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Creating a composite indicator and its interpretation for selected countries of the region of Southeast Asia

Diploma thesis

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BRNO 2015

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Abstract

The diploma thesis is focused on creation of the composite indicators and their interpretation in the region of Southeast Asia. The indicators are chosen from three crucial fields of development, namely economic, social, and environmental field. The thesis also deals with regional disparities. Three countries were chosen representing the former area of Indochina, and Thailand as their closest neighbour. The theoretical part provides a basic overview of the key definitions and characteristics related to the issues. In the analytical part five composite indicators from each field of development are computed to evaluate the situation in the chosen countries. Correlation, cluster analysis, and regional disparities evaluation are contained in the analytical part as well. Finally, the data are assessed and recommendations are proposed.

Key words

Composite indicators, regional disparities, Southeast Asia, correlation, cluster analysis

Abstrakt

Diplomová práce je zaměřena na tvorbu kompozitních indikátorů a jejich interpretaci na region Jihovýchodní Asie. Indikátory jsou vybrány ze tří hlavních oblastní rozvoje, a to z ekonomické, sociální a environmentální oblasti. Dále je v práci obsažena problematika regionálních disparit. K analýze byly vybrány čtyři země tohoto regionu. Teoretická část obsahuje přehled základních definic a charakteristik, které jsou s problematikou spojeny. V analytické části je vybráno pět kompozitních indikátorů z každé oblasti rozvoje, aby bylo možné zhodnotit stav v jednotlivých zemích. Analytická část také obsahuje korelaci, shlukovou analýzu a hodnocení regionálních disparit. Závěrem jsou zjištěná data rozebrána a jsou navržena některá doporučení na zlepšení situace.

Klíčová slova

Kompozitní indikátory, regionální disparity, Jihovýchodní Asie, korelace, shluková analýza

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ASA	Association of Southeast Asia
ASEAN	Association of Southeast Asia Nations
CIs	Composite indicators
CLI	Composite Leading Indicators
CO_2	Carbon dioxide
EEA	European Environment Agency
FA	Factor Analysis
FAO	Food and Agriculture Organisation of the United Nations
G	Gini index
GDP	Gross Domestic Product
GNI	Gross National Income
HCFC	Hydrochlorofluorocarbon
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
IHDI	Inequality-adjusted Human Development Index
ILO	International Labour Organisation
IMF	International Monetary Fund
Lao PDR	Lao People's Democratic Republic
MAPHILINDO	Greater Malayan Confederation
MDG	Millennium Development Goals
ODA	Official Development Assistance
ODP	Ozone Depletion Potential

ODS	Ozone Depleting Substances
OECD	Organisation for Economic Cooperation and Development
PCA	Principal Component Analysis
PPP	Purchasing Power Parity
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSD	United Nations Statistics Division
UNU-CRIS	UN University Institute on Comparative Regional Integration Studies
WB	World Bank
WHO	World Health Organisation
WTO	World Trade Organisation

1 INTRODUCTION

The decrease in the number of people living in poverty, environmental protection or struggle with diseases. These topics became frequently discussed on various summits around the world. It was also pointed out that the gap between the rich and the poor is widening or that global warming causes floods and threatens to flood out several islands. One solution for preventing these threats is to ensure that sustainable development in developing and developed countries functions in a stable way.

It can be stated that the developing countries have not yet secured sustainable development in every aspect of it. There still exist several parts of the development that need to be improved. Analysis of each pillar is necessary in order to define their weaknesses and concentrate the effort to improve the development in these weak spots.

The composite indicators are a widely used tool to compare development performance of objects, countries, regions etc. They can provide a comprehensive perspective of a phenomenon that cannot be analysed using only one indicator. To create a composite indicator with the final ranking several steps have to be followed and corresponding methods have to be chosen.[1] The composite indicators can be used in each pillar of the development: environmental, economic, and social.

The aim of the thesis is to assess development situation in chosen countries using the composite indicators and to evaluate regional disparities together with inequality in these countries. Each pillar of the development is represented by five indicators that are chosen subjectively. The environmental pillar includes CO_2 emissions, improved water sources, consumption of ozone-depleting substances, forest area, and agricultural area indicators. The economic pillar contains GDP growth, employment to population, gross savings, Net Official Development Assistance (ODA) received, and external debts indicators. The social pillar is

[1]HUDRLÍKOVÁ, Lenka. *Composite Indicators as a Useful Tool For International Comparison: The Europe 2020 Example*. Prague, 2013

composed of total fertility rate, ageing, life expectancy at birth, HIV infected, and under-five mortality rate indicators.

In addition the results of Thailand are compared with other countries in the region in order to find out the differences between Thailand as a never-colonized country with former French colonies, i.e. Cambodia, Lao PDR and Vietnam.

The thesis is divided into four main parts. Firstly, theoretical part provides basic overview of the main characteristics and definitions important for further analysis. Secondly, the methodological part describes methods and sources used. Thirdly, the composite indicators are computed in the analytical part for each pillar of the development and for each country. Ranking based on the results is produced to easily assess the final results. The regional disparities and inequality data are contained in this part as well. Finally, the results are evaluated and several recommendations are suggested to improve the weak performance in the countries if there is any. Furthermore a comparison of Thailand with other countries is contained in the recommendation.

2 THEORETICAL PART

2.1 Sustainable Development

2.1.1 Definition of the term

According to the World Bank, main aim of Sustainable development is to recognize that growth must be both inclusive and environmentally sound to reduce poverty, to build shared prosperity for today's population, and to continue to meet the needs of future generations. It is characterized by efficiency and carefully planned actions to deliver both immediate and long-term benefits for people, planet and prosperity.[2]

International Institute for Sustainable Development quotes the definition used in "Our Common Future" (Brundtland Report) from 1987, where Sustainable development meets the needs of the present generations without compromising the ability of future generations to meet their own needs. Two key concepts of needs are set. First point is that the concept of needs as the essential needs of the world's poor, to which overriding priority should be given, and second point is the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.[3]

The third and final definition, which should be given in this thesis, is not particularly different from the definitions mentioned above, but gives another perspective. It is crucial to define the development itself. The main aim of development is to maximize desirable social objectives. These objectives include increase in real income per capita, improvement in health and nutritional status, educational achievement, access to resources, fair distribution of income, and finally increase in basic freedoms. Sustainable development is then a situation in which these objectives do not decrease or worsen over time. In general it is a

[2]Sustainable Development Overview. 2014. *The World Bank*.
[3]What is Sustainable Development?: Environmental, economic and social well-being for today and tomorrow. 2013. *International Institute for Sustainable Development*

strategy that manages all assets, natural resources, and human resources, as well as financial and physical assets, for increasing long-term wealth and well-being. [4]

2.1.2 Three pillars of Sustainable Development

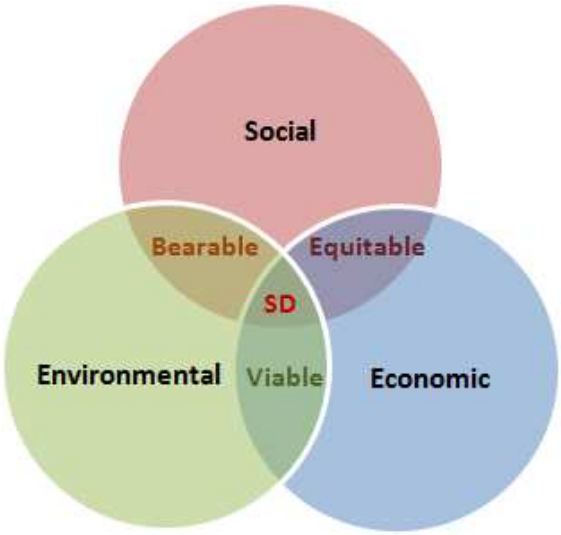
The three pillars of Sustainable Development represent the three key areas of sustainability. The main goal is to find balance between economic development, social development and environmental protection.

One of the most important discussions about sustainable development had been gathered in Rio de Janeiro, Brazil in 1992. The world leaders adopted Agenda 21, which specifies the action plans to realize sustainable development at national, regional and international level. This so-called Rio Earth Summit was followed in 2002 by the World Summit on Sustainable Development, where the Johannesburg Plan of Implementation was adopted. The plan provided concrete steps and time-bound targets and goals with minimizing the mistakes from previous Earth Summit. [5]

In 2012 the summit of world leaders gathered again in Rio de Janeiro. The highlighted points included the effort to secure renewed political commitment to sustainable development, assess the progress the implementation gaps in meeting already agreed commitments, and address new and emerging challenges. The Rio+20 Earth Summit focused also on green economy in the context of sustainable development and poverty eradication, and institutional framework for sustainable development.[6]

[4]PEARCE, David. Edward Barbier. 1990. *Sustainable development: economics and environment in the Third World*. Pages 2 – 4.
[5] Sustainable Development Overview: Background. 2014. *General Assembly of the United Nations.*
[6] Ibidem.

The three main pillars of sustainable development and their mutual connection, which should be observed, are shown in the Picture 1.



Picture 1: Three pillars of Sustainable Development, source: Own work

2.1.2.1 Social sustainability

Social sustainability as the least developed pillar is often posited in relation to ecological or economic sustainability. In general it means the ability of a social system, such as a country, to function indefinitely at a defined level of social well-being. The defined level corresponds to optimal quality of life for those living and their descendants. Despite this the optimal quality of life can differ in each nation, religion or even the class. Therefore the social sustainability represents the weakest pillar of the development.[7]

2.1.2.2 Environmental sustainability

The environmental sustainability is a systematic conditions where neither on a planetary nor on a regional level do human activities disturb the natural cycles more than planetary resilience allows, and at the same time do not impoverish the natural capital that has to be shared with future generations. It is based on a principle that every person, including the future ones, has a right to access the same

[7]Social Sustainability. 2013. *Twink.*

amount of natural resources. The industrial society and sustainability have to be in balance, the division between these two aspects are proved as an unwise use of renewable resources, like over-exploitation of some species or under-employment of renewable resources of energy, and as the similarly unwise consumption of non-reproducible resources, such as fast exhaustion of many reserves, high accumulation of waste; and thirdly dispersal of a growing number of synthetic substances into nature. [8]

Environmental sustainability is also contained in Millennium Development Goals as a goal 7. The main set targets are as follows: Integrate the principles of sustainable development into county policies and programmes and reverse the loss of environmental resources, reduce biodiversity loss and achieve a significant reduction in the rate of loss, halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation; and achieve, by 2020, a significant improvement in the lives of at least 100 million slum dwellers. These goals were set based on the facts that global carbon dioxide emissions have increased by more than 46 percent since 1990, nearly one-third of marine fish stocks have been overexploited and the world's fisheries can no longer produce maximum sustainable yields, or forests are disappearing at an alarming rate.[9]

2.1.2.3 Economic sustainability

Economic sustainability can be described as a process of allocation and protecting scarce resources, while ensuring positive social and environmental outcomes. Therefore the economic sustainability is connected to other two pillars of sustainable development.[10] The World Commission on Environment and Development defined the economic sustainability as an economically sustainable system, which must be able to produce goods and services on a continuing basis, to

[8]VEZZOLI, Carlo. MANZINI, Ezio. Design for environmental sustainability. London: Springer, 2008, page 6.
[9]Millennium Development Goals*: Goal 7: Ensure environmental sustainability. 2014.* United Nations.
[10]DOANE, Deborah. MACGILLIVRAY, Alex. 2001. *Economic Sustainability: The business of staying in business*. United Kingdom: The SIGMA project

maintain manageable levels of government and external debt, and to avoid extreme sectoral imbalances which damage agricultural or industrial production.[11]

The United Nations Conference on Sustainable Development, Rio+20, was held in June 2012. As the outcome of the conference three levels of sustainable economy were set. On the global level, an agreement has to be signed in order to develop a set of global Sustainable Development Goals in key priority areas to complement the existing Millennium Development Goals after 2015. The progress towards the achievement of the goals needs to be assessed and accompanied by targets and indicators. On the national level, it is necessary to recognise the limitations of GDP as a measure of well-being and sustainable development and a programme has to be introduced to develop new national indicators that go beyond GDP. At the corporate level, is important to acknowledge that the implementation of sustainable development will depend on active engagement of the private sector. The importance of corporate sustainability reporting also needs to be recognised and in large companies is necessary to consider integrating sustainability information in their reporting cycle.[12]

2.2 Southeast Asia

Southeast Asia is an area located south of China, east of India, and north of Australia. The term “Southeast Asia” was used during World War II by a British Admiral Lord Louis Mountbatten. The name refers to an area with common customs and unique characteristics. The similarities can be seen in climate as well; the region is tropical. All of the Southeast Asia countries experience the monsoon, although in a different time of year. The existence of wet and dry monsoons, prevailing strong southwest or northeast airflows creates the seasons. On the mainland, the landscape is dominated by several great rivers, such as the Mekong River, which flows from Tibet through China, Myanmar, Laos, Thailand,

[11]M. HARRIS, Jonathan. 2003. *Sustainability and Sustainable Development*
[12]Sustainable Economy. 2012. *The Prince's Accounting for Sustainability Project*

Cambodia and Vietnam and reaches the South China Sea. The rivers provide food and water for more than 100 million Southeast Asians.[13]

2.2.1 Political development

The first state organized in the Southeast Asia was the Hinduised Malay kingdom of Srivijaya. The capital city was Palembang in southern Sumatra. The main aim of the kingdom was to establish a sea route from India to China between Sumatra and the Malay Peninsula. At the beginning of the 13th century the Pagan kingdom acted in Burma, Srivijaya-Saleidra ruled in the Malay Peninsula, the Khmer kingdom of Angkor ruled in Cambodia and also in the part of Thailand. In northern Thailand and Laos Thai settlements acted. In the North Vietnam the kingdom of Annan had power and in the south Champa ruled.[14] In that century Southeast Asia entered a period of transition from ancient times. Five major powers were in the area between 14th and 18th century: Myanmar was under power of Ava, especially the Toungoo dynasty. In independent Vietnam the Later le dynasty ruled, the Thai state was under Ayutthaya or Ayudhia, Majapahit centred on Java; and Malacca centred on the Malay Peninsula.[15]

European powers started discovering the area in 15th and 16th century. Nevertheless Ming-dynasty from China had sent several flotillas in 14th century. Europeans, except for the Spanish in the Philippines, had no interest in colonizing the area but preferred controlling trade at the lowest financial costs. They were not equipped well, but they were determined, well-organized and disciplined fighters. The peak of the western colonization came in the 19th and in the beginning of the 20th century. Only Siam (today's Thailand) remained independent, the rest of the states were divided among the British, French, Dutch and Spanish, with the Portuguese clinging to the island of Timor. Colonial wars took place in Burma, Vietnam, the Philippines, and Indonesia. They continued into the 20th century. Colonial and modern states did not existed for a long time, mostly just for one generation. The

[13]BELLWOOD, Ian. GLOVER, Peter. 2006. *Southeast Asia: From prehistory to history.* Page 6.
[14]A Short History of South East Asia. *Stanford Univesity*
[15]FREDERICK, William H. 2012. History of Southeast Asia. *Encyclopaedia Britannica.* Page 6

Western colonial governments influenced mainly the economic sphere, the development was evident in production of tin, oil, rubber, sugar, rice, tobacco, coffee, tea, and other commodities. A new capitalist system was brought into the area. Even though Siam was not colonized, it was pushed to adopt the policies similar to those of the colonial powers in order to survive. The Japanese arrived at the area in 1941-42. This did not cause independence. The Pacific made it impossible for the former colonial powers to return to Southeast Asia for several weeks, sometimes even months. The Japanese were obliged to keep peace. In fact the real power was passed into hands of Southeast Asian leaders. It started an establishment of independent states. Nationalism developed in Vietnam and Indonesia. As a result an armed struggle arose in which the Western powers were defeated. The Indonesian revolution lasted for four years and it was won by a combination of military struggle and civilian diplomacy. The Vietnamese defeated the French by 1954. It took much more time because of an internal political struggle in the country and because of the role Vietnam had played in the global geopolitics. It led to the involvement of other external powers, such as the United States. It was the most violent revolution; in other countries of Southeast Asia the revolution was less violent.[16]

In the first two decades of independence a period of trial and error for states was constituted. The development of the system failed in Indonesia, where between 500,000 and 1,000,000 lives were lost in 1965-1966 because of the conflict between the Indonesian Communist Party and its opponents. Another conflict escalated between the Malays and the Chinese in 1969. In 1967 the Association for Southeast Asia Nations (ASEAN) was formed by Malaysia, Indonesia, the Philippines, Thailand and Singapore. It had played an important role, for example in making an end of the Vietnam-Cambodia conflict.[17]

[16]FREDERICK, William H. 2012. History of Southeast Asia. *Encyclopaedia Britannica*. Page 7
[17]Ibidem. Page 11

2.2.2 Economic situation

Southeast Asia is showing a strong economic performance, which will continue in the future. It is driven by population growth, growing trade and investment activity and the increasing complexity and international engagement of the major economies of the region – Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. These six countries are known as the ASEAN 6. Each country has a unique demographic, cultural, political and economic development profile. Singapore is the wealthiest country with GDP per capita almost double than all of other South East Asian nations together. Indonesia has the highest GDP, but at the same time it has the largest population, therefore the GDP per capita is much lower.[18]

The GDP growth projections reflect different stages of development and medium-term growth drivers of each country. The Southeast Asian countries will experience a growth comparable to the pre-global financial crisis. The real GDP growth rate in the Southeast Asian region is projected to average 5.4 % per annum from 2014 to 2018, against 5.5 % in the period 2000-2007. Indonesia is projected to be the fastest growing economy within ASEAN-6 countries, with an annual growth rate of 6.0 % in the period from 2014 to 2018. It is followed by the Philippines with 5.8. % . It is said that this strong performance of Indonesia and the Philippines is caused by robust growth in domestic demand, strong infrastructure spending and implementation of structural economic reforms. In Thailand and Malaysia the real GDP is projected to grow by an average annual rate of 5.1 % and 4.9 % in 204-2018. However, these two countries should improve their productivity in order to grow beyond the middle-income stage. Singapore's economy is projected to grow by 3.3 % annually over the period 2014-2018. The country is at more advanced level of economic development and its growth is rather sustainable than expressive. Cambodia, Lao PDR, Myanmar and Vietnam are expected to grow by 7.7 % per

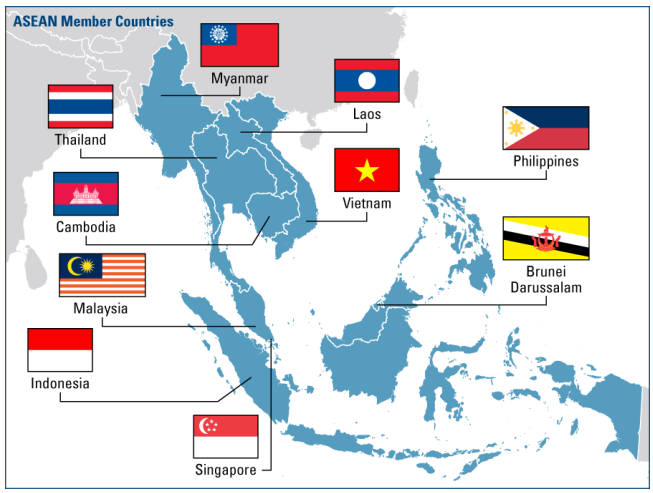
[18]Economic overview: Economic overview - Victoria and South East Asia. 2012. *Department of State Development Business and Innovation*

year. Real GDP growth in Cambodia and Myanmar is projected to average 7 % between 2014 and 2018 due to the openness to foreign investment.[19]

[19]OECD. *Economic Outlook for Southeast Asia, China and India: Beyond the Middle-income Trap.* 2014.

