degradation. Nevertheless, these studies are useful for emphasizing trends in productivity and spatial location of the plantations (Pirard, Secco and Warman, 2016).Their role might be supportive in knowledge of policy decision makers. Indeed, intensive researches dealing with the basis of the reasons for vast deforestations in tropical countries are now truly challenged.

As mentioned before, this study serves as a proposal to: sustainable forest management in the tropical and subtropical forests, how to mitigate plantation expansion and natural forests degradation, and finding a balance among those problems.

One of the decisive study which was published recently is the study dealing with negative impact on biodiversity within the reforestation on "bare hills" (McElwee, 2009). While the natural succession leads to a forest, more or less well- structured, the present vegetation cover is replaced by acacia monocultures. The level of biodiversity is very poor, even in comparison with present vegetation cover (bare hills). Therefore the situation should be changed, but the problem is that lot of communes and local residents derive their livelihood from present practice, i.e. from acacia plantations. The solution of this issue is differentiation of production which includes the present practice (acacia plantations) as well and adds segments with other forest production which brings better income but in long-term horizon. Naturally there are proposals, governmental and non-governmental, attempting to make solutions. However their solution are based on strict

regulation, bans of economic activities in forests, certifications etc., but they do not solve the situation of local people and enhance the struggle between communes and government (Yeom and Chandrasekharan, 2002). To conclude this part, it must be stressed that present recommendations and solutions do not touch the basis of the problem. The evaluation of Czech projects shows that they try to solve the problem implementing the Czech know-how of forest management to quite another natural condition. Nevertheless I must admit that in some parts, the projects are incoherent because there are differences among them. The differences are expressed in various applications of Czech know-how. While in Vietnam, the content of general guidelines is the most sophisticated, in Turkey is very brief. On the other hand, the biggest lack of general guidelines used in Vietnam is that differentiation of natural conditions is given in forest types not in forest habitat types. And the soil investigation in Vietnam is poorer than in Indonesia even than in Turkey. Three proposals make a differentiation expressed in different target tree species composition, rotation cycle, regeneration period, sylvicultural systems, recommendations for harvest, tending and reforestation. Those recommendations in Turkish case are very brief in comparison to the other projects. I must admit that all three projects try to solve the present forest status coming from use of FGT ´s as new approach which adds either new segments or new tree species into present forests. Using this strategy the present forest practices are not completely abandoned and still remain the economic basis for local residents and communes. In addition, such strategy of conversion is acceptable for local people. From this point of view, we should appreciate such attempts of solution regardless the fact that those projects were created only on small areas in comparison with whole country areas. They can serve as examples of methods how we can improve the present forest status without making troubles for local economies. Naturally, the projects must be critically evaluated and the study is one attempt of such critical view. The SWOT analysis revealed positive as well as negative facts and impacts to forests considering their present situation and their future. The heaviest problem is the future, because the lifestyle of poor farmers is more or less survival. If their income is more or less one or two dollars per day, they do not care about future, their care of the present. From this reason the strategy of implementing is addition of new segments to the present practice, not complete conversion. Looking at SWOT analysis, the two components are in all three projects: biodiversity maintenance and timber production. Using the Czech methods, they can

have biodiversity via forest economy (does not matter that local farmers do not care of biodiversity). The forest must be profitable and valuable native tree species are able to bring higher income than poor plantations. The problem is in long-term horizon so mixing the segments with fast growing and slow growing tree species seems to be one of the best ways for conversion. Furthermore the market situation indicating the lack of sources of valuable timber in the future (Dung, 2015). For instance Vietnam becomes now one of the biggest exporter of furniture based on processing of the most valuable timber. However nobody focus on future production of such timber. If we presume the shortage of valuable timber sources, new forests from the projects are able to solve this shortage, naturally not completely but only as examples.

6. CONCLUSIONS

The present situation in forests is getting worse and worse in contrast to effort of national and international institutions. Although they seek for valuable timber price, the care of regeneration of rich-structured forests is very poor. Rich-structured forests are converted to agriculture land or plantations of FGT´s. If the stock volume of valuable tree species (except teak) is limited and consequently their prices go up, the larger space for illegal harvest and corruption appears.

This study reveals certain positive and negative facts from recent and proposed czech projects in tropical and subtropical countries. Learning from the evaluation of this projects we should get rid of certain defficiencies in creation of future projects for developing aid. On the other hand, the evaluation also reveals that these projects become one of few projects trying to solve the problem in its basis. I do not want to judge present forest plantations as only negative forest methods. Forest plantations are better, even in biodiversity level, than a desert or very degraded (totally eroded) land. But now we should make the next step to add something; in our case to add a care of biodiversity and other forest functions. It is similar to the history of the Czech forestry. The spread of conifers in Czech Kingdom in nineteen century was reaction to heavily damaged forests in eighteen century and for assurance of renewable sources for developing industry and society. From this point of view it was well-appreciated and unique methods for improvement of the forest status. But now we know that monocultures have also disadvantages (pest infestations, wind disaster, war ´s reaction to free market, etc.) so the solution is not complete conversion of present conifer forests to forests formed by native tree species but creation of mixed forests. Thus the same strategy we should recommend also in tropical forests. We need a tool for implementation of those ideas. And the tool is differentiation according to natural conditions and creation of items of frame planning, i.e. creation of general guidelines. The first step is investigation of natural condition and establishment of basic groups of FHT. Every group is represented by native vegetation cover (climax) which would develop during natural succession. And now the second step must follow. The proposal of forest intervention in order to get the maximal production (timber and non-timber) in quality and quantity for local residents and communes. That is why the differentiation is manifested in different target tree species composition, rotation cycle, regeneration period, sylviculture systems, etc.

One thing is the most important. All systems presented in this study are able to work only in one case. If they are adapted by end users, in our case local farmers. So, in tropical and subtropical countries the solution is not only the case of forest expertises but mainly they lie on awareness of local people.

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