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Green Jobs and Climate Change

The Saxony Anhalt Region – Renewable Energies in the Perspective of the Economy and Vocational Education and Training

Fabienne-Agnes Baumann, Klaus Jenewein, Axel Müller

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A study based on the final report of the international Workshop “Green Jobs and Climate Change”, Magdeburg, Saxony-Anhalt, Germany, from December 10 to December 13, 2012, on behalf of the Gesellschaft für Internationale Zusammenarbeit (GIZ) and the German Federal Ministry of Economic Cooperation and Development (BMZ)

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Abbreviations and Acronyms

CDM - Clean Development Mechanism

CENELEC - National Electricity Council Mozambique

CONDES - National Council for Sustainable Development Mozambique

CTF - Clean Technology Fund

DONRE – Department(s) of Natural Resources and Environment Vietnam

EDM - Electricidade de Moçambique

EECO - Energy Efficiency and Conservation Office Vietnam

ESDM - Ministry of Energy and Minerals Indonesia

ESSV - Energy Self-Sufficient Village Programme

EVN - Electricité du Vietnam

FUNAE - Fundo da Energia Mozambique

MOET - Ministry of Education and Training Vietnam

MOIT - Ministry of Industry and Trade Vietnam

MONRE - Ministry of Natural Resources and Environment Vietnam

NAPA - National Adaptation Programme of Action Mozambique

NTP-RCC - National Strategy Program for Responding to Climate Change Vietnam

PARPA - Poverty Reduction Plan Mozambique

PLN - PT Perusahaan Listrik Negara Indonesia

SAPP - South African Power Pool

UEM - University Eduardo Mondlane Mozambique

UNEVOC - UNESCO International Centre for Technical and Vocational Education and Training

UNDP - United Nations Development Programme

UNFCCC - United Nations Framework Convention on Climate Change

VEPF - Vietnam Environment Protection Fund

Foreword

Green economy, green technologies, green TVET, green Jobs – the international discussion in the sustainable development context increasingly affects political, social, and ecological processes. As a consequence, new industries and employment opportunities are being developed in the field of renewable energies. Employment within this sector is expected to grow steadily during the next decades, especially in developing countries, where renewables could have a key role for sustainable socio-economic development. These new fields of employment depend on skilled workers, who have been trained through TVET programs and curricula based on the idea of sustainable development.

In accordance with these facts, the international workshop "Green Jobs and Climate Change" held in Magdeburg served as a forum to find answers to questions regarding this topic. Important aspects are concerning the support initiatives for sustainable development and renewable energies, best practice in the area of green jobs and green economy, possibilities to support sustainable and green TVET, and the process of greening economies. Ideas should be worked out in the view of the participants' existing cooperation networks, and strategies to enhance capacity building for green jobs in different world regions.

The workshop brought together participants from East Asia and Southern Africa, as well as German renewable energy experts, to develop a network to support further development in the area of green jobs between Eastern Germany and the ASEAN and SADC regions. Saxony-Anhalt with its variety of research institutions and well established economic structures regarding green technologies is known as a renewable energy hub and could prove to be an important partner in international cooperation for sustainable development.

Workshop discussions focused on how to make the best use of renewable energies in developing countries and emerging economies by adapting cooperation strategies to the respective needs of the international participants. The report at hand is the documentation of the workshop results, transforming them into ideas and suggestions for future activities, by institutions such as the Magdeburg UNEVOC-Centre „TVET for Sustainable Development" and the Gesellschaft für Internationale Zusammenarbeit GIZ GmbH. All workshop participants are interested and willing to collaborate in putting to practice the ideas developed in the workshop.

The hosts of the workshop extend their thanks especially to the Gesellschaft für Internationale Zusammenarbeit GIZ GmbH and to the government of Saxony-Anhalt for their help for and support of this important event.

Fabienne-Agnes Baumann, Klaus Jenewein, Axel Müller

1 “Green Jobs and Climate Change” – Conceptual notes

1.1 Key topics

This reports contains a study on “Green Jobs and Climate Change”, combining the findings of three country analyses and the results of a workshop held with national and international experts in Magdeburg from December 10 to 12, 2012. The study was carried out for the Gesellschaft für Internationale Zusammenarbeit GIZ GmbH on behalf of the Federal Ministry for Economic Cooperation and Development, BMZ. The key objective has been the identification of economic and labor market potentials regarding green jobs in selected regions, namely Indonesia, Mozambique and Vietnam. With the findings of the country analyses, a program of action was developed during the workshop based on which stakeholders in Saxony-Anhalt's economic, education, science and research sectors can establish perspectives for international cooperation.

One of the key topics of the workshop has been the identification of current labor market trends and qualification needs as well as participants’ individual potentials, interests, and expertise in the field of green jobs. Participants also discussed innovative education concepts for TVET, for instance the development of curricula for green jobs. Another key topic has been the development of a cooperation network for green jobs and climate change.

1.2 Key issues

Green economy, green technologies, green TVET, green jobs, and ‘green ideas’ seem to have an increasing effect on different political, social, and ecological processes. For more than two decades now, sustainability has been discussed as a concept for socio-economic development, the environment, and education. People increasingly agree that it is important to ensure that future generations are left no worse off than current generations. Therefore, the current development model seems flawed and inefficient regarding the creation of employment and opportunities reducing socio-economic inequalities across the globe. In the majority of cases, the degradation and exploitation of the environment affects those the most who already live and work in precarious conditions.

Furthermore, the changing nature of industry and work, the pressures of global financial crises, as well as limits and opportunities created by climate change, all impact businesses and society as a whole. Thus, advocacy for the integration of sustainable development into economic and working processes and educational concepts is strong.

The concept of sustainable development has already led to the development of new industries and employment opportunities in ecotourism, environmental monitoring, sustainable community development, eco-design, recycling, alternative energy sources, land rehabilitation, pollution control, and waste water treatment and reuse etc. The latter require skilled workers who, apart from technical knowledge, should also be aware of sustainable development and the respective working processes.

‘Green job concepts’ most importantly need strong and lasting partnerships between providers of TVET and the private sector in order to make a significant contribution to a sustainable future. In this context, the “green economy” holds a key position since it is here that new ways are found to save resources and to make our everyday lives more energy efficient and hence, more sustainable. Additionally, a considera-

ble number of new jobs could be created.

Partnerships between the education and private sectors are important in identifying the social, economic, and ecological challenges of modern societies and in developing ideas and strategies for appropriate solutions. As far as these solutions are concerned, developing countries hold a strategic position. The overuse of natural resources and the results of overconsumption are most severely felt at their doorstep: water shortages, exorbitant food prices, instable employment, and income losses are only a few of the massive economic and social threats. This is why the developing world should be a part of the solution, e.g. through intersectoral, interregional, and international partnerships taking on the cause of sustainable development.

A prerequisite for these partnerships is an enabling environment which provides the opportunity for all stakeholders to engage in dialogue, eventually resulting in innovative educational and economic concepts.

The workshop on "Green Jobs and Climate Change" has taken account for these developments by bringing together experts, entrepreneurs, and TVET practitioners in order to foster the exchange of know-how, technology, and good-practice in the field of green jobs and the green economy, focusing on renewable energies. Experiences have been shared and the latest developments have been discussed while working towards the long term goal of establishing a network which facilitates the dissemination of information, know-how, technology, and innovations.

1.3 Objectives

Several specific objectives had been identified for the international workshop on "Green Jobs and Climate Change".

- Developing an overview concerning economic structures, skills, and occupational needs in the renewable energy sector of the participating countries
- Formulating concepts for international TVET partnerships amongst the background of sustainable development and the UNESCO "Green Economy – Green Jobs" strategy
- Outlining a network structure which integrates German and international TVET stakeholders and institutions.
- Development of a "Plan for Action" based on the workshop results
- Establishing links for the GIZ's ILT-Program "Climate Change in TVET and Green Jobs"

1.4 Key questions

Prior to the workshop, a number of key questions had been identified with regard to future cooperation initiated by the participants:

- What kind of cooperation would be feasible?
- How can current best practices in the area of green jobs and green economy be transferred and applied to the context of the cooperation network which is to be established through the workshop?
- How can the participants' existing cooperation networks be linked to green TVET?

- How can the cooperation support sustainable and green TVET and the process of greening economies?
- What strategies can be formulated to enhance capacity building for green jobs?

1.5 Desired outcomes

Ideally the workshop activities result in the following:

- An active network to support further development in the area of green jobs between Saxony-Anhalt and the ASEAN and SADC regions
- Increased awareness about how to make the best use of renewable energies in developing countries and emerging economies
- Cooperation strategies adapted to the respective needs of the international participants
- Access to new markets for renewable energy industry representatives
- Strengthening of the state of Saxony-Anhalt as a renewable energy hub through international cooperation

1.6 Methodical approach and the three phases of the program

The first phase of the program consisted of the compilation of an assessment outlining the potential for renewable energies and green jobs in the Asian and African partner countries of Indonesia, Mozambique, and Vietnam. Through identifying potentials, needs, and the current status quo concerning renewables, light was also shed on possible areas for future cooperation between Asian and African stakeholders and green economy representatives from the state of Saxony-Anhalt.

On the basis of the assessments, a workshop representing phase two was held in Magdeburg, Germany. Participants had the chance to get to know each other and sort out interests and potential areas for cooperation. On one hand, the study visits provided the international participants with an insight into renewable energy projects and training for renewables in Saxony-Anhalt. On the other hand, international participants were encouraged to engage with German experts and practitioners representing research facilities, companies, and TVET in three consecutive workshop sessions as well as through separate presentations. Participants had the opportunity to share experiences and discuss the latest developments while working towards the long term goal of establishing a network which facilitates the dissemination of information, know-how, technology, and innovations.

In phase three, the previous country assessments were assembled and expanded by the findings and outcomes of the workshop phase, including recommendations concerning strategies and topics for future cooperation representing the final report of the workshop.

1.7 Limitations

There have been several limitations to this project:

- Time: there were only three days for presentations, discussions, and workshop sessions and one day for study visits.

- Context: presentations on the topic of renewable energies in Saxony-Anhalt mostly focused on solar and wind energy.
- Participation: the workshop group was comparatively small due to short notice and the date of the event.

2 The country assessments

2.1 Introduction

Energy is a key to economic growth, prosperity, and social equality. Access to energy is a prerequisite for the achievement of several development goals, such as improving health care, improving educational provision and achievement, creating economic opportunities, and ultimately eliminating poverty and hunger. Shortly: development without energy is impossible. However, choices about energy should not be made without taking long-term consequences into account. Countries and development stakeholders should be enabled to find individually appropriate and sustainable solutions for their particular circumstances.

The world's current development model rather leads to further inequalities, unprecedented exploitation of natural resources, and environmental degradation. Evidently, with climate change at everyone's doorstep, alternatives need to be found.

A transition to sustainable energy systems seems inevitable and perhaps one of the biggest challenges of the century. National governments are facing the task of drafting appropriate legislation and taking action accordingly. To attract the necessary investment, developing countries and emerging economies should create an enabling environment. The transition to a more sustainable global economy also requires significant changes in our current lifestyles and consumption habits. This is why society as a whole needs to be a part of the decision making process. At the same time, the private sector is fundamental to the success of governmental plans and programs for sustainable development: businesses provide solutions and investments as well as technology and market expertise.

Renewable energies are supposed to open up the way to low carbon economies. Although the initial cost of electricity generated by renewables is presently higher than that of fossil energy sources, renewable energy addresses sustainability issues such as pollution, energy security, and resource conservation, making renewables more attractive in the long run.

People in many developing countries are confronted with unreliable or limited national electricity grids, while renewable energies represent a promising off-grid alternative. A decentralized energy supply is also attractive for small scale investments as costs are expected to be soon competitive to fossil energy. Meanwhile, developing countries still have comparatively low deployment rates.

Interest in renewable energy is rising across the globe and emerging economies are about to catch up and could even surpass developed countries in the deployment of alternative energy sources.

The research and development of renewable energy technologies is currently dominated by developed countries. Importing the technology is expensive and usually not an option for developing countries, so they could benefit from support in adapting renewables to their local circumstances, for instance through international cooperation networks. Developing local capacities for the transition to more sustainable energy solutions is crucial, as the expansion of renewable energy is already hampered by a lack of knowledge and skills. Therefore, a commitment to vocational education and training for renewable energies from the professional to the management and financing levels is highly important. Employment in the context of renewable energies and also in a number of other fields is often referred to as 'green

jobs'.

Green jobs have been defined by the International Labor Organization as *decent* jobs that:

- reduce consumption of energy and raw materials
- limit greenhouse gas emissions
- minimize waste and pollution
- protect and restore ecosystems

The green jobs sector usually comprises

I. energy conservation,
II. renewable energy,
III. waste reduction and recycling, and
IV. forestry and plantation

(Kleden and Kauppert, 2011, p.5).

Particularly relevant for the context of these assessments are skills and employment in the renewable energy sector. As with most sectors, employment in the renewable energy (RE) sector is organized along value-chains. That means that a range of different skills levels is needed from the manufacturing and distributing RE equipment to the construction, installation, maintenance, and management of RE systems. In the case of biomass and biofuels, not only technical but also agricultural aspects play a role (ILO, 2012a).

To start with, large numbers of workers are needed to produce, construct, and install the necessary RE equipment, while operating and maintaining these systems require much less personnel. Biomass and bioenergy usually require more workers than other renewable energy sources (Ibid.). Furthermore, renewable energies, especially in the research and development segment, demand a considerable number of engineers (ILO, 2012a).

The aspects above are only some of many that need to be taken into consideration for green job provision, especially in developing countries and emerging economies where resources and expertise are often limited. Additionally, developing and emerging economies are more vulnerable to skill shortages in times of employment booms within certain sectors. Demand for labor can also suddenly disappear again, depending on the level of development of the respective technologies. This makes it difficult to plan and conceptualize education and training in sectors such as renewable energies.

'Green jobs' in a general sense most importantly need strong and lasting partnerships between providers of education and training and the private sector in order to match labor market supply and demand. A 'greener' economy is also likely to create favorable circumstances for job creation and economic opportunities, possibly lifting many out of poverty. Climate change and environmental exploitation in turn pose a threat to many livelihoods in both developing and developed countries.

It is with respect to this background that the following assessments have been prepared. They have been commissioned by Otto-von-Guericke-University in Magdeburg and GIZ and have served as preliminary assessments for the workshop on "Climate Change and Green Jobs". Findings for the assessments exclusively originate from existing literature on the subject, and all current data depend solely on the availability of information.

The assessments provide an overview of the policy framework and regulatory environment of Indonesia's, Mozambique's, and Vietnam's energy sector. They further examine the potentials and current status of renewable energies in the countries and identify energy specific needs, problems, and barriers. Information is also given on environmental challenges and about the activities in the national training sector concerning renewable energies.

Some thoughts have been expressed on possible areas of cooperation for future partnerships on climate change, which can now be found in Chapter 4 of this workshop report.

The assessments originally concluded with several paragraphs on renewable energies in the German state of Saxony-Anhalt, one of the country's renewable energy hubs and a potential partner for developing and emerging countries for the transition to sustainable energy systems. This information has been expanded and compiled in Chapter 3.

2.2 Indonesia

2.2.1 Indonesia in facts and figures

Indonesia is an archipelagic country in Southeast Asia comprising a total area of 1,904,569 km². It shares borders with East Timor, Malaysia, and Papua New Guinea. The more than 13,000 Indonesian Islands were colonized by the Dutch during the 17th century. During World War II, Japan occupied Indonesia from 1942 to 1945, and four years after Japan's capitulation Indonesia's sovereignty from the Netherlands was finally recognized. The first democratic elections took place in 1999 after Indonesia had suffered from decades of oppressive rule. Indonesia is currently the fourth most populous country in the world and home to the world's largest Muslim population, and its Gross Domestic Product (GDP) was estimated at US $1.125 trillion in 2011 (the figure refers to GDP with purchasing power parity PPP). GDP growth was estimated at around 6.5 percent in 2011. In descending order, industry, services, and agriculture make for the most important GDP contributions. According to estimates, Indonesia's labor force is composed of some 117 million people in 2011, with most employees working in the service, agriculture and industrial sectors (in descending order). However, Indonesia's unemployment rate ranges from around six to seven percent, with 12 percent of Indonesians living below the national poverty line (Central Intelligence Agency CIA World Factbook, 2012).

2.2.2 Key environmental challenges

Indonesia is blessed with a richness of natural resources whose preservation is perceived as vital to the country's future. Due to its archipelagic nature, it is very prone to the results of climate change such as severe flooding but also to man-made deforestation and land degradation.

