COUNTRY PROFILE

about recycling and water economy in **VIETNAM**

German RETech Partnership
Recycling & Waste Management
Made in Germany

German Water Partnership

BLACKFOREST SOLUTIONS

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uve

IMPRINT

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COUNTRY PROFILE SOCIALIST REPUBLIC OF VIETNAM

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ABBREVIATIONS

AFD	Agence Française de Développement
AusAID	Australian Agency for International Development
GDP	Gross Domestic Product
CWS	California Waste Solution Company
Danida	Danish International Development Agency
DOC	Department of Construction
DOIT	Department of Industry and Trade
DONRE	Department of Natural Resources and Environment
DPC	District People's Committee (Volkskomitee des Distrikts)
DPI	Department of Planning and Investment
DWA	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V.
ECA	Export Credit Agency
EE	Erneuerbare Energien
EPC	Engineering Procurment Construction (Techn. Planung – Beschaffung – Errichtung)
EPTC	Electricity Power Trading Corporation
ERAV	Electricity Regulatory Authority of Vietnam
EU	European Union
EUR	Currency information Euro
EVN	Electricity of Vietnam
IH	Inhabitant
Finida	Finnish International Development Agency
FIT	Feed-In-Tariff (Feed-in tariff into the public electricity grid)
GDE	General Directorate of Energy
GHG	Greenhouse Gas Emissions (climate-damaging gas emissions)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GoV	Government of Vietnam
GTAI	Germany Trade and Invest
HCMC	Ho-Chi-Minh-City
JICA	Japan International Cooperation Agency
n/a	No information available
KEXIM	Export-Import Bank of Korea
KfW	Kreditanstalt für Wiederaufbau
MDG	Millennium Development Goals

Mio.	Million
mm/a	Rainfall in millimeters per year
MOIT	Ministry of Industry and Trade
MoNRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
Bio.	Billion
NLDC	National Load Dispatch Center
NPDP	National Power Development Planning
NPT	National Power Transmission Corporation
ODA	Official Development Assistance
PC	People’s Committee (Local People's Committee)
PDP	Power Development Plan
PIT	Personal Income Tax
PPA	Power Purchase Agreement
PPC	Provincial People’s Committee
PPDP	Provincial Power Development Planning
PPK	Paper, Paperboard, Cardboard
PPP	Public Private Partnership
REDS	Renewable Energy Development Strategy
RPCo	Regional Power Corporation
SEDP	Socio-Economic Development Plan
SEDS	Socio-Economic Development Strategy
TTP	Transpazifischen Freihandelsabkommen
URENCO	Urban Environment Company
USD	Currency information US Dollar
VAT	Value-added tax
VDC	Vietnam Datacommunications Company
VEA	Vietnam Environment Administration
VND	Currency information Vietnamese Dong
VWS	Vietnam Waste Solution Inc.
WENID	Waste Management and Environment Improvement Department
WtE	Waste-to-Energy (Energy generation from waste)

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1. INTRODUCTION

The Export Initiative Environmental Technologies of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) aims to disseminate and strengthen knowledge and application of environmental and climate protection technologies and innovative (green) infrastructure in targeted countries. Among other activities, the dissemination of knowledge will be specifically promoted through those activities that help small and medium-sized enterprises (SMEs) with their high support needs in internationalisation of their "green" range of services to meet the ever-growing global demand for environmental, climate protection and efficiency technologies. This includes information management at the companies, which can be supported by providing market information.

Based on the experience of the German RETech Partnership (RETech) and the German Water Partnership (GWP), access to sound economic, legal, political, sales market-relevant and competitive information, which at the same time is tailored to the usability in SMEs, for a relevant target market as the basis for investment decisions is often difficult for individual companies. Particularly in the case of SMEs with limited human and financial resources, the availability of a solid and practical information base is indispensable in order to support the willingness to enter new markets. This is also a prerequisite for further export promotion measures to achieve the desired effects.

The initiators of these "country profiles" - RETech, GWP and the consulting firm eclareon GmbH - have already cooperated closely on this issue in 2014 and 2015 within the framework of a study by the Federal Ministry for Economic Affairs and Energy on the existing instrument of export promotion for an export initiative for environmental technologies. This led to the project idea for the creation and dissemination of common country profiles, and in spring 2017, for the first time and with the support of the export initiative Environmental technologies

- a common structure for such country profiles was developed,
- it was developed for a general, cross-industry part and the industry-specific part
- and the research, analysis and processing by experienced consulting firms in these countries was implemented.

In the year 2017, the country profiles for Ukraine, Serbia, Jordan, United Arab Emirates, Saudi Arabia and Cuba were published and discussed at an industry event in the BMU. Since then, the country profiles have been available for free download on the websites of RETech and GWP. Over 1,000 copies have already been downloaded.

Due to this very positive response, the Export Initiative Environmental Technologies supports the creation and provision of six further country profiles. For the second series of publications, the countries Argentina, Brazil, China, India, Vietnam and Montenegro were selected as well as presented and discussed again at an sector event in the BMU.

The current project is carried out as a joint project by the member companies BlackForest Solutions GmbH, Tilia GmbH and uve GmbH for management consulting. In addition to GWP, RETech, Tilia and BlackForest Solutions, other member companies of both associations were responsible for the creation of country profiles: Andreas von Schoenberg Consult, BiPRO GmbH,Dr. Burghard-ibd and Intecus GmbH

We wish all readers an inspiring reading and a successful entry into these countries!