2.3 ASEAN

The Association of Southeast Asian Nations was founded in August 1967 by five men representing five Southeast Asia countries. The document, entitled as the ASEAN Declaration also known as the Bangkok Declaration, set the basic aim and purposes of the ASEAN. These are: Economic growth, social progress and cultural development; regional peace and stability; economic, social, cultural, technical, scientific and administrative collaboration; mutual assistance in training and research; collaboration in agriculture and industry, trade, transportation and communications, and the improvement of living standards; promotion of Southeast Asian studies; and cooperation with regional and international organizations. In general, the main aim of signed is to live in peace with each other, to settle their conflicts peacefully and by using soft power rather than by force and hard power, and to cooperate with one another for common purposes. The Declaration was opened to all remaining countries in the region and it set a goal to bring all Southeast Asian countries together.[20]



Picture 5: ASEAN Member countries, source: EU-Vietnam Business Network

Regional inter-stare organizations existed in Southeast Asia, for instance the MAPHILINDO of Malaysia, the Philippines and Indonesia, the Association of Southeast Asia (ASA) among Malaysia, the Philippines and Thailand. Their purpose was limited. MAPHILINDO was created to solve territorial disputes and ideological differences of its members; ASA was focused on economic and cultural purposes and excluded the largest country in the region, Indonesia, and other states

[20]SEVERINO, Rodolfo. 2008. ASEAN. Singapore: Institute of Southeast Asian Studies, Pages 1 - 9.

of the mainland, except for Thailand. MAPHILINDO existence lasted only from 1963 to the foundation of ASEAN in 1967. ASA existed formally for 6 years, from 1961 to 1967.[21]

First summit meeting of ASEAN happened in February 1976 in Bali. Leaders of the ASEAN member countries – Soeharto of Indonesia, Hussein Onn of Malaysia, Ferdinand Marcos of the Philippines, Lee Kuan Yew of Singapore, and Kukrit Pramoj of Thailand - codified the regional norms for inter-state relations in the region. These norms were: Respect for the independence, sovereignty, equality territorial integrity and national identity of all nations; freedom from external interference, subversion or coercion; non-interference in the internal affairs of one another; the peaceful settlement of disputes; renunciation of the threat or use of force; and effective cooperation among themselves. In the summit a rudimentary central secretariat was established and the ministerial forum for economic cooperation was formalized.[22]

In the first years of its establishment ASEAN dealt with several disputes. Vietnam invaded Cambodia in the beginning of 1979. Even though the aim of the action was to stop the genocide made by Khmer Rouge, ASEAN did not accept it and it was considered as an expansionism. In 1984 Brunei Darussalam joined ASEN followed by Vietnam in 1995, Laos and Myanmar in 1997 and Cambodia in 1999.[23]

2.3.1.1 Structure of ASEAN

The ASEAN Charter came into force in December 2008 and it codified existing ASEAN principles. It also set out the mandate and function of the different ASEAN bodies. The ASEAN Summit is a supreme policy-making body and it meets twice a year. It is consisted of ASEAN Heads of State or Government. The second highest body is the ASEAN Coordinating Council. It is comprised of ASEAN Foreign Ministers and they meet twice a year. The main responsibility is to decide the criteria and rules for ASEAN engagement with external entities or

[21]SEVERINO, Rodolfo. 2008. ASEAN. Singapore: Institute of Southeast Asian Studies. Pages 1-9.
[22] Ibidem.
[23] Ibidem

civil society organisations. The three ASEAN Community Councils include Political Security, Economic and Socio-Cultural topics. Ministerial representatives, one per each ASEAN State coordinate the work of different sectoral bodies within their community in order to achieve the objectives of ASEAN pillars. Communities meet twice annually.[24]

The ASEAN Sectoral Ministerial Bodies represent another institution influencing the ASEAN functioning, they are responsible for specific sectors, such as labour, where misters of all member countries make up one sectoral ministerial body. They report to the Community Councils. Each body has relevant senior officials committees and technical bodies to assist in its work.[25]

Other institutions operating under ASEAN are the ASEAN Inter-governmental Commission on Human Rights, the ASEAN Secretariat, the Secretary General, the Deputy Secretary Generals, or the Committee of Permanent Representatives.[26]

2.3.2 ASEAN Community

The ASEAN Charter entered into force in 2008 and it identified major actions to community-building process. The ASEAN Community is comprised of three main pillars – the Political-Security Community, Economic Community and Socio-Cultural Community. For each pillar a Blueprint was adopted, which identifies basic characteristics and steps of the Community.[27]

The ASEAN Economic Community implements the initiatives to achieve a single market and production base, allowing the free flow of goods, services, investments, and skilled labour, and free movement of capital across the region. ASEAN's potential market is larger than the European Union or North America. ASEAN is also one of the most open economic regions in the world, if we take into account total exports, which are over $1.2 trillion – nearly 54% of total ASEAN GDP and 7% of global exports. The Economic Community adopted a Blueprint. It sets target

[24]About ASEAN. *Human Rights in ASEAN*. 2013.
[25] Ibidem.
[26] Ibidem.
[27]Association of Southeast Asian Nations (ASEAN). *US Department of State*. 2012.

for economic development from 2015 to 2020. The Economic Community is defined by four pillars: Creating a single market and production base, increasing competitiveness, promoting equitable economic development, and integrating ASEAN with the global economy. A Free Trade Agreement and the Common Effective Preferential Tariff have modified tariff rates on goods coming from ASEAN members to virtually zero for ASEAN-6. The four remaining and new ASEAN members have to reduce their tariffs until 2015. The Economic Community also covers poverty reduction and socio-economic disparities.[28]

The ASEAN Political-Security emphasizes the principle of comprehensive security and commits to address the political, economic, social and cultural aspects of building an ASEAN Community. It tries to ensure that countries in the region live in peace with another and with the rest of the world in a just, democratic and harmonious environment. It is based on shared standards and rules of good conduct in inter-state relations, effective conflict prevention and resolution mechanism, and post-conflict peace-building activities. It promotes political and security cooperation rather than defence pact, military alliance or a joint foreign policy. ASEAN Member Countries have to share the responsibility for strengthening peace, stability and security of the region free from foreign military interference in any form of manifestation. Political development represents one of the crucial areas. ASEAN Member Countries shall promote political development, share vision and common values to achieve peace, stability, democracy and prosperity in the region. The Member Countries shall not adopt unconstitutional and undemocratic changes of government or the use of their territory for any actions undermining peace, security and stability of other Member Countries.[29]

The ASEAN Socio-Cultural Community contributes in the people-oriented and socially responsible field with a view to achieving enduring solidarity and unity among the people in the Member countries of ASEAN. It tries to build a common identity and a caring and sharing society which is inclusive and where the well-being, livelihood and welfare of the people are secured. It is mainly focuses on the

[28]ASEAN Economic Community: 12 Things to Know. *ADB.* 2014.
[29]ASEAN Security Community Plan of Action. *Association of Southeast Asian Nations.* 2014

human, cultural and natural resources for sustained development, which should be in a harmonious and people-oriented ASEAN environment. The specific productive actions are written in the Blueprint including the topics such as poverty alleviation, equity and human development.[30]

2.3.3 Indochina

Indochina, also known as French Indochina, is comprised of three states – Vietnam, Laos, and Cambodia. They were formerly associated with France, at first within its empire and later within the French Union. The term refers to influence of India and China on the culture of the region. After capturing the Indochina between 1858 and 1893, the French created the first Indochinese Union to govern. Except in Cochinchina, the southern part of Vietnam, the original Vietnamese, Cambodian, and Laotian royal houses continued under a federal-type central government, which had exclusive authority in foreign affairs, finance, defence, customs, and public works. In 1940 the Japanese occupied the Tonkin area of northern Vietnam and in the following year they took over the rest of Indochina. The local French government remained in office until March 1945, when the Japanese proclaimed the autonomous state of Vietnam. The regime collapsed in 1945. A Democratic Republic of Vietnam was proclaimed in the north governed by the Viet Minh with nationalist leader Ho Chi Minh. Laos and Cambodia were re-occupied by the French. The Indochinese Federation was founded while the Democratic Republic of Vietnam was treated as an independent state. The First Indochina War erupted and during 1949 and 1950, the French ratified separate treaties that appointed independent, self-governing states within the French Union. However, the leaders of the states were “puppet” rulers and the real independence came after the Geneva Conference in 1954, which ended a struggle between the French and the Viet Minh.[31]

[30]ASEAN Socio-Cultural. *Association of Southeast Asian Nations*. 2014
[31] Indochina. *Encyclopeadia Britannica*. 2014

2.4 Composite Indicators

Composite indicators (CIs) are used as a tool for public communication and policy analysis. The indicators can reflect the diversity of countries performance or monitor sustainable development targets. Due to the easy interpretation and complexity, the composite indicators became more popular.[32] However, the difficulties of a CIs methodology sometimes cause misleading or wrong policy conclusion, especially when one dimension of the indicator is ignored.[33] CIs are mathematical combinations of individual indicators that represent different dimensions of a concept whose description is the objective of the analysis. The construction of composite indicator is composed of several stages where subjective judgement has to be made, the selection of indicators, the treatment of missing values, the choice of aggregation model, the weights of the indicators and more.[34]

Composite indicators experience three levels of grouping:

1. Individual indicator sets represent a group of separate indicators or statistics.

2. Thematic indicators are gathered together around a specific area of theme. It requires identifying a crucial set of indicators that are linked or related to each other. They are presented individually rather than synthesised in a composite.

3. Composite indicators are formed when thematic indicators are compiled into a synthetic index and presented as a single composite measure.[35]

2.4.1 Advantages and disadvantages

The important points to consider are advantages and disadvantages of constructing the composite indicator. On the whole an indicator can be a quantitative or qualitative measure derived from a series of observed facts that can uncover

[32]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008
[33]FREUDENBERG, Michael. *Composite Indicators of Country Performance: A Critical Assessment.* France, 2005. Page 5
[34]NARDO, Michela. SAISANA, Michaela and collective. *Tools for Composite Indicators Building.* European Communities, 2005
[35]Step 1: Theoretical framework. *Joint Research Centre: The European Commission's in-house science service*, 2012

relative positions in given area. An indicator points out the direction of change across different units through time. Furthermore it identifies trends and it draws attention to particular issues. It can measure several multidimensional concepts which cannot be interpreted by a single indicator, such as industrialisation, sustainability, single market integration, knowledge-based society etc.[36]

Firstly the advantages have to be provided. The Organisation for Economic Co-operation and Development (OECD) summarized the major advantages of composite indicators as follow: They can summarise complex, multi-dimensional realities with a view to supporting decision makers. They are easier to interpret in contrast to many separate indicators and they assess progress of countries over time. Apart from this the composite indicators reduce the visible size of a set of indicators without dropping the underlying information base. In addition they make it possible to include more information within the existing size limit, place issues of country performance and progress at the centre of the policy area, as well as facilitate communication with general public and promote accountability. Finally the CIs help to construct narratives for lay and literate audiences and they enable users to compare complex dimensions effectively.[37]

Naturally the CIs have disadvantages too. They can send misleading policy messages if they are poorly constructed or misinterpreted. In addition they may invite simplistic policy conclusions and they may be misused, for example they can support a desired policy, if the construction process is not transparent or lacks sound statistical or conceptual principles. Furthermore the selection of indicators and weights could be the subject of political dispute or it may disguise serious fallings in some dimensions and increase the difficulty of identifying proper remedial action, if the construction process is not transparent. Finally the results may lead to inappropriate policies if dimensions of performance that are difficult to measure are ignored.[38]

[36]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008
[37]Ibidem.
[38]Ibidem.

2.4.2 Construction of composite indicators

According to OECD recommendations 10 steps for constructing the composite indicators should be accomplished. Theoretical framework represents the first step. It provides the theoretical basis for the selection and combination of variables into a significant composite indicator. If it is needed, the theoretical framework structures the various sub-groups of the phenomenon and it completes a list of selection criteria for the underlying variables, such as input, output, or process. Next a data selection is done. The data should be analytical, apart from this measurable, they should cover the chosen country; and most importantly should be relevant to the indicators of the measured phenomenon with relationship to each other. It checks the quality of the available indicator, discusses the strengths and weaknesses of each selected indicator as well as it creates a summary on data characteristics, such as availability across country or time, source or type. If some data are missing, they need to be completed in order to provide a complete dataset, for instance by means of single or multiple imputations. It provides a measure of the reliability of each imputed value, so as to assess the impact of the imputation on the composite indicator results and it is necessary to discuss the presence of outliers in the dataset.[39]

According to OECD a multivariate analysis should be used to study the overall structure of the dataset, assess its suitability, and guide subsequent methodological choices, such as weighting or aggregation. It is used mainly to check the structure of the data, to identify groups of indicators or groups of countries that are statistically similar and provide an interpretation of the results. After this step a normalisation is needed to render the variables comparable. A suitable normalisation procedure should be selected, which respect both the theoretical framework and the data properties. A presence of outliers is then discussed and scale adjustments are made, if necessary. Highly skewed indicators should be transformed. The sixth step is weighting and aggregation. They should also respect the theoretical framework. Appropriate weighting and aggregation procedures are

[39]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008

selected to discuss whether the correlation issues among indicators should be accounted for and whether compensability among indicators should be allowed. An uncertainty and sensitivity analysis assess the robustness of the composite indicator in terms of mechanism for including or excluding an indicator, the normalisation scheme, the imputation of missing data etc. All possible sources of uncertainty in the development of the composite indicator should be identified together with composite scores and ranks with uncertainty bounds. The eighth step requires going back to the data in order to reveal the main drivers for an overall good or bad performance and to profile country performance at the indicator level. The correlation should be checked, transparency is crucial. At this step it is identified whether the composite indicator results are overly dominated by few indicators. Links to other indicators should be made to find a correlation of the composite indicator with existing indicators as well as to identify linkages through regressions. The final step is visualisation of the results – it can influence interpretability. A technique, which communicates the most information, should be selected and in should present the results in a clear and accurate manner.[40]

2.4.2.1 Theoretical framework

According to OECD, a theoretical framework represents a key starting point in constructing composite indicators. It clearly defines the phenomenon to be measured and its sub-components. Individual indicators are selected with weights that reflect their relative importance and the dimension of the overall composite. The whole process should be based on the most desirable indicators to measure not on the indicators which are available. OECD provides as an example a gross domestic product measures. It measures the total value of goods and services produced in a given country, where the weights are estimated based on economic theory and they reflect the relative price of goods and services. It is a stable indicator, which have been developed over the last 50 years, whereas indicators

[40]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008

such as competitiveness or e-business readiness might be very subjective, since the economic research in these fields is still being developed.[41]

The whole concept and definition should clearly define the measured composite indicators. It refers to the theoretical framework, it links various sub-groups and it underlines the indicators. OECD points out that the multi-dimensional concepts can be divided into several sub-groups therefore they need to be linked together with theoretical and empirical framework. Experts and stakeholders should be involved in this step in order to show a different viewpoint of quality and relevance. Finally selected criteria are identified to evaluate whether an indicator should be included or not in the overall composite index. It describes the phenomenon i.e. input, output or process.[42]

The European Commission in its thesis "Tools for Composite Indicators Building" suggests a division of theoretical framework by M. Giampietro. He noticed that the quality of the theoretical framework depend on three crucial challenges for the scientific community. At the beginning a feasibility needs to be checked, especially the feasibility of the effect of the proposed framework in relation to different dimensions, such as technical, economic, social, political or cultural together with different scales: local (e.g. technical coefficients), medium (e.g. aggregate characteristics of large units) and large scales (e.g. trend analysis and benchmarks to compare trajectories of development). As a second point he suggests addressing several legitimate perspectives found among stakeholder on how to structure the problem. The suggested final step is handling in a credible way the unavoidable degree of uncertainty, or genuine ignorance associated to any multi-scale, multi-dimensional analysis of complex adaptive systems.[43]

[41]Ibidem.
[42]OECD. *Handbook on constructing composite indicators: methodology and user guide,* 2008
[43]NARDO, Michela. SAISANA, Michaela and collective. *Tools for Composite Indicators Building.* European Communities, 2005

2.4.2.2 Selecting variables

The quality of chosen variables influences the overall principle of the indicator. The variables should be selected based on their relevance, analytical soundness, timeliness, accessibility and many more. The choice of indicator needs to be based on the theoretical framework, whereas the data can be selected subjectively. A lack of data limits the ability to build the composite indicator. Composite indicator often includes qualitative data from surveys or policy reviews. The scaling of variables by an appropriate size measure provides an objective comparison across small and large countries. These variables are for example population, income, trade, volume, and populated land area.[44]

The composite indicators and sub-indicators should be constructed in a way to respect the max, min and opt criteria. The max type of the indicators means that the greatest value is desirable to achieve, for instance business growth, employment, transport service, and level of education. The min type indicators search for the smallest possible value. In this type is included criminality, child mortality, amount of emissions, etc. To achieve the Opt type an optimal value of sub-indicators, such as median age or fertility is introduced.[45]

2.4.2.3 Missing data

The OECD presents three patterns of missing data. Data can be missed completely at random. They do not depend on the variable or data in the set. As an example income is stated, where missing values would be if people who do not report their income have, or would have the same income as the people who have reported it. Second type are data missing at random. They do not depend on the variable of interest, but are important for other variables in the data set. The third type is not missing at random data. They depend on the values themselves, e.g. high income households are less likely to report their income.[46]

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[44]OECD. *Handbook on constructing composite indicators: methodology and user guide,* 2008
[45]JADCZAKOVÁ, Veronika. *Composite Indicators.* Brno, 2014. Lectures
[46]OECD. *Handbook on constructing composite indicators: methodology and user guide,* 2008

There are three ways for dealing with missing data. Complete case analysis, also called case deletion, omits the missing data from the analysis. It ignores the differences between the complete and the incomplete samples. Errors can more likely occur. Single imputation or multiple imputations consider missing data as a part of the analysis and they try to impute values through either single imputation (mean, median etc.) or multiple imputation.[47] Other possible treatment is complete case or listwise approach, which include objects with complete data and they leaves the missing data. All-available approach can be used when the researcher uses all available data as they are. Missing data can also be replaced by mean or median or by a known value coming from an object that supposed to similar.[48]

2.4.2.4 Multivariate analysis

Before the composite indicator is constructed the data need to be analysed and the suitability of the data set is completed. Principal components analysis (PCA) reveals how the variables change in relation to each other and the association between them. The correlated variables are transformed into a new set of uncorrelated variables using a covariance matrix or the correlation matrix. Factor analysis (FA) corresponds to PCA, but is based on a particular statistical model. The Cronbach coefficient alpha (c-alpha) estimates internal consistency of items in a model or survey. It analyses the insight in the structure of the data set. Cluster analysis classifies greater amount of information into smaller set. It also gathers data based on their similarity on different individual indicator. Cluster analysis aggregates the indicators; it serves as a tool for exploring the impact of the methodological choices in the construction phase. It selects groups of countries for imputation of missing data with a view to decrease the variance of the imputed values.[49]

[47]Ibidem.
[48]JADCZAKOVÁ, Veronika. *Composite Indicators.* Brno, 2014. Lectures
[49]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008

2.4.2.5 Normalisation of data

The data set has to be normalised as the indicators often have different units. Several methods of normalisation exist. Ranking represent the simplest normalisation method. It is not influenced by outliers and it allows the performance of countries to be evaluated over time. These are the main advantages of this method. However, the loss of information on absolute levels and the impossibility to draw any conclusion about the difference in performance limit the method. It is used to build a composite on the development and application of information and communication technology across countries.[50]

Equation of ranking: $I^t_{qc} = \text{Rank}(x^t_{qc})$

Another possible method is standardisation (or z-scores). It converts indicators to a common scale with a mean of zero and standard deviation of one. If some indicator has extreme values, it will have greater effect on the composite indicators.