A general problem in Indonesia is weak environmental management. Investment in environmental and natural resource policy has been quite remarkable but to date progress has been slow, mainly because of a lack of commitment as well as financial and human resource capacity (World Bank, 2009, p.4). Furthermore, environmental aspects are seldom integrated into governmental planning and public investment. National decentralization processes have led to a redistribution of responsibilities and opened up room for interpretation and implementation of regulations. While some regional and local level administrations keep to existing rules, others come up with new regulatory procedures which often bypass national standards and regulations and therefore undermine national efforts regarding sustainability

(World Bank, 2009, p.4).

There is a lack of professional staff to deal with environmental issues and a lack of public awareness on the topic as well. Although past environmental disasters have stirred concerns over climate change and the country's environmental situation, valuing natural resources and the environment is not rooted deeply enough in societal values. Without participation and the voice of Indonesia's citizens it seems difficult to undertake the necessary steps towards a sustainable future. As long as there is no clearly articulated demand for sustainable solutions to the country's economic and environmental problems, the government has limited the incentive to scale up its efforts (World Bank, 2009, p.6). In Indonesia's policies concerning energy, climate change, and natural resources are necessarily intertwined due to the local circumstances: natural resources play an important role in the country's economy, as agriculture, forestry, and mining (especially coal) make up about one third of its GDP. This in turn has led to non-sustainable exploitation of natural resources, not only in the forestry but also in the fishery sector. The commercialization of natural resources is again closely tied to the provision and security of livelihoods, especially in poorer rural areas. Limited access to electricity, water, and sanitation; the consequences of climate change and natural disasters; subsidies for fossil energies and environmental degradation are acute constraints to Indonesia's economic growth (Ibid.).

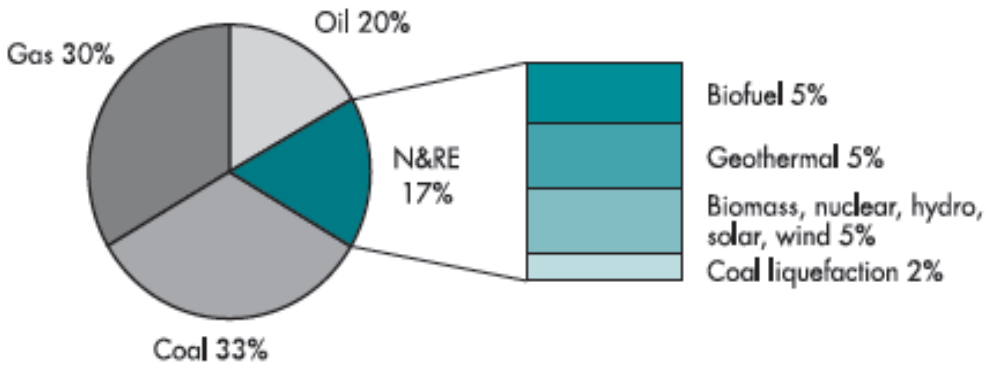
2.2.3 The energy sector

Governance structure

International agreements and national policies

In August 1994, Indonesia ratified the UN Framework Convention on Climate Change (UNFCCC), and it signed the Kyoto Protocol on December 3rd, 2004. However, Indonesia is not obligated to reduce Greenhouse Gas (GHG) emissions as it is a non-Annex 1 party. Since the archipelago is highly vulnerable to climate change and is the third largest emitter of GHG, largely through its energy sector, the government at the 2009 G-20 Summit nonetheless pledged to reduce its GHG emissions by 26% by 2030. Indonesia is also participating in the ASEAN Energy Awards program, especially concerning energy efficiency in buildings and industry (Clean Energy Info Portal REEGLE, n.d.).

. National primary energy supply in year 2025



(International Energy Agency, 2008, p.91)

Current key national policies in place include the 'National Energy Policy' (KEN) of 2006 and the 'Energy Blueprint 2005-2025' which outlines the policy's energy programs and targets. According to the Blue-

print, Indonesia strives to further diversify its energy mix through increasing the share of new and renewable energies, as can be seen in the graphic below which illustrates the targets of the Energy Blueprint.

Other policies are the 'Presidential Regulation No. 5' of 2006, which regulates the development of renewable energy and the 'National Energy Conservation Master Plan' (RIKEN) of 2005, which targets Indonesia's energy saving potential through improving energy efficiency and energy conservation. In 2004, the 'Green Energy Policy' (Ministerial Decree No. 2 of 2004) was adopted to utilize and more efficiently use renewable energies and to increase public awareness of energy efficiency.

Renewable energies are indirectly supported further by the 'Ministerial Decree on Small Distributed Power Generation Using Renewable Energy'. The decree is supposed to benefit small renewable energy power plants by opening up the possibility of selling their surplus production to the local grid. However, the allowance capacity is limited to one Megawatt (MW). The similar 'Ministerial Regulation on Medium Scale Power Generation' limits the allowance capacity to 10 MW (International Energy Agency IEA, 2008, p.94).

Stakeholders

Responsibilities regarding climate change, the environment, and renewable energies are distributed to several governmental institutions. The Ministry of Energy and Minerals (ESDM) and its four Directorates General represent a streamlined governance structure for the energy sector. ESDM also operates three agencies (Geology, Research and Development, and Education and Training). ESDM is in charge of formulating and implementing policies for oil, gas, coal, electricity, and geothermal power. The Directorate General of Electricity and Energy Utilization, a subordinate branch of the ESDM, is the chief regulator of the energy sector, designing legislation and its corresponding implementation, enforcement, and compliance (REEGLE, n.d.). The Ministry also oversees Indonesia's energy demand and supply (Kleden and Kauppert, 2011, p.9, REEGLE, n.d.).

Other relevant ministries are those for Forestry, Environment, Agriculture, and Industry. The Ministry of Industry provides training for industries on the topic of energy conservation and efficiency as well as for energy auditors and energy managers (Kleden and Kauppert, 2011, p.9).

Governmental agencies who could be potential partners for renewable energies and green job development are: the 'National Council on Climate Change', which was created in 2008 and comprises eight working groups in the areas of technology transfer, finance, mitigation, adaptation, forestry and land use, basic science and green house gas inventory, post-Kyoto aims and a marine working group; the 'Energy efficiency and Conservation Clearinghouse of Indonesia', a service institution under the ESDM that works towards energy saving and energy efficiency; the 'National Energy Council' (DEN), established in 2007, which coordinates cross-sector energy needs and prepares the 'National Energy Policy' (Kleden and Kauppert, 2011, p.9, REEGLE, n.d., Zaituni et al, 2010, p.15).

The government-owned enterprise PT Perusahaan Listrik Negara (PLN) was the only provider of electricity across Indonesia until 2009. With the 'Electricity Law No. 30' of 2009, PLN's monopoly status in regard to supplying customers was dissolved. Private electricity providers can now apply for a 'license to provide electricity for public use' (IUPTL), but PLN still has to approve their feeding into the grid. PLN operates four semi-autonomous distribution stations in East, West, and Central Java and in Jakarta respectively, and their assets from electricity generation have been allocated to two subsidiaries named PJB

and Indonesia Power (REEGLE, n.d.)

The 'National Development Agency' (BAPPENAS) is in charge of assessing the progress towards the goals of the 'Energy Blueprint' while the 'Agency for the Assessment and Application of Technology' (BPPT) conducts research on energy. METI, the 'Indonesian Renewable Energy Society' is a forum for the promotion of renewable energy and it integrates representatives from renewable energy associations, the government, and private and research sectors (Kleden and Kauppert, 2011, p.9, REEGLE, n.d.) The 'Clean Technology Fund' (CTF) is a multilateral fund which was created to support initiatives on renewable energy and energy efficiency. The CTF also assists in achieving long term goals such as the reduction of GHG or increasing Indonesia's electrification rate, e.g. through co-financing geothermal power projects (REEGLE, n.d.).

Several national programs have been formulated regarding the country's energy supply: the 'Micro Hydro Project Programme, which started to be implemented in the early 1990s, and the 'Energy Self-Sufficient Village (ESSV) Programme'[1] of 2007 which was focused on enabling villages to generate enough energy to be self-sufficient. The ESSV draws on energy sources such as solar, biogas, micro-hydro power, biomass, and biofuels. The government aimed at establishing 2000 ESSVs by 2009 (IEA, 2008, p.97). Another program focuses on Solar Home Systems (SHS) which started in the mid-1990s (Ibid., p.101). While the government's first 'Fast Track Programme' lays its focus on expanding the capacity of fossil fuel power sources, coal and natural gas, by 10,000 MW by 2013, the second 'Fast Track Programme' seeks to increase the capacity of renewable energies by 50 percent between 2009 and 2014 (REEGLE, n.d.)

Current market situation and renewable energy potentials

Indonesia has a large potential for the use of renewable energies but to date only a fraction of this potential is being tapped. Currently, the archipelago relies heavily on fossil fuels. A decade ago, Indonesia had been exporting oil, natural gas, and coal but due to ever increasing domestic energy demand, as Indonesia's total energy consumption grew by almost 30 percent during the last decade, exports had to be cut back. Since 2004, the country has even needed to import crude oil and refinery products on a large scale. In 2010, discovered domestic reserves of crude oil and natural gas have been estimated by the Indonesian government to only last 23 and 52 more years, respectively (Hasan et al., 2012, p.2017).

Renewable energy	Resources (MW)	Installed capacity (MW)
Hydro	75 670	4 200
Geothermal	27 000	1 052
Mini/micro hydro	450	86
Biomass	49 810	445
Solar	4.8 kWh/m²/day	12
Wind	9 290	0.6

The table gives an overview of currently installed capacities and general renewable energy potentials (IEA, 2008, p.92).

To this day only about 65 percent of Indonesian households have access to grid electricity (REEGLE, n.d.,

[1] For more Information refer to:

International Trade Administration ITA, 2010, p.5).

The import of fossil fuels, which provide by far the largest part of Indonesia's energy capacity, places a significant burden on the country's financial resources. As a result, the government is now committed to exploit its renewable energy resources by bringing policies en route which are supposed to facilitate access to renewable energies in the energy market.

Geothermal power

Indonesia possesses 40 percent of the world's geothermal resources, representing some 27,000 MW, mainly on the islands of Sumatra, Java, Bali, and Sulawesi. Currently only three to four percent of this potential is being used (ITA, 2010, p.3, IEA, 2008, p.100). Development and management of geothermal energy is regulated by Law No. 27 of 2003. There are two different business schemes in place for the generation of geothermal energy: the first one separates the management of electricity production from that of development and operation of the geothermal power plant. The second one combines overall management of production, development, and operation. The government aims to increase the share of geothermal energy to 9,500 MW by 2025 (IEA, 2008, p.100). To date nine so called Geothermal Working Areas are planned throughout the archipelago (Hasan et al., 2012, p.2017).

Solar power

Indonesia also offers very considerable solar power resources. Its location at the Equator leads to 4.8 kilowatt-hours per square meter per day. However only 12 MW of solar power are being used. Photovoltaic systems have been installed mainly in the form of Solar Home Systems (SHS), often in urban areas but also for off-grid usage to increase the electrification ratio. By the mid-1990s, a SHS program was launched which led to the installation of around 100,000 SHSs. Through a follow-up program currently underway, another 30,000 systems are being installed. In July 2012, the government signed a contract with Basel Investido and Shanghai Aerospace Automobile Electromechanical for the construction of a 200 MW solar power plant (IEA, 2008, p.101, REEGLE, n.d.).

Wind power

Wind power in Indonesia is best exploited through off shore systems because of the lack of wind that close to the Equator, whose speed ranges from 3-6 meters per second. The higher wind speed areas are located on the less populated eastern Indonesian islands, where there is a lack of transmission infrastructure to sustain large wind farms. Wind energy is thus currently limited to medium- or small- sized projects, while the country's wind energy potential is estimated at some 9,000 MW. PLN is currently the most active investor in wind energy. Three 85 KW power units are already installed at the island of Bali, where another 15 units are planned. Larger units ranging from 100 to 300 KW are planned in other regions, (West Java and West and East Nusa Tenggara) while the ESDM built several 80 KW units in Bali and North Sulawesi by 2007. However, most planned wind power projects still need investors (IEA, 2008, p.101, ITA, 2010, p.5).

Hydro and marine power

Indonesia, as an island nation, has significant potential for hydro and marine power. To date only around five percent of this potential, which is estimated at 75,600 MW, is being used. Already installed projects

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http://pse.litbang.deptan.go.id/eng/index.php?option=com_content&task=view

are mini- and micro-scale units from 50 to 500 KW which are not connected to the grid and largely serve rural communities. Since the technology is well developed and readily available, it can be expected that hydro power will play an important part in Indonesia's future energy market. The hydro power market is regulated by the 'Ministerial Decree on Small Distributed Power Generation using Renewable Energy' of 2002 and the 'Ministerial Regulation No. 2 on Medium Scale Power Generation using Renewable Energy' of 2006 (IEA, 2008, p.99).

The only marine power system is located in the Lombok Strait. Another World Bank financed project in West Java, the Upper Cisokan Pumped Storage Hydroelectric power plant, is to be completed in 2016. Indonesia also received a grant from the UNDP (United Nations Development Program) in 2007 to launch a program on 'Integrated Microhydro Development' (REEGLE, n.d., ITA, 2010, p.4).

Biomass

Another significant potential lies with Indonesia's biomass resources which are estimated at almost 50,000 MW. Today only around one percent of Indonesia's biomass potential is developed. Biomass reserves include rice residues, sugar, rubber, palm oil, and fast growing crops such as jatropha, sweet sorghum, and cassava. The most promising commercial application for biomass is said to be cogeneration by agribusinesses, as some 147 million tons of biomass are produced yearly in Indonesia. Almost 1,200 MW could be produced for the generation of heat and electricity. Presently, biomass residues are most often combusted, but it is expected that gasification could prove to be more efficient and cost- effective (ITA, 20120, p.4, IEA, 2008, p.99).

Besides biomass residues, organic waste could be transformed into landfill gas and used to produce electricity, too. Jakarta alone is estimated to produce 6,300 tons of waste daily. The Indonesian government has already selected five companies to build waste-treatment plants (IEA, 2008, p.99).

Biofuels

Biofuels now play an important part in Indonesia's export sector. Biofuels either exist in the form of biodiesel, bioethanol, or bio-oil. Producing palm oil has proven to be financially very attractive due to its various possibilities of application not only for biofuels but also for cosmetics and edible oils (Kleden and Kauppert, 2011, p.9). There are currently about 9.4 million hectares of palm oil plantations, making Indonesia one of the leading palm oil producers in the world. Furthermore, bio-oil has been identified as *the* renewable energy focus in Indonesia (IEA, 2008, p.95). This is why research into biofuels, especially their economic and technical aspects has been fostered by the ESDM, the BPPT, and other research and development (R&D) institutions. In the face of rising prices for conventional fuels, Indonesia drafted a National Biofuel Roadmap in 2006, targeting a five percent share of biofuels in the market. Among a dozen licensed biodiesel producers, PT Eterindo Wahanatama is the biggest one, providing biodiesel and bioethanol that can be purchased at some 220 gas stations throughout Jakarta and Surabaya (Ibid., p.97-98). Biofuel utilization has been declared mandatory for public transportation and other industries through the Ministerial Regulation No. 32 of 2008 (REEGLE, n.d.).

An example of good practice for the sustainable production of biodiesel through jatropha is the Waterland Project which has existed since 1995. The Waterland R&D team conducted research on high-yielding jatropha and also started planting in 2006. Waterland represents a holistic approach to achieve ecological balance and contributes to the development of sustainable energy solutions while improving the so-

cio-economic situation of the project's farmers. Thus, the roll-out potential of Waterland is immense[2].

However, biofuels cannot be seen without controversy, as plantations, especially of non-edible crops, strain the world's food supply, contribute to deforestation, land degradation, and often lead to disputes over land use (IEA, 2008, p.95, Kleden and Kauppert, 2011, p.9). Other problems result from Indonesian palm oil producers preferring to sell their products on the international market rather than the domestic one, which leads to higher prices for cooking oil within the country. Incidents of unhealthy working conditions have also been reported from palm oil plantations (IEA, 2008, p.95, Elfani, 2011, p.48).