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2. SUMMARY

Since its opening to the market and its rapprochement with the West in the early 1990s, Vietnam has undergone rapid and very dynamic change. It is now one of the countries in Southeast Asia with the highest economic growth rates. Population growth and economic growth lead to increasing urbanization and infrastructure development, but at the same time also mean continuously increasing waste volumes and environmental protection challenges. A shortage of areas in conurbations and a growing environmental awareness mean that landfilling is no longer seen as the sole and long-term solution to the problem of waste. Modern waste and wastewater treatment technology, energy generation from waste, and even the introduction of separate waste management systems are increasingly becoming the focus of Vietnam's policy-makers, reflecting the country's programming and legal status. The companies involved in the recycling and water management thus open up a new market, especially for the supply of equipment and plants, but also for engineering and consulting services. Additional positive signals for the development of these markets are based on the steadily widening economic relations with the European Union and the recently concluded free trade agreements. Germany also enjoys a reputation in Vietnam as a manufacturer of high-quality technology and a carrier of excellent know-how in the field of recycling and water management. To use and confirm this reputation, and to assert against Vietnam's traditional trading partners such as Japan and Korea, is a great opportunity and a challenge at the same time. If sustainability is actually an essential investment criterion for the country and the financing of projects improves as a hitherto often critical point in dealings with Vietnam, Vietnam offers the German environmental technology partner favorable prospects for the future.

Vietnam has business potentials along the entire waste disposal chain in the recycling management segment. This is due to the high catch-up demand in almost all areas. In addition to the expansion and modernization of waste collection, the use of waste and thus the reduction of landfill quantities is a top priority. In addition to biological processes, Waste-to-Energy projects are increasingly coming to the fore. There is still a lot of experimenting with domestic technology in both areas, but in the long run there will hardly be a way around well-established process paths and equipment components. The task of rehabilitating existing waste deposits, implementing and improving gas and leachate collection, and providing landfills with higher environmental standards is already without alternative today and will continue to gain in importance. German companies have a lot to offer Vietnam in this regard and should be welcome and highly appreciated as business partners.

On the state side, the frame conditions at the political level for improving the situation in drinking water supply and wastewater disposal were changed, so that the market entry for foreign companies was also simplified. However, the execution of state decrees is only sluggish, for example in the (partial) privatization of state-owned companies in the water management.

On the side of wastewater disposal, at urban and rural level, there are still large deficits, among others, caused by an inefficient tariff system. In the area of drinking water supply, efforts have already been made to improve the supply situation through infrastructure investments. But there is also a catch-up demand here, for example in reducing water losses. The water sector in Vietnam therefore offers German companies a large number of market opportunities. In addition to technical equipment, such as for central sewage treatment plants or equipment for leak detection in the drinking water network, training and further education for operating and management personnel is also a business area for German companies.

Joint German-Vietnamese ventures ("joint ventures") or capital contribution in public companies in the Vietnamese water industry offer German companies significantly better access to the market and thus better business opportunities.

3. COUNTRY-SPECIFIC BASIC INFORMATION

3.1. GEOGRAPHY AND DEMOGRAPHY

Area and population density

Vietnam is an elongated coastal state in Southeast Asia, bordered on land by China, Laos and Cambodia. Much of its coastline runs east to the Gulf of Tonkin and the South China Sea, to the south of which there is a much shorter coastline to the Gulf of Thailand. With a surface area of about 331,000 km², Vietnam is only insignificantly smaller than Germany, but with a population of around 94 million, it has a much larger population density. On average, nearly 290 inhabitants live here on the square kilometer (see Germany 231 inhabitants / km²) [1], [23], [115].

About three quarters of the land area is mountainous. Along the coast are fertile lowlands with two large deltas. As the rice chamber of the country is the approximately 40,000 km ² large Mekong delta in the south. With an area of about 15,000 km², the delta of the Red River is also an important rice-growing area in the north.

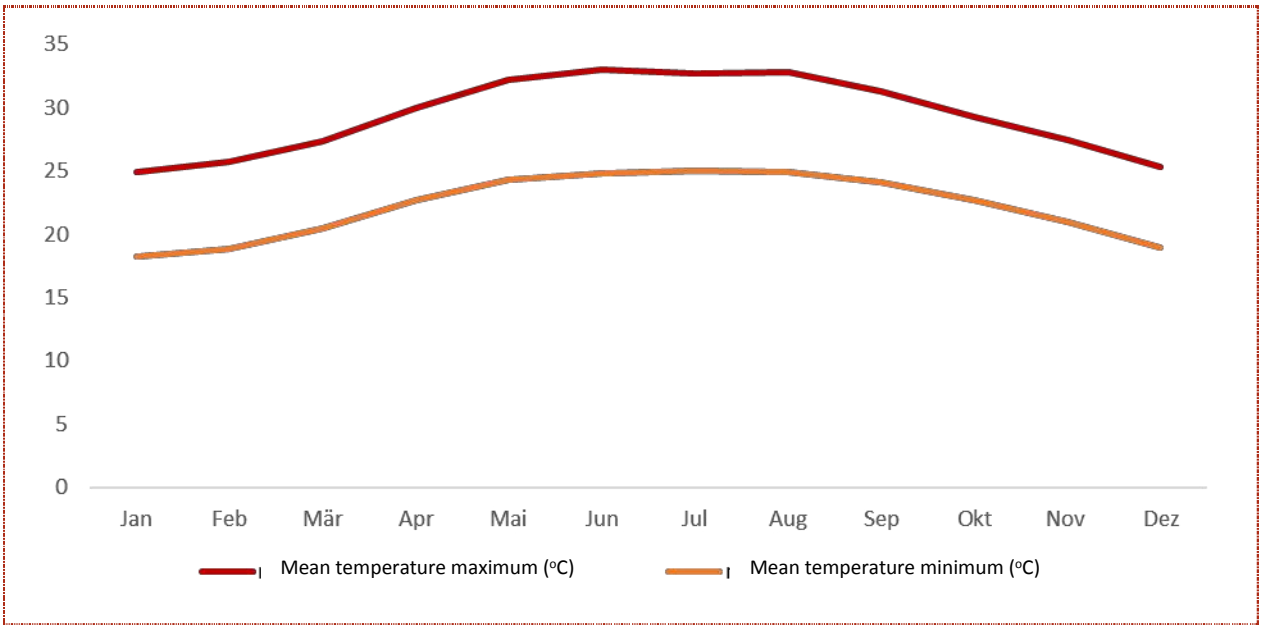
Figure 3.1: Map of Vietnam with regional structure and provincial borders