Equation of Standardisation (z-scores): $I^t_{qc} = \frac{x^t_{qc} - x^t_{qc=\bar{c}}}{\sigma^t_{qc=\bar{c}}}$

Other normalisations used are min-max, distance to a reference measures, cyclical indicators, re-scaling, categorical scale etc. [51]

2.4.2.6 Weighting and aggregation

Weighting influences the overall composite indicator and the country rankings. As Freudenberg emphasized, the all variables may be given equal weights or they may be given differing weights which reflect the significance, reliability or other characteristics of the underlying data. Therefore weights should be chosen in relation to the theoretical framework or conceptual rationale for the composite

[50] Ibidem.
[51] OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008

indicator.[52] The easiest method is to assign weights $w_j > 0$; j = 1,2..,p to p indicators is called equal weighting, where all variables are worth the same in the composite and variables are given the same weight, thus indicators are weighted by 1.[53]

The sum of all weights is equal to the number of all variables.

$$\sum_{j=1}^{p} w_j = 1$$

Weights sometimes reflect the statistical quality of the data. Higher weights are assigned to statistically reliable data with broad coverage. Weighting methods are as follows: Rating scales – it is used with odd number of items which can be converted into subjective criteria (importance of the indicator can be rated as 1 = very much below average, 2 = below average, 3 = average, 4 = above average, 5 = very much above average). Furthermore, weights are standardized by dividing each item by sum of items across all indicators so that all standardized weights sup up to one.[54]

Indicator could also be weighted in co-operation with experts who recognise the strengths, weaknesses and nuances of the data within a given theoretical context. For instance, an international e-commerce benchmarking exists in the United Kingdom and it is based on the judgment of independent experts on the influence of the factors being measured on e-commerce adoption and impacts.[55]

Matrix of pairwise comparison prefers row standardized weights. It is a symmetrical p×p and it refers to comparing indicators in pairs. If row is believed more important than column indicator, number 1 is assigned to row indicator and 0 to column indicator. On the other hand, if row indicator is less important than column indicator, 0 is assigned to row indicator. If indicators are considered to be equal, 0,5 is assigned to both of them. Cells below are filled in inverse way. The diagonal elements are left empty. Weights are calculated by dividing row sums

[52]FREUDENBERG, Michael. *Composite Indicators of Country Performance: A Critical Assessment*. France, 2005
[53]JADCZAKOVÁ, Veronika. *Composite Indicators.* Brno, 2014. Lectures
[54]JADCZAKOVÁ, Veronika. *Composite Indicators.* Brno, 2014. Lectures
[55]FREUDENBERG, Michael. *Composite Indicators of Country Performance*. France, 2003

either by $\frac{p(p-1)}{2}$ producing weights which sum up to 1 or by $\frac{(p-1)}{2}$ producing weights which sum up to p. As an alternative to pairwise comparison a preference matrix can be used, where weights are assigned to indicate how many times row indicator is more important than column indicator. It means that if row indicator is three times more important than column indicator, a weight 3 is assigned in contrast to $\frac{1}{3}$ weight for the column indicator (see Table 1 and Table 2).[56]

Indicator	X1	X2	X3	X4	Sum
X1		1	1	1	3
X2	0		0	0,5	0,5
X3	0	1		1	2
X4	0	0,5	0		0,5
Sum	x	x	x		6

Table 1: Example of Matrix of pairwise comparison, source of data: Jadzakova Composite Indicators Lectures, own work

Indicator	X1	X2	X3	X4	Sum	Weight
X1		3	3	1/2	6,5	0,34
X2	1/3		1	2	3,33	0,18
X3	1/3	1		1/5	1,53	0,08
X4	2	1/2	5		7,5	0,40
Sum	x	x	x		18,86	1,00

Table 2: Example of Preference matrix, source of data: Jadzakova Composite Indicators Lectures, own work

Less weight can be given to variables that suffer most from missing values in the attempt to partially correct for data problems. If more weights is assigned to the components with better quality and availability it improve the reliability of a composite indicator.[57]

2.4.2.7 Robustness, sensitivity, aggregation

"Uncertainty analysis focuses on how uncertainty in the input factors propagates through the structure of the composite indicator and affects the composite indicator values. Sensitivity analysis assesses the contribution of the individual source of

[56]Ibidem.
[57]FREUDENBER, Michael. Composite Indicators of Country Performance: A Critical Assessment", *OECD Science, Technology and Industry Working Papers*, 2003

uncertainty to the output variance."[58] The uncertainties are assessed by several steps such as inclusion and exclusion of individual indicators, modelling data error based on the available information on variance estimation, using alternative data normalisation schemes etc. The results of the robustness analysis are interpreted as a country ranking with their related uncertainty links. The sensitivity analysis results are shown in terms of the sensitivity measure for each input source of uncertainty and it represents how much the uncertainty in the composite indicator for a country would be reduced if that particular input source of uncertainty were removed. The results of a sensitivity analysis are shown as a scatter plot with the values of the composite indicator for a county on the vertical axis and each input source of uncertainty on the horizontal axis. [59]

Aggregation is used regardless the used method of standardization. Sub-indicators are aggregated in the form of composite indicator by two approaches. A weighted sum approach is used for dataset without missing values. Then a weighted sum approach is applied if missing values are present, not only value in the sum, but also respective weight has to be excluded. Aggregation then creates dimensionless composite indicator.[60]

2.4.2.8 Presentation of the results

The presentation of the final results represent a crucial part in the overall analysis. The results should be interpreted in an understandable and clear method. Tables should be completed by graphical representation hence the tables can obscure sensitivity issues.

The simplest presentation is a tabular format, where the composite indicator is presented for each country as a table of values. OECD refers to disadvantage that tables are a comprehensive approach, however they may be too detailed and not visually appealing. On the other hand they display countries in a descending rank order, it can track changes in country performance in a time and they can be

[58]OECD. *Handbook on constructing composite indicators: methodology and user guide,* 2008
[59]Ibidem.
[60]JADCZAKOVÁ, Veronika. *Composite Indicators.* Brno, 2014. Lectures

adapted to show targeted information for sets of countries grouped by geographic location, GDP etc.[61]

Bar chart is a graphical representation of project activities that are shown in time-scaled bar lines with no links shown between the bars. It is also defined as a graphic display of schedule-related information.[62] In a case of composite indicators the countries are on the vertical axis and the values of the composite on the horizontal. The dominant bar indicates the average performance of all countries. It can be a target to be reached by countries too.[63]

Line chart illustrates the changes of a composite across time. The values for different countries are displayed in different colours or symbols. The indicators are displayed by using absolute levels, absolute growth rates like percentage points with respect to the previous year or a number of past years, indexed levels and indexed growth rates etc.[64]

Trends in country performance are presented in trend diagrams. It is used when at least two different time points, changes or growth rates can be illustrated. In case of EU Summary Innovation Index, the trend performance displays the performance of European countries on innovation indicators. Country trends are presented on the X-axis and levels are given on the Y-axis. [65]

[61]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008
[62]Construction Project Scheduling and Control By Saleh A. Mubarak page 16
[63]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008
[64]Ibidem.
[65]OECD. *Handbook on constructing composite indicators: methodology and user guide*, 2008

2.5 Regional Disparities

The term disparity is defined by several institutions and dictionaries as follows: The American Heritage Dictionary defines disparity as inequality of difference, as in age, rank, wages, etc. International Labour Organisation refers to differences between economic performance and welfare between countries or regions. OECD claims that regional disparities express the scope of difference of intensity manifestation of economic phenomena under investigation observed within regions of given country. Karin Vorauer explains that under regional disparities we understand deviations from any conventional reference division of characters taken as relevant, in association with different spatial benchmark levels.[66]

2.5.1 Character of disparities

Regional disparities are used for identification and examination of differences in subject relevant characters. It is finding a difference between subjects within defined set of states, countries, regions, municipalities, enterprises etc. and what impact it has on their changes, namely system changes in structure and behaviour. It finds the negative characters. It is called a disparity approach.[67]

Additionally an examination of difference of subjects, their relevant characters, is made. It leads to understanding their uniqueness as well as capability to differ specifically and efficiently from other subjects under examination together with their comparative efficient use. Capability plays positive role. However, it is a less frequent reason.[68]

2.5.2 Data and sources

José Villaverde and Adolfo Maza stated in their UNU-CRIS Working paper that economists tend to be mainly concerned with income disparities. Besides it the study of disparities in other areas, such as unemployment, human capital,

[66]KUTSCHERAUER, Alois. *Regional Disparities: Disparities in country regional development - concept, theory, identification and assessment*, 2010. Pages 6-9.
[67] Ibidem.
[68] Ibdiem

infrastructure, has great relevance in order to know more about the various paths of the economic growth process in different regions. Economists consider production (income) per capita[69] and labour productivity[70] as key variables. These variables share the same numerator in addition to highly correlated denominator – population and employment. Another part is to decide which variable best represents production. Speaking generally Gross Domestic Product is considered as an option, although it depends on the specific purpose of the analysis. Thus sometime the Gross Value Added is more adequate. It does not include government transfers and indirect taxation. It goes without saying that a long time-series data should be chosen.[71]

2.5.3 Regional inequality

The inequality is measured by several indicators. The Gini index (G) is a descriptive inequality indicator related to the Lorenz curve. It measures the proportion of total income in a given percentage of population. It is calculated as the ratio of the area between Lorenz curve and the 45° line to the whole are below the 45°line. The expression is as follows:[72]

$$G = \frac{1}{2\bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} p_i \, p_j |y_i - \, y_j|$$

Where n stands for the number of observations, p_i and p_j refer to the population share of observations i and j and $\bar{y}$ is the mean per capita income. The value of index ranges from 0 (complete equality) to 1 (complete inequality). Other used indicators are the Theil index or the Atkinson index. [73]

[69]Production per capita is the ration between production and population.
[70]Labour productivity is the ratio between production and the units of labour employed.
[71]VILLAVERDE, José. MAZA, Adolfo. *Measurement of Regional Economic Disparities*. Belgium, 2009
[72] Ibidem.
[73] Ibidem.

3 METHODOLOGY

Countries were chosen from the Southeast Asia region. The comparison of these countries is made in order to see the development and differences between them.

The thesis is divided into four main parts. Theoretical part deals with theoretical framework, which is needed to define crucial characteristics and definitions. It is structured as a literature research containing topics such as Southeast Asia region, constructing composite indicators, regional disparities definition etc. The research is made using books, articles, handbooks, reports or relevant internet sources related to the topic. The OECD "Handbook on Constructing Composite Indicators" serves as a useful source of basic information on CPI's.

The analytical part provides computation of composite indicators for each country and for each pillar of the development. Because of the inability to travel to the specific country and collect the data through the offices located in these countries, secondary data are used from reliable sources, namely the World Bank, Millennium Development Goals database, International Labour Organisation reports, World Health Organisation reports, UNESCO database or United Nations Department of Economic and Social Affairs statistical database. The indicators were chosen subjectively based on available data and possible relationship with other indicators in the pillar. Means of the raw data from the period 2000 - 2012 are transformed into formulas needed to construct the composite indicators. Normalisation of data, weighting, and missing data completion represent key methods in constructing the composite indicator therefore they are applied in the thesis. Results are interpreted in tables, figures, and development diamonds.

The regional disparities comparison is included in the analytical part as well. Data for comparison of HDI and IHDI were collected from United Nations Development Programme, namely from the Human Development Reports for each year. Thaiwebsites and Asiafinest databank provided the Lorenz Curve data. These data were found on official websites for each province in the country. Gini coefficient for Thailand and Vietnam was computed using formula based on results from

Lorenz curve, however the data for Cambodia and Lao PDR provinces were not available, therefore they were completed from the World Bank database.

Results and figures in the whole analytical part were calculated using the programme Excel. To assess the relationship between the indicators cluster analysis and correlations were made in the programme STATISTICA.

The results and recommendation part analyses the reached results, emphasizes the possible weaknesses, and solutions or recommendations are suggested.

4 ANALYTICAL PART

4.1 Environmental indicators

The effective environmental indicators must meet the range of criteria. First of all they must be matched to their purpose. As Briggs and Corvalan stated in their book "Decision-Making in Environmental Health: From Evidence to Action", the indicators must address the problem of concert, at the appropriate point in the environment-health chain, and at appropriate geographical and temporal scales and resolution. Then the indicators should be presented in an easily understandable and usable form.[74]

The OECD presented the use of environmental indicators at the international level in the publication "Core Set of Indicators" in 1974. Since then many international, intergovernmental and national institutions defined variety of indicators. The United Nations Environment Programme (UNEP), the United Nations Development Programme, World Bank, and the World Resources Institute published the most important ones. At the European level, the European Environment Agency (EEA) defined the indicators. [75]

The concept of environment itself has been evolving since the Stockholm UN Conference on the Human Environment in 1972 through the UN Conference on Environment and Development in Rio de Janeiro in 1992 to the World Summit on Sustainable Development on Sustainable Development in Johannesburg in 2002. The environment is a part of sustainable development and it is interconnected with the economic and social pillar. The indicators cover the linkages between the three pillars. According to Bedřich Moldan, Tomáš Hák and collective, the indicators show the degree of decoupling between the environmental pressures (for example

[74]CORVALÁN, C, David J BRIGGS a G ZIELHUIS. *Decision-making in environmental health: from evidence to action.* Pages 1-5.
[75]MOLDAN, Bedřich a Tomáš HÁK. *Composite Indicators of Environmental Sustainability*. Prague, 2005. Article.Charles University Environment Center, Prague

the emissions of harmful substances) and the economic performance (such as GDP) can be seen as the example of the mentioned linkages. [76]

4.1.1 Theoretical framework and selected indicators

The key environmental indicators are, according to the OECD, those that measure the environmental progress, complemented with several sets of sectoral environmental indicators to help integrate environmental concerns in sectoral polices. The OECD further states that the indicators are derived from environmental accounting and they are now widely used in the OECD countries. The OECD selected key indicators with respect to their policy relevance, major challenges in the 21st century, such as pollution issues and issues related to natural resources and assets, their analytical soundness, and their measurability. These indicators are for instance CO_2 emission intensities, municipal waste generation intensities, intensity of use of fish, water or forest resources etc.[77]

In this thesis the indicators were chosen subjectively according to their relevance and availability of data for the chosen countries. The World Bank database was used as the major source of data.

4.1.1.1 CO_2 Emissions

Carbon dioxide (CO_2) represents the major greenhouse gas emitted by human activities. In is naturally present in the atmosphere as a part of the Earth's carbon cycle.[78] Human activities are adding more CO_2 to the atmosphere and it influences the ability of natural sinks, like forests, to remove CO_2 from the atmosphere. The main activity creating CO_2 is the combustion of fossil fuels, such as coal, natural gas, and oil, for energy, transportation, industrial processes, and land-use. [79]

The Millennium Development Goals define the crucial indicator of the CO_2 measurement as follows: Total CO_2 contains emissions from all national activities.

[76]Ibidem.
[77]OECD. *Key Environmental Indicators*. Paris, 2008.
[78]Carbon cycle is the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals.
[79]United States Environmental Protection Agency. *Overview of Greenhouse Gases*. 2013

It is estimated from sectors like energy, industrial processes, agriculture, waste, and the sector of land use, land-use change and forestry. CO_2 emissions per capita are measured as the total amount of carbon dioxide emitted by the country as a consequence of all relevant human activities, divided by the population of the country. CO_2 emissions per $1 GDP (PPP) are total CO_2 emissions divided by the total value of the gross domestic product (GDP) expressed in purchasing power parities (PPPs). The CO_2 emissions per $1 GDP (PPP) are used in this thesis. [80]

4.1.1.2 Improved Water Source

Water Sanitation Health belongs to goal 7, target 7c of the Millennium Development Goals. By 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation should be halved. The drinking water is used for domestic purposes, drinking, cooking and personal hygiene, whereas safe drinking water meets certain microbiological and chemical standards of drinking water quality provided by the WHO Drinking-water Quality Guidelines. WHO further specifies that the access to safe drinking water is measured against the proxy indicator: the proportion of people using improved drinking water sources – household connections, public standpipe, borehole, protected spring, and rainwater collection.[81]

WHO defines improved water source as an access to safe drinking water, which is measured by the percentage of the population using improved drinking-water sources. [82]

4.1.1.3 Consumption of ozone-depleting substances

The indicator monitors the reduction in the usage of Ozone Depleting Substances (ODSs). It is controlled under the Montreal Protocol. The Montreal Protocol was designed to protect the ozone layer. It is measured in metric tons of ODS weighted by the Ozone Depletion Potential (ODP), otherwise referred to as ODP tons. The

[80]Millennium Development Goals Indicators. *The Millennium Development Goals Indicators: The official United Nations site for the MDG Indicat*ors. 2013
[81]Water Sanitation Health. *World Health Organisation*. 2014
[82]Ibidem.

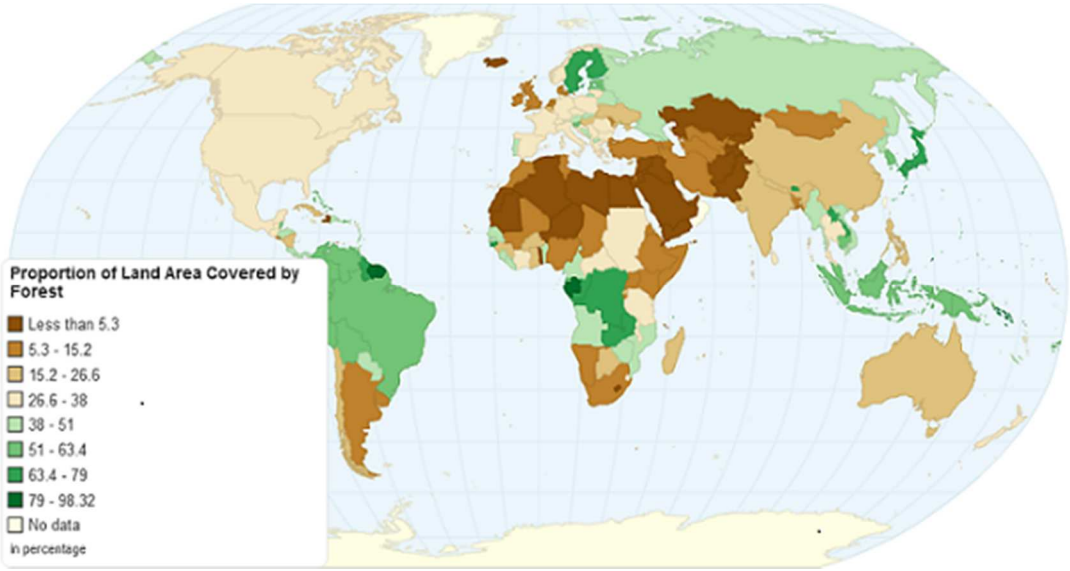
Millennium Development Goals define the Ozone depleting substances (ODS) as any substance containing chlorine or bromine that destroys stratospheric ozone layer, which absorbs most of the biologically damaging ultraviolet radiation. These substances are categorised into annexes with different groups in each annex, such as chlorofluorocarbons, halons, methyl bromide etc. The ODP is defined as the amount of ozone depletion caused by a substance. It is calculated as the ration of the impact on ozone of a chemical substance compared to the impact of a similar mass CFC-11, which is the range of ODPs from 0.6 to 1 while hydrochlorofluorocarbons (HCFCs) have ODPs that range from 0.001 to 0.52. The halons have ODPs up to 10 while methyl bromide has an ODP of 0.6. [83]

4.1.1.4 Forest Area

The World Bank characterises the forest area as land under natural or planted stands of trees of at least 5 metres in place, whether productive or not. It excludes tree stands in agricultural production system, e.g. fruit plantations or agroforestry system, and trees in urban parks and gardens. [84]

[83]Millennium Development Goals Indicators. *The Millennium Development Goals Indicators: The official United Nations site for the MDG Indicators*
[84]Forest area (% of land area). *The World Bank, 2012*

The Picture 3 shows the forest area as a percentage of total land area by country in the worldwide comparison. The countries of Indochina together with Thailand belong to countries with higher percentage of forest area, Thailand and Vietnam are placed in the group with 38 to 51 percentage of total land area. Cambodia and Laos reach even higher percentage, from 51 to 63.4 percent for Cambodia and 63.4 to 79 percent for Lao PDR.



Picture 6: Proportion of land area covered by forest, Millennium development goals indicators, 2011

4.1.1.5 Agricultural Land

Agricultural is explained by The World bank as the share of land area that is arable, under permanent crops, and under permanent pastures. Arable land is interpreted by FAO as land under temporary crops (if the land is double-cropped, it is counted just once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. If the land is under permanent crops it is cultivated with crops that occupy the land for long period of time and they need not be replanted after each harvest. These crops are for example cocoa, coffee, and rubber.[85]

[85]Agricultural land (% of land area). *The World Bank*. 2012

The Table 3 indicates data for the five chosen indicators. The data are provided in different units, which are specified in the last row. Means of data from 2000 to 2012 were calculated and they were used for the further computation. The minimum and the maximum value for each indicator is highlighted in red.

Raw data matrix	CO2 emissions	Improved water source	Consumption of ozone-depleting substances	Forest area	Agricultural land
Type of the indicator	MIN	MAX	MIN	MAX	MAX
Thailand	0,39	94,46	2312,82	37,08	39,52
Cambodia	0,13	56,31	47,98	61,45	30,26
Lao PDR	0,09	58,92	19,42	70,11	9,17
Vietnam	0,38	86,46	353,36	41,30	9,17
Source of data	World bank	World bank	MDG's	World bank	World bank
Unit	kg per PPP $ of GDP	% of population with access	in ODP metric tons	% of land area	% of land area

Table 3: Raw data matrix - Means from 2000 to 2012 for each indicator, own work

For better illustration and comparison of the raw data results, the means are displayed in the Figure 1.

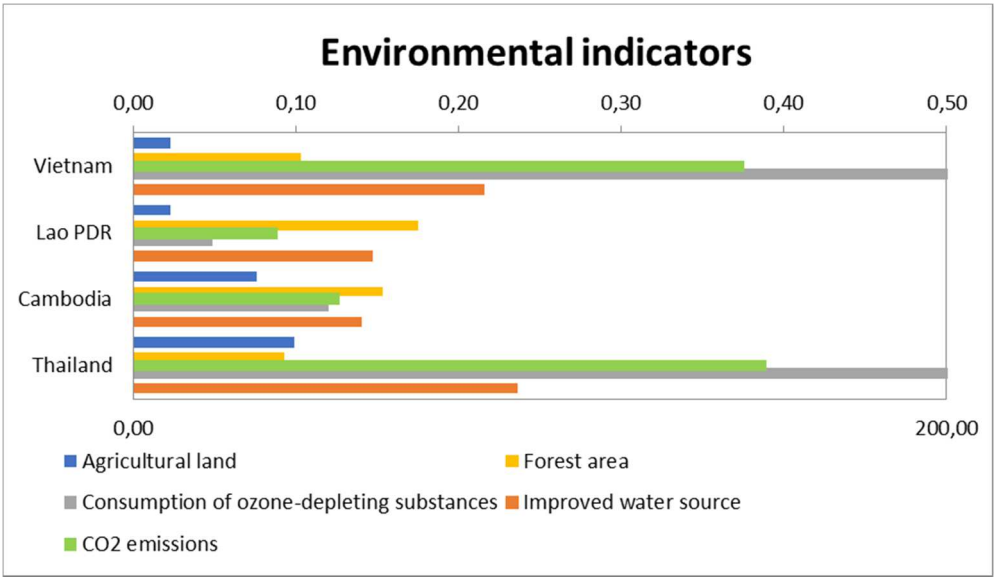


Figure 1: Means of raw data from 2000 to 2012, own work

4.1.2 Normalisation of the data

To be able to compare the data in different units, the selected variables and their means have to be normalised. In this thesis the minimum-maximum (min-max) method was used. This method provides indices that range by construction between 0 (laggard with minimum value) and 100 (leader with maximum value). Therefore it expresses the distance of the chosen country from the overall best and the worst performing country.[86]

If the indicator is defined as maximum indicator – the greater the value of the indicator is, the better – the normalisation is calculated as follows:

$$MAX = \frac{actual\ value - minimum\ value}{maximum\ value - minimum\ value} * 100$$

In other words:

$$MAX = \frac{x_i - x_{min}}{x_{max} - x_{min}} * 100$$

[86]FREUDENBERG, Michael. *Composite Indicators of Country Performance: A Critical Assessment*. France, 2005. Page 23.