Needs, problems, and barriers

Indonesia is facing several challenges, the most critical being meeting the country's economic growth targets. Economic growth in turn leads to the increased energy demand by an estimated seven percent annually. At the same time, the Indonesian government has set an electrification target of 90 percent by 2020 (Wilcox, 2012). Rising prices for fossil fuels and exorbitant financial constraints through a flawed subsidy mechanism will eventually result in the government turning to a more sustainable energy mix.

There is already a favorable environment for renewable energies since Indonesia is endowed with the necessary natural resources. However, presently the development of renewable energies is hampered by a number of circumstances.

Indonesia's biggest problems concerning the expansion of renewable energy resource exploitation are a lack of incentives and a lack of investments.

Despite demonstrating willingness to change, inconsistent and quick-fix policy making creates an uncertain regulatory environment. Complicated authorization procedures for land-use permissions hinder investments in renewable energy infrastructure, as well as Indonesia's Investment Law which prohibits investment in small power plants producing less than 10 MW (ITA, 2010, p.6, Wilcox, 2012, IEA, 2008, pp.100-101). Coordination between the different stakeholders is often characterized by overlapping or unclear distribution of responsibilities as well as a lack of communication and information about current technology trends and costs (REEGLE, n.d.). Accordingly, there needs to be a transparent regulatory framework which provides investors with information on legislation, taxes, and the bidding process.

Ignorance concerning renewable energies and the respective technologies results in a shortage of financial support for RE projects. Even though some private sector banks have dispensed the necessary capital they are not willing to invest because they are skeptical about new or unknown technologies (ITA, 2010, p.6). This means that awareness about alternative energy sources and their potential needs to be increased.

The increasing investment into fossil fuels and the further subsidizing of them contradict Indonesia's commitment against climate change and the reduction of threats to the environment. Fossil energy resources are heavily subsidized which leads to a significant bias towards oil, gas, and coal consumption and a constrained budget for other energy investments. Customers of regular grid electricity pay prices below the market value (Wilcox, 2012); therefore, there is no incentive for customers to demand more sustainable sources of energy. The removal of subsidies can easily be identified as a key prerequisite for Indonesia's transition to more renewable energy. Another possibility could be so called feed-in-tariffs for renewable energies, which are also used in Germany.

[2] For more information on Waterland refer to: http://www.waterlandplantations.info/

The status of the state-owned utility Perusahaan Listrik Negara (PLN) as the sole seller and buyer of electricity in Indonesia is also problematic as competition on this market does not exist. All other providers depend on the approval of PLN to feed their generated power into the grid (REEGLE, n.d.).

The high upfront cost of renewable energies makes foreign investment a necessary precondition for a change in Indonesia's energy profile towards more sustainable sources. Investments are particularly needed for the improvement of transmission infrastructure as well as for renewable energy manufacturing and serving capacities. The lack of management and maintenance service infrastructure and service expertise for renewable energy projects can only be tackled by investing in training of renewable energy professionals at all levels. Moreover, the success of programs like the second 'Fast Track Programme' relies on [foreign] investment.

In addition, particular problems exist in the respective renewable energy sectors. For instance, around 80 percent of geothermal reserves are located in conserved forests, which means that geothermal wells could be drilled inside of them but the power plants would have to be built outside and also require a presidential decree (Wilcox, 2012, REEGLE, n.d.).

The solar power sector suffers from the lack of domestic solar cell production and lack of personnel that is trained to install and maintain photovoltaic systems. No regulation has been implemented that allows solar power households to sell their surplus energy to PLN, even though this could serve as an incentive for the investment in solar energy (ITA, 2010, p.5).

In order to remove these barriers, Indonesia is participating in a UNDP and Global Environmental Facility (GEF) financed project called BRESL ('Barrier Removal to the Cost Effective Development and Implementation of Energy Efficiency Standards and Labeling Project'). The project includes five major programs including policy making, capacity building, and manufacturing support (REEGLE, n.d.).

2.2.4 Labor market, green jobs, and TVET

The Indonesian economy has remained relatively stable since it recovered from a downturn during the Asian economic crisis in 1997-1998. Most economic activity is concentrated on the two islands of Java and Sumatra, which accounted for 82 percent of the Indonesian GDP in 2010. Indonesia's unemployment rate in 2010 was at 7.1 percent. Women and youth aged 15 to 25 face the most barriers in accessing opportunities for employment, thus, the general labor force participation rate for males (83.8 percent) was significantly higher than for female workers (51.8 percent) in 2010 (ILO, 2012b, p.8). The labor market participation of women is mainly hindered by socio-cultural factors and general employment practices (ILO, 2011, p. 10). With the prospect of unemployment ahead, many young people now stay in education longer as increasing incomes have made education more affordable for Indonesian families (Ibid.). Most Indonesians are employees, followed by employers assisted by workers who are often unpaid, own-account workers, and unpaid family workers. As a result, underemployment and informal employment remain high. In 2010, 14.1 percent were underemployed [working less than 35 hours/week]. In the same year, the share of informal employment of workers aged 15 and older was at 57.2 percent for men and 61.8 percent for women (ILO, 2011, p.11, ILO 2012b, pp.10-11).

Employment in the different sectors has undergone some changes in the past decade. The agricultural sector (38.3 percent), formerly the country's biggest employer, has been overtaken by the services sector (42.3 percent). The number of manufacturing jobs has also decreased while manufacturing productivity has increased. Since the Asian financial crisis, labor-intensive sectors, for instance the textile and leather

industry, have grown smaller while more capital intensive sectors (e.g. transportation, equipment, and machinery) have grown. Industry in general accounted for 19.3 percent of employment in 2010 (ILO, 2012b, p.19, ILO, 2011, p.4). Another sector with growing employment is the construction sector due to increased spending on construction projects. This sectorial shift in employment has also changed the demand for skilled labor. As more workers move to the service and to manufacturing industry, higher level skills are needed. It is noteworthy that graduates from Primary School and Junior High School, both general and vocational, as well as from Senior High School, also general and vocational, are most likely to face unemployment (36.8 percent and 40.2 percent respectively in 2010) (ILO, 2012b, p.20, ILO, 2011, p.10). This suggests that there is a lack of job opportunities for High School graduates and that graduates could not acquire the necessary skills to match the new demand of the labor market. Many young employees are underemployed or work on the basis of short-term contracts which leads to employers being reluctant to invest in further training of young employees (ILO, 2011, pp.25-26).

Based on past policy development concerning climate change and sustainable development, the expansion of renewable energies, energy efficient construction, and a shift from fossil to biofuels, especially in public transport, is likely to bring about more changes in the Indonesian labor market and in educational provision.

In Indonesia, with its partly isolated islands and regions, basic energy provision through renewable energies is not only a very appropriate option, but also expanding the use of locally available renewable energy sources represents an opportunity for job creation and income generation. For instance, the International Energy Agency estimates that biofuel development alone could create some 3.5 million jobs, although the latter would be mainly non- or lower-skilled jobs on plantations (IEA, 2008, p.96).

Elfani (2011, p.48) states that in 2009, the biggest percentage of workers in Indonesia (58 percent) worked in the agriculture, forestry, manufacturing, and construction sectors. These sectors are also expected to have the biggest potential for green job creation in Indonesia. This is due to the fact that a more sustainable economy will need more skills for the sectors which help bring about changes in the national energy supply and for the reduction of GHG. It is expected that there will be a shift from the mining and service sectors towards manufacturing, construction, and agriculture, while employment in agriculture might increase the most significantly (Kammen, Kapadia and Fripp (2004), cited in Elfani, 2011, p.51). Generally, green job creation is very likely to benefit Indonesia since employment will be created in sectors where employment is currently decreasing or low to start with (Elfani, 2011, p.51).

However, Indonesia's government does not yet have a detailed skill development strategy regarding green jobs. General technical capacity and management training has been provided to authorities at the national and local governmental level, to public industries, and to university candidates. Furthermore, there have been initiatives by the ministries to establish competency standards for professions in sectors related to climate change and environmental degradation. The Training Center for Electricity and Renewable Energy provides training in the field of renewable energies, mainly for the application of technology and human resource development (REEGLE, n.d.). The Indonesian energy company Pertamina has entered cooperation with the University of Auckland, New Zealand for the training of engineers for geothermal energy solutions. A variety of education and training programs will be offered in New Zealand comprising post-graduate certificates and short term trainings (ESDM, 2012).

2.3 Mozambique

2.3.1 Mozambique in facts and figures

Mozambique is located in Southern Africa and shares borders with South Africa and Swaziland in the South, Zimbabwe and Zambia in the West, and Malawi and Tanzania in the North. The country was a Portuguese colony for almost five centuries until 1975. After being released into independence, Mozambique was one of the poorest countries in the world and since 1977 has been stricken by nearly two total decades of civil war. Poor management under socialist rule until 1989 aggravated the country's difficulties. In 1990, Mozambique adopted a new constitution and paved the way for multiparty elections and democratic rule, while in 1992 the United Nations succeeded in negotiating a peace agreement between the main adversaries Frelimo [Front for the Liberation of Mozambique] and Renamo [Mozambique National Resistance]. Relative political stability and a number of macroeconomic reforms have, with the support of donors and through abated debt, helped Mozambique trigger economic growth. In 2011, the real growth rate was at 7.2 percent, which makes Mozambique one of the strongest African performers. Services, agriculture, and industry, mostly aluminum, make for the biggest contributors to Mozambique's Gross Domestic Product (GDP). However, half of the country's population was estimated to live below the national poverty line in 2008. Mozambique has a labor force of almost 10 million people, with the largest employment sectors being agriculture, service, and industry (in descending order). Unemployment is estimated at some 20 percent (Central Intelligence Agency World Factbook, 2012).

2.3.2 Key environmental challenges

Mozambique is among the three most vulnerable African countries in terms of environmental or weather related hazards such as floods, droughts, and cyclones, which pose regular threats. Tropical cyclones usually occur from October to April, and around six percent of Mozambique's territory is frequently exposed to flooding.

Overexploitation within the forestry and fishery sectors and uncontrolled fires are problematic, too. Mozambique is prone to climate change also through its geographic location since it has a coastline of around 2,700 km and a large part of the land area is under the sea level. It is also downstream to nine international rivers, which regularly cause floods and droughts. These floods are not only caused by heavy rains and cyclones, but also by the flooding and water discharge from dams in neighboring countries (Macaringue, 2010, p.4, p.25, Ölund Wingqvist, 2011, p.10).

High temperatures[3], infertile soils, erosion, and air pollution are additional problems. Air pollution in Mozambique mainly occurs indoors and is caused by the burning of wood, which is one of the main energy sources in the country due to increasing prices of kerosene. Therefore, Mozambique's rural population largely relies on wood for energy and selling charcoal provides an income to many (Ölund Wingqvist, 2011, p.2, Clean Energy Info Portal REEGLE, n.d., Macaringue, 2010, p.26). Moreover, so called "slash and burn" practices contribute to environmental degradation and erosion, and they sometimes lead to uncontrolled fires which directly impact 40 percent of the Mozambican territory annually.

[3] A Climate Change Report published by the INGC (Institute of Disaster Management) in 2009 revealed that annual means of minimum and maximum temperatures in Mozambique between 1960 and 2006 changed significantly, especially since the 1990s. While temperatures were often below 30°C until 1990, they are now constantly above 30°C (Macaringue, 2010, p.9).

Over 60 million Mozambicans live in coastal areas and many make a living on marine fishery. Fishery also accounts for eight percent of Mozambique's exports, but overfishing, which is illegal, pollution, and natural disasters threaten these livelihoods (Ibid., p.4, Ibid., p.8).

Due to the country's size, the climate in Mozambique varies between the North and the South. During the last two decades, rainfall has increased in the North, while the South has often been subject to long periods of drought. In central Mozambique, climate conditions are shaped by both droughts and floods (Macaringue, 2010, p.26).

The use of chemicals, heavy metals, and fertilizers in agriculture and mining causes land degradation and desertification. Increased interest in large scale coal mining and in biofuel production could further prevent more sustainable land use (Ölund Wingqvist, 2011, p.2, p.4). Generally, environmental degradation costs Mozambique some six percent of its GDP, mostly caused by air pollution and inadequate management of water and sanitation (Ibid., p.2, p.6).

2.3.3 The energy sector

Governance structure

International agreements and national policies

Mozambique is a signatory to a number of international agreements concerning the environment, biodiversity, and climate change, and to this end a Mozambican delegation attended the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. As the Rio Conference obligations were compiled into „Agenda 21", the Mozambican government in 1995 drafted a 'National Program' as the basis for the implementation of the Agenda in the country. In 1997, the 'Environmental Law' (Law No. 27) was passed which provided the foundations for environmental policies and institutions (National Council for Sustainable Development CONDES, 2002, p.3, Cabral and Francisco, 2008, p.7).

Mozambique signed the 'African Convention on the Conservation of Nature and Natural Resources' and also ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994, as well as a couple of agreements concerning the protection of the Ozone Layer [Vienna Convention and Montreal Protocol]. In 2006, Mozambique had submitted its first 'National Communication on Climate Change' to the UNFCCC and had developed a 'National Adaptation Programme of Action' by 2008 (Ölund Wingqvist, 2011, p.14). Further, a number of strategies, laws, and regulations have been formulated such as the 'Environment Strategy for Sustainable Development 2007-2017', the 'Energy Law', and the 'Investment Law' of 1993. The Investment Law requires Environmental Impact Assessments of all investors for all projects in all sectors, measuring eventual pollution, degradation, and other environmental implications (Cabral and Francisco, 2008, p.7, Vaz et al., 2011, p.24).

Since Mozambique is very vulnerable to natural disasters and climate change, the government has emphasized the overarching role of 'Climate Change Adaptation' (CCA), 'Disaster Risk Reduction' (DRR), and social protection in all main development policies and governmental strategies. Most policies and other documents therefore include CCA, DRR, and social protection, and policy-making in Mozambique is thus generally supportive regarding environmental and climate issues (Macaringue, 2010, p.7., p.4). Examples are the PARPA (Poverty Reduction Plan) of 2006, the respective five-year 'Government Programmes' (PG), the annual 'Economic and Social Plan' (PES), and the 'National Adaptation Programme of Action' (NAPA) of 2007. PARPA contains specific energy strategies such as expanding off-grid energy supply

through renewable energies, corresponding private sector investment, and a mandatory share of biofuels in liquid fuels since 2012 (Vaz et al., 2011, p.20)

The NAPA is the country's main document outlining measures against climate change. Adaptation in this context describes the necessary actions to be undertaken to adjust to the consequences of and counter climate change, for instance by reducing GHG emissions (Macaringue, 2010, p.8).

The basis for all undertakings in the energy sector is the Energy Policy of 1998, which contains a clear account of the importance of energy to households and the economy. In 2000, the 'Energy Sector Strategy' was developed to serve as an Energy Policy follow-up. The strategy outlines implementation, regulation, the role of the private sector, a market strategy, investments, and general plans of action for the energy sector. To support the National Energy Strategy, the government launched an "Energy Reform and Access Project" between 2003 and 2011. The focus of the project was to widen access to electricity and to improve the availability of electricity for economic growth and social services. Additionally, the project advocated the development of renewable energies. Expansion of the national grid is regulated by the 'Electricity Master Plan for Development of the National Grid 2005-2019' while the Development of renewable energies is specified through Resolution No. 62 of 2009 (REEGLE, n.d.).

Stakeholders

Responsible for the Mozambican energy sector is the Ministry of Energy (ME), which oversees three National Directorates that are in charge of Electrical Energy (DNEE), New and Renewable Energy, and Liquid Fuels. Mineral resources are under the responsibility of a separate governmental body, the Ministry of Mineral resources. The Ministry of Agriculture and Rural Development (MINAG) is in charge of more traditional fuels such as wood. This ministry holds a key position for the Coordination of Environmental Affairs (MICOA). As the name indicates, the MICOA formally coordinates environmental action including activities concerning the Kyoto Protocol and clean development mechanisms (CDMs) (REEGLE,n.d., Macaringue, 2010, p.7). Several of the Mozambican sector ministries have also established their own environmental institutions or units, sometimes consisting of a one employee entity. These sector institutions are not sufficiently coordinated by MICOA, which often results in double responsibilities and lack of communication (Cabral and Francisco, 2008, p.11, Ölund Wingqvist, 2011, p.12). Under the guidance of MICOA, three Sustainable Development Centers (CDSs) were set up in 2003 and 2004. Although their mandate is not yet clear, the CDSs operate with regard to coastal areas, urban environment, and natural resource conservation and management (Cabral and Francisco, 2008, p.9).