Source: wikimedia.org, 2017; CC-BY-SA 2.0 DE or CC BY-SA 3.0

The mountainous parts of the country are formed to approximately equal proportions of mountainous landscape and hill country. In the northwestern, Yunnan Mountains rises at 3,144 m of Fan Si Pan (Vietnamese Phan Xi Păng) as the highest mountain in Vietnam [2]. As important navigable rivers, the Red River flow in the north on a length of 510 km and the Mekong in the south with about 220 km through the country. About 40% of the country's surface is wooded. Tropical rainforest forms the main growth formation, but only exists in a few areas as a primary forest.

Climate

The land extends over 16 degrees of longitude and two climatic zones. While the northern part is subtropical, tropical monsoon prevails in the south, with annual rainfall of between 2,000 and 3,000 mm. The summers are hot and humid, the main rainy season is April to October, with local differences. Even in the rainy season, it rarely rains for days. However, especially around Hoi An but also in the Mekong delta, floods occur more frequently in this season. In the north, a more moderate climate leads to higher seasonal differences. In the state middle, the average annual temperature is just under 26 degrees Celsius, the rainfall amounts to 1750 mm. The so-called cloud pass between Hue and Da Nang forms a pronounced meterological divide and is considered the climatic boundary of the country [4].



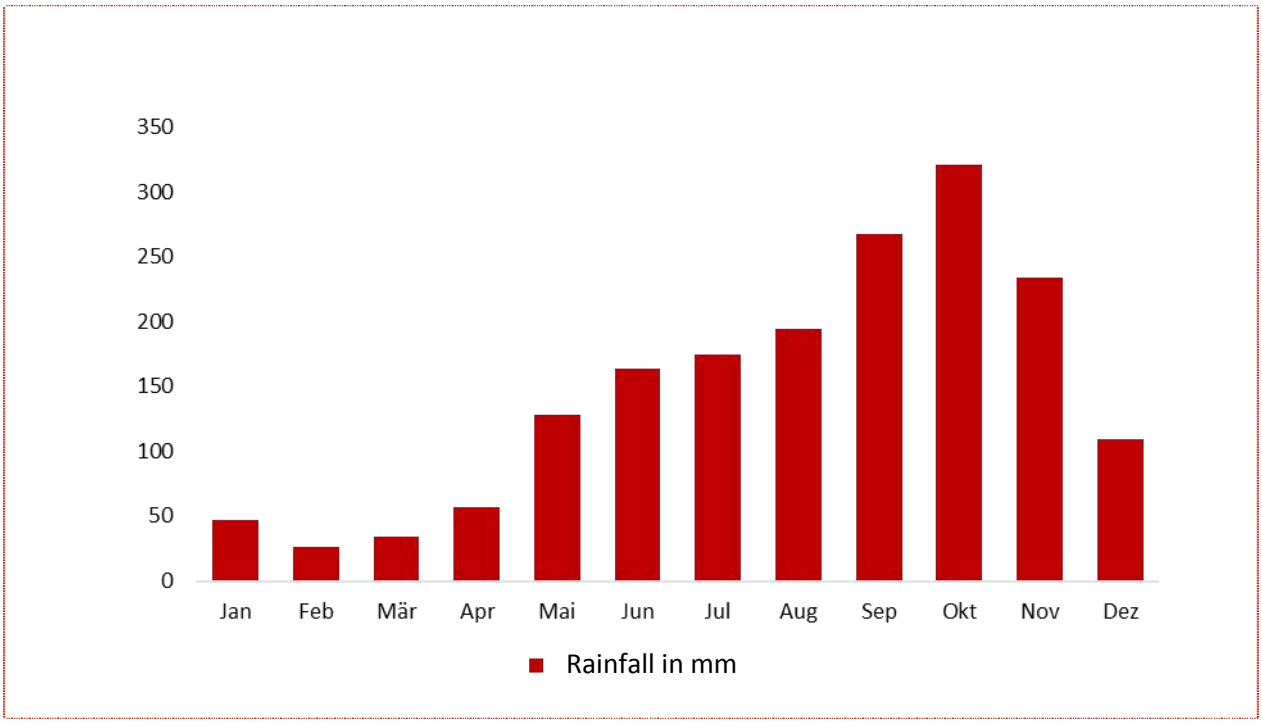


Figure 3.2: Mean temperatures in ° C and rainfall in mm for Vietnam

Source: wetter.de, 2016 [3]

Age structure and urbanity

The population of Vietnam has been growing at a fairly steady rate of 1% on average for many years. The growth momentum in the larger cities is significantly higher, with the number of inhabitants increasing by more than 3-4% annually [5]. The proportion of people living in cities is currently around 35%, which is only about half that of Germany. However, this proportion has increased very dynamically since 1990: While the rate of urbanization in Germany has barely changed since 1990, it was still 19% in Vietnam at that time [6].

Especially the younger part of the population is now concentrated in the urban areas. In return, there has been a strong aging of the population in rural areas. In 2016, around 23% of Vietnamese were up to 14 years old, 70% between 15 and 64 years old and 7% aged 65 and over [7].

The majority of the population lives in the lowlands along the coastline, where the larger cities are also located. The mountainous interior is, on the other hand, extremely sparsely populated and infrastructural, in some cases poorly developed. More than a third of all Vietnamese people now live in the densely populated delta of the Red River, which also includes the state capital Hanoi (Vietnamese Hà Nội). In the region, according to economists, far more people are making a living in agriculture than the land can actually feed. This overpopulation contributes to the fact that large parts of the people living in the capital area will probably continue to live only on the margins of the subsistence level, despite the advancing industrialization.