If the indicator is recognised as minimum indicator—the lower the value of the indicator is, the better—the normalisation is calculated as follows:

$$MIN = \frac{maximum\ \ value - \ actual\ value}{maximum\ value - minimum\ value} * 100$$

In other words:

$$MIN = \frac{x_{min} - x_i}{x_{max} - x_{min}} * 100$$

This normalisation method does not affect ranking for individual indicators it transforms the initial values.

The results of the normalisation for the chosen environmental indicators are interpreted in the Attachment 1. Lao PDR is a leader in three indicators – CO_2 emissions, consumption of ozone-depleting substances, and in forest area. Thus considering the forest area as the maximum indicator, the leading position of Lao PDR means that Lao PDR has the highest percentage of forest area in the country from the four chosen countries. In improved water source and agricultural land Thailand dominated and reached the 100 value.

4.1.3 Weighting

Matrix of pairwise comparison is the chosen weighting method in this thesis. It refers to comparing indicators in pairs using row standardized method. If the row indicator is assumed as more important than column indicator, "1" is assigned to row indicator and "0" to column indicator. On the other hand if a row indicator is less important than a column indicator, "0" is assigned to the row indicator, and if the indicators are evaluated equally, "0,5" is assigned to both of them. Cells below main diagonal are filled in inverse fashion, it means "0", "1" and 0,5". The on-diagonal elements remain empty, because the indicators cannot be compared with itself. [87]

Weights are calculated by dividing row sums by the total sum.

$$Weight: \frac{Sum\ of\ x_i}{Total\ Sum}$$

The Table 4 contains subjectively assigned weights to each indicator. If the weight is 1, the indicator is more important. For instance it was decided that improved water source has importance 1 in the relation to CO_2 emissions, which have importance 0, and it is then less important indicator in this relationship.

Indicator	CO_2	Improved water source	Ozone-depleting substances	Forest area	Agricultural land	Sum	Weight
CO_2		0	0,5	0	0	0,5	0,05
Improved water source	1		1	0,5	0,5	3	0,30
Ozone-depleting substances	0,5	0		0	0	0,5	0,05
Forest area	1	0,5	1		0,5	3	0,30
Agricultural land	1	0,5	1	0,5		3	0,30
					Total Sum:	**10**	

Table 4: Matrix of pairwise comparison - weights of chosen economic indicators, own work

[87] JADCZAKOVÁ, Veronika. Composite Indicators. Brno, 2014. Lectures.

Missing data can influence the indicator as less reliable for the countries when only limited information is available and can distort the position of all countries in the composite. The missing values in this thesis were data from the years 2011 and 2012 for CO_2 emissions indicator. The missing data were compensated by the method of nearest neighbour, when the most similar case for the one with a missing value is identified and substituted.[88] In this case data from the previous years 2009 and 2010 substituted the missing data. The method is also known as hot deck imputation. Its approach is similar: The missing value is replaced by a known value coming from an object that is supposed to be similar.[89]

[88]FREUDENBERG, Michael. *Composite Indicators of Country Performance: A Critical Assessment*. France, 2005. Page 10
[89]JADCZAKOVÁ, Veronika. Composite Indicators. Brno, 2014. Lectures.

4.1.4 Presentation of the results

The final results show the ranking and index of each country computed from the standardized data matrix multiplied by weights. The index is calculated as median of sums divided by each sum for the chosen country. The data are provided in percent. Final ranking is done according to the results of the index.

The Table 5 demonstrates that Thailand reached the Rank 1 which is the worst result possible in the field of environmental protection - 100 % is the average result. Everything above this level is also above average. Cambodia with the rank 2 still belongs to above average countries. Lao PDR and Vietnam are below average. Vietnam has the best result with index 68,77%, highly below average, therefore it can be said that Vietnam exceeded other countries in the environmental pillar.

Standardized data matrix*weights								
	CO_2	**Improved water source**	**Ozone-depleting substances**	**Forest area**	**Agricultural land**	**SUM**	**Index**	**Rank**
	MIN	**MAX**	**MIN**	**MAX**	**MAX**			
Thailand	0,00	30,00	0,00	0,00	30,00	**60,00**	**128,77 %**	**1**
Cambodia	4,37	0,00	4,94	22,13	20,84	**52,28**	**112,20 %**	**2**
Lao PDR	5,00	2,06	5,00	30,00	0,00	**42,06**	**90,26 %**	**3**
Vietnam	0,23	23,71	4,27	3,83	0,00	**32,04**	**68,77 %**	**4**
					Median:	**46,59**		

Table 5: The final results of environmental indicators, own work

The relationship between rank and index is represented in the Figure 2. It is visible that Vietnam reaches the rank 4 whereas Thailand has the rank 1.

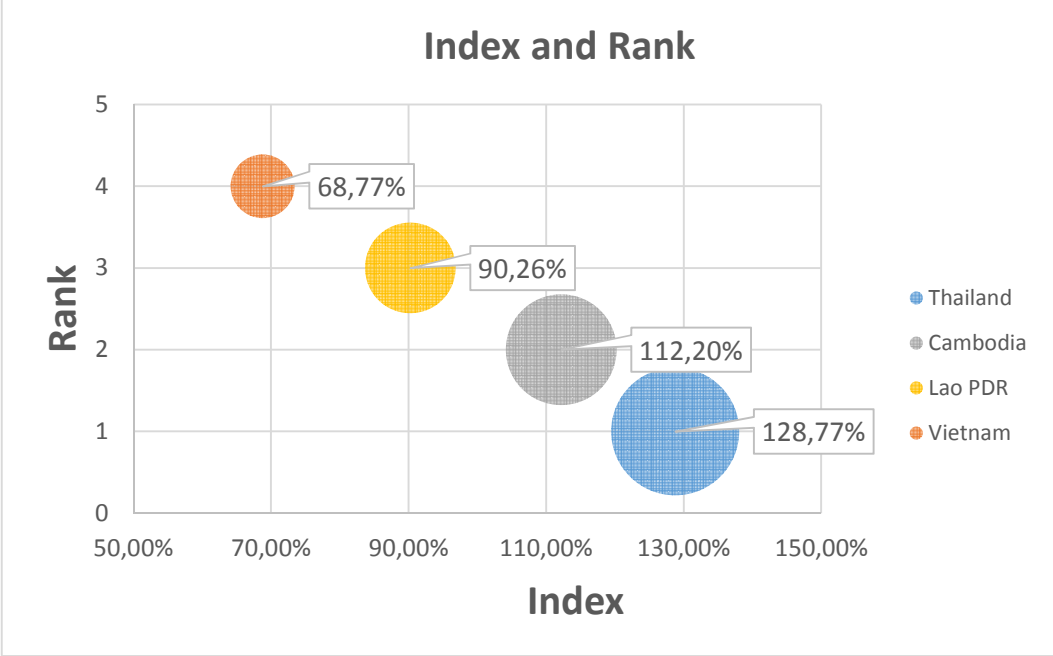


Figure 2: Index and Rank of chosen countries, environmental indicators, own work

4.1.4.1 Development Diamond

The development diamonds are used to illustrate relationships between four environmental indicators for a given country. The shape of the diamond presents the results. Any point outside the reference diamond shows a value higher than the group's average, while any point inside signals below-average achievement.[90]

The Figure 3 interprets the development diamond for environmental indicators and their means. It shows the difference between the results of each country. In improved water sources Thailand and Vietnam highly prevail in comparison to Lao PDR and Cambodia. On the contrary, the result for Cambodia and Lao PDR overcome the other two countries. It should be said that each indicator is in different units. The development diamond illustrates four indicators therefore the consumption of ozone-depleting countries was excluded from the figure.

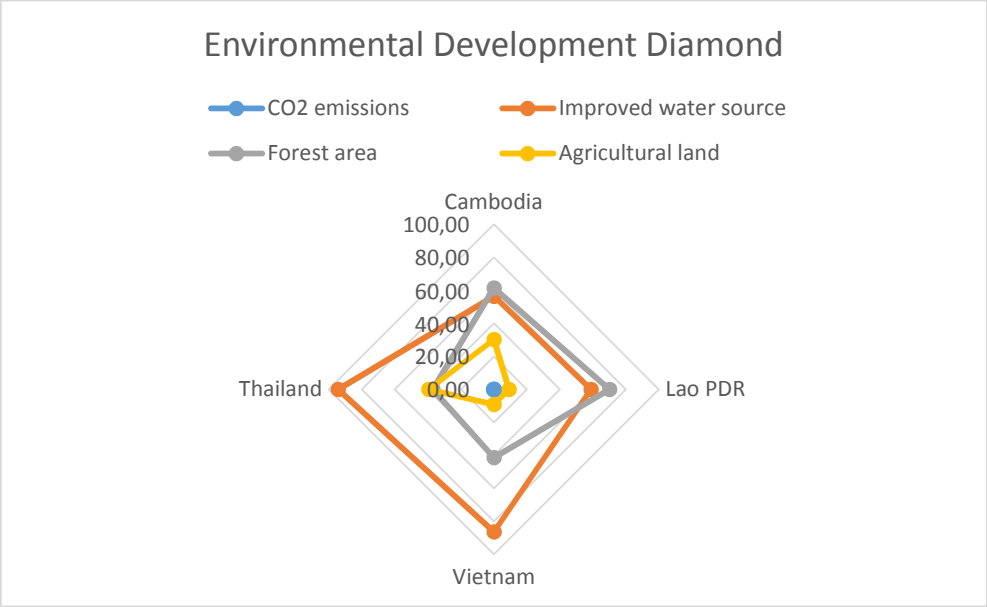


Figure 3: The Development Diamond – Environmental Indicators, own work

[90]WORLD BANK. Composite Indicators of Development. USA, 2012.

4.2 Economic indicators

The CIs have many functions and they play an important role in policy making or in shaping the frame of thinking of policy actors. As Laurens Cherchye and Willem Moesen emphasize in their discussion paper about the economic composite indicators, the CIs support public communication on countries' relative performances in wide range of fields such as the environment, the economy, human development, technological development. [91]

The economic CIs deal with short-term movements in an economy by using measures that are highly sensitive to upcoming changes in business conditions. Therefore the investors and policymakers follow them. At the global scale the best-known studies are the OECD's Composite Leading Indicators (CLI). The publications summarize data for the OECD member countries together with some non-member nations. The OECD calculates Composite Leading Indicators in order to forecast for example the industrial production within the given region or nation. The CLIs has been being published since 1981.[92]

Rhona C. Free states in her analysis 21st Century Economics: A Reference Handbook that each measure and each indicator provides information about a particular aspect of the economy, therefore for studying economy's overall behaviour, a combination of these measures - a composite indicator - must be used. As discussed in the publication, there are three type of economic indicators. Coincident indicators measure the current level of economic activity and they modify with the business cycle. Leading indicators decrease before the recession and increase before expansion begins, thus they can be used as to forecast the economic cycle moving. Lagging indicators measure what the level of economic activity has been. [93]

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[91]CHERCHYE, Laurena. WILLEM Moesen, and collective. *Constructing a knowledge economy composite indicator with imprecise data*. Belgium, 2009. Pages 3-5
[92]BAUMOHL, Bernard. *The secrets of economic indicators: Hidden clues to future economic trends and investment opportunities*. Pages 354, 355
[93]FREE, Rhona C. *21st century economics: A reference handbook.* Thousand Oaks. Page 299

To evaluate overall economic performance of the chosen country, several measures are used to register different areas of economic activity.[94]

4.2.1 Theoretical framework and selected indicators

The Economist presented in their publication "Guide to Economic Indicators: Making Sense of Economics" several reasons for interpreting economic indicators. The indicators can measure companies and their products, investors can judge the time of their investment projects, people are provide with a better understanding of how the economy is performing and they can judge the government's economic policies, and much more.[95]

Data for economic indicators were selected subjectively. The availability of the data was taken into account. As the major source of the data the World Bank was used based on the high relevance of the data. For the employment data the International Labour Organisation served as the crucial source.

4.2.1.1 GDP growth

At first it is necessary to define Gross Domestic Product (GDP). Peter Jochumzen explains GDP in his book "Essentials of Macroeconomics" as the market value of all finished goods and services produced in a country during a certain period of time. Only finished goods and services are included. He also claims that in order to be able to draw reasonable comparisons GDP over time, inflation must be adjusted. To determine the effect of inflation the GDP is divided by a price index. It is then called the real GDP. The GDP-growth is defined as the percentage change in GDP over a specific period of time. This composite indicator is used as one of the economic composite indicators in this thesis. If the real GDP growth is used it is the percentage change in real GDP. The real growth shows how much the economy grows in a certain period of time when the effect of inflation is removed.[96]

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[94]FREE, Rhona C. *21st century economics: A reference handbook.* Thousand Oaks. Page 298
[95]THE ECONOMIST. *The Economist guide to economic indicators: Making sense of economics*. Pages 1-6
[96]JOCHUMZEN, Peter. *Essentials of Macroeconomics*. Ventus Publishing ApS: Bookboon, 2010. Page 22

4.2.1.2 Employment to population

The employment to population ratio refers to the proportion of the economy's working-age population which is employed. The OECD points out that the employment-to-population ratio shows information on the ability of an economy to create jobs, and in several countries it is connected with the unemployment rate. The high performance of the indicator is considered as good, however, the indicator alone does not provide information on labour market problems e.g. low wages, underemployment, bad working conditions, or the existence of a large informal sector. The working-age population varies in many countries. For most of them, it is defined as persons aged 15 years and older. Thus the International Labour Organisation limit is 15 years and it corresponds to social standards, education, and work eligibility in most of the economies. Although, in some countries, especially in the developing ones, the younger workers are included and their working age starts earlier than in the developed world. Apart from the age, the population base can differ. Usually the civilian non-institutional population is included, however, many economies include the armed forces in the population bases for employment ratios.[97]

4.2.1.3 Gross savings

The United Nation Statistics Division (UNSD) specified the Gross savings as disposable income less consumption. It can be calculated either for each institutional sector of the total economy. The data are provided in the local currency or as a percentage of the nation's GDP. The indicator itself measures the level and extent of the resources available for investment in capital assets. Savings are in general related to investment. If the income is not used to buy consumer goods and services, the resources will be invested in productive capital, for example factories and machinery. Thus savings can increase the amount of capital available and they can contribute to the future economic growth. As mentioned above, the indicator is linked with other measures of economic development, such as gross capital formation and savings as the percentage of GDP. There exist three

[97]OFFICE, International Labour. *Key indicators of the labour market*, 2001-2002. Pages 49 and 53

ways of deriving the gross savings. Firstly, the gross disposable income less consumption can be used. Secondly, it equals to the sum of gross capital formation, net capital inflows from the rest of the world and changes in foreign reserves. Finally, it is derived from the net lending/borrowing to/from the rest of the world by adding gross capital formation and net capital transfers to the rest of the world. However, the gross savings don not take into account social and environmental conditions.[98]

4.2.1.4 Net ODA received

The indicator is by the UNSD defined as total Official Development Assistance (ODA) given or received as a share of GNI of the source or recipient country. It measures the size of flows that are aimed at promoting development and welfare of the developing countries. It includes information about the borrower's receipts of aid from official lenders or official lender's concessional flows to developing countries. According to the United Nations recommendation, if the country is developed, the ODA will represent 0,7% of GNI. The indicator is linked with the other financial and international cooperation indicators. The UNSD also states that the Official Development Assistance consists of grants or loans to developing countries that are undertaken by the official sector with the aim of promoting economic development and welfare. ODA loans are provided at concessional financial terms and they are usually presented in net form, which means that the net flows equal total new flows minus amounts received. The Gross National Income (GNI) is defined as the sum of value added by all resident producers plus any taxes not included in the valuation of output, plus net receipts of primary income (compensation of employees and property income) from abroad. [99]

4.2.1.5 External debt stocks

The World Bank characterizes total external debt stocks as debt owed to nonresidents repayable in currency, goods, or services. Total external debt is then

[98]*Gross Savings.* The United Nations, 2012.
[99]*Net Official Development Assistance Giver or Received as a Percentage of Gross National Income*. The United Nations, 2012

the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short term debt. In the short-term debt all debt have an original maturity of one year or less and interest in arrears on long-term are included. The definition of GNI was provided above. [100]

The Table 6 shows the means of five chosen economic indicators in the time period from 2000 to 2012. The source of data is also specified in the table. The last row includes unit in which each indicator was calculated. The minimum and maximum value for each indicator is highlighted in red.

Raw data matrix	GDP Growth annual	Employment to population	Gross Savings	Net ODA received	External debts
Type of the indicator	**MAX**	**MAX**	**MAX**	**MIN**	**MIN**
Thailand	4,32	71,96	27,69	-0,02	39,53
Cambodia	7,98	81,02	14,31	8,75	52,19
Lao PDR	7,16	77,18	13,08	10,81	115,90
Vietnam	6,49	75,34	29,46	3,44	35,38
Source of data	**World bank**	**International Labour Organisation, World bank**	**World bank**	**World bank**	**World bank**
Unit	**annual %**	**%**	**% of GDP**	**% of GNI**	**% of GNI**

Table 6: Raw data matrix for economic indicators, own work

[100]External Debt Stock (% of GNI). *The World Bank. 2012*

4.2.2 Normalisation of data

As in the previous part the data for economic indicator were normalised using the min-max method. The table with the results is available in the Attachment 1. Cambodia prevails in two types of indicators, namely in the GDP growth annual and employment to population. The leader with the maximum value in gross savings is Vietnam. However, the results for Vietnam predominates also in external debts. Thailand exceed in net ODA received, although it is minimum indicator.

4.2.3 Weighting

The same method as in the previous section was used to assign weight to economic composite indicators. According to matrix of pairwise comparison the weights were assigned subjectively. For instance gross savings and net ODA received gained the same weight 0,5. On the contrary employment to population got in the relation to gross savings the importance 1, thus it is evaluated as indicator with greater importance than the gross savings indicator (see the Table 7).

Indicator	GDP Growth annual	Employment to population	Gross Savings	Net ODA received	External debts	Sum	Weight
GDP Growth annual		0,5	1	1	1	3,5	0,35
Employment to population	0,5		1	1	1	3,5	0,35
Gross Savings	0	0		0,5	0,5	1	0,10
Net ODA received	0	0	0,5		0,5	1	0,10
External debts	0	0	0,5	0,5		1	0,10
					Total Sum	**10**	

Table 7: Matrix of pairwise comparison – weights of chosen economic indicators, own work

4.2.4 Missing data

The economic indicators dataset was complete and no missing values were found.

4.2.5 Presentation of the results

The final results in this section were calculated using the same method as in the previous one. It is obvious that Thailand occupies the fourth position with index highly below average. The third place belongs to Lao PDR. The index 111,75% assigns the second position to Vietnam. The best results within economic indicators belong to Cambodia with 148,50%. The results correspond with index above average (see the Table 8).

Standardized data matrix*weights								
	GDP Growth annual	**Employment to population**	**Gross Savings**	**Net ODA received**	**External debts**	**SUM**	**Index**	**Rank**
	MAX	**MAX**	**MAX**	**MIN**	**MIN**			
Thailand	0,00	0,00	8,92	10,00	9,49	**28,41**	**52,36%**	4
Cambodia	35,00	35,00	0,75	1,90	7,91	**80,56**	**148,50%**	1
Lao PDR	27,22	20,19	0,00	0,00	0,00	**47,41**	**87,40%**	3
Vietnam	20,76	13,05	10,00	6,81	10,00	**60,62**	**111,75%**	2
					Mean:	**54,25**		

Table 8: The final results of economic indicators, own work

The Figure 4 illustrates the relationship between index and rank. Cambodia with the rank 1 and index 148,50% reached the best position. The worst result belongs to Thailand.