Electricidade de Moçambique (EDM) has existed since 1977 and is the state owned national electricity utility. EDM is responsible for the generation, distribution, and transmission of electricity; renewable energies only play a minor role when compared to other activities that expand the national grid. Although the Electricity Act of 1997 opened up the market for other electricity operators, EDM still has a considerable monopoly status (REEGLE, n.d., Hankins, 2009, p.31).

The Electricity Act also paved the way for setting up the National Electricity Council (CENELEC). CENELEC has only operated since 2008 and currently has no executive powers. Monitoring the conduct of EDM and the government is its main role, as due to limited legal authority and capacities it cannot function as a genuinely independent regulator (Hankins, 2009, p.33).

Another key stakeholder is the National Energy [Electricity] Fund (Fundo da Energia FUNAE). FUNAE is a public sector institution with financial autonomy. It was established in 1998 and receives revenues from

taxes, levies, and fines. Taxes and levies have to be paid when licenses or concessions are issued for electricity projects while fines have to be paid in cases of infringement of energy legislation. FUNAE is supposed to provide technical assistance, launch information campaigns, and provide energy supply to rural areas and low-income urban households (Hankins, 2009, p.32).

Through the Environment Law of 1997, the National Council for Sustainable Development (CONDES) was established in 2000. CONDES serves as an advisory body to the Mozambican Cabinet Council in matters of ratification of international environmental agreements and regarding national legislation of natural resource management. CONDES is supposed to engage with Mozambican citizens in order to learn about public opinions concerning environmental affairs (CONDES, 2002, pp. 13-14). CONDES consists of civil society representatives and cabinet members and is chaired by the prime minister.

The main governmental coordination body for response to natural disasters and climate change is the Disaster Management Institute (INGC). Disaster management is increasingly perceived as a key component of Mozambique's development strategies. INGC issued two Climate Change Reports and a 'Master Plan for the Prevention and Mitigation of Natural Disasters', determining the impacts of climate change in Mozambique and identifying appropriate measures for the development of national capacities to tackle climate change (Macaringue, 2010, p. 10, p.12).

Important environmental Non-governmental Organizations(NGOs) include Centro Terra Viva (CTV), which provides research and policy advice to the Mozambican government, and FEMA (Forum Empresarial para o Meio Ambiente), which represents the private sector's interests regarding the environment (Cabral and Francisco, 2008, p.11, p.17).

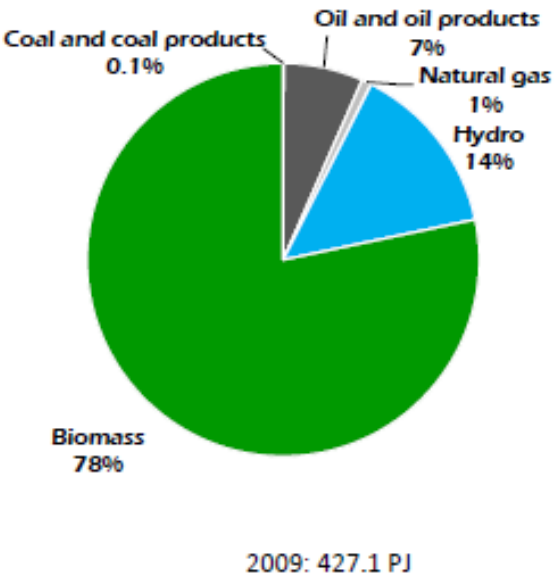
International donors are organized into a coordination group, meeting monthly to integrate their efforts towards the environment. The European Commission has also identified Mozambique as one of the target countries of its Global Climate Change Alliance (GCCA) (Macaringue, 2010, p.14, p.15). The United Nations System presently holds a key role in coordinating activities by UNDP (United Nations Development Programme), UNEP (United Nations Environmental Programme), the government, and civil society. UNDP for example supports the integration of environmental matters into the Mozambican school curriculum (Macaringue, 2010, pp.4-5, p.18).

Current market situation and renewable energy potentials

Mozambique has vast energy resources which would satisfy most the country's energy needs even though the demand for energy is currently growing by around seven percent annually (Chambral, 2010, p.6). The most important energy sources in 2009 were biomass, hydropower, oil, and oil products, as can be seen in the diagram below, which shows Mozambique's Total Primary Energy Supply (TPES) in 2009, which amounted to 427.1 Petajoules (PT). To date, the share of coal and gas could be significantly higher but no data is available to demonstrate those changes in the Mozambican energy mix.

Since Mozambique is a large country, its population is very dispersed throughout the entire territory, and two thirds of all Mozambicans live in rural areas. More than 80 percent of Mozambique's population is presently not connected to the domestic electricity grid. That makes biomass such as wood or self-made charcoal the most important energy source, mainly for cooking, making indoor air pollution a serious health threat. Deforestation and erosion are unfortunately the results of this massive use of wood (Chambral, 2010, pp.5-6, Hankins, 2009, p.29). Percentages of households connected to the grid with access to electricity vary between 10 and 13 percent. Most of these households are located in urban cen-

ters, like the capital Maputo and its outskirts, all capitals in the country's provinces, and many municipal areas. The government has set the target of an electrification rate of 20 percent by 2020 (Chambral, 2010, p.6).



(International Renewable Energy Agency, 2012, p 9)

Electricidade de Moçambique (EDM) administrates and maintains an installed capacity of about 240 Megawatts (MW) which mostly stems from hydropower, diesel, and gas. Diesel and gas are used by generators which supply energy via mini grids, independently from the national grid. Mini grids are also state owned and are operated by the regional or local level administrations. Mozambique operates a three tier energy supply system, starting with the national grid for which EDM is responsible. It is supervised by the Ministry of Energy, which through the regional and local administrations is also in charge of the mini grids, with the exception of contributions by international donors. The other sector ministries have the responsibility of the independent grids, which are for health and educational applications (Ibid., p.9). The enormous task of expanding off-grid provision is the mandate of FUNAE, and a rural electrification program is presently supported by India with a grant of US $25 million (African Economic Outlook AEO, 2011, p.6).

Costs for electricity are usually higher in areas of low-demand as compared to large towns. Currently, uniform tariffs exist for all customers throughout the country, which leads to implicit subsidizing. For a majority, electricity is simply not affordable (Chambral, 2010, p.7, p.10).

Mozambique is part of the South African Power Pool (SAPP) which was established in 1995 and also comprises Angola, Botswana, Congo, Lesotho, Malawi, Namibia, Swaziland, South Africa, Tanzania, Zambia, and Zimbabwe. Adding up the installed capacities of all countries, SAPP outputs 53,000 MW, the demand of which the South African company Eskom dominates at around 80 percent. Mozambique is the second largest energy exporter, mainly to South Africa, with over 2,000 MW. Despite joining forces, SAPP cannot yet meet the energy demand of the region which is growing by 1,500 MW per year (Hankins, 2009, p.28).

The Mozambican Cabinet approved a 'Strategy for the Development of New and Renewable Energy' in 2011. The main objective of the strategy is to provide access to energy through renewable energies for those far from the national grid. Over a fifteen year period from 2011 to 2025, the use of renewables for

electricity generation will be regulated and enhanced. Special focus is placed on solar power systems, wind, geothermal, and biomass, especially sugar cane.

Geothermal power

The potential of geothermal energy is estimated at 25 MW, of which none is being tapped at the moment. Geothermal resources include 38 thermal springs, but there are no known initiatives to explore or assess their market value yet (Vaz et al., 2011, p.44).

Solar power

Many activities related to renewable energies are based on solar power. This is hardly surprising as Mozambique's solar power potential is considerable: solar radiation averages around 5.7 KW per hour per square meter per day. However, only about one MW of the existing potential capacity has been installed. Installed solar capacity is mainly used for electrification off the grid while heating and supplying power in households and in urban areas is rare. FUNAE is the country's main driver for solar power use. The government and donors have financed the larger part of solar power investments, for instance for schools, health services, and government buildings. Connecting solar power systems to the national grid is currently not a priority, as it is perceived as too expensive (Vaz et al., 2011, p.39, Hankins, 2009, p.20). Private sector activities in the solar sector have been very limited but companies are increasingly showing interest. In 2011, 'Self Energy Mozambique' announced to invest US $42 million into renewable energy projects based on various energy solutions through solar power. Projects are specifically aimed at remote communities (allafrica, 2011). 'Phaesun', together with DEG, (German Investment and Development Association) will run a two year project worth 300,000€. Through the project, electricity will be provided to citizens of Pessene, about 50 kilometers from Maputo. In so called 'Solar Shops', pico solar systems and lamps can be rented or bought, and these lamps have already been installed in a school and two teacher accommodation buildings. During the course of the project the German 'Sonnenplus GmbH' will eventually provide training to 15 future solar system traders, and the University of Ulm will develop lectures on photovoltaics for Eduardo Mondlane University (Ali-Oettinger, 2010).

In 2012, a laboratory for photovoltaic systems was inaugurated at the Maputo Industrial Institute. The laboratory functions as a training facility as well as a research center. Public and private sector stakeholders are free to use the institution. The GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH) had invested € 49,000 to build and equip the laboratory (The Zimbabwean, 2012).

India has invested US $10 million into building a solar panel factory in Maputo, which employs 70 Mozambicans and also supplies the necessary raw material. Solar panels will be assembled in Mozambique and eventually some components of the panels will also be manufactured in the country, which is supposed to decrease prices for the solar systems (Manhice, 2011). South Korea also plans to build three solar power plants there worth US $35 million. Generally, the worth of the Mozambican solar power market is estimated to be between US $50 and $100 million over a five year period, excluding donor and FUNAE initiatives (Vaz et al., 2011, p.40).

Wind power

Although a comprehensive wind mapping exercise has not yet been done, estimates and smaller studies suggest a promising potential for wind power. Wind speeds have been measured at six to seven meters per second along the considerable Mozambican coastline and in the Niassa highlands which rise up to 1,000meters. This means that small stand-alone systems or wind farms could prove viable, especially

from June to August which are the windiest months in the country.

The first wind energy pilot project is being implemented in Inhambane where a generator is supposed to produce 300 KW (Hankins, 2009, pp.20-21). Further, Mozambicans have long term experience with wind pumps such as for water supplies in rural areas. The Clean Energy Company in Cabo Delgado has developed hybrid systems which combine solar modules and self-made wind turbines which generate up to one KW. The most significant problems concerning wind power are a lack of incentive to invest in the technology and difficulties to feed wind generated energy into the grid due to tariff issues (Vaz et al., 2011, pp.43-44).

Hydro and marine power

Large hydropower projects are one of the main focuses of the Mozambican energy sector. The country relies heavily on exporting its generated power to neighboring countries, above all South Africa, to generate foreign exchange income (Energypedia, 2012).

Mozambique has a total hydropower potential between 12,000 and 14,000 MW, of which only some 2,300 MW are currently being used. By far the largest hydropower source is the Cahora Bassa dam located in the Zambezi basin, which is also Africa's second largest dam. The dam's operating company, Hidroelectrica de Cahora Bassa (HCB), was owned by Portugal until 2011, when Portugal sold its last 15 percent share to Mozambique. Cahora Bassa is presently being expanded and another dam, the Mpanda Nkuwa, is being constructed and is expected to generate 1,300 MW (Vaz et al., 2011, p.40, AEO, 2008, p.469, AEO, 2011, p.6, Hankins, 2009, p.51). There is large potential for small-scale hydro projects as well, especially in Central Mozambique. Small scale hydropower comprises capacity generation between 10 KW for pico-hydro, 100 KW for micro-hydro, and up to 15 MW for mini-hydro. In Mozambique, mini-hydro has received the most attention, apart from the large scale dam projects. To date, more than 60 locations have been identified for mini-hydro projects for on- and off-grid provision. However, only a small number of hydropower projects have been completed in the last five years, which is mostly due to lack of capacity on the financial and technological side, as well as due to inconsistent and uncoordinated planning and lack of focus on small hydro projects. In order to exploit Mozambique's mini-hydro or even medium-hydro (up to 50 MW) potential, it is estimated that investments of some US $500 million are needed (Vaz et al., 2011, pp.41-42).

Biomass

Apart from the traditional biomass resources such as wood, charcoal, and agricultural waste, cogeneration of more modern biomass is considered to have an enormous potential in Mozambique. Especially the sugar industry could be both a producer and beneficiary. Sugar production on the country's five major plantations results in about 433,000 tons of so called bagasse. This means that the energy potential of cogeneration amounts to hundreds of MW. The five major sugar mills already have their own electricity and thermal cogeneration facilities which fuel the sugar production process itself. Although the facilities are connected to the grid, surplus generation cannot be sold off as there is no such regulation in place. Other biomass resources are wood waste, which stems from the paper industry, solid waste, forest residues, maize, cassava, and wastes from cashews, coconuts, and animal waste. The options for energy generation are burning, gasification, and anaerobic digestion which produce methane gas. Investments are needed for more efficient gasification technologies and the general investment potential lies between US $100 and $200 million (Vaz et al., 2011, pp.36-37, Hankins, 2009, pp.17-18).

Biofuels

Mozambique has the potential to become one of the world's largest biofuel producers. Only around seven percent of the available arable land in the country is currently being used and there are over 40 million hectares of poor quality land which could be utilized for non-edible crops. Biofuel is also a sector with considerable economic interest. Requests for the use of over 12 million hectares of land have been forwarded to the government which could result in doubling the amount of the currently cultivated land. Most requests concern biofuel production through planting of sugarcane and sweet sorghum and jatropha for biodiesel (Hankins, 2009, p. 16, Ölund Wingqvist, 2011, p.4). Canada has already implemented a pilot project for jatropha on 1,000 hectares and intends to expand it to 5,000 hectares in the near future.

It is very likely that the biofuel sector will grow significantly due to the Mozambican government's regulation on the use of biofuels: starting in 2012, petrol must contain 10 percent bio-ethanol and diesel must contain three percent bio-diesel (Vaz et al., 2010, p.22-23).

However, biofuels cannot be seen without controversy, as plantations, especially of non-edible crops, strain the world's food supply, contribute to deforestation, land degradation, and often lead to disputes over land use (IEA, 2008, p.95, Kleden and Kauppert, 2011, p.9).

Needs, problems, and barriers

Mozambique has established a comparatively comprehensive and sound policy framework for the management of climate change issues, although there is a focus on natural hazards and disasters. Nonetheless, implementation of policies is perceived to be weak. A lack of expertise, insufficient financial resources, and coordination difficulties impede progress in matters concerning the environment and the conservation of natural resources. Incidents of corruption related to the issuing of licenses and concessions for projects in the mineral resource or construction sector have been reported, hampering the accountability of governmental regulating institutions (Macaringue, 2010, p.22, Ölund Wingquist, 2011, p.15).

Cooperation between the different ministries and between the government and other stakeholders is weak. MICOA, the coordination entity, needs more political leverage as well as human and capital resources, and it needs to create incentives for the enforcement of legislation (Macaringue, 2010, p.22, Ölund Wingquist, 2011, p.12). CONDES, the monitoring agency for the implementation of environmental policies and intersectoral dialogue on environmental issues, lacks the necessary authority to enforce legislation (Ölund Wingquist, 2011, p.12). CENELEC has yet to be established as an independent regulator of the electricity market (Hankins, 2009, p.33).

Mozambique is witnessing almost uncountable initiatives by international donors, yet there needs to be a mechanism to coordinate all these efforts, especially concerning climate change. Despite heavy donor involvement, most activities are run and financed on a project by project basis. This does not lead to long term environmental financing through the Mozambican national budget. Dependence on external funding leads to many processes taking place outside national budget formulation (Ölund Wingquist, 2011, p. 13-14).

Another problem is a lack of public awareness about climate change and civil society involvement in activities geared towards it and energy sustainability. Mozambicans need to develop ownership of and advocacy for 'green' initiatives (Macaringue, 2010, p.22).

In the energy sector, legislation and regulation is allegedly weak or incomplete. There are no particular incentives for investments in the sector, as private investment in renewable energies comprises less than 10 percent. Regulation is missing for power producers other than EDM regarding operation and connection to the main grid, or for mini-grids. Regarding isolated grids or off-grid energy generation, little progress has been made. Attempts by FUNAE and other local bodies to expand access to electricity for the rural population have not been sustainable. No feed-in tariffs for renewable energy sources are in place, and EDM is not required to gain electricity from renewable sources. Legislation for energy efficiency or energy saving and conservation is also missing (Vaz et al., 2011, pp.21-22, Hankins, p.31).