Vietnam's largest city and economic center is Ho Chi Minh City (Vietnamese Thành phố Hồ Chí Minh or HCMC for short). Under its old name Saigon (Sài Gòn), which is still used today in parallel with Ho Chi Minh City, it was the capital of the Republic of Vietnam until April 1975. It is estimated that about 8.3 million inhabitants live in the administrative area of the city, of which just 6 million in the core city. Outside the core city, HCMC does not form a contiguous urban area, but has a rather rural settlement structure.

Table 3.1: Population of the largest cities in Vietnam

City	Inhabitants	Year
Thành Phố Hồ Chí Minh (Ho-Chi-Minh-City, formerly Saigon)	5.880.615 (core city) 6.642.000 (core city) 8.297.500 (administrative area)	2009 Census 2016 estimated 2016 estimated
Hà Nội (Hanoi)	2.316.772 (city) 3.442.000 (city) 7.328.400 (with fringe areas, Hà Tây)	2009 Census 2016 estimated 2016 estimated
Đà Nẵng (Da Nang)	915.00	2016 estimated
Hải Phòng [Haiphong]	842.000	2016 estimated
Biên Hòa (Bien Hoa)	821.000	2016 estimated
Cần Thơ (Can Tho)	786.000	2016 estimated
Huế (Hué)	302.983	2009 Census
Nha Trang	292.693	2009 Census
Vũng Tàu (Vung Tau)	282.415	2009 Census
Long Xuyên	245.699	2009 Census

Source: Thomas Brinkhoff, 2016 [5]

Ethnic, linguistic and religious groups

Vietnam is similar to its neighbors only in very few aspects. Not only geographically and climatically, but also historically and culturally, the country represents an intersection between the Indian subcontinent and China and embodies thereby "Indochina" in a concise manner. Carried by a mixture of Chinese, Indian and European culture, it forms a kind of melting pot of different customs, traditions and religions. Nevertheless, Vietnam presents itself as a surprisingly independent and homogeneous country. In fact, 88% of its population consists of ethnic Vietnamese (Việt or Kinh) sharing a long, shared history. The rest of the population includes the "overseas Chinese" (Vietnamese: Hoa), whose number is estimated at about 1.2 million, and especially Hmong, Thai and Khmer.

In total, the country has 54 ethnic minorities. Much of the minority share is located in the mountains of the north and on the high plateau of central Vietnam, which is about 7 million people. The culture and language of the minorities are very different from those of the ethnic Vietnamese, who in turn have little respect for the minorities [4].

Religious freedom is guaranteed to the population by the Vietnamese constitution. The vast majority of Vietnamese, however, gives no concrete creed, so that the religious affiliation in Vietnam is difficult to determine. Often there is no strict separation of denominations in the understanding of religion of the Vietnamese. However, more than half of the population assumes a Buddhist faith, with 7% attributed to the Roman Catholic Church. Other major religious groups are formed by Cao Dai with up to 4%, Hoa Hao with about 3%, Protestantism with up to 2% and Islam with less than 0.1% following in the population [8].

The official language of the country is Vietnamese, English is now by far the most common foreign language. More and more Vietnamese are also familiar with Japanese and Chinese. Historically, French, Russian or German language skills are still found, especially among the older generation [4]. Especially, around 100,000 Vietnamese who studied in the GDR, received training or worked as well as their offspring own German language skills. The number of Vietnamese studying in Germany is increasing again.

Education

Education has a high priority in Vietnam. Since 2008, significant parts of the government budget have been allocated to this area, while public expenditure on education exceeds 6% of the gross domestic product [11]. This has helped to improve important education indicators and to bring about significant progress in the general level of education. The creation of "Basic Quality Standards for Schools" has enabled national universal access to education and minimum quality standards in each elementary school [9].

In Vietnam, the majority of children are already receiving pre-school education. To fulfill a general compulsory school attendance and / or its duration, there are different conceptions. Nevertheless, the number of people with no education is now very low.

According to UNICEF's most recent indicator report, around 98% of school-aged children (6-10 years old) attend elementary school, and for the most part, the further education path extends from secondary education to upper grades (grades 10-12) [9]. Especially in rural areas, many children leave school prematurely, with school costs and the need to contribute to family support being the main reasons. Around 16% of children between the ages of 5 and 17 are already employed or employed in the labor market. Even up to 20% under 19 marry.

The literacy rate is over 96%. Even in rural areas, with 95%, it is only slightly below average, while almost 99% of the city's population can read and write [9].

For vocational training, Vietnam generally has a 3-year apprenticeship. According to the General Department of Vocational Training, Vietnam has well over 1,000 VET institutions, including more than 150 technical schools, 300 vocational schools, just under 900 VET centers and over 1,000 other educational institutions [23].

There are also numerous state and private universities. The most prestigious are Hanoi National University and Ho Chi Minh City National University. Access to the universities is regulated by an entrance examination. For every 100,000 inhabitants, the number of students in 2013 was rising to 2,454 (see Germany 3,611 students / 100,000 inhabitants in 2014). The universities are financed to 60% by state subsidies and 40% by tuition fees. In the future, the autonomy of the universities will be increased. Other important goals for the higher education sector up to 2020 have been laid down in the "Higher Education Reform Agenda" (HERA).

Every year, slightly more than 440,000 university graduates are registered, who generally have a bachelor's degree. Especially in the VET and higher education sector, the curricula are criticized: they are often very theory-oriented and do not focus enough on the needs of today's modern practice. High-quality VET and higher education degrees (for example, comparable to master qualification) are still rather rare and therefore good specialist qualifications are difficult to find. For 2016, the rate of persons with a vocational or higher educaton degree was only 16% [56]. It is gratifying to note that the number of Vietnamese students studying in Germany has been growing steadily, reaching more than 6,000 in 2016 [11], [114].