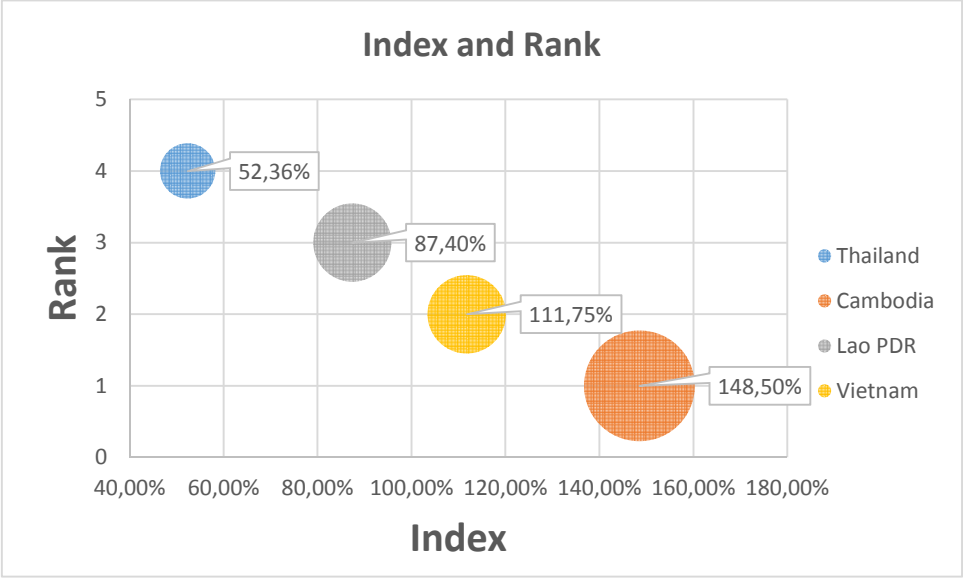

Figure 4: Index and Rank of chosen countries, economic indicators, own work

4.2.5.1 Development Diamond

As written above, the development diamond illustrates the relationship between four chosen indicators and the countries. Net ODA received was excluded from the figure. External debts in Lao PDR highly prevail the other results. Employment to population does not indicates strong abnormalities.

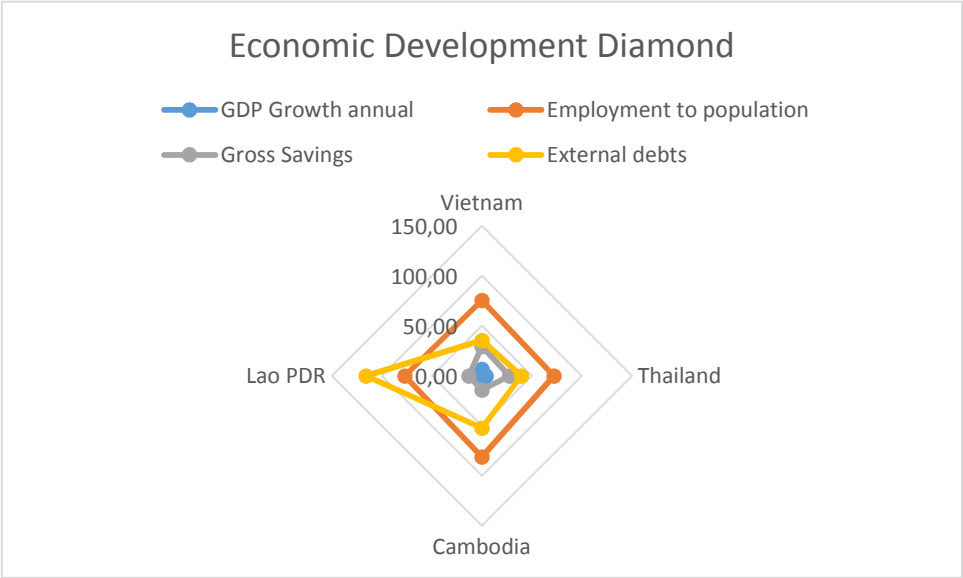

Figure 5: The Development Diamond – Economic Indicators, own work

4.3 Social indicators

The social indicators are aimed for analysing and better understanding of social problems in a given country. The social indicators influence public policy, including decision-making process, policy choice and evaluation of alternatives, and monitoring. The three key functions of social indicators were identified – monitoring, social reporting for public enlightenment, and social forecasting. The key purpose of social indicators is to monitor change over time in a broad range of social phenomena beyond traditional economic indicators. Indicators also represent a form of social reporting that could support public enlightenment on social issues.[101]

The term social indicators was given in 1960s by the American Academy of Arts. It was created in order to detect and anticipate the nature and magnitude of the second-order consequences of the space program for American society. Thus the development of social indicators came with academy projects – they provided statistics, statistical series, and other forms of evidence to track social changes and to evaluate specific programs and their impact.[102]

The social indicators have impact on all kinds of fields. In the policy analysis the social indicators define the problem and frame the terms of policy discourse. In the medical field, the social indicators and quality of life measurements help to focus not only on the physical health of the patient but also on the social health. They influence the development of medical interventions. In the managerial field the social indicators help to raise the standard of living of the business employees. With the rule "happy employee, productive employee" the social indicators can emphasize the problems in the company and they can support the further changes. Scientists use the time series of indicators to assess theories, hypotheses, and models of social change.[103]

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[101]SHARPE, Andrew. *A Survey of Indicators of Economic and Social Well-being.* Ottawa, 1999. Pages 6-9.
[102]LAND, Kenneth. SIRGY, C. MICHALOS, Alex. *Handbook of social indicators and quality-of-life research*. Pages 1-18.
[103]Ibidem.

4.3.1 Theoretical framework and selected indicators

Social indicators are used to monitor the social system. Examples of these indicators include unemployment rates, crime rates, estimates of life expectancy, health status indices, school enrolment rates, average achievement scores, election voting rates, and measures of subjective well-being such as satisfaction with life as a whole and with specific aspects of life. [104]

The social indicators in this thesis were chosen subjectively. The availability of the data was taken into account. The data were collected from the World Health Organisation, the World Bank, the United Nations Department of Economic and Social Affairs, and the Millennium Development Goals databank.

4.3.1.1 Total fertility rate

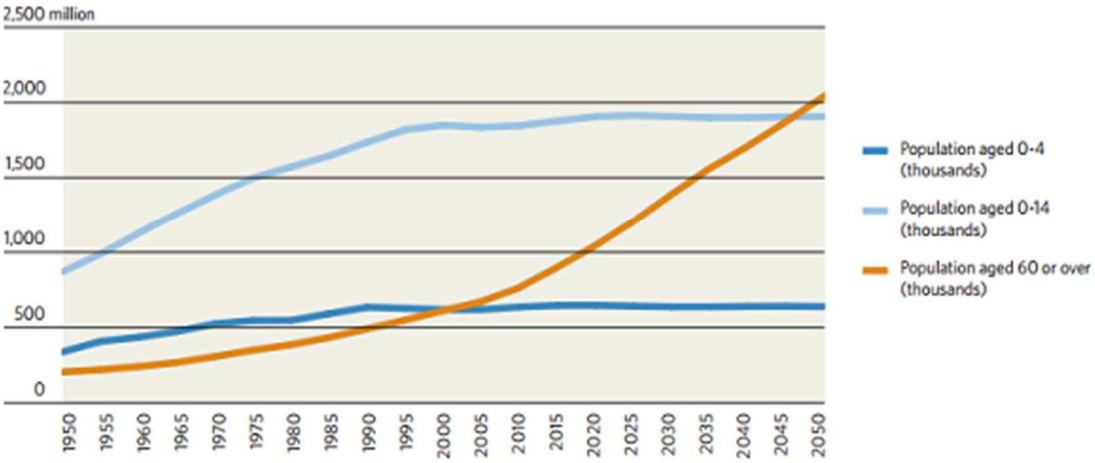
As defined by the World Bank the total fertility rate specifies the number of children that would be born to a woman if she were to live to the end of her childbearing years (usually estimated as 50) and bear children in accordance with current age-specific fertility rates. [105] The indicator is measured in births per woman. The high fertility rate is related to increased risk of maternal morbidity and mortality. The United Nations also mention that women with high number of children find in more difficult to work outside the home. Therefore they have lower opportunities to improve their economic and social status. However, in the long-run the fertility rate continues to decline, the share of working-age population also declines thus the number of older people increases. It leads to high dependency ratios. The generations with low production of children do not have enough children to replace itself and this leads to reductions in population. Total fertility level above 5 children per woman is considered as high fertility. The ideal total fertility levels of about 2.1 children per woman. In means that the average number of children a woman would have to reproduce herself by bearing a daughter who survives to her childbearing age. If the replacement level of fertility is sustained

[104]LAND, Kenneth. SIRGY, C. MICHALOS, Alex. *Handbook of social indicators and quality-of-life research*. Pages 1 – 18.
[105]Fertility rate total (births per woman). *The World Bank*. 2012

over a sufficiently long period, each generation will replace itself in the absence of migration. Total fertility below 2.1 children per woman is below-replacement fertility. Very low fertility rate is below 1.3 children per woman. Fertility rate can also be specified according to the age of women.[106] Total fertility rate in the world dropped by half from five children per woman in 1950-1955 to 2.5 children in 2010-2015, and it is expected to continue declining. [107]

4.3.1.2 Percentage of population aged 60+ years

The population aged 60 or over is increasing faster than the total population in almost all world regions. Generally, the population aged 80 years or over is growing faster than any younger age group within the older population. The ageing of the population refers to the process when older individuals become a proportionately larger share of the population. The Picture 4 shows the population aged 0-4, 0-14 and 60 or over in the time period from 1950 to the predictions of 2050. The population ageing is increasing because of the declining fertility rates, lower infant mortality and increasing survival at older ages. [108]



Picture 7: Population aged 0-4, 0-14 and aged 60 or over, 1950-2050, source: United Nations Population Fund Report

[106] *Total Fertility Rate*. The United Nations, 2012.
[107] UNFPA. *Chapter 1: Setting the scene. The United Nations Population Fund*, 2013
[108] Ibidem.

4.3.1.3 Life expectancy at birth

Life expectancy at birth refers to the average number of years that a new-born could expect to live if he or she were to pass through life subject to the age-specific mortality rates of a given period. The average life expectancy at birth has increased by nearly 20 years since 1950. However, the mortality rate rose in some part of the world because of new infectious diseases. In 2000 about 70 per cent of all countries have achieved the life expectancy at birth of 60 years or more. The 30 per cent that have not reached the goal for the year 2000 were mostly African countries. [109]

4.3.1.4 People living with HIV, 15-49 years

The number of people living with Human Immunodeficiency Virus (HIV), 15-49 years refers to the percentage of individuals aged 15-49 living with HIV. HIV is a virus that weakens the immune system and it leads to AIDS, the acquired immunodeficiency syndrome. HIV destroys the body's ability to combat with the infections and diseases which can ultimately lead to death. The indicator is measured as the number of individuals aged 15-49 living with HIV divided by the total population aged 15-49. [110] According to estimates by WHO and UNAIDS, 35 million people were living with HIV globally at the end of 2013. Approximately 2.1 million people became newly infected in 2013, and 1.5 million died of AIDS-related causes. [111]

4.3.1.5 Under-five mortality rate

The United Nations define the indicator as the probability of dying before age 5 years per 1000 newborns. The reduction of the child mortality became one of the most supported development goals. Despite progress in reducing child mortality in the world, there still exist a large gap between the developed and developing countries. During 2000-2005, under-five mortality rate was estimated at 9 per 1000 in the developed regions but at 153 per thousand in the least developed countries.

[109]WHO. *Life expectancy at birth. World Health Organisation*, 2006
[110]Goal 6. Combat HIV/AIDS, malaria and other diseases. *The Millennium Development Goals Indicators: The official United Nations site for the MDG Indicators.* 2013
[111]HIV/AIDS. *World Health Organisation*. 2014

The indicator is influenced by poverty, education, the availability and quality of health services, by environmental risks including access to safe water and sanitation, and by nutrition. The indicator is closely related to life expectancy at birth. In the less developed countries a problem with calculating the under-five mortality rate can occur because of the data collection may omit many infant and child deaths. An infant mortality rate refers to the number of deaths under 1 year of age during a period per 1000 live-births during the same period.[112]

In the Table 9 means of the chosen indicators in the period from 2000 to 2012 are given. The minimum and the maximum value of the indicator are highlighted in red. The units of each indicator are provided in the last row.

Raw data matrix	**Total fertility rate**	**Ageing**	**Life expectancy at birth**	**HIV**	**Under-five mortality rate**
Type of the indicator	**MAX**	**MIN**	**MAX**	**MIN**	**MIN**
Thailand	1,73	10,95	72,62	1,43	17,41
Cambodia	3,65	5,88	67,46	1,16	65,12
Lao PDR	3,93	5,43	64,85	0,13	94,19
Vietnam	2,11	8,25	74,69	0,38	29,40
Source of data	**WHO, World Bank**	**WHO, United Nations, Department of Economic and Social Affairs**	**UNESCO, WB**	**MDG**	**MDG**
Unit	**births per woman**	**%**	**years**	**%**	**per 1,000 live births**

Table 9: Raw data matrix for social indicator, own work

[112] *Under-five Mortality Rate*. The United Nations, 2012

4.3.2 Normalisation of data

The data in this section were normalised in the same way as in the previous set of indicators. The results of the normalisation are given in the Attachment 1. Lao PDR reached the best position in total fertility rate, ageing of the population (percentage of population aged 60+ years), and in the percentage of people with HIV. Vietnam is the leader in life expectancy at birth. Thailand has the highest values in under-five mortality rate.

4.3.3 Weighting

The weights were given to the indicators using the same method as in the previous sections – the matrix of pairwise comparison. For instance total fertility rate is more important than HIV thus the total fertility rate has weight 1. Under-five mortality rate has the same weight as total fertility rate. Both indicators have weight 0,5 (see the Table 10).

Indicator	Total fertility rate	Ageing	Life expectancy at birth	HIV	Under-five mortality rate	Sum	Weight
Total fertility rate		1	0	1	0,5	2,5	0,25
Ageing	0		0	1	0	1	0,10
Life expectancy at birth	1	1		0,5	1	3,5	0,35
HIV	0	0	0,5		0,5	1	0,10
Under-five mortality rate	0,5	1	0	0,5		2	0,20
					Total Sum	**10**	

Table 10: Matrix of pairwise comparison – weights of chosen economic indicators, own work

4.3.4 Missing data

The social indicators dataset was complete and no missing values were found.

4.3.5 Presentation of the results

The results for social indicators are shown in the Table 11. It was computed using the same method as in the previous indicators. Vietnam reached the best position with the above the average result 130,66%. The worst results belong to Lao PDR, however, they not so far from the average. Cambodia occupies the second position and Thailand the third.

Standardized data matrix*weights								
Indicator	**Total fertility rate**	**Ageing**	**Life expectancy at birth**	**HIV**	**Under-five mortality rate**	**SUM**	**Index**	**Rank**
Type of the indicator	**MAX**	**MIN**	**MAX**	**MIN**	**MIN**			
Thailand	0,00	0,00	27,62	0,00	20,00	**47,62**	**90,02 %**	**3**
Cambodia	21,75	9,18	9,30	2,06	7,57	**49,85**	**94,25 %**	**2**
Lao PDR	25,00	10,00	0,00	10,00	0,00	**45,00**	**85,07 %**	**4**
Vietnam	4,28	4,90	35,00	8,06	16,88	**69,11**	**130,66 %**	**1**
					Mean:	**52,90**		

Table 11: Final results of social composite indicators, own work

The Figure 6 displays the relationship between index and rank within the social

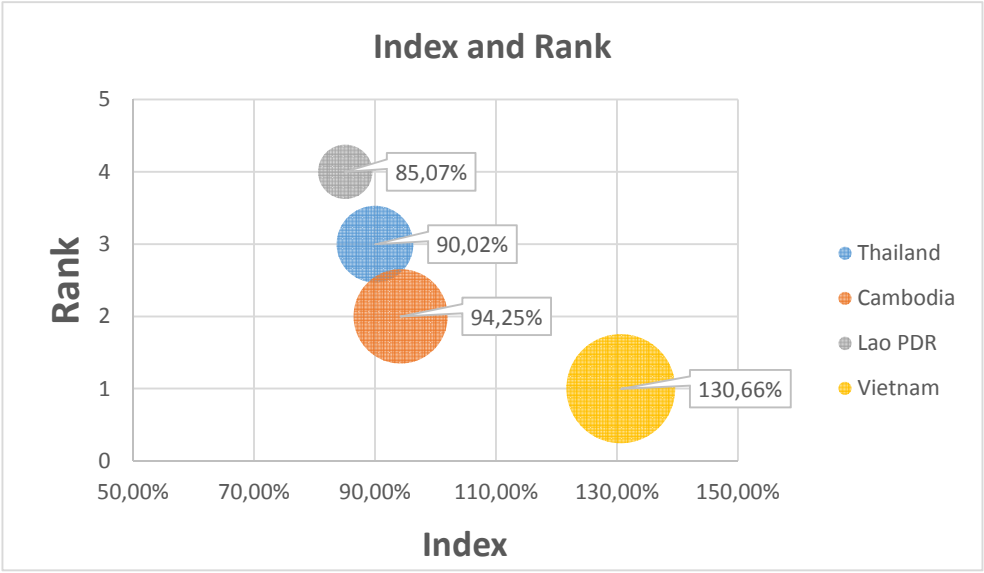


Figure 6: Index and Rank of chosen country, social indicators, own work

indicators. As was written above Vietnam has the best result from the chosen countries.

4.3.5.1 Development Diamond

The development diamond for social indicators exhibit the four chosen indicators. The HIV index was excluded from it. The Figure 7 demonstrates that Lao PDR dominates in under-five morality rate. Life expectancy at birth reaches almost the same level in all four countries.

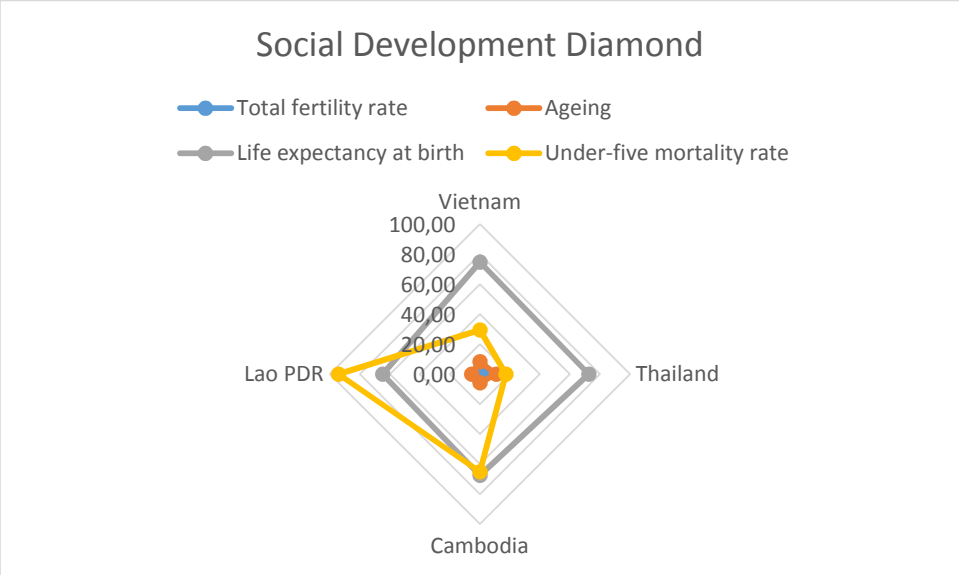


Figure 7: The Development Diamond – Social Indicators, own work

4.4 Correlation

Correlation tries to depict how the chosen variables differ from each other, in other words it shows the relationship between these variables and their dependency. Correlation can be either positive or negative. There are two traditional measures of correlation: the coefficient of correlation (r) and the coefficient of determination (r^2). The coefficient of correlation represents a value that oscillates between -1 and 1. It indicates association or direction of a relationship between dependent and independent variables. It means if the sign of the correlation is positive, the relationship between variables is also positive. If the relationship between two variables is negative, then the sign of correlation is also negative. If a correlation reaches either r = +1,0 or r= -1,0 it indicates a strong relationship. A value close to +1,0 indicates nearly perfect positive correlation. A value close to -1,0 represents almost negative correlation. If the coefficient approaches zero, there is very little or no relationship. The coefficient of determination (r^2) represents measure of strength between a dependant and independent variable. It measures the proportion in the dependent variable (Y) that is explained or accounted for by the total variation in the independent variable (X). It ranges between 0 and +1,0. The measure +1,0 is a correlation of 100 percent. The main difference between r and r^2 is that the value of r^2 represents more accurate meaning and is also easier to interpret.[113]

To show the correlation between chosen variables (composite indicators) a scatter plot is used in this thesis. It easily shows a potential relationship, either positive or negative, between these variables. From each pillar two composite indicators were chosen in order to show the correlation between them. Kurtosis and skewness were made using four indicators from each pillar.