2.3.4 Labor market, green jobs, and TVET

Mozambique currently faces two main challenges concerning the labor market; while economic growth has remained comparatively steady, it has not been very inclusive leading to a slow down in poverty reduction and a lack of employment opportunities. The country's demographic situation puts more pressure on the labor market, as its population is predicted to grow by 2.3 percent annually at least until 2050 (Jones and Tarp, 2012, p.13). Investments in mining and extractive industries, transport, construction, and agriculture have helped the Mozambican GDP grow; however, not enough employment opportunities have been created yet. The energy sector which currently represents around five percent of the Mozambican GDP, has received considerable investments, too, but mostly in the form of so called "mega projects" which also do not lead to a significant creation of employment. As a result, only 32 percent of those economically active4 are formally employed and only around half of the economically active population in urban areas and 43 percent in rural areas are fully employed, which is working 40 hours per week (African Economic Outlook AEO, 2012, p.2. p.5, Jones and Tarp, 2012, p.5, p.18).

The distribution of employment in 2009 indicates that a structural shift from agriculture to industry or manufacturing is at a very early stage. At that time, over 80 percent of economically active Mozambicans worked in agriculture, and less than four percent worked in manufacturing. In urban areas, the percentage of employment in the primary sector was at 46, followed by the tertiary sector with 42, and 11 percent in the secondary sector. Only a small shift has occurred from agriculture to the service sector (Ibid., p.25).

The distribution of skill levels varies across employment sectors. While workers in the rural primary sector have attended school for three years or less, workers in the secondary sector have completed three, and tertiary sector employees such as public servants have had up to four or more years of education. On average, male workers have attended school for one more year than female workers (Jones and Tarp, 2012, p.22).

In Mozambique technical and vocational education and training (TVET) is largely provided by governmental institutions under the management of the Ministries for Education and Labor. Throughout the last decade, more and more private and not-for-profit providers have diversified the Mozambican TVET market. Through decades of civil war education has suffered at all levels. That leaves many Mozambicans with no or little formal education; around 75 percent have attended school for five years or less, and less than 10 percent have obtained a secondary school qualification. Only 15 percent of total secondary

[4] Due to persisting poverty, the majority of younger Mozambicans is economically active, as is basically everyone at a working age between 15 and 64. Consequently, participation in full-time education and general retention rates are low.

school enrolment is attributable to formal TVET provision. A lack of teaching staff, strained financial resources, and a mismatch of supply and demand are only some of the difficulties currently weakening public TVET provision. Access to TVET provision is also often restricted by a supply bias towards urban areas (African Economic Outlook, 2008, p.470).

Currently, the demand for skilled labor has far outpaced the supply in the renewable energy sector. Especially labor intensive sectors such as biofuels are expected to create a lot of new jobs. However, policy and investment support for education and training for renewable energies is not yet sufficient. Capacity building for renewables is still limited to isolated efforts, often by international donors or NGOs, and governmental efforts are at an early stage. Presently, the government has not implemented formalized technical training programs. There are no industry associations and no public education programs promoting the importance of renewable energies. This is hardly surprising as the development of renewable energies is also at a rather rudimental stage (Ölund Wingquist, 2011, p.7, Hankins, 2009, p.33).

CONDES has advocated the integration of environmental components into the first two years of the primary school curriculum, and the introduction of environmental subjects into different higher education courses and in the country's journalism school (CONDES, 2002, p.26).

The University Eduardo Mondlane (UEM) has established a renewable energy program which trains engineers specializing in renewable energies. UEM activities are focused on off-grid energy supply through renewable sources (Hankins, 2009, p.34). The National Research Fund aims at fostering research for renewable energies. However, since renewable energies are a fairly new discipline in Mozambique, many institutions compete for limited research funding opportunities.

In July 2012, South Korea signed an agreement with the Mozambican government worth US $ 18 million to build technical training centers in three provinces (Macauhub, 2012). The Foreign Ministry of Finland (FORMIN) supports one of the three CSDs (Centers for Sustainable Development). The CSD in Chimoio now offers training for primary school teachers in environment related topics and training for natural resource management. In collaboration with the Pedagogic University in Maputo, modules for open courses have been developed also on natural resource management. And FORMIN supports environment clubs in schools and an awareness campaign on uncontrolled logging and fire (FORMIN, 2006).

The United Nations Industrial Development Organization (UNIDO) has presented plans for the set-up of a Mozambique National Cleaner Production Center (MNCPC) which is supposed to facilitate transferring technology and techniques for cleaner production from developed to developing countries. Mozambican enterprises, especially those from the industrial sector, and environment stakeholders are to be involved in training, policy dialogue, and the dissemination of information about clean technology (UNIDO, n.d.).

The capacity building project TREE (Transfer Renewable Energy and Efficiency), which is part of the 'Renewables-Made in Germany Initiative' by the German government, has been running in Mozambique since 2012. TREE is a further education project aimed specifically at representatives from the public sector, the finance sector, and industry. Through seminars and e-learning, education for professionals is offered that is focused on renewable energy technologies (Renewables Academy Renac, n.d.).

2.4 Vietnam

2.4.1 Vietnam in facts and figures

Vietnam is located in Southeast Asia, bordering China in the North, Laos in the West, and Cambodia in the South. France had occupied the country for almost a century until 1954. During the following two decades, Vietnam was divided into a communist North and anti-communist South until the country was reunited under communist rule after years of civil war. Conservative leadership, repression, emigration, international isolation, and a centrally-planned economy have weakened Vietnam in the past. Since the mid-1980s, the government has been pursuing a "renovation policy" which has led to increased economic liberalization and structural reforms in order to modernize the economy and to make it more competitive. Vietnam has been a member of the World Trade Organization since 2007, clearly signaling that it seeks international integration and export orientation. However, Vietnam's economy remains in the control of state-owned companies, accounting for around 40 percent of the country's Gross Domestic Product (GDP). Industry, services, and agriculture in descending order are the largest contributors to the Vietnamese GDP, which has constantly grown by around six percent or more per year recently. Vietnam's labor force has 48 million people, mostly working in the agricultural, services, and industry sectors in descending order, and unemployment was estimated at 3.6 percent in 2011. Over 14 percent of the more than 91 million Vietnamese citizens live below the national poverty line (CIA World Factbook, 2012).

2.4.2 Key environmental challenges

Vietnam is currently among the three most populous countries in Southeast Asia; its population is still growing, and urbanization is increasing. Further, Vietnam's population is unevenly distributed throughout the country with the majority living in the Mekong and Red River Deltas. While a large and still growing population is an environmental threat in itself, economic reforms have spurred other unfavorable developments. The agricultural sector is growing, and its use of chemicals leads to uncontrolled pollution. Pollution is also high due to insufficient sanitation in many villages and urban areas due to uncontrolled waste disposal. Water and natural resources especially in the forestry and fishery sector are currently overexploited (Thang and Khoi, 2010, pp.185-186). The growing number of industrial zones, untreated industrial waste, and construction waste strain the environment further. Land use, particularly by state-owned farms, is often inefficient, which is a delicate issue considering arable land resources being increasingly scarce. Around 7.8 million hectares of land have been classified as degraded, either by droughts, floods, or man-made conditions (Ibid., p.187, p.189, p.190).

Vietnam is also highly prone to climate change. During the past five decades, temperature means in Vietnam have increased by 0.5 to 0.7 °C while Northern Vietnam has been witnessing the most rapid rise in temperatures. In the next one hundred years Vietnam is expected to be subjected to a temperature rise of 2.8°C in the North and 2°C in the South if global emissions stay at the current level. Vietnam is expected to experience more heat waves which could cause an increase of cases of dengue fever and malaria (Ibid., p.203).

Also during the past 50 years, rainfall has decreased by two percent, but rainfall amounts have increased by 10 percent when caused by storms and other tropical weather phenomena (Ibid., p.198, p.199). Tropical cyclones have been identified as posing the biggest threat to Vietnam, which in global comparison is one of the countries most stricken by natural disasters. Tropical cyclones usually hit Northern Vietnam in August, Central Vietnam in October, and move southwards in November. Apart from the physical threat,

cyclones have serious effects on the country's agricultural production and fishery sectors which represent livelihoods for many poorer households (Ibid., p.199, p.204, p.203). In recent years, cyclones have occurred later in the season and with more intensity, putting the coastal population even more at risk, while heavy rainfalls related to the storms cause landslides within the country (Ibid., p. 203).

The repeated occurrence of floods and droughts in Vietnam already seriously affects agriculture and water supplies and could disturb the generation of electricity through hydropower systems. Additionally, Vietnam is one of the countries most at risk of a rising sea level, which would severely affect its economy and could threaten up to nine percent of the country's territory (Thang and Khoi, 2010, p.203).

Presently, public awareness towards environmental protection is mainly focused on climate change and natural disasters. However, at the grassroots level, which is likely to be hit hardest by the effects of climate change and environmental degradation, awareness is very low to non-existent. Many think that the protection of the environment is solely a governmental task and is ranked very low in the priorities of most citizens (Ibid., p.192).

2.4.3 The energy sector

Governance structure

International agreements and national policies

Vietnam signed the Kyoto Protocol in 2002 and is part of the United Nations Framework Convention on Climate Change (UNFCCC). The Vietnamese Ministry of Natural Resources and Environment (MONRE) was designated to be the main institution for participation in and implementation of the Kyoto Protocol and the UNFCCC. MONRE set up a steering committee to fulfill these tasks. MONRE is responsible for the coordination of relevant stakeholders to monitor and update information on climate change and is also responsible for fostering cooperation with international organizations. Research and the development and assessment of measures against climate change are based on the 'Clean Development Mechanism' (CDM). The CDM is one of three mechanisms installed by the Kyoto Protocol to support sustainable development in Vietnam. The CDM is connected to the trading of emission reduction credits. In Vietnam the mechanism does not yet work on a larger scale as it is hampered by several circumstances: there is a lack of awareness in the Vietnamese business community about CDM and thus not much appreciation for CDM projects. Limited capacities lead to a limited number of registered CDM projects, and the fact that the finance credits gained by the CDM have to be paid to the 'Vietnam Environment Fund' is a disincentive for potential investors (Thang and Khoi, 2010, p.213). As part of the CDM, the 'Prime Ministerial Decision No. 130' of 2007 included renewable energy projects into the mechanism's investment policy (Hai and Lien, 2009, p. 133). On the international level, Vietnam is also part of the 'Promotion of Energy Efficiency and Conservation Project' which is implemented by the ASEAN Center for Energy (Clean Energy Info Portal REEGLE, n.d.).

Vietnam passed a 'Law on Environmental Protection' in 1993, which was revised in 2005 in order to keep up with industrialization and modernization within the country. A number of sector specific laws and regulations are in place, for instance, prior to the approval of every investment project, an Environmental Impact Assessment (EIA) has to be prepared and submitted to the authorities in charge. A 'Rural Electrification Policy' has been in place since 2000 (Thang and Khoi, 2010, p.180, p.181, World Bank ESMAP, 2002, p.22). In addition, Vietnam has developed a national program called 'National Strategy Program for Responding to Climate Change' (NTP-RCC) in 2008 for the period from 2009 to 2015. Through the

program, climate change impacts and respective needs for adaptation and mitigation are supposed to be identified. On the basis of the NTP-RCC, it is planned to develop an inter-ministry network for communication and cooperation. To speed up the development of the network, a steering committee headed by the prime minister and an executive board was established. The Vietnamese government seeks to integrate climate change issues into the 'National Socio-economic Strategy' (from 2011 to 2020) and the 'Socio-economic Development Plan' (from 2011 to 2015) which is supposed to mainstream climate change issues. All sectors and provinces are to develop 'Climate Change Action Plans'. In general, the NTP-RCC represents the main strategy to cut Green House Gas (GHG) emissions (Thang and Khoi, 2010, p.211).

A 'Renewable Energy Development Project', developed in 2002 by the World Bank and Electricité du Vietnam (EVN) serves as the framework for Vietnam's renewable energy policies. The program will run until 2014 and targets large scale development of renewable energy projects, especially for rural energy supply. A 'National Renewable Energy Development Plan' was drafted for the period from 2010 to 2015 and foresees further development until 2025.

The 'National Energy Development Strategy' aims at a share of renewable energies of three percent by 2010, five percent by 2025 and 11 percent by 2050 in the national energy mix. There is also the 'Power Development Plan' under which investors can contribute to small-scale renewable energy projects and consequently receive additional support from the government. Another important policy is the latest 'Renewable Energy Master Plan' (REEGLE, n.d.).

With the support of the World Bank, the Vietnamese government has implemented a 'Clean Production and Energy Efficiency Project' which will run from 2011 to 2016. The project aims to improve energy efficiency in key industrial sectors. Another objective is the set-up of an 'Energy Efficiency and Conservation Office' (EECO) within the Ministry of Industry and Trade. Training will be provided for EECO staff concerning implementing, monitoring, and evaluation activities related to energy efficiency and conservation. In 2010, a respective 'Law on Energy Efficiency and Conservation' was established (Ibid.).

Stakeholders

In 1992, the Ministry of Science, Technology, and Environment and the provincial Departments of Science, Technology, and Environment were established to take charge of environmental issues on the national and regional level. A decade later in 2002, the institutions on both levels were restructured and are now the Ministry of Natural Resources and Environment (MONRE) and Departments of Natural Resources and Environment (DONRE). In 2008, the Vietnam Environment Administration was founded with the mandate to upgrade the MONRE environmental departments (Thang and Khoi, 2010, p.180).

The Ministry of Industry and Trade (MOIT) is in charge of all activities related to the energy sector, thus managing and directing all energy industries, including fossil and renewable resources. Policy making and the development of strategies and master plans also fall under MOIT's responsibilities. MOIT's Energy Department administrates all energy providers, including electricity, coal, mineral, oil, and gas (REEGLE, n.d.). Other Ministries are responsible for capital and foreign investment (Ministry of Planning and Investment), for tariffs and taxation (Ministry of Finance), and for research and development (MONRE). MONRE further has the overall authority in climate change matters (REEGLE, n.d., Thang and Khoi, 2010, p.180).

Electricité du Vietnam (EVN) is a state-owned facility and the biggest provider of electricity in Vietnam, its market share was at 68 percent in 2009. EVN has the responsibility to ensure investments in the gen-

eration of power and expansion of the grid. Competition on the market is gradually being encouraged and through independent power producer schemes, other suppliers provided around 5,400 MW in 2009 (REEGLE, n.d.)

Another key governmental agency is the Institute of Energy (IoE) which, sometimes in collaboration with other institutions, is responsible for studies concerning renewable energies and the development of renewables. The institute also implements policies regarding sustainable energy resources. In 2007, the IoE set up a 'Centre for Renewable Energy and Clean Development Mechanisms' in accordance with the CDM mechanism of the Kyoto Protocol (REEGLE, n.d.).

The 'Vietnam Environment Protection Fund' (VEPF) is chaired by the vice minister of the MONRE and six other representatives from other ministries. Its purpose is to register, monitor, and generally manage 'GHG emission reduction certificates' (CERs) under the CDM. The fund can also issue financial support in the form of soft loans or co-sponsoring to programs and projects concerned with bio-diversity or natural resource conservation, and pollution control or prevention (VEPF, n.d.).

Climate change projects have been very actively implemented by the United Nations Development Programme (UNDP), specifically in the field of raising awareness, climate change information management, and national communication to the UNFCCC. Apart from that, UNDP helped formulate the NTP-RCC, and it works towards the implementation of 'Global Climate Models' in Vietnam (Thang and Khoi, 2010, p.214).

Current market situation and renewable energy potentials

To date, the majority of Vietnam's energy supply stems from coal and hydro power. The electricity utility EVN also increasingly uses gas-fired power plants to generate electricity. In 2006, estimates of CO2 emissions from electricity generation in Vietnam were at 36 million tons. Coal output is expected to grow further and is also geared towards export. However coal reserves within the country are estimated only to last until around 2015 which means that the country will soon be forced to import fossil resources. The increased exploitation of coal reserves comes with serious threats to the environment and contradicts climate change policy (Thang and Khoi, 2010, p.191, Nguyen, 2008, p.13).

Vietnam is fortunate to have all kinds of other alternative resources, but currently its capacity to exploit and process these resources to meet the country's energy demand is limited. Wasting energy is another serious problem and the productivity of existing power plants is rather low. The government has now introduced measures to enhance energy efficiency and passed a 'Law on Energy Conservation'. Due to increased economic growth, Vietnam also experiences the same phenomenon as many other developing countries: a rapid increase in the demand for energy. According to estimates, Vietnam's energy industry has to grow some 15 percent per annum to meet the country's goal for economic growth of six to eight percent (Thang and Khoi, 2010, pp.207-208).