Universities and research institutes that also deal with the water and recycling management are listed in Table 3.2.

Table 3.2: Universities and research institutes with course content and research on the water and recycling management

Name of the institution	Main location
Industrial University of Ho-Chi-Minh-City, IUH	HCMC
Vietnam National University, Hanoi University of Science and Technology, HUS	Hanoi
Can Tho University	Can Tho City
National University of Civil Engineering, NUCE	Hanoi
Saigon University, SGU	HCMC
Vietnamese-German University, VGU (Vietnamesisch-Deutsche Forschungsuniversität)	HCMC, Binh Duong

Sources: own researches as of 02/2018

In the United Nations Human Development Index 2016, which combines income, life expectancy and education statistics, Vietnam ranks 115th out of a total of 188 countries, with 0.683 points. Vietnam thus continued the trend of slight improvement from previous years. In comparison, Germany ranks 4th with 0.926 points and thus considerably better positioned [13].

3.2. POLITICS AND ECONOMIC DEVELOPMENT

State form, political structures and developments

Vietnam is a socialist republic with a one-party system. Although a loyal opposition is wanted, admission of further parties is unlikely to be expected for the future. Less than 10% of delegates to the National Assembly are not currently members of the Communist Party. The National Assembly meets twice a year to discuss and pass laws and constitutional amendments. It also elects the president for a five-year term and appoints ministers and judges. The president (since April 2016 Trần Đại Quang) appoints the prime minister as head of government (since April 2016 Nguyễn Xuân Phúc).

The Politburo of the Communist Party of Vietnam or its General Secretary determines the political guidelines. The highest party organ is the party's Central Committee, which normally meets twice a year. Every five years, a party congress is held. By forcing the division of power and thus independence from the Politburo, the National Assembly is now increasingly trying to gain in importance. In the meantime, it has the authority to approve the budget and exercises control over key state organs. People's Commitees, in the national language Uy Ban Nhan Dan, represent state power at the local level. Their executive organs are the so-called People's Committees. The local population determines the composition of both organs in a direct election procedure, with the candidates usually resulting from party proposals.

An independent judiciary is de facto non-existent in Vietnam. The selection of persons acting in the Vietnamese legal system is heavily influenced by the Communist Party, with political reliability being an important selection criterion. Decisions of the judiciary, with the Supreme People's Court as the highest body, are also strongly aligned with the policies and wishes of the party. Many judges and lawyers are not trained in this field, but the aldermen in Vietnam, in contrast to the German system, have a legal education. The People's Courts at the district and provincial level, the military tribunals and the administrative, economic and labor courts are subordinate to the Supreme People's Court. The punishment continues to include the death penalty, which is particularly applicable to serious cases of corruption or drug trafficking.

Administratively, Vietnam is divided into 58 provinces. In addition, there are centrally administered cities (currently Hanoi, Ho Chi Minh City, Da Nang, Haiphong and Can Tho) which are on a level with the provinces. There is a further breakdown for these administrative units. The provinces are subdivided into districts (huyện), provincial towns (thành phố trực thuộc tỉnh) and cities at district level (Thị xã). For the centrally administered cities, districts (huyện), district-level cities (Thị xã) and urban districts (quận) are considered to be the further subdivision levels. This structure of the administrative units of Vietnam has its starting point in the decentralization by the constitution of 1992. The people's commitees form at the same time the provincial governments, which, however, have to subordinate themselves to the central government.

Although external political decision-making processes are still lacking in transparency, very controversial party-internal discussion processes have in the recent past provided the guarantor for consensus-oriented compromises within political leadership and on economic policy issues. Accompanied by the rotation of a core elite of decision-makers, this has been able to secure the country a relatively high social system stability. However, as well as for the legitimacy of the country's political elite, continued economic growth remains indispensable [17]. To this end, the Vietnamese government also brings up some will to reform.

The manifesto for this is a 10-year strategy for the socio-economic development of the country (Socio-Economic Development Strategy (SEDS) 2011-2020), highlighting, among other structural reforms, sustainability, social justice and macroeconomic stability in its meaning. Increasing qualifications for a modern industry, improved market mechanisms and further infrastructure development are defined as main areas of action. In the Socio-Economic Development Plan (SEDP) 2016-2020, adopted in 2016, the political leadership then committed itself to certain omissions in the implementation of the strategy and announced reform accelebrations.

Economic growth, GDP, currency and inflation

After a turbulent history, overshadowed by many war events, Vietnam's independent path into the global economy began around the mid-1980s, when the political doctrine and reform efforts known as Đổi Mới (New Structure) began to take hold. By the end of 1979, the 5th Party Congress had opened the door to the private sector. After that, the global economic depression and political changes in the Soviet Union forced the party to take even more far-reaching action. This led to the decisions at the 6th Party Congress in December 1986. For example, foreign investment was allowed in the country and agriculture was contracted to the families. This enabled strong economic growth with average annual growth rates of 7%.

The strong isolation from abroad fell away with the abolishment of the US embargo in 1994. Afterwards, Vietnam, which was still led by the socialists but structurally reformed by Đổi Mới and turned to the market economy, succeeded in becoming one of the fastest growing countries in the world. Especially in the area of HCMC, but also in the regions around Vung Tau, Nha Trang, Da Nang, Hanoi or Haiphong, the developments are still going on at a rapid pace.

Rapid changes and always dynamic development spurts have brought especially the last two decades. The economy is booming almost uninterrupted and the foreign policy isolation is completely overcome. The interdependence in globalized production chains has made Vietnam a low-wage location for investors. This also gives the country an internal potential for conflict and two topics of major strategic importance: the future economic model and relations with the People's Republic of China and the USA.