Skewness asymmetry is defined as a degree of symmetry around arithmetic mean. It is measured by a moment bas coefficient of skewness (k3) also known as a third standardized moment. If the k3 exceeds zero, the skewness is right-sided. If it equals zero, a complete symmetry relative to the gaussian distribution occurs. If the skewness goes below zero, it is called left-sided asymmetry. Kurtosis, commonly

[113]MACFIE, Brian P. NUFRIO, Philip M. *Applied statistics for public policy.* 2006

called peakeness or flatness, refers to a level of presence for values in the point of gravity of a symmetric distribution. It is measured as a moment-based coefficient of kurtosis (k4), which is the fourth standardized moment reduced by 3.0. Kurtosis may be influenced by a presence of extreme values. If the k4 exceeds zero, the kurtosis is greater than normal one and it refers to peaked distribution. Kurtosis equalling zero means normal kurtosis relative to the normal gaussian distribution. If the values are lower than zero, the kurtosis is lower than normal. This is called flat distribution. [114]

The skewness and kurtosis for economic indicators are analysed in the Table 12. The GDP Growth is the only indicator having negative skewness. It means that the skewness is negative with the left side asymmetry. Other indicators reached positive skewness with the right side asymmetry. Net ODA received belongs to flat distributed kurtosis with the negative result and kurtosis lower than normal. Other indicators exceeded zero therefore their result falls under greater than normal distribution. The external debt stocks overcame zero with a very low value.

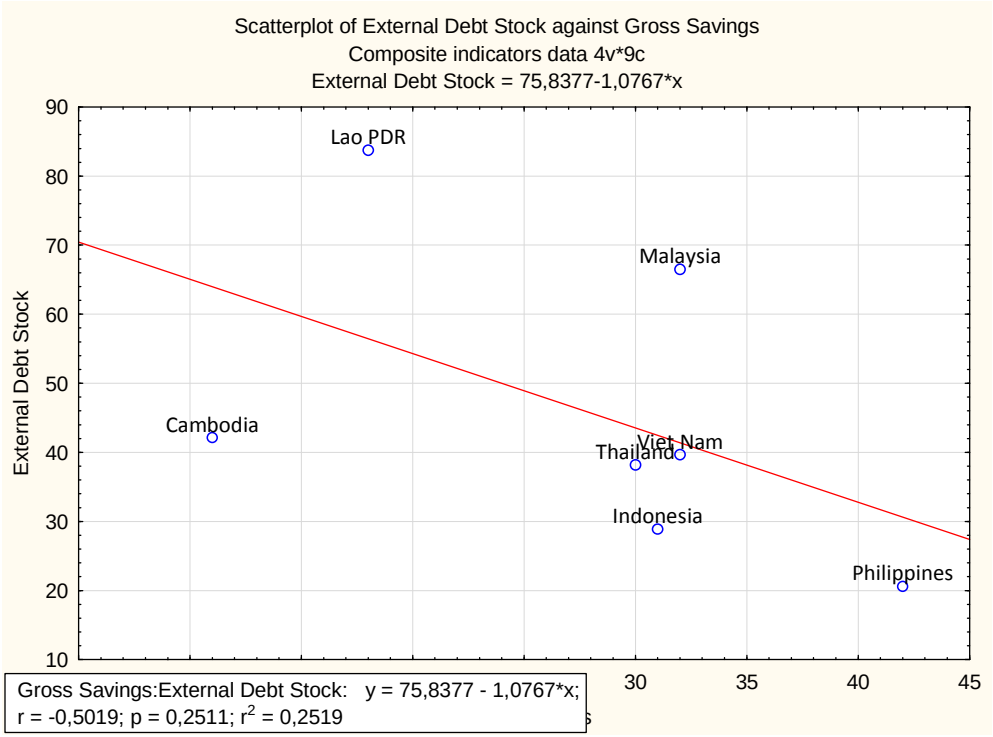
Variable	Descriptive Statistics (Composite indicators data)	
	Skewness	**Kurtosis**
Gross Savings	2,86932	8,43052
External Debt Stock	0,94562	0,13911
GDP Growth	-1,47021	2,35093
Net ODA received	0,39987	-2,10006

Table 12: Level of skewness and kurtosis, economic indicators, own work using STATISTICA

Correlation between the gross savings and external debts stock was measured to represent the economic pillar. The relationship between these indicators is relatively strong with negative coefficient of correlation r = - 0,5019. The closer the result to -1 is, the more negative the correlation is. The coefficient of determination between these indicators suggests positive strength between these variables; however the number is very low. In Vietnam and Thailand the variables represent strong similarity. The further the countries are from the line, the higher the

[114]JADCZAKOVÁ, Veronika. Characteristics of data derived from moments. Brno, 2013. Lectures.

dissimilarity between these variables is. It is obvious that Lao PDR, Malaysia and Cambodia have the largest dissimilarity (see the Picture 5).



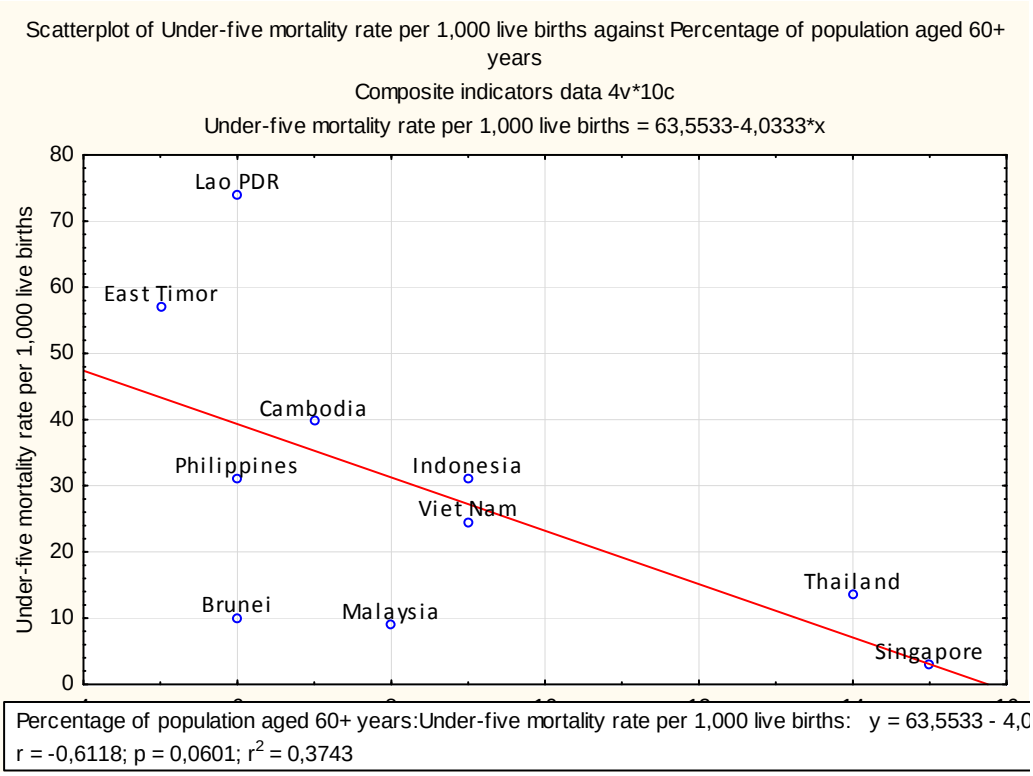
Picture 8: Scatter plot for external debt stock and gross savings, own work using STATISTICA

Skewness and kurtosis for social indicators is defined in the Table 13. Every indicator reached positive results with right sided skewness. Negative kurtosis occurred in life expectancy at birth. It means that life expectancy at birth experienced kurtosis lower than normal and it is flat. Other indicators with kurtosis above zero belong to kurtosis greater than normal.

Variable	Descriptive Statistics (Composite indicators data)	
	Skewness	**Kurtosis**
Total Fertility Rate	1,526770	2,988606
Percentage of population aged 60+ years	1,187370	0,293989
Life expectancy at birth (years)	0,521035	-0,415802
Under-five mortality rate per 1,000 live births	0,885124	0,159882

Table 13: Skewness and kurtosis, social indicators, own work using STATISTICA

The correlation in social pillar was calculated using under-five mortality rate per 1,000 births and percentage of population aged 60+. The coefficient of correlation shows negative relationship between these variables with r = -0,6118. The relationship is strong. Coefficient of determination results in relatively small strength between these variables with r^2 = 0,3743. The largest similarity was found in Vietnam, Philippines, Cambodia, Indonesia, and Singapore. Lao PDR has the highest dissimilarity between these variables (see the Picture 6).



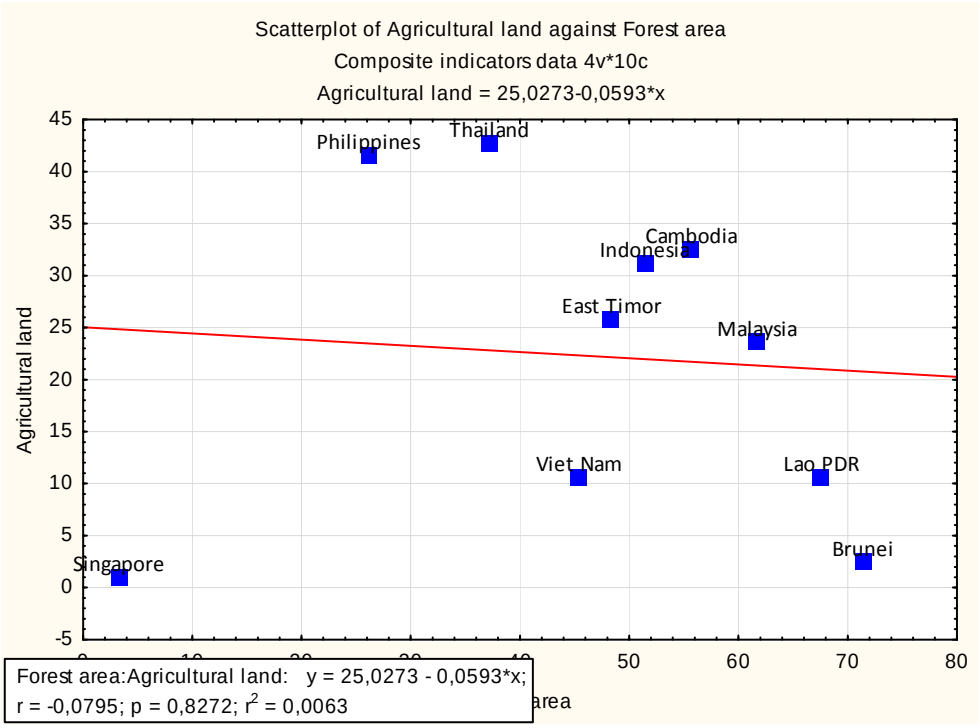
Picture 9: Scatter plot for under-five mortality rate per 1,000 live births and percentage of population aged 60+ years, own work using STATISTICA

Environmental indicators are analysed in Table 14. Negative skewness in forest area and agricultural area resulted in the left-sided asymmetry. Consumption of ozone-depleting substances and CO_2 emissions indicators have positive, right-sided skewness. Agricultural land and CO_2 emissions experienced kurtosis below the normal with the negative values (flat distribution). Forest area and consumption of ozone-depleting substances approached positive results with kurtosis greater than normal (peaked distribution).

Variable	Descriptive Statistics (Composite indicators data)	
	Skewness	Kurtosis
Forest area	-1,03847	1,09584
Agricultural land	-0,10054	-1,43945
Consumption of ozone-depleting substances	1,67127	2,40247
CO_2 emissions (kg per PPP $ of GDP)	0,03405	-1,43782

Table 14: Skewness and kurtosis, environmental indicators, own work using STATISTICA

Correlation between environmental indicators was calculated using agricultural land against forest area. The correlation coefficient r = -0,0795 indicates negative relationship. The number is very low therefore it can be said that there is almost no relationship between these indicators. This statement confirms the result of the coefficient of determination, which is very low with r^2 = 0,0063. The similarity is visible in Malaysia or East Timor, Singapore with the furthest result has the biggest dissimilarity (see the Picture 7).



Picture 10: Scatter plot for Agricultural land and Forest area, own work using STATISTICA

4.5 Regional Disparities

Regional disparities serve to compare the chosen countries and to analyse the inequality between them. Disparities between the countries tend to decline in recent years, however, within the countries themselves they did not. The income gap between the rural and urban areas has not decreased.[115]Three occurrences can be defined. If the regional disparities are related to population, quality of life, its effects in incomes and living level, the disparities occur in social sphere. If they are associated with the economic development and their effect in regional outputs or employment level, the regional disparities occur in economic sphere. The disparities can be related to geographical, natural and technical conditions and their effect in availability of markets, educations, services and infrastructure. These disparities occur in the territorial sphere.[116] In this thesis the regional disparities influence the overall development of the country therefore they are not focused on the specific sphere.

4.5.1 Human Development Index

Human Development Index (HDI) tries to evaluate the criteria for assessing the development of a country. It is a summary measure of average achievement in crucial aspects of human development, such as a long and healthy life, being educated and having a decent standard of living. It is calculated as the geometric mean of normalized indices for each of the three dimensions. [117]

The first dimension is health. It is assessed by life expectancy at birth and it is calculated using minimum value of 20 year and maximum values of 85 years. The second educational component is measured by mean years of schooling for adults aged 25 years and expected years of schooling for children of school entering age. Mean years of schooling are estimated by UNESCO Institute for Statistics based on

[115]OECD. *OECD regions at a glance*. Paris: Organisation for Economic Co-operation and Development, 2009. Page 9
[116]KUTSCHERAUER, Alois. Regional Disparities: *Disparities in country regional development - concept, theory, identification and assessment.* Pages 7-12
[117]Human Development Index (HDI). *United Nations Development Programme.* 2014

data collected from censuses and surveys available in the database. Expected years of schooling estimates are used according to enrolment by age at all levels of education. It is also provided by UNESCO Institute for Statistics. These two parts are combined into an education index using arithmetic mean. Finally, the standard of living dimension is measured by gross national income per capita. The minimum income is $100 (PPP) and the maximum is $75,000 (PPP). The logarithm of income is used in HDI to reflect the diminishing importance of income with increasing GNI.

The Table 15 provides HDI in the chosen countries. The closer the result is to 1, the better. It is obvious that Thailand has the best HDI from these countries, followed by Vietnam.

	2006	2007	2008	2010	2011	2012	2013
Thailand	0,78	0,783	0,704	0,715	0,716	0,72	0,722
Cambodia	0,584	0,593	0,564	0,571	0,575	0,579	0,584
Lao PDR	0,613	0,619	0,533	0,549	0,560	0,565	0,569
Vietnam	0,72	0,725	0,617	0,629	0,632	0,635	0,638

Table 15: Human Development Index in chosen countries, source of data: Human Development Reports, United Nations Development Programme, own work

4.5.2 Inequality-adjusted Human Development Index (IHDI)

The Inequality-adjusted HDI (IHDI) was firstly presented in the 2010 Human Development Report. It was developed after several criticisms that the statistical information from which the HDI values are computed do not involve any information how health, income, and education are distributed in the population. It shows how much the human development in a country falls short of the potential human development under the condition of complete equality, in other words how the achievements are distributed among the population including each dimension's average value according to its level of inequality. Therefore, the IHDI results are usually lower than the HDI values.[118]

[118]BROCKMANN, Hilke a Jan DELHEY. *Human happiness and the pursuit of maximization: Is more always better?*. 2013

The Figure 8 illustrates the IHDI in Thailand, Cambodia, Lao PDR, and Vietnam. The best result in IHDI belongs to Thailand. Thailand also prevailed in HDI measures therefore it can be said that the inequality is the lowest across the four chosen countries. Thailand is followed by Vietnam. Vietnam experienced increasing tendency in the IHDI. Cambodia and Lao PDR have the worst results. Cambodia reached very low numbers in 2010 and 2011. The inequality adjusted index was just 0.35 and 0.38. Although the Lao PDR experienced better results, Cambodia overcame Lao PDR in 2013 with the result 0.44 in comparison to the 0.43 to Lao PDR.

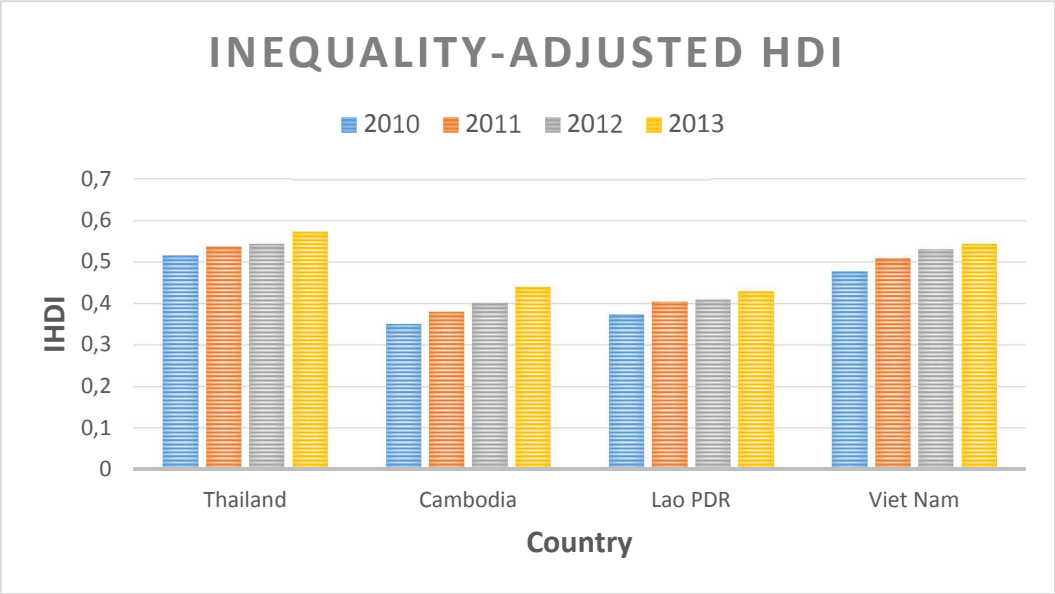


Figure 8: Inequality-adjusted HDI, source of data: UNDP, own work

4.5.3 Lorenz Curve

Lorenz Curve represents one of the most used tool in inequality and income distribution measurement. It shows graphically which proportion of total income is in the hands of the given percentage of population. The x-axis records the cumulative proportion of population ranked by income level. The range is <0,1>. The y-axis records the cumulative proportion of income for the given proportion of population, in other words the income share calculated by taking the cumulated

income of the given share of the population, divided by the total income.[119] In this thesis GDP per capita for each province in the chosen country was used.

The perfect income distribution depicts an Ideal Lorenz Curve. It illustrates the situation of everybody having the same income - this means that the given proportion of the population would have the same proportion of income, for instance in a population of 100 individuals everybody had 1/100 of total income. The income would be equally distributed in the population. Although it would be an ideal situation, an income distribution is usually made of poor and rich people when the poor individuals own less than an equally distributed share of total income because the rich individuals own more than the equally distributed share.[120] Therefore the empirical Lorenz Curve is calculated. The larger the difference between the ideal and the empirical Lorenz Curve, the larger the inequality in the country; in other words the smaller the area surrounded by both lines, the more equalized spread of data takes place. The aim of the curve is to delineate the area between the idealized 45° line under exactly equal distribution among the classes and the empirical Lorenz curve.[121]

The Lorenz curve was created for two countries: Thailand and Vietnam. Unfortunately, data for Lao PDR and Cambodia were not available since they lack of proper database with results for each province in the country. The Figure 9 depicts the Lorenz curve for Thailand. It was created based on data collected from the Thai websites. The region is divided into several regions with number of provinces. The empirical curve illustrates the inequality in Thailand. The difference between the ideal and empirical curve is Gini coefficient which will be calculated further on. However, it can be stated that inequality occurs.

[119]BELLÚ, Lorenzo Giovanni. *Charting Income Inequality: The Lorenz Curve*. Rome, 2005
[120]Ibidem.
[121]JADCZAKOVÁ, Veronika. *Measuring concentration.* Brno, 2014. Lectures.