Since 2002, private companies have been permitted to participate in the market but EVN is still the main supplier. Ninety-five percent of the Vietnamese urban population is connected to the grid, and 89 percent lies in rural communities. Independent power producers account for about 20 percent of the market, indicating that there are market opportunities for producers of renewable energies. In 2009, only one percent of Vietnam's renewable energy potential was being used for electricity generation (Hai and Lien, 2009, p.133). By 2012, the number had risen to five percent, while the governmental target is still to reach 11 percent by 2020 (Vietnam Net Bridge, 2012). Moreover, a 'Master Plan for Renewable Ener-

gy' was submitted to the government for final approval in 2012.

Presently, there are numerous initiatives to support the expansion of the renewables share in the Vietnamese energy mix. For instance in May 2012, a manufacturing facility for electronic power converters was inaugurated in Binh Duong. The facility is owned by a Singapore-based investor and incorporates manufacturing, assembling, engineering, and testing facilities for solar power panels, which are to date mostly imported (Viet Nam News, 2012b).

Geothermal power

Geothermal resources are mainly located in Northwest and Central Vietnam. Some 300 hot streams with temperatures ranging from 30°C to 148°C have been mapped already and are estimated to hold an energy potential of 1,400 Megawatts (MW) (Vietnam Net Bridge, 2012). Currently, geothermal energy does not receive much attention in Vietnam's renewable plans.

Solar power

Due to its location, Vietnam has considerable solar power resources. Solar radiation is said to be between four and six KW in the Southern and Central regions of the country. Also in these particular regions, rural electrification is rather advanced through grid extension which facilitates feeding solar power generated electricity into the grid. Technologies applied most often in Vietnam are solar photovoltaic and solar thermal systems, often in remote or mountainous areas. Installed capacity currently equals 1.5 MW, mainly in households or facilities like hospitals, or it is used for tele- and marine communication (NL Agency, n.d.).

Wind power

Wind power has received much attention in Vietnam. The country is located in the monsoon wind zone and the wind density is estimated to be at 800 to 1,400 KW hours per square meter per year on the Vietnamese islands and 500 to 1,000 KW hours per square meter per year in the mountainous and coastal areas and the Mekong delta. The total potential of wind energy could be up to 713 GW (NL Agency, n.d.).

Energy experts even state that within Southeast Asia, Vietnam has the biggest wind power potential, of which only 3.5 percent was utilized in 2010. More than 20 wind power projects have been counted in 2012, of which many were at the planning state or under construction. The biggest investor presently is the 'Vietnam Renewable Energy Joint Stock Company' (REVN), and together with the German 'Fuhrländer AG' and the Malaysian company 'Timar Wind Solar Energy', it has pledged US $800 million for the development of wind power in the Ninh Thuan province (Vuong and Tran, 2012, Vietnam News, 2012a).

Hydro and marine power

There are no reliable figures concerning the potential of marine power in Vietnam (Hai and Lien, 209, p.139). In turn there are vast hydro power resources in the country, mainly located in the North and Center. The economic potential of hydro power is estimated to be at 84 TWh per year. Around 1,500 sites for potential small hydro power systems have been identified so far and over 200 plants already exist. Hydro power currently accounts for around 40 percent of the Vietnamese energy supply. The biggest project to date is the 'Son La' project which is supposed to reach a capacity of 2,400 MW in 2012. In general, five hydroelectric expansions are under way and three more are planned. Pumped storage hydroelectricity has an estimated potential of another 10,000 MW, mainly in the North and South (NL Agency, n.d., Clean

Energy Info Portal REEGLE, n.d.).

Biomass

Biomass production in Vietnam is above all based on forestry and agricultural by-products and solid waste. Other resources include rice husks, sugar cane, coffee husk, coconut shells, and paddy straw, amounting to an energy potential of up to 1,600 MW, but this potential is still largely unused. Over 30,000 Polyethylene Biogas Digester (PBD) units have been installed over the past ten years, and they are widely accepted by Vietnamese farmers. One power generation plant operates on municipal solid waste and generates almost 16 kilowatt hours. Another waste-to-power project was completed in 2005, mainly funded by the Netherlands. Only three out of 43 Vietnamese sugar mills currently sell about 50 MW of electricity to EVN. A program called 'Biogas for animal husbandry' was launched in 2007. (NL Agency, n.d., Clean Energy Info Portal REEGLE, n.d., World Bank ESMAP, 2002, p.8, Hai and Lien, 2009, p.139).

Biofuels

Biofuel in the form of ethanol is generated mostly from agricultural by-products such as manioc starch, sugar wastes, potatoes, corn, and peas. There are three bio-ethanol plants in Vietnam which produce 320 million liters per annum. However, the potential for more biofuel generation is limited because arable land is increasingly limited due to urbanization, industrialization, and climate change (Hai and Lien, 2009, p.139).

Needs, problems, and barriers

Major problems related to climate change in Vietnam include insufficient coordination among the numerous responsible bodies. MONRE has the authority to take on the overall management of climate change issues for which it currently does not have the coordination capacities, while the participation of the other stakeholders should to be improved (Thang and Khoi, 2010, p.180). Awareness among policy makers regarding climate change remains limited, particularly when weighing economic development against environmental protection. Implementation of environmental protection policies to date is slow and often ineffective, leading to many objectives not being met. In addition, there is a lack of financial and human resources to effectively implement climate change policy. As one of the key stakeholders, the industry sector has not much interest in environmental protection. Regulations are thus often ineffective, tend to overlap each other, and are weakly enforced (Ibid., p.191-192).

Regulations and the existing policy frameworks are not considered to be adequate to trigger the development of renewables. As in many other developing countries, a lack of financial resources is a major barrier in using renewable energy for the national energy market. Capacity building within all relevant institutions with regard to renewable energy technology, their commercial viability, and their role for sustainable development is a key need in Vietnam. At the present, there is no independent regulatory agency for the energy market that helps EVN maintain a conglomerate within the sector (REEGLE, n.d.).

A sound basis of commercial businesses in the field of manufacturing, installing, and maintaining renewable energy systems and equipment in Vietnam would be most helpful for the development of renewable resources. The formation of such businesses is hindered by the non-transparency of business licensing and regulations as well as a lack of incentives. This means that renewable technology and the respective trained personnel are scarce at all levels. Financing possibilities such as consumer credit and long term payment plans are not yet available. Another striking point is the insufficient availability of data concerning renewable energy potential in Vietnam which constrains the planning of renewable projects

(World Bank ESMAP, 2002, p.10).

2.4.4 Labor market, green jobs, and TVET

Since the implementation of the 'renovation strategy' in 1986, Vietnam has experienced relative economic success with an annual GDP growth rate between 5 and 8 percent. Nonetheless, due to its increasing global economic integration, the Vietnamese labor market has been hit by economic crisis since 2008, and even workers who have stayed in employment have been subjected to deteriorated working conditions. Vulnerable employment was at 61.5 percent in 2009, mostly in agriculture and services. The constant growth of the Vietnamese population puts additional pressures on the labor market (ILO, 2010, pp.5-7).

The manufacturing sector has been hit the hardest by the crisis which has had serious implications for the newly export-oriented Vietnamese economy, hindering exports by some 10 percent in 2009. The agricultural sector still has a large but constantly decreasing share of the Vietnamese GDP and employment sector. In 2009, 47.6 percent of the Vietnamese labor force worked in agriculture, 30.6 percent in services, and 21.8 percent in industry. Vietnamese labor market participation for those workers 15 years and older was at 76.5 percent in 2009, and unemployment was at 2.6 percent (Ibid., pp.5-7, p.12). This reflects the trend that young Vietnamese people tend to leave the educational system early to become economically active and that due to the lack of social security mechanisms, the majority of the 15 and older age group *has* to work, also in informal or self-employment settings, as "[…] participation in the labor market is for many Vietnamese the only way to support themselves and their families." (Ibid., p.xv). An overview of the employment status in 2009 suggests that although labor market participation was high, the kind of jobs taken were not necessarily decent jobs: most Vietnamese workers were self-employed (49.6 percent), followed by own-account workers (44.7 percent), wage or salaried workers, and unpaid family workers. Women were generally less likely to work in formal employment, and 33.7 percent of wage and salaried workers worked on the basis of verbal agreements rather than written contracts (ILO, 2010, p.11, pp.14-15).

Productivity, measured as the ratio of output per employed person, has increased especially in the Vietnamese industry and services sectors (Ibid, p.21). However, a permanent shift from the low-productivity and labor intensive agricultural sector to more technology and value-added sectors can only be sustained by ensuring the availability of skilled workers. In Vietnam only around 27 percent of workers have undergone professional training for the occupation they are economically active in. Only 15 percent of the Vietnamese labor force has completed vocational training or has obtained non-academic qualifications. Vietnam is thus in dire need of TVET graduates, especially at the middle occupational level, e.g. technicians and other professionals. To remedy this, the government has developed a strategy to move vocational education and training and activities geared towards improved employability into the center of national development planning. Vocational qualifications are seen as a key component regarding modernization, economic growth, and competitiveness. The aim is to increase the share of TVET graduates to 55 percent by 2020, and out of the 55 percent more than half are supposed to have obtained qualifications at the middle or higher occupational levels. In this context the government intends to significantly expand the national TVET capacities while seeking to improve the quality of the current provision and aligning industry and market needs with TVET provision (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH GIZ, 2012).

Currently, there is no specific strategy for green jobs in place, but the expansion of the TVET sector is

likely to open up opportunities to integrate or develop such occupations into the country.

The responsibility for vocational education and training at the state level has been mandated to the Ministry of Labor, Invalids, and Social Affairs (MOLISA) and the Ministry of Education and Training (MOET), which is in charge of secondary school vocational education and training. These line ministries administer Personnel and Training Departments, which are in charge of managing and administrating TVET institutions, developing occupational standards, and recruiting, training, and retraining of teaching staff (UNESCO-UNEVOC, n.d.).

Provincial Departments of Education and Training (DOET) run professional offices which are responsible for educational administration and management at the local and municipal level.

TVET policies, curriculum management, TVET strategy design, and institutional planning is the mandate of the Secondary Technical and Vocational Education Department (STVED). There are different forms of vocational training and education provision offered, comprising informal, formal, and on-the-job training as well as short-term courses, and apart from public provision, non-governmental organizations, donors, private, and semi-private providers coexist (UNESCO-UNEVOC, n.d.). The heterogeneity within the Vietnamese TVET sector leaves significant and promising possibilities for training providers in the field of green jobs.

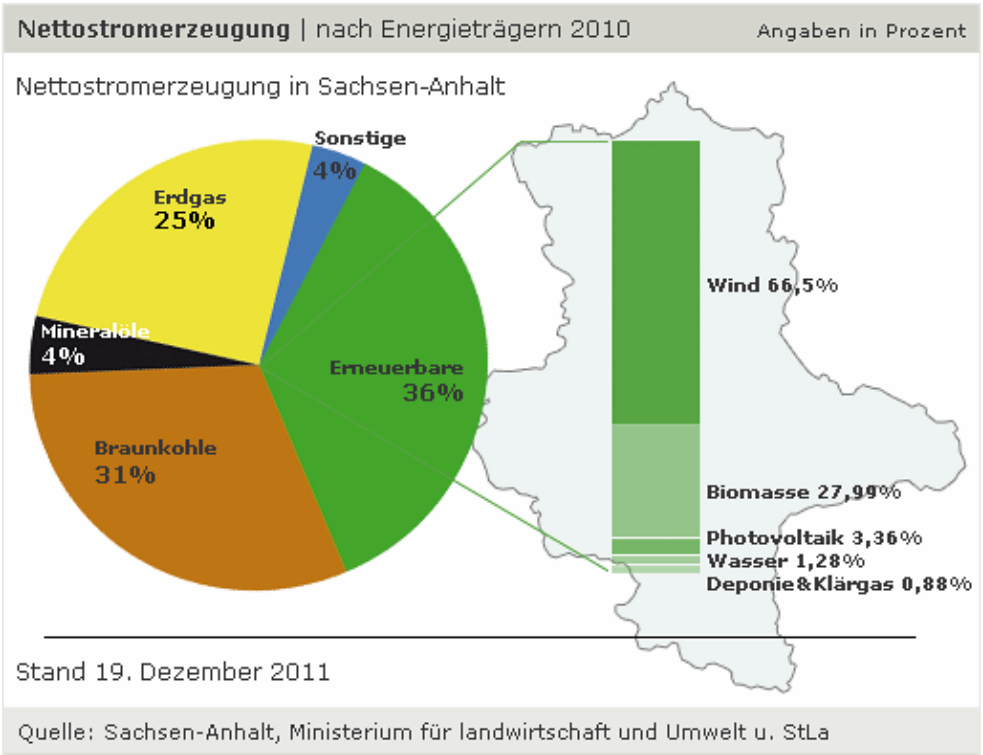
Professionals for renewable energies are currently trained at three different levels: for instance, there are high level electrician qualifications, middle level mechanic qualifications, and lower level biomass/biogas system and process management qualifications taught in vocational schools. At the academic level, the CEFINA Research and Training Center on Water and Environmental Technology at the Ho Chi Minh Polytechnic University and the Renewable Energy Center at Can To University are actively training students in renewable energy related fields.

3 Renewable energies in Saxony-Anhalt

Today, the federal state of Saxony-Anhalt, situated in central Germany, is one of the leading regions in the fields of renewable energy production in Germany. In 2011 more than 37 percent of the total electricity generated and more than 70 percent of the consumed electrical energy within the state of Saxony-Anhalt was produced by renewable energy technologies like wind power, hydro power, photovoltaics, and biomass (Minsterium für Wissenschaft und Wirtschaft des Landes Sachsen-Anhalt, 2012).

Wind energy has the biggest share in this result with 2352 installed wind turbines and an installed power generating capacity of 3.6 GW that contributed nearly 48.1 percent to the net power consumption in 2011 (Molly, 2011). Apart from wind energy, biomass and photovoltaics also contribute a continuously growing share to this development. In 2010, renewable energy sources displaced lignite as the traditionally most important energy source for electricity generation in Saxony-Anhalt. Photovoltaics could contribute a share of about 3.4 percent with a current growth rate of 122 percent, and the photovoltaic sector more than doubled its installed generation in the year from 2009 to 2010. Given that fact, photovoltaics are currently the fastest growing sector in the field of renewable energies (Statistisches Landesamt Sachsen-Anhalt, 2011).

As the state of Saxony-Anhalt is characterized by strong agricultural activities, biomass, with nearly 27 percent, also contributes a very important share to electricity generation through renewable energy sources and in addition plays a continuously growing role in the heating of homes and bio-fuel production. Nearly 70 percent of the German bio-ethanol production is located in this state.

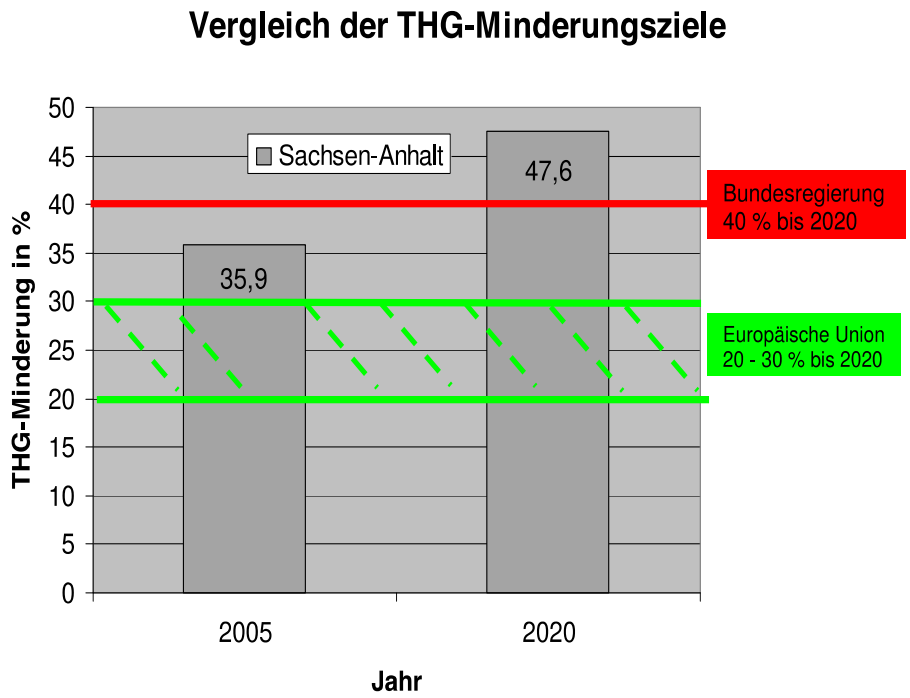


The chart shows the Net Electricity Production of Saxony-Anhalt in 2010 in order of shares of the different energy sources (MDR Aktuell, 2012). The share of renewables was at 36 percent, including wind power, biomass, photovoltaic energy, hydro energy and electricity generated by gasification of waste and sewage.