By joining the Trans-Pacific Free Trade Agreement (TPP) in 2015, the country hopes for additional momentum for its economy, as well as offering new prospects for further reducing foreign dependence on China. However, the agreement also sets conditions, including the privatization of state-owned companies, the admission of non-governmental trade unions and the observance of strict environmental regulations. Vietnam is under pressure to adapt its model of a "socialist-oriented market economy" to TPP requirements.

In 2016, Vietnam's gross domestic product (GDP) was $ 205.3 billion, or $ 1,770 per capita [19]. In retrospect, its annual growth rate since the beginning of the 2000s has averaged over 6%. Only in the years 2008 and 2009 as well as 2012 and 2013, it fell below this mark. Growth of around 6.7% was again forecast for 2017, which is even expected to be slightly exceeded in 2018 and is also forecast as average for future years [20], [55]. Decisive for the positive economic forecasts is the persistently high domestic demand for goods and the further increase in exports as well as the influx of foreign investment [55].

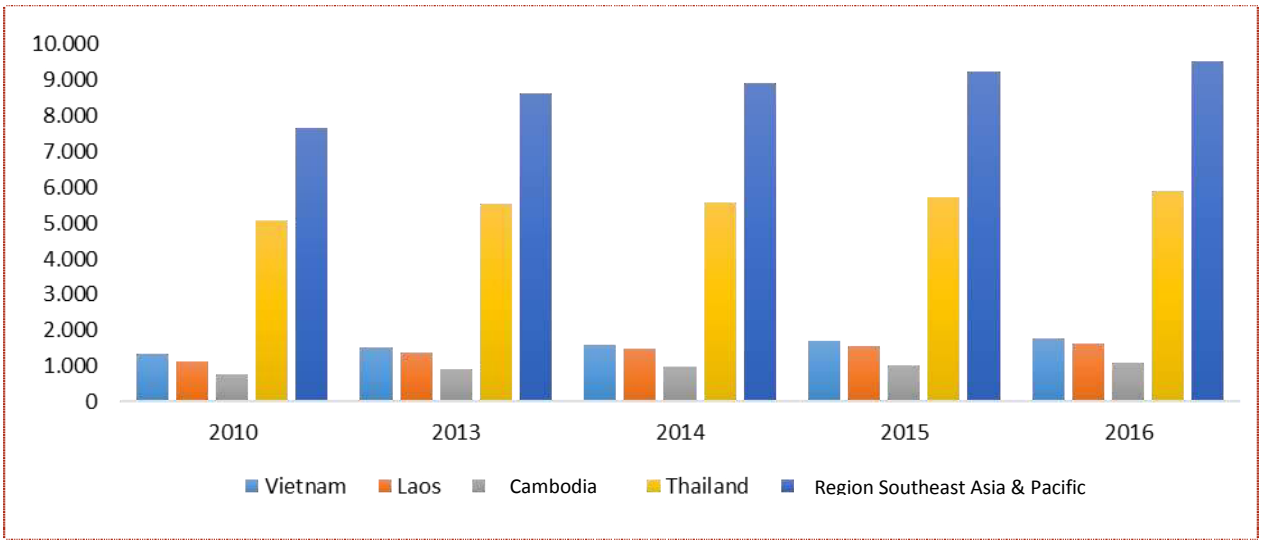


Figure 3.3: Gross domestic product development in thousands of dollars (constant 2010) in selected countries of the region

Source: World Bank, 2016 [19]

The national currency of Vietnam is the Vietnamese Dong (Việt Nam Đồng, VND). The exchange rate of the VND against the US dollar has been relatively stable since about 2011, i.e. the rates against the EUR fluctuate with the dollar exchange rate. As a value around which the currency has fluctuated fairly closely for years, the value of the VND to the EUR can be fixed at around 28,000 VND. Compared to the dollar, the market value of the Vietnamese currency has been around 22,700 VND for a good two years [18].

Greater fluctuations in the past have been the inflation rate. It changed 2016 by around 3% against the previous year, compared to the decade before , the changes ware in the range of 1% (2015) to 23% (2008), with the ten-year average at around 8.5% [21].

Income and employment

Vietnam's continued economic growth has allowed it to make significant progress in poverty reduction. In 1993, more than half of the population had to live on incomes below $ 2 per day. With such a low income level, only about 3% of Vietnamese people today need to secure their livelihoods. Below the national poverty line, there were still 13.5% of the population in 2014 [20].

The employment rate of the country is estimated at around 78%, officially only slightly more than 1.1 million unemployed are registered, which corresponds to a rate of around 2% [11], [21]. In the corresponding statistics, however, the many only agriculturally active and ultimately subsistence-based people are insufficiently comprehensible. Especially among mountain peoples and minority groups, a precarious situation and a high risk of poverty often persist [23].

The overall salary level in Vietnam is relatively low, underscoring the country's importance as a low-cost producer for international economic chains. The monthly average salary was recently around VND 5 million (about EUR 180), while Vietnam's living wage is estimated to be about 4.1 million VND (about EUR 145 million). While the low-skilled workforce outperforms this threshold with an average monthly income of around 4.85 million VND (around EUR 175), the higher-skilled people earn more than VND 11 million (around EUR 395) per month [21]. However, the income average shows that the vast majority of wage earners work in areas with lower work skills.

The employment rate among people over the age of 15 is slightly higher for men with 81% than for women with 71%. Agriculture, forestry and fisheries are the fields of activity for almost half of the working population. The service sector accounts for 32% and the industrial sector for around 21% [11].

Emblematic economic sectors

The formerly paramount importance of agriculture, forestry and fisheries for the economy of Vietnam is slowly declining in favor of the service and manufacturing industries. Although Vietnam is still an agricultural country in terms of employment, the sector's contribution to GDP is only under 20%.