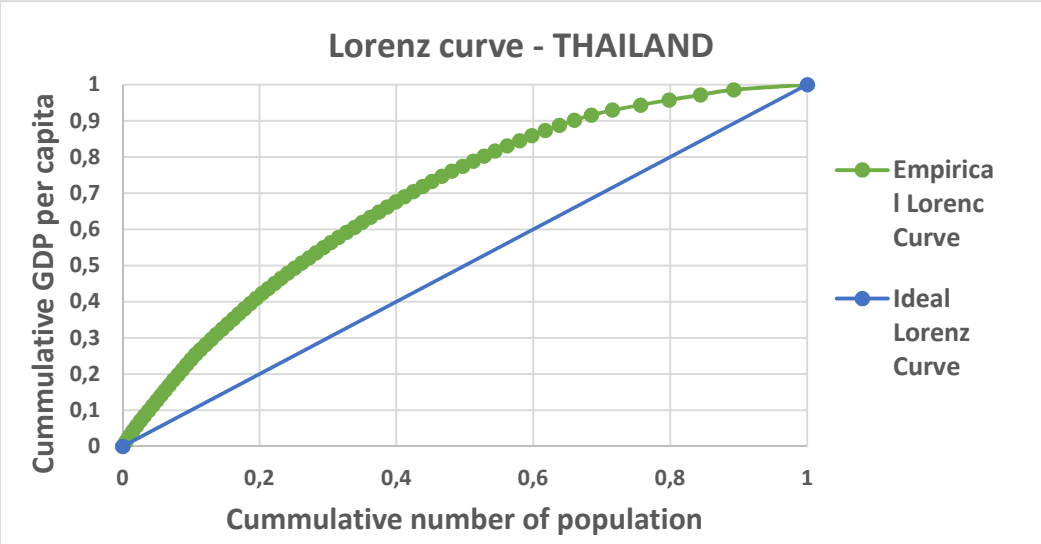


Figure 10: Lorenz curve for Thailand, source of data: Thai websites, own work

To compare the inequality a Lorenz Curve for Vietnam was created (see the Figure 10). It needs to be pointed out that for Vietnam it was not complete because of the lack of resources therefore not all the provinces in the country were used. Strong inequality occurs in the country although the curve shows that the inequality is lower than in Thailand. An accurate result will be provided in the Gini coefficient calculation further in the thesis.

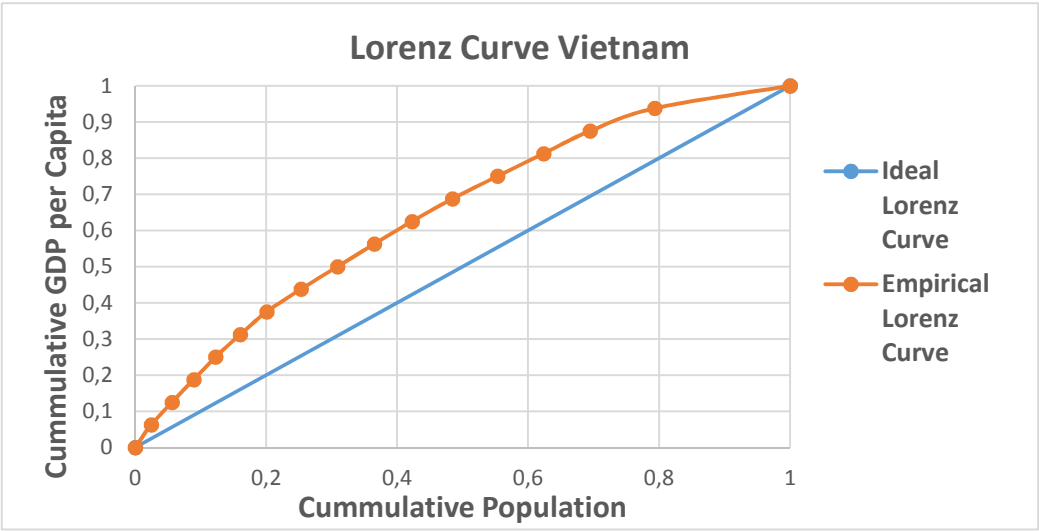


Figure 9: Lorenz curve for Vietnam, source of data: AsiaFinest databank, own work.

4.5.4 GINI Coefficient

The Gini coefficient measures the degree of inequality in the income distribution. It is used in relationship with the Lorenz curve. The Gini coefficient is computed as the area between the line of perfect (ideal) income equality and the empirical Lorenz curve divided by the entire triangular area under the line of perfect income equality.[122]

$$Gini\ coefficient = \frac{Area\ between\ the\ line\ of\ perfect\ income\ equality\ and\ actual\ Lorenz\ curve}{Entire\ triangular\ area\ under\ the\ line\ of\ perfect\ income\ equality}$$

The Gini coefficient is a dimensionless measure. The values move within interval <0;1>. The closer the result is to 1 the worse. Value of G=0 represents the idealized absolute equality and value of G=1 means the most unequal distribution. The data are usually provided as the Gini index, which is the Gini coefficient multiplied by 100.[123]

The Gini coefficient for Thailand and Vietnam will be calculated as follows:

$$G = \frac{1}{10000}[10000 - \sum_{i=2}^{n}(100cp_i - 100cp_{i-1})(100cq_i + 100cq_{i-1})]$$

The Gini coefficient for Lao PDR and Cambodia are collected from the World Bank because of the lack of values for each province in the country.

[122]ARNOLD, Roger. *Economics.* California: South-Western College Pub, 2015
[123]JADCZAKOVÁ, Veronika. *Measuring concentration*. Brno, 2014. Lectures.

In the Table 16 the Gini coefficient for chosen countries is calculated. The data for Cambodia are from the year 2011, the rest of the countries use the data from 2012. The results for Vietnam and Thailand were calculated using the formula mentioned above in the text. Unfortunately, data for computing the Gini coefficient for Cambodia and Lao PDR were not available, therefore the World Bank calculation was used. Thailand experienced the best result with the Gini coefficient 0,384. The worst result belongs to Vietnam. The further the result from 1 is, the worse the performance is. Therefore it can be said that none of the countries have reached at least medium value of the Gini coefficient. It can also be said that the countries experience great inequality.

Gini coefficient			
Vietnam	**Thailand**	**Cambodia**	**Lao PDR**
0,295	0,384	0,318	0,362

Table 16: Gini coefficient in chosen countries, source of data for Cambodia and Lao PDR: World Bank, source of data for Thailand and Vietnam: own calculation

4.6 Cluster Analysis

The cluster analysis assigns objects, such as regions, countries, respondents, products etc. based on a set of user selected characteristics (variables) into a-priori unknown groups called clusters. The aim is to find natural grouping of these objects. Therefore objects in the same group (cluster) are more similar to each other than objects in other clusters. The strong relationship is called within-cluster homogeneity, which should be high, together with low within-cluster variability. Objects from other groups are more different, which means that they shall exhibit high between-cluster heterogeneity together with high between-cluster variability. Each object belongs to only one cluster. The purpose of the cluster can be identified as an effort to create clusters with the within-cluster variability minimized and at the same time the between-cluster heterogeneity maximized. [124]

The variables are expressed in different units therefore the data need to be standardized. Then a dissimilarity matrix was done (see the Attachment 3). The biggest dissimilarity was found between Brunei and Lao PDR with the result 50,8.

To have more reliable results 10 countries from Southeast Asia were used in order to define the clusters. Three clusters were set. As the Table 17 presents Thailand, Cambodia, Lao PDR, and East Timor belong to the first cluster. Second cluster includes Vietnam, Malaysia, Indonesia, and Philippines. Third cluster contains Singapore and Brunei. These results were computed using Ward's method of Squared Euclidean distances.

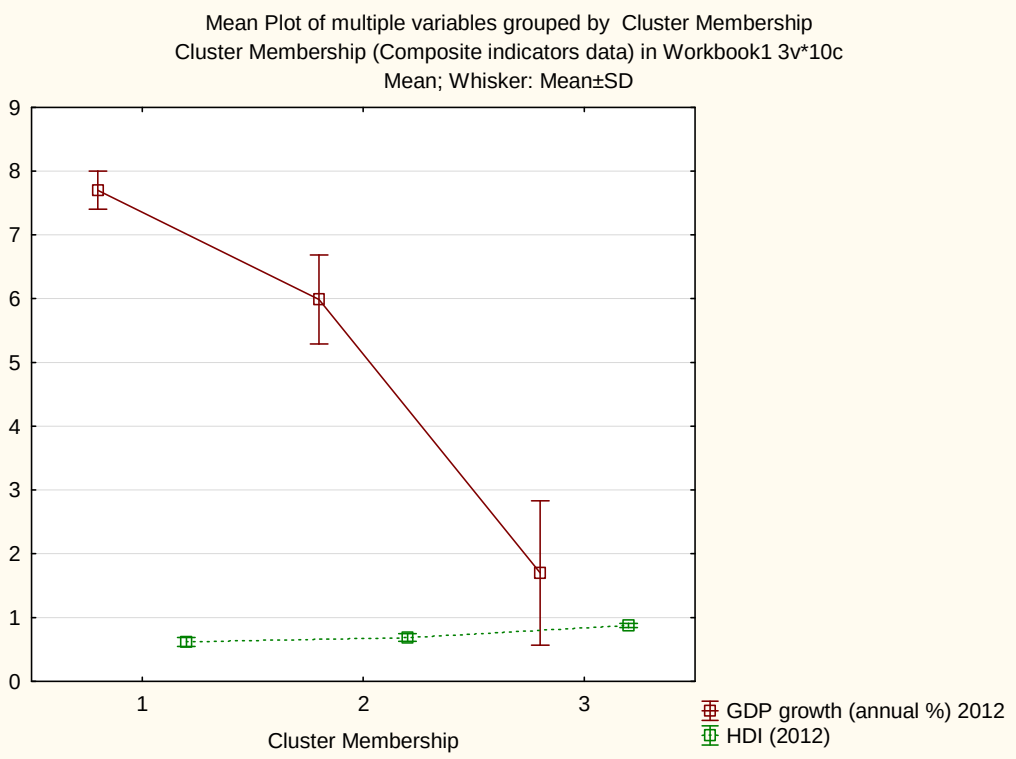
[124]JADCZAKOVÁ, Veronika. *Measuring proximity*. Brno, 2014.

	Cluster Membership (Composite indicators data) Linkage distance = 2,87206 Ward`s method Squared Euclidean distances		
	Cluster Membership	**GDP growth (annual %) 2012**	**HDI (2012)**
Thailand	1	7,6671738	0,72
Cambodia	1	7,31334551	0,579
Lao PDR	1	8,02421103	0,565
Vietnam	2	5,24736716	0,635
Malaysia	2	5,6	0,77
Indonesia	2	6,3	0,681
Philippines	2	6,8	0,656
Singapore	3	2,5	0,899
Brunei	3	0,9	0,852
East Timor	1	7,8	0,616

Table 17: Cluster Membership, own work using STATISTICA

Picture 8 illustrates the heterogeneity between variables. The most heterogeneous cluster is the one with the largest whiskers (vertical lines extending from the boxes). The whiskers indicate standard deviations of a given variable and present the level of cluster homogeneity with respect to a measured indicator.[125] In this case it is cluster in the right corner of the picture. This cluster includes Singapore and Brunei. The least heterogeneous cluster is the one in the left corner with 4 cases – Thailand, Cambodia, Lao PDR and East Timor.

[125]JADCZAKOVÁ, Veronika. *Measuring proximity*. Brno, 2014.



Picture 11: A profile-diagram, heterogeneity of the clusters, own work using STATISTICA

The description of each cluster together with interpretation of the results is contained in the Table 18.

Cluster Identification	Involved Countries	Cluster description
Cluster 1	Thailand, Cambodia, Lao PDR, East Timor	Homogenous cluster with above average GDP growth and high HDI
Cluster 2	Vietnam, Malaysia, Indonesia, Philippines	Relatively homogenous cluster with average GDP growth and average HDI
Cluster 3	Singapore, Brunei	Heterogeneous cluster with low GDP growth and high HDI

Table 18: Interpretation of cluster analysis results, own work

5 RESULTS AND RECOMMENDATIONS

5.1 Environmental pillar

The environmental protection became an often discussed problem in past years. One of the major problems is global warming. Global warming is caused by the release of CO_2 and other substances into the atmosphere. It leads to greenhouse effect when the planet is overheating due to the number of CO_2 in the atmosphere causing acceleration of sea level and heat waves. The industrial revolution in the world increased the number of factories spreading toxic substances into the air. They also contaminate waters causing water pollution and shortage of drinkable water. With the increasing number of used cars and comfort the probability of environmental catastrophe rises.

The decreasing number of forests known as deforestation also leads to global warming. Forests are the largest producers of oxygen, they make the air clean and with the decline of the forests the amount of CO_2 increase as well.

If the results of this pillar are compared it is probable that Thailand reached the worst position from the chosen countries. The rank 1 means that Thailand has the highest and at the same time the worst results in the field of environment. It is obvious especially in the consumption of ozone-depleting substances. Thailand overcame the other countries enormously. The country produced 2312,82 metric tons in the period from 2000 to 2012 (mean number). In comparison with Lao PDR which produced only 19,42 metric tons of the same substances the results for Thailand are alarmingly larger. Thailand also produced the highest number of CO_2 emissions and has the lowest number of forest area. On the other hand the amount of agricultural land and improved water source are the biggest in Thailand. These results can indicate that Thailand is getting closer to the developed world, however, it is related to worsening of the environment.

The improvement of water sources should be taken into account in Lao PDR and Cambodia. These countries reached 58.92 and 56.31 percent of the population with

access to these water sources – half of the population in the country has no access to the improved water sources.

Kyoto protocol can serve as an example of the binding regulation of CO_2 emissions. Developing countries have not signed it, thus their CO_2 emissions are not regulated. As it is clear from the Thailand example some of the developing countries should regulate the amount of CO_2 emission with similar treaty or protocol. With increasing amount of stable infrastructure people will travel more. Therefore the increasing tendency of CO_2 emissions can continue with the higher usage of cars. Using renewable resources and green electricity from solar panels or wind powers can reduce CO_2. However, these methods are expensive and developing countries have not yet reached the amount of CO_2 emissions as the developed countries have. In case of Thailand this possibility should be discussed together with other more developed countries in the region of Southeast Asia. Deforestation is one of the major sources of CO_2 emissions as well.

Improved water source refers to people with access to piped water either in the household or at least at some public standpipe, borehole, dug well etc. It is connected to sanitation facilities and hygiene. The main causes for low number of improved water sources are lack of money, lack of education in the field of building the water systems, low participation of the government or the people in the region. The first point is that the problem needs to be identified. If the water is contaminated, tests need to be carried out in order to prevent diseases caused by it. The source of clean water needs to be found. Then the education part has to be fulfilled. People should be taught by several volunteers to see how to build a cheap and efficient water pump. They can spread their knowledge to other villages and regions. The local people are sometimes reserved and do not accept the help from strangers. If the help comes from the local inhabitants, they might be able to accept it. The amount of organisations providing hand water pump is increasing. They can educate people in the most affected regions. However, help from the government, funds, subsidies, foreign direct investment or developed countries is crucial in order to finance these projects.

5.2 Economic pillar

Thailand was predicted to exceed the chosen countries in the field of economy. Thus it is surprising that the result of this country is the worst one. The economic crisis together with political disputes greatly influenced the performance of the country. Even though the country has nearly the lowest percentage of external debts and almost the highest gross saving from the compared countries, the annual GDP growth is the lowest and is far behind the leading country Cambodia. The mean employment to population from 2000 to 2012 is the worst from the chosen countries. The political situation should be stabilized in order to attract more tourists. Cambodia was affected by the economic crisis. The GDP growth fell from 6.69 in 2008 to 0.09 in 2009. Thailand even experienced negative economic growth in 2009 with the result -2.33. Lao PDR and Vietnam managed to stabilize the situation with small decrease in their results. On the other hand Lao PDR has the highest external debt stock (in percent of GNI). In comparison to Vietnam the mean external debt stock for Lao PDR from 2000 to 2012 was 115.90 whereas Cambodia had almost three times lower result 35.38

The performance of South East Asian countries is influenced by several factors. They profit from tourism, foreign direct investments, increasing number of exports etc. The Official Development Assistance helps the developing country in the field of infrastructure, health or education in terms of funds, subsidies or loans. On the other hand the less the ODA is used the more sufficient and developed the country is. The countries in the region are highly trade-dependent, thus with improving infrastructure the possibilities of trade increase. Vietnam may be one of the fastest growing economies in the region with high number of exports into the world.

Employment in the country can be improved by increasing foreign direct investment or by focusing on attracting foreign investors to come to the country, start business there and employ more local people. Foreign direct investors can either copy their hometown activities or implement them in the developing country, or they can use the developing country as an exporter in the rest of the world. Third option is to start a business in the developing country, focus on its implementation

and further development in the area. To improve the stability in the economy, especially in Thailand, the household spending and export should increase. It is connected to education as well because if the investments in education are high, the export-competitiveness increases with higher value added to goods for export.

Innovation can promote economic development as well. Start-up business and improving innovation can encourage entrepreneurship in the country. It can be supported by proper governmental policies decreasing the bureaucracy connected to it and supporting the growth of businesses.

5.3 Social pillar

The population growth represents currently one of the major problems in the social field. The developing countries suffer from high fertility rate whereas developed world fertility rate is stagnating or even decreasing. The low number of fertility rate influences ageing of the population. With improving healthcare, technologies and medications the people are growing old thus there is a lack of young people in productive age to support them in the future. Ideal fertility rate is around 2.3 or 2.5. Thailand − being below this number − is getting closer to the developed country trend with the decreasing fertility rate. This result is caused by the family planning program in Thailand. On the contrary Lao PDR and Cambodia exceed the ideal rate with mean results from 2000 to 2012 of 3.93 for Lao PDR and 3.65 for Cambodia. Therefore in can be said that the fertility rate in Thailand should increase while in Lao PDR and Cambodia it should decrease. Vietnam is experiencing almost perfect rate with the result 2.11.

This recommendation is supported by the ageing results with Thailand in the leading position and Lao PDR and Cambodia having the lowest numbers.

The life expectancy in the country is related to the development of the healthcare. The better the healthcare, the higher life expectancy can be possibly reached. Vietnam has the highest life expectancy from the chosen countries supporting the fact that Vietnam invests more in healthcare. However, healthcare in Vietnam is still highly underdeveloped. Thus it attracts foreign investors to support the

development who see the potential growth in it. Healthcare influences under-five mortality rate as well. It can be improved with support of international organisations such as the World Health Organisation or the United Nations Children's Fund (this organisation is specialized in children's rights, survival and protection). Lao PDR should focus mainly on decreasing the under-five mortality rate. The government plays an important role. It can either use their own resources or the Official Development Assistance to support the improvement of healthcare.

It is not surprising that Thailand has the highest number of HIV infected from the chosen countries. The sex-tourism is typical for Thailand with the European tourists coming to the country to experience cheap sex with Thai people. The sex-tourism business should be reduced. If the Europeans are infected, they travel back to their county and spread the disease. The education about dangers of it needs to be improved - people should know more about it, how to protect themselves from the disease using condoms. Several governmental policies should be implemented in order to stop potential growth in this type of business.

5.4 Regional disparities

Regional disparities assess differences between economic performance and welfare between countries. The HDI, IHDI and Gini coefficient were used to evaluate the situation in chosen countries.

The Human Development Index (HDI) takes into account crucial aspects of development in the country, including education, standard of living or health. Thailand reached the best position in every year in the period 2006-2013. The results fluctuate around 0,7. However, decrease from 2007 result 0,783 to 2008 result 0,704 indicates that Thailand was strongly affected by the economic crisis in the world. Thailand also suffered from ongoing political crisis from 2008 to 2014 and it is still not completely certain if the situation is stable. These two facts probably caused major decrease in tourism - only from 2008 to 2009 the tourism

decreased by 21 %. [126] Tourism represents major income of the country, therefore it can be stated that if the income from tourism decreased, country cannot invest in the key areas of the human development as much as it is needed. But in comparison to other chosen countries Thailand stands out. With improving political situation increasing number of tourists is expected to cause growing tendency in HDI. In IHDI Thailand confirmed its leading positon, on the other hand the inequality still needs to be improved because the latest result of 0.573 from 2013 shows that Thailand is still very far from the perfect result of 1.

The decrease in results from 2007 to 2008 can be seen in all the chosen countries. Lao PDR experiences the biggest increase from the chosen countries from 0.533 in 2008 to 0.569 in 2013. Lao PDR belongs to medium human development category ranking 139 out of 187 countries in the world. The increase is evident especially in the life expectancy and standards of living fields, on the contrary the education still needs to be improved. Lao PDR also needs to deal with unexpected situations, such as natural disasters.[127] Progress needs to be secured and guaranteed to avoid people falling into poverty again. In the terms of inequality measured by IHDI Lao PDR still achieves very low numbers indicating high inequality and uneven distribution of income in the county.

Mechanisms and measures capturing uneven distribution of wealth in the country are the key element in a fight with inequality. The major change is in hands of the policy makers and government. First of all, access to basic needs such as food, healthcare, education or social protection has to be ensured. Then policy interventions and public investments can target on the weak areas in the development in order to support the future growth. The change in monetary and financial policies may lead to financial securities together with financial control. Inequalities in employment can be solved by monetary policies ensuring standardized amount of money received with emphasis on labour rights and

[126]CHOMTHONGDI, Jacques-chai. Thailand and the World Financial Crisis: How will civil unrest further damage Thailand's economic position? *The Globalist.* 2009

[127]Maintaining human development requires reducing risks and building resilience. *United Nations in the Lao PDR*. 2014

working conditions.[128] Help of international organisations can be used. The International Labour organisation helps in the field of employment, the World Trade Organisation can recommend several trade transitions or the World Health Organisation support proper healthcare and investment in medicine, research and technologies connected to it.