Technology leading companies in the field of wind power and photovoltaics like ENERCON in Magdeburg and QCELLS of the Solar Valley Photovoltaic-Cluster Wolfen-Bitterfeld have settled down in the region for the last 15 years. About 2.7 percent of the workforce in Saxony-Anhalt, more than 24,400 people, is already employed in the fast growing renewable energy sector (Wind ca. 9200, Photovoltaic ca. 8100, and Biomass ca. 6700 employees). Between 2004 and 2011 employment rates in those sectors more than doubled, which has also caused a constantly growing demand of well-trained specialists in the different technology sectors (Agentur für Eneuerbare Energien, 2012).

The build-up of a vital industry in the field of renewable energies is strongly supported by the state government of Saxony-Anhalt, the Ministry of Science and Economics (MWW), and the Ministry of Agriculture and Environment (MLU). The environmental and economic policies of the state of Saxony-Anhalt are especially focused on the prevention of climate change and the promotion and protection of the new green industry branches.

With the Climate Protection Program 2020, a countrywide action plan to prevent climate change was agreed upon in 2010 by the state with the goal of reducing GHG emissions by up to 47.6 percent by the year 2020 compared to the emission levels in 1990. This ambitious target exceeds the national German target in reducing climate gas emissions by 7.6 percent by 2020 and the goal of the European Union by more than 12 percent.



The chart to the left shows a comparison of Green House Gas reduction targets of the State of Saxony-Anhalt with target of the federal government of Germany (red line) and targets of the European Union (green line) (Ministerium für Landwirtschaft und Umwelt des Landes Sachsen-Anhalt, 2010, p.7).

Planned measures according the Climate Protection Program 2020 are:

- reducing energy consumption and improving energy efficiency by 20%
- promoting renewable energies such as wind, photovoltaic, solar thermal, geothermal, biomass, and hydropower to meet the planned targets
- implementing new concepts of public and private transport e.g. E-Mobility
- implementing new energy saving concepts in the field of building and construction

- developing further the educational system as well as the vocational education and training system to meet the demand of well-trained specialists

The Ministry of Science and Economics (MWW) supports regional alliances like CEESA, the Cluster for Renewable Energies Saxony-Anhalt, in which companies of the regional renewable energy sector and regional science and research communities (e.g. the Fraunhofer Society, the Anhalt University of Applied Sciences, the University of Applied Sciences Magdeburg-Stendal, and Otto-von-Guericke-University Magdeburg) are organized.[5]

Within this context another very important stakeholder is the 'Landesverband für Erneuerbare Energien e.V.' (LEE) which is mainly focused on small and medium size enterprises.[6] CEESA and LEE have an important function in strengthening and connecting the different research and development stakeholders in the fields of renewable energies like wind power, photovoltaics, and biomass. Their main goal is the development of new strategies and projects for new intelligent energy distribution and storage solutions as well as solving problems of production, installation, and maintenance to improve energy reliability and to further increase the energy supply based on renewable energy technologies.

With Otto-von-Guericke-University Magdeburg and Martin-Luther-University Halle-Wittenberg, four universities of applied sciences, and research institutions like the Fraunhofer Society, Saxony-Anhalt is also a center for research and development regarding new renewable energy applications, cooperating with research institutions worldwide.

Regional competence Saxony-Anhalt

The Fraunhofer Institute for Factory Operation and Automation (IFF) belongs to the renowned Fraunhofer Society's network. The IFF is a research facility which has established partnerships with various regional, national, and international business, industry, and academic stakeholders. Fraunhofer IFF offers customized applied research solutions in various fields of engineering such as logistics, renewable energy or automation. The institute has been operating in the ASEAN region for more than a decade and is keen on expanding its activities by offering training for engineers in using virtual reality technologies in different stages of the product life cycle (e.g. design review, commissioning, factory planning, marketing, and training) or training for trainers in using virtual reality technologies for developing technology-based training systems, for example in the field of construction and renovation.

The International Cooperation Unit at the Institute for Vocational Education and Human Resource Management, Otto-von-Guericke-University Magdeburg operates in four main areas: education and further training, capacity building, R&D, and networking to exchange experience and know-how.

The International Cooperation Unit currently has five areas of competence:

- vocational education and training for sustainable development
- initial and further training for VET trainers
- the development of curricula and of teaching and learning materials for vocational training and further training

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5 CEESA – Cluster für erneuerbare Energien Sachsen-Anhalt (2012): http://www.ceesa-org.de. [Accessed 25 November 2012].

6 Landesverband Erneuerbare Energie Sachsen-Anhalt (2012): http://www.lee-lsa.de. [Accessed 25 November 2012].

- human resource development for businesses
- the development of innovative learning arrangements for initial and further vocational training

Additionally, International Leadership Trainings (ILTs) are carried out in the field of knowledge management, media development, or green jobs and climate change, all in cooperation with the GIZ state office. The institute also offers international master programs and has organized several summer universities and other international events regarding TVET.

The UNESCO-UNEVOC Centre Magdeburg is constituted by three Magdeburg institutions, namely the Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Fraunhofer Institute for Factory Operation and Automation (IFF), and Otto-von-Guericke-University. Naturally, the Magdeburg UNEVOC Centre is part of the global UNEVOC Network. Based on the Centre's main focus on "education for sustainable development", activities such as providing further training or curriculum development are geared towards human resource development, networking, and research.

In cooperation with the currently built up Science-Center Magdeburg, which will reach full operational status in the year 2015, the activities of the UNESCO-UNEVOC Centre Magdeburg in education and training can be significantly improved.

The Science Center, situated in the area of the 'Wissenschaftshafen Magdeburg', is a joint venture of the city of Magdeburg, the Helionat GmbH, the UNECSO-UNEVOC-Center Magdeburg, and other companies working in the field of renewable energy technologies. It will be an institution which offers a versatile course program regarding sustainable development and renewable energy supply. Therefore it is planned to be a center were different technologies in the field of renewable energy supply like photovoltaics, solar heating and cooling technologies, geothermal heating, and electric wind power generation are displayed and can be seen in operation. The Science Center Magdeburg is driven by the spirit of promoting awareness towards sustainable development. Beside energy supplied by renewable sources, another important field of activity of the Science Center will be energy efficiency e.g. of building and construction and e-mobility, which is seen as an important market for the next decade.

The Science Center is therefore regarded as an important hub which connects educational and research institutions with companies in Saxony-Anhalt that work in the various fields of renewable energy production and storage.

Apart from the newly established Science Center Magdeburg, there are other institutions of further education in the field of renewable energies like the Teutloff Kompetenzzentrum für Erneuerbare Energien 'Hermann Scheer' Barby, the Bildungszentrum Energie GmbH Halle, and the Bildungs- und Technologie Zentrum BTZ Bernburg GmbH, which also offer different training programs for regional and international demands within the field of green jobs. With all those mentioned institutions, tailor made solutions, especially in the field of further educational programs, are possible.

Saxony-Anhalt appears to be a well prepared location in regard to the political and economic framework, as well as a strong renewable energy partner for research and development, production and operation, and education and training. The graphic below shows a knowledge map, visualizing the companies, and educational and scientific institutions in the Saxony-Anhalt region, which could be partners for future cooperation in projects related to green jobs.

Federal State of Saxony-Anhalt with places of interest for renewable energy projects

- **orange**: companies related to the production of renewable energies technology
- **green**: companies in the field of installation/operation/maintenance
- **dark blue**: research and educational institution in the field of renewable energy
- **light blue**: private educational institution in the field of TVET and green jobs

For detailed information see the table.

Possible partners of cooperation by working-area

Technology		Qualification	Research & Development
Production	**Installation, Operation & Maintainance**		
Hanwha Q-Cells GmbH 1	Simmersberg Solar GmbH, Dessau 1	Otto-von-Guericke-Universität Magdeburg 1	
Calyxo GmbH 2	Sonnen-Froehlich Solar und alternative Energiesysteme, Dessau 2	Martin-Luther-Universität Halle-Wittenberg 2	
Bio-Ölwerk Magdeburg GmbH 3	Elektroanlagenbau Michael Embach e.K., Magdeburg 3	Hochschule Magdeburg-Stendal 3	
Enercon GmbH 4	AMS innovative Windenergiesysteme ams – Int. Handelsgesellschaft mbH 4	Teutloff “Kompetenzzentrum für erneuerbare Energien” Barby 4	Fraunhofer-Center für Silizium-Photovoltaik CSP Halle 4
Heizungsbau intelli production GmbH 5	Windpark Druiberg GmbH & Co.KG 5	BTZ Bildungsgesellschaft mbH Bernburg 5	Institut für Automation und Kommunikation ifak, Magdeburg 5
Aluminimwerk Schönebeck 6	BLZ Geotechnik GmbH 6	Bildungszentrum Energie GmbH, Halle 6	Fraunhofer-Institut für Fabrikbetrieb und –automatisierung IFF Magdeburg 6
ERO Edelstahl-Rohrtechnik GmbH 7 .	GWM Gesellschaft für Wirtschaftsservice Magdeburg mbH 7	IHK Bildungszentrum Halle – Dessau GmbH 7	. . .
ITS Halle CELL GmbH 8	Helionat eG 8	. . .	. . .
VERBIO Ethanol Zörbig GmbH & CO.KG 9	. . .	. . .	. . .

4 Results of the workshop session

Workshop I: Renewable Energies and Technology
Moderation: Prof. Dr. Klaus Jenewein (Otto-von-Guericke-Universität)
Fabienne-Agnes Baumann (Otto-von-Guericke-Universität)

Participants:
Prof. Dr. Frank Bünning, Rosa Jacob Chilundo, Jörg Dahlke, Helge Fredrich, Annika Fünfhaus, Kai Gleißner, Dr. Klaus Hahn, Saurip Kadi, Jens Kramersmeyer, Justiani Liem, Uranio Stefane Mahanjane, André Mundt, Axel Müller, Damiao Namuera, Valeriano Pedro, Eddi Santosa, Mac Van Tien

Key question	Mozambique	Vietnam	Indonesia
What measures are already in place to support renewable energies?	• The government's five year development plan • There is a strategic plan for RE, which focuses on the installation of solar power systems for hospitals, health centers, and schools in rural areas. • A national directorate for RE • An atlas to map renewable energy sources is currently being compiled and is expected to be available in 2013. • FUNAE, a publicly financed fund for alternative energies, is in charge of rural electrification and RE project development. • Renewable energies have been integrated into the curricula of technical schools.	• National strategy to reduce the share of coal and oil for energy generation • Alternatives are hydro, solar, wind, and biomass power • Germany is currently active in the wind power sector. • The Vietnamese government supports nuclear power and cooperates with Japan, Russia, and France. Nuclear power is seen as an innovative and clean energy source and generally supported by the Vietnamese population.	• PLN gives incentives to use electricity generated by RE. • It also currently buys electricity generated by RE (geothermal and hydro power) and sells it at around twice the price of fossil energy. • PLN has also formed a new RE division. • PLN currently does not allow bidding for new initiatives regarding RE. • PLN allows the operation of community power systems independent from the grid, which generate not more than 1 MW. • There are efforts to build RE industries, mainly bioethanol. • Pertamina, the national oil company, has agreed to buy bioethanol, aiming at gradually substituting crude oil. • Some Indonesian Polytechnics have installed and work with RE teaching technology from Lucas Nülle. • On remote Indonesian islands, tribes still practice a lifestyle in harmony with the nature. • Research by anthropologists aims at promoting this lifestyle as a role model for the rest of the population.

Workshop I: Renewable Energies and Technology			
Key question	**Mozambique**	**Vietnam**	**Indonesia**
What political/ governmental targets have been set?	• Due to recent discoveries, the Mozambican government promotes the exploitation of national coal and gas reserves.	• The main governmental document concerning RE is the Master Plan by the Ministry of Science and Technology which includes the goal to reduce CO2 emissions by 5% per year. • Other key governmental stakeholders are the Ministry of Industry and Trade and Ministry of Natural Resources and Environment. • In July 2011, Vietnam's prime minister approved a national strategy for human resource development (2011-2020) which aimed at increasing the number of trained workers (including in renewable energies) to 44 million or 70% of the national workforce by 2020.	• The Indonesian president has voluntarily pledged to reduce the country's CO2 emissions by 26% by 2025. • The government is also enforcing legislation to use non-subsidized fuel (namely Pertamax instead of Premium). • ESDM (Ministry of Energy and Mineral Resources) aims at a biofuel share of 20% by 2020. • The Ministry of Forestry seeks to plant one billion trees in the next years to support the reduction of emissions and to prevent erosion and soil degradation. • Public transport in the Jakarta area is supposed to run exclusively on gas. • Pertamina Envogas is the major player for the supply of gas for public transportation. • The government has established under the aegis of the ESDM the Directorate General of New Energy, Renewable Energy, and Energy Conservation.

Workshop I: Renewable Energies and Technology			
Key question	**Mozambique**	**Vietnam**	**Indonesia**
What are the four most important innovative ideas and focal points for future activities concerning RE and technology?	*Micro level/individual level:* • The National Program for RE: its success depends on the implementation by the Mozambican population *Meso level/projects:* • Renewable Energy Atlas for measuring and mapping RE resources and provision of data (to be completed in 2013) • FUNAE as an institution to channel funds to RE projects • University Eduardo Mondlane and the Pedagogic University collaborate in the field of human resource development for renewable energies and technology *Macro level/legislation:* • The National Program for RE A grid code and feed-in-tariffs for RE are planned for 2013	*Micro level/individual level:* • The use of solar energy and biogas is supported in rural regions *Meso level/projects:* • The national Master Plan is implemented at the community level and in schools, which results in the integration of RE into school curricula. • Energy efficiency measures for companies and the industry *Macro level/legislation:* • Vietnam needs campaigning for raising awareness in the context of more sustainable energy resources and usage. • There should be a law which obligates the industry to energy efficiency and energy conservation.	*Micro level/individual level:* • There is a nationwide green leader training competition which is also televised. • Households can make use of small biogas systems to cover their energy demand. • In Indonesia a pilot project called Bank Sampah (Waste Bank) supports the burning of waste from households to produce fertilizer. Individuals can drop off their waste at the bank where it is weighed. According to the weight, participants receive a compensation. • Some Indonesian Polytechnics collaborate for the development of RE professionals; they develop TVET subjects and certification for training courses. • There are individual consultants to local governments on the subject of green planning and financing of projects. *Meso level/projects:* • There are several projects which place the model of a green community at their center, for instance “Green Islands for the New World” which focus on activities for the production of sustainable, value-added products such as spices. • There is also Waterland and a project called KOMOTREX[7]. • Another project aims at redesigning the greater Jakarta area to a green city, and eight small islands near Jakarta have been involved in a solar energy project. • There are initiatives to support green building/construction. *Macro level/legislation:* • It was suggested that the Indonesian government pursue bilateral carbon trading outside the Clean Development Mechanism • Bilateral carbon trading could comprise exchanging emission certificates for renewable energy technology. • A green business model was proposed which could be developed with GIZ.

7 KOMOTREX stands for KOMODO TRadehub & financial EXchange and is part of the “Green Island Initiative for the World”. The initiative is supported by the Indonesian Presidential Initiative GoGreen GoClean Indonesia. KOMOTREX is an innovative initiative to protect and conserve the Indonesian region of Manggarai Barat which is located on the West part of the island of Flores. The region is known for its unique flora and fauna and wild and marine life. For more information on KOMOTREX, please contact the workshop team.