Metal and cement production, manufacturing and the extraction of minerals through mining and oil and gas production together now form a more significant economic pillar of the country. Overall, the manufacturing sector contributes well over 40% to the country's GDP. In particular, the production of textiles and footwear are rapidly growing sectors, and their share of foreign exports is particularly strong. The main location of the production sites for consumer goods is the Mekong Delta in the south of the country, with the area around the cities of Can Tho and My Tho as the focus of concentration. The construction sector has also seen significant growth in recent years and has developed considerable strength [21]. However, the country is struggling with considerable risks of a real estate bubble, which in the meantime has had negative effects on the construction industry over and over again [23].

The industrialization of the country initially began in the urban centers and has meanwhile also reached its immediate surroundings. The position of HCMC and the immediately adjacent provinces (above all Bà Rịa-Vũng Tàu) and the corridor between the capital Hanoi and the port city Haiphong and the coastal corridor between Hue and Da Nang stand out. These regions record most of the settlements and large-scale investments of the industry and, as a result, the highest employment rates in the country. Such developments were and are also promoted through the designation of special zones by the government. These include among others Export Processing Zones, which are equipped with economic privileges [22]. In many areas, the Vietnamese economy is very export-dependent. It mainly exports textiles, marine products, coffee, wooden furniture and electronic products [23].

The service sector has risen to Vietnam's most important economic pillar. Its share of GDP now amounts to more than 40%. Outstanding growth rates are recorded in the tourism sector, which is one of the booming industries [25]. The associated dangers of uncontrolled expansion, the negative effects on the environment but also the participation of the resident population in revenues should be regulated by a law enacted in 2005. However, its enforcement and control still shows considerable weaknesses [23].

The service sector is also expected to see another growth spurt for the economy in the future. In addition, the sectors IT and communication, construction and infrastructure as well as trade are to be expanded. The country also offers good conditions for the development of its energy market. For example, government officials are also attaching very high priority to the development of their country's energy sector. Accordingly, a long-term energy plan was prepared by 2020. It can already be established that regenerative energies are becoming increasingly important. Some wind turbines are already in operation across the country and larger solar power plants are being built. Especially on some islands energy self-sufficiency through generation from regenerative sources is sought. The country's power supply is not yet 100% stable, and the large cities are still affected.

Table 3.3: Main economic sectors of Vietnam by employment share in 2015

Sector	Employment share	
	in %	in Tsd.
Agriculture, forestry and fisheries	44	23.259
Manufacturing	15,3	8.083
Trade services; Maintenance and repair work	12,7	6.710
Construction industry	6,5	3.432
Hotel and restaurant industry	4,6	2.441
Education and qualification	3,6	1.896
Traffic and storage	3	1.592
Water / wastewater management, waste management and other sanitation and environmental services	0,2	120

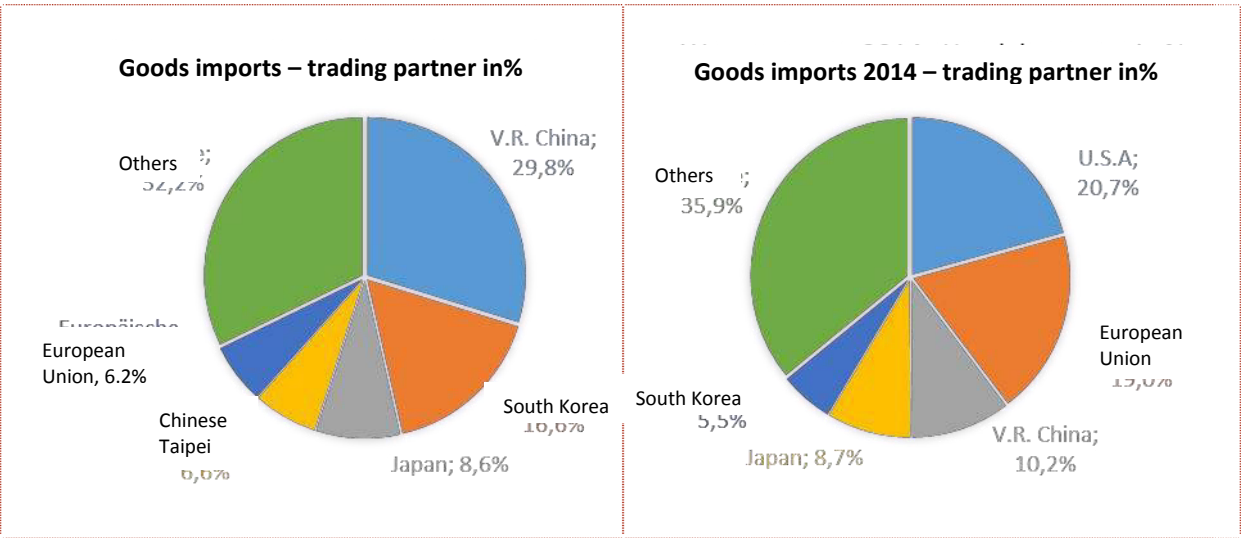
Source: General Statistics Office of Vietnam, 2018 [24]

International economic relations

Vietnam is very strongly involved in global trade. In terms of imports and exports, the country ranks 25th and 26th worldwide in commodity trading statistics. The country has very intensive trade relations, especially in Asia; apart from Japan, South Korea and Singapore, neighboring China in particular is the most important trading partner. In the export sector, the US and Germany are also among the top 5 trading destinations [26].

The trade volume between Germany and Vietnam totaled EUR 11.41 billion in 2016. With a volume of EUR 2.6 billion, Vietnam's exports from Germany ranked 49th in 2016. Imports from Vietnam to Germany amounted to EUR 8.8 billion in the same year, putting the country in 23rd place among the importing countries. In the foreign trade balance with Germany, Vietnam thus has a surplus of around EUR 6.2 billion [25].