[128]GHOSH, Jayati. Inequality is the biggest threat to the world and needs to be tackled now. *The Guardian*. 2013

6 CONCLUSION

The main aim of the thesis was to compare the development performance of the four chosen countries from the region of Southeast Asia, and to recommend possible solutions. The results of Thailand were emphasized in order to see if the fact that Thailand was never a colonized country influenced the final results. The development was compared using composite indicators. For each pillar of the development five indicators were chosen to cover the crucial aspects of it.

The theoretical part described the basic definitions, characteristics and methods important in creating the composite indicators, such as weighting, normalisation of the data, presentation of the results etc.

The analytical part assessed each pillar of the development in the chosen countries. To see the relationship between some indicators the cluster analysis was used. The cluster analysis provided evaluation of homogeneity or heterogeneity between two indicators in the chosen countries. Inequality was discussed in the regional disparities part with comparison of Gini coefficient, HDI and IHDI.

Finally, the results were compared and evaluated in the last part of the thesis. It can be said that Thailand exceeded the chosen countries mainly in the past. At the end of the Second World War Thailand belonged to one of the world's poorest countries and the economy had been stagnating for a century. 50 years later Thailand was included into the Asian Tigers statistics together with Korea, Taiwan, Hong Kong and Singapore as the fifth Tiger. Thailand was considered to be a stable country with sustainability, macroeconomic stability, and declining poverty. The country gained its position due to market-oriented economy and open attitude towards the trade and investment flows with the rest of the world. However, the economic crisis and political disputes have caused the decreasing tendency in Thailand's economic performance with other countries moving forward faster in the results. The political situation created unstable background in the country with the decreasing flow of tourism. Tourism is one of the major incomes in the country,

therefore Thailand policy makers have to focus on the effects of the decreasing tourism.

The position of Thailand in the Asian Tigers is connected to greater environmental damages. It is not surprising that Thailand reached the worst position in the environmental indicators calculation. In the past years the focus on the environmental protection was not emphasized. Together with the economic and political stability Thailand should improve the environmental results as well.

Cambodia and Lao PDR should decrease the fertility rate using a family planning programme. With investments in the healthcare the life expectancy should increase together with the under-five mortality rate. This number is in case of Lao PDR still very high. In terms of economic performance their economic growth is still increasing even though Cambodia was affected by the economic crisis in a major way.

Vietnam experiences development with relatively stable economic growth, high employment to population, high gross savings, low external debt stock, and low number of net ODA received. Life expectancy at birth is the highest in Vietnam with the almost perfect fertility rate.

The results showed that even though Thailand is a part of the Asian Tigers, the development in the past years suffered from political changes and economic crisis. The other countries compared in the region are increasing their competitiveness in terms of development with Vietnam in the leading position.

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Source of pictures

Picture 1:

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Picture 2:

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Picture 3:

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ATTACHMENTS

Attachment 1: Normalisation of data, standardized data matrix: Min-Max

Source of data: Own work

Environmental indicators:

Standardized data matrix: Min-Max					
	CO_2 emissions	Improved water source	Consumption of ozone-depleting substances	Forest area	Agricultural land
Type of the indicator	MIN	MAX	MIN	MAX	MAX
Thailand	0,00	100,00	0,00	0,00	100,00
Cambodia	87,31	0,00	98,75	73,78	69,47
Lao PDR	100,00	6,85	100,00	100,00	0,00
Vietnam	4,56	79,03	85,44	12,78	0,00

Economic indicators:

Standardized data matrix: Min-Max					
	GDP Growth annual	Employment to population	Gross Savings	Net ODA received	External debts
Type of the indicator:	MAX	MAX	MAX	MIN	MIN
Thailand	0,00	0,00	89,20	100,00	94,85
Cambodia	100,00	100,00	7,51	18,95	79,13
Lao PDR	77,77	57,69	0,00	0,00	0,00
Vietnam	59,32	37,30	100,00	68,07	100,00

Social indicators:

Standardized data matrix: Min-Max					
	Total fertility rate	Ageing	Life expectancy at birth	HIV	Under-five mortality rate
Type of the indicator:	MAX	MIN	MAX	MIN	MIN
Thailand	0,00	0,00	78,91	0,00	100,00
Cambodia	86,99	91,77	26,56	20,59	37,86
Lao PDR	100,00	100,00	0,00	100,00	0,00
Vietnam	17,13	48,95	100,00	80,59	84,38

Attachment 2: Development of data for each indicator

Environmental indicators:

CO2 emissions (kg per PPP $ of GDP)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	0,43	0,44	0,44	0,43	0,43	0,40	0,38	0,35	0,34	0,36	0,35	0,36	0,35	0,39
Cambodia	0,15	0,15	0,14	0,14	0,12	0,12	0,11	0,12	0,12	0,12	0,12	0,12	0,12	0,13
Laos	0,10	0,08	0,10	0,09	0,10	0,09	0,09	0,09	0,08	0,08	0,08	0,08	0,08	0,09
Vietnam	0,33	0,35	0,37	0,38	0,39	0,38	0,36	0,37	0,38	0,39	0,39	0,39	0,39	0,38

Source of data: World Bank, own work

Improved water source (% of population with access)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	92	92	93	93	94	94	95	95	96	96	96	96	96	94,46
Cambodia	42	44	46	49	51	54	56	59	61	64	66	69	71	56,31
Laos	46	48	50	52	55	57	59	61	63	65	68	70	72	58,92
Vietnam	77	79	81	82	84	85	87	88	89	91	92	94	95	86,46

Source of data: World Bank, own work

Consumption of ozone-depleting substances (in ODP metric tons)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	5104,6	5204,7	3612,5	3152,1	2528,5	2317,3	1464,4	1380,6	1197,5	1012	1088,8	832	1171,6	2312,82
Cambodia	97	97	97	89,9	74,6	50,8	34,6	19,9	9,3	17,1	12,8	13,7	10,1	47,98
Laos	45,2	42	42,9	35,9	23,1	21,3	19,4	8	3,6	3	2,5	2,7	2,8	19,42
Vietnam	369,4	353,7	447,4	404,6	419,3	458,7	401,1	298,2	277,5	289,3	311,7	292,9	269,9	353,36

Source of data: Millennium Development Goals, own work

Forest area (% of land area)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	37,2	37,2	37,1	37,1	37	37	37	37	37,1	37,1	37.1	37.2	37.2	37,08
Cambodia	65,4	64,5	63,6	62,6	61,7	60,8	60,1	59,3	58,6	57,9	57.2	56.5	55.7	61,45
Laos	71,6	71,3	71	70,6	70,3	69,9	69,6	69,3	68,9	68,6	68.2	67.9	67.6	70,11
Vietnam	37,7	38,6	39,5	40,4	41,3	42,2	42,6	43,1	43,6	44	44.5	45.0	45.4	41,3

Source of data: World Bank, own work

Agricultural land (% of land area)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	38,82	38,81	38,54	38,27	38,28	38,38	38,56	38,76	39,25	40,87	41,22	41,22	42,79	39,52
Cambodia	27,02	27,70	28,33	28,89	29,63	30,34	30,90	30,90	31,47	31,47	32,04	32,04	32,60	30,26
Laos	8,02	8,24	8,27	8,40	8,49	8,70	8,93	8,86	9,87	10,16	10,30	10,30	10,70	9,17
Vietnam	8,02	8,24	8,27	8,40	8,49	8,70	8,93	8,86	9,87	10,16	10,30	10,30	10,70	9,17

Source of data: World Bank, own work

Economic indicators:

GDP growth (annual %)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	4,75	2,17	5,32	7,14	6,34	4,60	5,09	5,04	2,48	-2,33	7,81	0,08	7,67	4,32
Cambodia	8,77	8,04	6,69	8,51	10,34	13,25	10,77	10,21	6,69	0,09	5,96	7,07	7,31	7,98
Laos	5,80	5,75	5,92	6,07	6,36	7,11	8,62	7,60	7,82	7,50	8,53	8,04	8,02	7,16
Vietnam	6,79	6,19	6,32	6,90	7,54	7,55	6,98	7,13	5,66	5,40	6,42	6,24	5,25	6,49

Source of data: World Bank, own work

Employment to population (%)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	70,80	71,00	71,70	71,70	72,20	72,60	71,90	72,60	72,40	72,50	72,30	71,90	71,90	71,96
Cambodia	76,60	77,50	77,50	77,60	78,50	79,70	80,60	81,50	81,40	84,20	86,70	87,30	84,10	81,02
Laos	78,40	78,20	77,90	77,40	76,90	77,40	77,20	77,00	76,80	76,60	76,50	76,50	76,60	77,18
Vietnam	76,00	75,50	75,90	75,60	75,70	75,50	75,10	74,90	74,80	74,50	75,30	75,00	75,60	75,34

Source of data: World Bank, International Labour Organisation, own work

Gross savings (% of GDP)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	30,00	29,00	28,00	28,00	28,00	28,00	30,00	33,00	31,00	3,00	31,00	31,00	30,00	27,69
Cambodia	14,00	17,00	15,00	15,00	13,00	14,00	17,00	14,00	17,00	14,00	13,00	12,00	11,00	14,31
Laos	2,00	3,00	10,00	7,00	7,00	11,00	20,00	19,00	18,00	21,00	18,00	16,00	18,00	13,08
Vietnam	28,00	29,00	28,00	26,00	25,00	34,00	36,00	31,00	27,00	29,00	30,00	28,00	32,00	29,46

Source of data: World Bank, own work

Net ODA received (% of GNI)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	0,58	0,25	0,24	-0,69	0,03	-0,10	-0,11	-0,13	-0,24	-0,03	0,00	-0,05	-0,04	-0,02
Cambodia	11,20	10,95	11,85	11,57	9,47	8,92	7,61	8,15	7,49	7,26	6,86	6,45	6,02	8,75
Laos	16,90	14,41	16,44	15,76	11,89	11,31	11,15	9,72	9,55	7,39	6,16	5,12	4,67	10,81
Vietnam	5,07	4,11	3,42	4,21	3,80	3,38	2,84	3,34	2,65	3,68	2,64	2,77	2,75	3,44

Source of data: World Bank, own work

External debt stocks (% of GNI)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	66,08	59,80	51,37	42,73	37,91	34,92	31,43	26,37	25,33	31,88	34,84	32,97	38,20	39,53
Cambodia	74,93	70,68	71,31	71,74	67,59	58,69	50,58	33,44	32,08	34,63	35,10	35,53	42,17	52,19
Laos	151,74	147,42	181,11	122,41	115,90	109,08	107,17	113,07	99,86	102,19	85,24	87,69	83,78	115,90
Vietnam	38,74	36,20	35,70	37,92	37,04	33,65	28,71	30,95	27,54	32,61	40,28	40,92	39,69	35,38

Source of data: World Bank, own work

Social Indicators:

Total Fertility Rate (births per woman)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	1,9	2	1,9	1,9	1,9	1,9	1,8	1,64	1,8	1,46	1,44	1,43	1,41	**1,73**
Cambodia	4	4,9	4,8	4,7	4	3,9	3,3	3,12	2,9	3,01	2,97	2,93	2,89	**3,65**
Lao PDR	4,1	5	4,8	4,7	4,7	4,6	3,3	3,48	3,5	3,37	3,29	3,2	3,11	**3,93**
Vietnam	2,4	2,3	2,3	2,3	2,3	2,2	2,2	1,89	2,1	1,84	1,82	1,97	1,77	**2,11**

Source of data: WHO, World Bank, own work

Percentage of population aged 60+ years (%)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	9,9	8,3	8,8	9,0	10,2	11,0	12,0	11,0	11,0	11,0	12,9	13,2	14,0	**10,9**
Cambodia	5,7	4,4	4,6	4,7	5,5	6,4	6,0	5,8	6,0	6,0	7,2	7,2	7,0	**5,9**
Lao PDR	5,5	5,6	5,5	5,4	5,3	5,6	5,0	5,3	5,0	5,0	5,6	5,8	6,0	**5,4**
Vietnam	8,6	7,5	7,4	7,4	7,5	8,6	8,0	7,4	9,0	9,0	8,9	8,9	9,0	**8,2**

Source of data: WHO, United Nations, Department of Economic and Social Affairs, own work

Under-five mortality rate per 1,000 live births														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	22,5	21,5	20,5	19,5	18,6	17,8	17	16,3	15,6	15	14,5	14	13,5	**17,41**
Cambodia	110,5	100,8	89,7	79,2	70,5	63,6	57,9	53,4	49,5	46,4	43,8	41,6	39,7	**65,12**
Lao PDR	117,4	113,2	108,9	104,8	100,8	97	93,3	89,7	86,2	82,9	79,6	76,7	74	**94,19**
Vietnam	35,1	34	32,9	31,9	31	30	29,2	28,3	27,5	26,7	25,9	25,2	24,5	**29,40**

Source of data: UNESO, World Bank, own work

Life expectancy at birth (years)														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Thailand	71	71	71	72	72	72	73	73	73	74	74	74	74	**72,62**
Cambodia	62	63	64	65	66	67	68	69	70	70	71	71	71	**67,46**
Lao PDR	62	62	63	63	64	65	65	65	66	66	67	67	68	**64,85**
Vietnam	74	74	74	74	74	75	75	75	75	75	75	75	76	**74,69**

Source of data: Millennium Development Goals, own work

People living with HIV, 15-49 years old, %														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Mean**
Thailand	1,902	1,802	1,702	1,602	1,502	1,402	1,402	1,302	1,302	1,202	1,202	1,202	1,102	**1,43**
Cambodia	1,602	1,602	1,502	1,402	1,302	1,202	1,102	1,002	1,002	0,902	0,902	0,802	0,802	**1,16**
Lao PDR	0,102	0,102	0,102	0,102	0,102	0,102	0,102	0,102	0,102	0,102	0,202	0,202	0,202	**0,13**
Vietnam	0,302	0,302	0,302	0,402	0,402	0,402	0,402	0,402	0,402	0,402	0,402	0,402	0,402	**0,38**

Source of data: Millennium Development Goals, own work

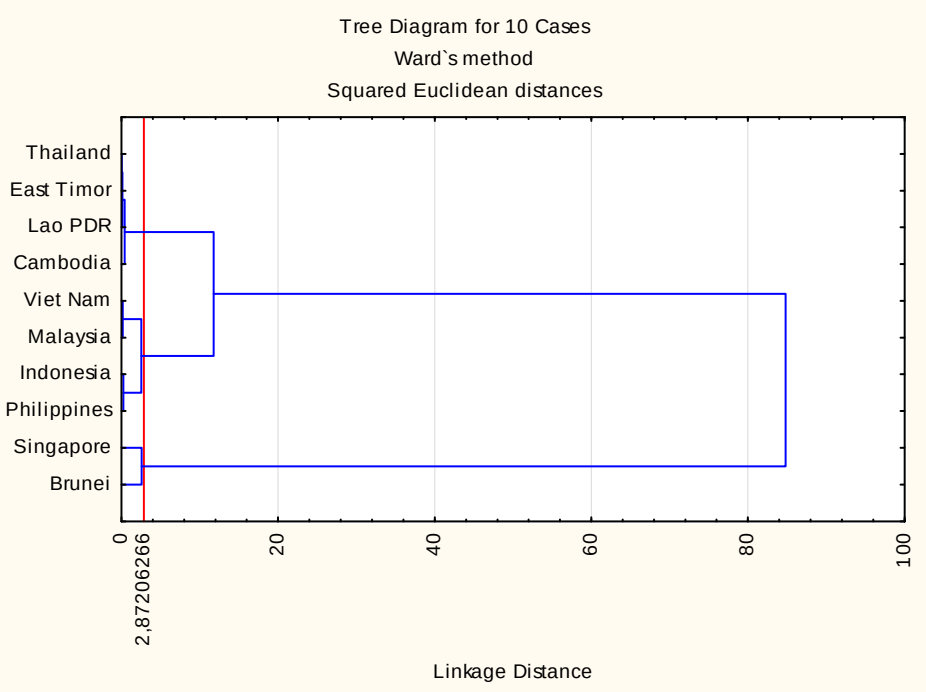
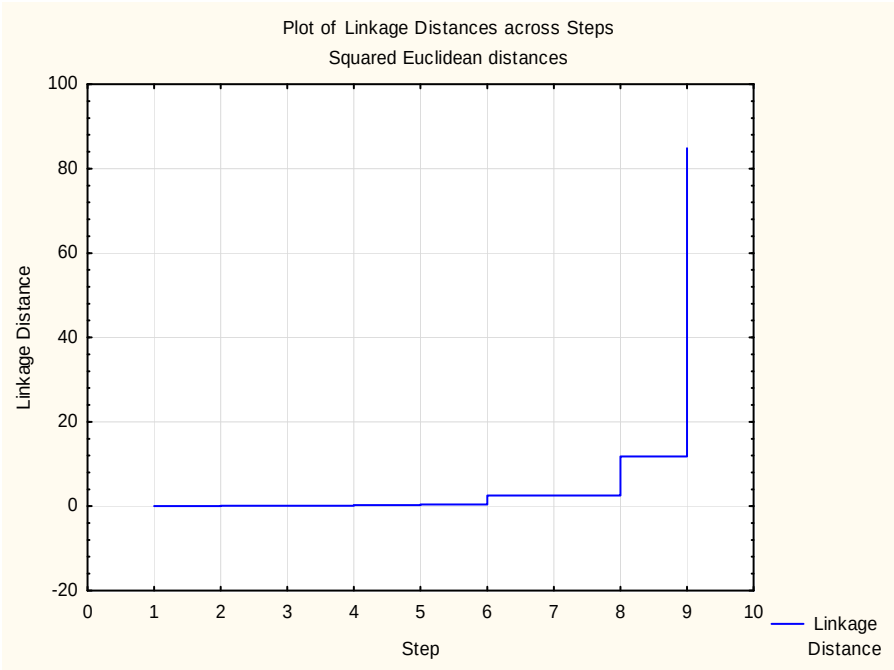
Attachment 3: Cluster Analysis data, own work using STATISTICA

Variable	Correlations (Composite indicators data) Marked correlations are significant at p < ,05000 N=10 (Casewise deletion of missing data)			
	Means	Std.Dev.	GDP growth (annual %) 2012	HDI (2012)
GDP growth (annual %) 2012	0,707107	0,707107	0,707107	-0,707107
HDI (2012)	-0,707107	-0,707107	-0,707107	0,707107

Case No.	Squared Euclidean distances (Composite indicators data)									
	Thailand	Cambodia	Lao PDR	Vietnam	Malaysia	Indonesia	Philippines	Singapore	Brunei	East Timor
Thailand	0,0	0,1	0,2	5,9	4,3	1,9	0,8	26,7	45,8	0,0
Cambodia	0,1	0,0	0,5	4,3	3,0	1,0	0,3	23,3	41,2	0,2
Lao PDR	0,2	0,5	0,0	7,7	5,9	3,0	1,5	30,6	**50,8**	0,1
Vietnam	5,9	4,3	7,7	0,0	0,1	1,1	2,4	7,6	18,9	6,5
Malaysia	4,3	3,0	5,9	0,1	0,0	0,5	1,5	9,6	22,1	4,9
Indonesia	1,9	1,0	3,0	1,1	0,5	0,0	0,3	14,5	29,2	2,3
Philippines	0,8	0,3	1,5	2,4	1,5	0,3	0,0	18,5	34,8	1,0
Singapore	26,7	23,3	30,6	7,6	9,6	14,5	18,5	0,0	2,6	28,2
Brunei	45,8	41,2	**50,8**	18,9	22,1	29,2	34,8	2,6	0,0	47,7
East Timor	0,0	0,2	0,1	6,5	4,9	2,3	1,0	28,2	47,7	0,0

Linkage distance	Amalgamation Schedule (Composite indicators data) Ward`s method Squared Euclidean distances									
	Obj. No. 1	Obj. No. 2	Obj. No. 3	Obj. No. 4	Obj. No. 5	Obj. No. 6	Obj. No. 7	Obj. No. 8	Obj. No. 9	Obj. No. 10
0,0284588	Thailand	East Timor								
0,1267619	Thailand	East Timor	Lao PDR							
0,1425749	Vietnam	Malaysia								
0,2506250	Indonesia	Philippines								
0,4055963	Thailand	East Timor	Lao PDR	Cambodia						
2,539489	Vietnam	Malaysia	Indonesia	Philippines						
2,562209	Singapore	Brunei								
11,77302	Thailand	East Timor	Lao PDR	Cambodia	Vietnam	Malaysia	Indonesia	Philippines		
84,83353	Thailand	East Timor	Lao PDR	Cambodia	Vietnam	Malaysia	Indonesia	Philippines	Singapore	Brunei

Squared Euclidean distances, own work using STATISTICA



Plot of Linkage Distances across Steps, own work using STATISTICA