Workshop II: Skills Development for Green Jobs

Moderation: Prof. Dr. Klaus Jenewein (Otto-von-Guericke-Universität)
Fabienne-Agnes Baumann (Otto-von-Guericke-Universität)

Participants:
Prof. Dr. Frank Bünning, Rosa Jacob Chilundo, Jörg Dahlke, Helge Fredrich, Annika Fünfhaus, Kai Gleißner
Dr. Klaus Hahne, Saurip Kadi, Jens Kramersmeyer, Justiani Liem, Uranio Stefane Mahanjane, André Mundt
Axel Müller, Damiao Namuera, Valeriano Pedro, Eddi Santosa, Mac Van Tien

Key question	Mozambique	Vietnam	Indonesia
Are there trained workers who generally could fulfill the tasks mentioned in WS I?	• There are some graduates from the INEFP, where technicians are trained in company based training modules, but output is too low (only around 12 students per class).	• In Vietnam, professionals for RE are trained at three different levels, for instance there are high level electrician qualifications, mechanics are trained at a middle level and biomass/biogas system and process management is offered in vocational schools at a lower level. • Qualifications at the academic level are also provided by the Vietnam Industrial University in Hanoi.	• Indonesia does not have enough trained workers to support RE development.

Workshop II: Skills Development for Green Jobs			
Key question	**Mozambique**	**Vietnam**	**Indonesia**
Are there skills deficits which could be eliminated by training or re-training the labor force for RE? ***What kind of training would be appropriate?***	• Appropriate training modes could encompass short courses in order to up grade existing qualifications with specialized input for RE. • Internships have proven to be very rewarding for students from technical and other VET institutions. • Once there is a Mozambican RE industry, internships could be a way to provide on-the-job training. • Distance learning courses could widen access to education and training provision especially for those in rural areas • The latter could also be reached through mobile training units • A holistic approach to sustainable training provision would be the set up of model schools in the sense of a green campus project. • At the UEM/UP, a test facility has been established for batteries, photovoltaic modules, and LED lightning systems.	• In Vietnam, training for the installation and maintenance of photovoltaic power systems is necessary. There should also be research into how to combine electricity and heat generation.	• In Indonesia, technical and vocational education and training could be delivered via distance learning in the form of a "cyber campus" • The existing training model of Polytechnics could be franchised to other institutions, while Polytechnics could join forces to establish a more coherent training provision. • Training provision for RE should be decentralized because of the geography of the country. • Indonesia needs a skills forecast to plan skills development for RE. • A skills profile for RE would also be helpful, in order to structure the curricula. • The Ministry of Environment should restructure curricula to sensitize students and teachers to environmental protection, climate change, and a more sustainable lifestyle.

Workshop II: Skills Development for Green Jobs			
Key question	**Mozambique**	**Vietnam**	**Indonesia**
Is it necessary to restructure or update existing curricula, or to implement new training courses for RE?	• Yes • There needs to be a holistic approach to training for RE and for climate change and environmental protection. Sensitization and raising awareness should start as early as primary school.	• Vietnam needs new (training) laboratories for RE technology. TVET teachers need [re-] training in order to be able to deliver training for RE.	• There needs to be a holistic approach to training for RE and for climate change and environmental protection. • Sensitization and raising awareness should start as early as primary school. • There should be linkages between general, vocational, and academic education concerning energy and its role for climate change and environmental protection. • Training courses should be modularized. • Training and educational institutions have to act as role models and should follow a green philosophy.
Key question	**Mozambique**	**Vietnam**	**Indonesia**
What kind of demand is there for cooperation concerning green jobs, climate change, and renewable energies?	• Shaping the political framework for climate change and green jobs • Eliminating lack of training facilities and services • Providing knowledge regarding the availability of RE solutions	• Information concerning climate change, green jobs, and renewables is needed. • Establishment of research network between Otto-von-Guericke-University and other research institutions • Curriculum development for RE training	• Training • Projects • Funding • Cooperation modeling → For climate change, green jobs and renewables
Key question	**Mozambique**	**Vietnam**	**Indonesia**
What are the three most important projects/plans to be realized in your country?	• Training for green jobs and a green economy, especially renewable energy • Technology transfer in the field of renewables • Organization of a regional conference for Saxony-Anhalt and Mozambican stakeholders	• Campaigning and awareness raising for green energy and green jobs • Human resource development for renewables and green jobs • Curriculum development for green jobs	• Green cyber university • Bilateral carbon credit program • Green electricity for remote islands • Diffusion of the of the pilot projects KOMOTREX and Green Island

Workshop II: Skills Development for Green Jobs			
Key question (German partners)	**Otto-von-Guericke-University/ UNEVOC Centre "TVET for SD"**	**Research sector (Fraunhofer IFF)**	**Cooperative, people to people approaches**
What ideas and potentials exist for cooperation with developing countries?	• Assistance with pilot projects for energy provision to rural communities • Intensifying cooperation with TVET institutions • Development of new, tailor-made curricula for RE training • Sharing of good practice examples • Exchanging of experience and knowledge through the UNEVOC database which also matches parties to develop projects for sustainable development • Technical education and sensitization for schools • Provision of qualification modules and certified programs • Curriculum development and compilation of green jobs profile • Research and development for TVET, renewables, and sustainable development • Integration of cooperation activities into the UNESCO-UNEVOC network • Organization and hosting of international conferences and workshops	• Developing individual needs based RE training systems • Training trainers through virtual reality models • Transfer of RE technologies and knowledge transfer • Mapping data, data visualization • Student exchange	**Landesverband Erneuerbare Energien** • Cultural exchange • Community partnerships • Cooperation between cooperatives • Development of mobile RE laboratories • Development of local projects with the involvement of respective local population • Development of innovative financing instruments for RE projects **BTZ Bernburg, Dr. Klaus Hahne/ INBAK** • Training system for teachers in the forms of interactive, mobile virtual reality training systems • Innovating schools to sustainable learning centers • Compilation of a catalogue of green vocations • Adapting the European Curriculum for Solar Specialists (200h lecture course) to needs of developing countries • Provision of knowledge map of RE centers in Germany • List of curricula for RE in TVET Provision of media and experimental equipment for RE training

5 Recommendations and possible areas for cooperation

5.1 Workshop

Based on the findings of the workshop, several cross cutting issues could be identified which have been perceived by all participants to be relevant for further action on green jobs and climate change:

- Curriculum development for renewable energies in particular and for sustainability in general, which is not limited to vocational education and training but is applied to all educational levels, starting as early as primary schooling
- Technology transfer for renewable energies
- Human resource development and capacity building for green jobs and climate change
- Raising awareness regarding renewable energies and climate change
- Policy making and financial support to address climate change issues and to plan and implement projects

These cross-cutting issues provide a basis for the following suggestions for possible future cooperation activities in the field of renewable energies.

5.1.1 Curriculum development

Generally it would be beneficial to carry out small-scale projects in general education and vocational education and training. These could comprise several topics such as curriculum development, which could be outsourced to a suitable institution on a project by project basis. In the course of curriculum development, the development of respective teaching and learning technologies and media is possible in order to support the educational infrastructure in the partner countries.

The participating country representatives have also expressed the need for a skills profile for green jobs in order to structure the curricula accordingly.

5.1.2 Technology transfer

The transfer of technology for renewable energies and the provision of training for those technologies could be taken on by renewable energy businesses or research institutions in Saxony-Anhalt through the development of individual needs-based RE technology training systems. Virtual reality models could be applied for the training of trainers in the green jobs sector. The further development of renewable energy systems needs sufficient and reliable data on resources which is often lacking in developing countries. Therefore mapping data and data visualization could also be provided and taught. Businesses or research institutions could also engage in student exchanges and the provision of internships as well as the support of PhD theses and research programs which would contribute to knowledge transfer in the field of renewables. In Vietnam for instance, research should be conducted and consequently supported into how to combine electricity and heat generation through renewable energies.

5.1.3 Human resource development/capacity building

Representatives of the participating countries have all expressed the need for human resource development and capacity building in the field of green jobs and for climate change issues in general. A part of this need could be satisfied by offering training for teachers in renewable energy related fields and by offering training of trainers who work with apprentices in green occupations or in occupations that need to be 'greened'. Participants have emphasized that the various modes of distance learning could be especially useful to reach the rural population.

In Mozambique, not many young people have the chance to complete technical training as a prerequisite for renewable energy systems development. It is thus evident that output of technical graduates needs to be increased, and the participants have accordingly named appropriate training modes. They could encompass short courses in order to improve existing qualifications with specialized input for RE. Also, internships have proven to be very rewarding for students from technical and other VET institutions. Hence, once there is a Mozambican RE industry, internships could be a way to provide on-the-job training. As has been mentioned, distance learning courses could widen access to education and training provision especially for those in rural areas which could also be reached through mobile training units. A holistic approach to sustainable training provision would be the set up of model schools in the sense of a green campus project.

Furthermore, existing facilities in Mozambique such as the UEM/UP test facility for batteries, photovoltaic modules, and LED lightning systems could be a beneficial environment for RE human resource development.

In Vietnam, training for the installation and maintenance of photovoltaic power systems is necessary. Vietnam also needs new [training] laboratories for RE technology while at the same time TVET teachers need [re-]training to be able to deliver training for RE in those laboratories.

In Indonesia, technical and vocational education and training could be delivered via distance learning, e.g. in the form of a "cyber campus" which would benefit those living on remote islands. Training provision for RE should be decentralized because of the geography of the country, and the courses should also be modularized to be able to flexibly respond to the skill demands of the market.

As some Indonesian Polytechnics already work with sophisticated teaching tools such as Lucas Nülle equipment, this existing training model could be franchised to other institutions. This would enable the less well equipped training providers to also offer quality training for renewable energies while not having to come up with the necessary funding for their own educational infrastructure. Polytechnics could also be supported to join forces to establish a more coherent training provision. Further, Indonesia could be supported by developing a skills forecast to meet the market's demand for skilled labor in the field of renewable energies.

5.1.4 Awareness raising

International projects, workshops and conferences as well as community based approaches are a suitable way to contribute to increasing the awareness of climate change issues, the benefits of alternative and clean energy sources, and the importance of green jobs for a cleaner and more sustainable economy.

The workshop participants have further emphasized that there needs to be a holistic approach to training for RE and for climate change and environmental protection which involves sensitization and raising awareness as early as primary school. Linkages should be established between general, vocational, and academic education concerning energy and its role in climate change and environmental protection while supporting training and educational institutions acting as role models in terms of a green philosophy.

Raising awareness could be supported by cooperative or people to people approaches for which Mozambique and Indonesia have shown much interest and have been quite successful in the past. Representatives from a German cooperative for renewable energies in Saxony-Anhalt have already suggested that a cooperation could involve cultural exchange, community partnerships, the joint development of mobile RE (training) laboratories, the development of local projects with the involvement of respective local population, and the development of innovative financing instruments for RE projects.

Cooperative and people to people approaches usually prove to be a key instrument to develop local ownership of projects which in the long run contribute to the sustainability of donor activities.

5.1.5 Policy making and financial support

The domain of policy making and the bi- or multilateral funding of activities for climate change, green jobs, and renewables naturally involves cooperation at the governmental level. Such cooperation could involve the support of existing national programs and master plans for the topics above, especially at the implementation stage. Activities could also involve policy learning regarding tariffs, tax incentives for [foreign] investment, the general support of manufacturing, or research and development for renewable energy solutions.

The workshop participants have suggested the organization of a regional conference for Saxony-Anhalt and Mozambican stakeholders in the field of renewable energies. Another idea was to develop a bilateral carbon credit program (outside the CDM) which could involve trading emissions for renewable energy technology.

Generally, it has been noted that at the governmental level there needs to be some shaping of the political framework for climate change and green jobs which is to go hand in hand with awareness raising and sensitization for these topics.

In addition to the issues above, the international participants have shown much interest in solutions for waste, water, biomass, and energy efficient construction. These areas represent other possible areas for cooperation.

Apart from that, a platform or instrument to facilitate communication and exchange between national and international renewable energy as well as climate change and green jobs stakeholders was proposed. This would also promote and assist the follow-up process of the actions taken in the aftermath of the workshop.

Finally, it should be noted that when developing projects with a focus on renewable energies, the national governments in all three countries currently give priority to the exploitation of domestic resources of coal, gas, and/or oil. In the case of Vietnam, nuclear power is just being developed and is seen as a clean energy source, therefore competing with renewable energy systems.

5.2 Country assessments

Possible areas for cooperation have also been identified based on the country assessments which have been compiled *prior* to the workshop.

5.2.1 Possible areas for cooperation Indonesia

Skilled technicians are the key to reliable installation and maintenance of renewable energy systems, therefore investment in training is needed, e.g. through technical cooperation and the exchange of TVET expertise.

As the majority of engineers in Indonesia are said to be unaware of materials, designs, and construction techniques concerning renewable energies, there is more potential for cooperation at the academic level.

Solar power and hydro power are particularly relevant for rural electrification, as still one third of Indonesia's population does not have access to electricity. Further, access for the rural poor through renewable energies can play an important role in creating possible new economic activities. Therefore it would be recommendable to draw on the GIZ's previous experience in the hydropower sector through the Micro Hydro Project Program.

Financial support could be drawn from the Clean Technology Fund (CFT), which is supposed to help promote energy efficiency and renewable energy. The government of Indonesia also offers funding through a sovereign wealth fund and considers implementing various incentives for foreign investment such as tax breaks.

5.2.2 Possible areas for cooperation Mozambique

Similar to many other developing countries, Mozambique is caught between the desire for economic growth while ensuring sustainability to combat climate change. The country needs investments as well as professional expertise concerning renewable energies. Therefore it is important that the government creates a clear investment structure, transparent tendering processes, and incentives for private sector engagement in more than just profitable commercial cash crops for biofuels. At this point, Mozambique can potentially engage in policy learning through cooperation on the governmental level.

Advice to the government regarding a sound and reasonable tariff system would facilitate the expansion of renewable energy sources for the national electricity grid.

The support of small scale electrification projects through hydro or solar power seems potentially suitable for the rural population far from the national grid. FUNAE would be the appropriate partner for such an undertaking as it is in charge of supplying energy solutions to over 2 million off-grid Mozambicans. Further, continuing the project 'Access to Modern Energy Services Mozambique' (AMES-M) is recommendable.

In terms of training, it is very likely that, considering the current state of the Mozambican TVET system, initiatives will remain limited to a project level. Short term courses are manageable for instance to update the skills of technical graduates of the very popular and renowned INEFP (National Institute(s) for Professional Training).

There is a need for the training of technicians in the legislation concerned with the implementation of renewable energy systems and for the training of trainers. Training and education for renewables could also be supported by setting up an appropriate material or equipment infrastructure for technical training.

Cooperation regarding the adaptation of the Mozambican TVET curriculum would also be possible: as German TVET curricula, not only in the technical fields and crafts, are currently being restructured towards sustainability. Experiences and best practice could be shared among key stakeholders of the TVET sector.

Looking at the example of the University of Ulm, cooperation on the higher education level could prove to be rewarding for both parties: Mozambican engineering students could become interns in the German renewable energy sector or could attend classes at German universities. In turn, the German renewable energy industry could more easily adapt their technology to appropriate solutions for developing countries based on direct input from developing country representatives. Of course this would involve additional funding.

5.2.3 Possible areas for cooperation Vietnam

With regard to Vietnam, similarly as for other developing countries, cooperation could focus on the development of policy instruments, of regulations and on capacity building in institutions and concerning human resources. The government holds a key position for the creation of the necessary enabling environment for renewable energies.

The mobilization of resources, especially financial, is also important. There need to be initiatives regarding raising awareness within the Vietnamese population, not only about natural disasters and general environmental issues, but also about the role renewables could play in combating climate change and further environmental degradation.

Vietnam could use some help in setting up a cohesive legal framework for investments, and there needs to be a reliable financial mechanism including incentives to create a positive investment climate. Advice to the government regarding a sound and reasonable tariff system would facilitate the expansion of renewable energy sources for the national electricity grid.

Germany is already a major investor in Vietnam, mainly in the manufacturing and processing sector, and this could be a good basis to integrate renewable energies, as the Vietnamese wind energy sector is already benefitting from German expertise and investment.

Moreover, Vietnam already possesses a well expanded electricity grid, which is an important prerequisite for the development of renewables and their consequent connection to consumers.

There is a need to update equipment, for instance out of 300 small hydro power systems, only 100 are currently functioning.

A good educational basis, Vietnam's literacy rate is at 95 percent, provides a promising basis for investments in skills for green jobs. It is recommendable that the experience of GIZ, through the 'Trained in Vietnam' initiative, is utilized for other TVET initiatives by German stakeholders. On the other hand, the Vietnamese government needs to foster the assumption of technical professions and needs to integrate sustainable development topics into curricula. Cooperation regarding the adaptation of the Vietnamese

TVET curriculum would also be possible since German TVET curricula, not only in the technical fields and crafts, are currently being restructured towards sustainability. Therefore, experiences and best practice could be shared among key stakeholders of the TVET sector.

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