Figure 3.4: Vietnam's largest trading partners by goods imports and exports in 2015 in %



Source: WTO, 2018 [26]

Vietnam has steadily expanded its economic relations with the European Union. The latest highlight is a free trade agreement (UN-EU FTA), which was concluded in August 2015. Its full implementation is expected from 2019. 99% of all tariffs between the EU and Vietnam will then disappear within the next ten years [28].

Vietnam's main exports include electronics, crude oil, footwear and textiles, agricultural products and furniture. In particular, Germany participates in footwear and textile goods, electronic products and agricultural products. Vietnam mainly buys machines and industrial units, vehicles and vehicle parts, electronic components and pharmaceuticals from Germany. In the agrarian sector, meat imports play a role.

Germany is Vietnam's most important trading partner within the EU. In terms of their quality, German products enjoy a very good reputation in Vietnam. Above all, under the growing middle class, purchasing power and demand for products "Made in Germany" are increasingly developing positively [28].

German investors were active in Vietnam with 58 business units in 2015, although the number was still 40 business units in 2012 and has since steadily risen. In total, these employed more than 23,000 people in Vietnam in 2015 and generated revenues of EUR 2.25 billion [27].

Infrastructure

The development of infrastructure in Viet Nam is very important, not least because the state considers the importance of these investments for the further development of the economy, but also recognized for the expansion of tourism. Often, the infrastructure still has the characteristics of the French colonial era or, as in much of the northern mountainous region or central plateau, has not yet been properly developed. The previously unstable or even missing power supply is a noteworthy problem here.

Residuals are also recorded in the road network, whose length is currently specified at 220,000-225,000 km. Only just over a quarter are two-lane roads. Vietnam has no comparable motorway system as Germany. The share of highways on the road network is about 8%. Almost 90% of the highways are equipped with an asphalt surface, but only about 20% of the entire road network. The state of expansion often only allows low driving speeds of 30 to 50 km / h on average. Vietnam has right traffic [29], [31], [32].

Vietnam's best known and most important road traffic artery is the so-called Highway 1 (National Route 1A), which connects Hanoi with the economic metropolis HCMC. Almost parallel to this, the Ho Chi Minh Highway runs through the highlands between both metropolises along the Lao border. Both roads are now in a generally good condition. However, there are still settlement territories that have no paved roads to their centers. In addition to the necessary modernization of existing transport routes, the extension of the road network is therefore an important infrastructure task in the country. With an average 4.5% investment contribution from GDP for road construction, Vietnam is currently devoting itself most heavily to this task in Asia. Major projects such as the World Bank's "3rd Rural Transport Project" are making an important contribution [20].

Vietnam's annual transport growth now reaches around 10%. The traffic infrastructure capacity that is often no longer sufficient in many large cities and the consequent congestion is to be met with new public transport and extra lanes. For example, Hanoi and HCMC are trying to create a separation between cars and motorcycles by means of track assignment, thus improving traffic flow.

Figure 3.5: Highway network and cross-border road links in Vietnam

Source: adapted presentation based on World Food Program Logistics, 2013 [59]

Rail transport has meanwhile played an important role in regional and local traffic but also in container transport. In terms of area, the proportion of rail lines in Vietnam is higher in relation to other Asian countries and amounts to around 0.9 km of railway tracks per 100 km² (see Germany 12.2 km / 100 km²) [115]. In addition to the Trans-Vietnam connection, which went into operation in 1938, the route from Hai Phong City to Lao Cai Province is of key importance. The railroad provides the best means of transport for supplying the industry with bulk goods and heavy loads via these main rail routes and also connects otherwise impassable areas. The total of more than 2,600 km long main routes have, according to Vietnam Railways alone over 1,200 official and more than 4,200 unofficial railroad crossings. However, this and also the state of development, which is not yet comparable with Western standards, ensures a slow transport speed. The construction of a Hanoi-HCMC high-speed railway route was abandoned [31].

Rivers, which make up a total of around 42,000 km in Vietnam and are considered to be transportable in at least a quarter, are further important transport axes. As waterways, especially the Mekong and the Red River are of considerable importance, because the transport of bulk goods (coal, sand, stones, wood) as well as food takes place especially on these two rivers. Larger ships can only partially navigate the rivers due to a lack of sufficient expansion. However, Vietnam has more than 100 port facilities along its 3,200 km long coastline [31]. Of these, about 10-20 ports are medium sized, and at least three to five are classified as major ports (Cam Pha Port, Da Nang, Haiphong, HCMC, Phu My, Quy Nhon).

Both in cargo and passenger transport, air traffic in Vietnam is becoming ever more important. The aviation sector is an important link of the tourism industry, and both sectors have recently developed at the same speed. Air transport and an extensive network of airfields allow for short transport times, which otherwise are relatively long on the other roads in the country. Up to 40 airfields are regularly used, 11 of which have international status. In addition to HCMC and Hanoi, Da Nang, Phu Quoc, Can Tho and Hue (Phu Bai) are Vietnam's major airports. More than 30 foreign airlines currently head for Vietnam, with well over 20 international routes and almost 20 domestic routes. Scheduled flights with foreign countries are mainly via HCMC (Tân Sơn Nhất) and Hanoi (Nội Bài), the travel time by direct flight from Germany is 12-13 hours. The time difference compared to the Central European Time Zone is +5 in summer and +6 in winter.

In order to expand the transport infrastructure as quickly as possible, the government plans to implement several new seaports and airports as well as the expansion and modernization of the road and rail network by 2020. The government plans to invest around 9% of GDP in the infrastructure for these goals [31].

One of the most rapid developments has taken the telecommunications in Vietnam. Until about 1990, not even directly connected to an international telecommunication system, since the beginning of the 2000s Internet access has been available in all major cities as well as in most smaller cities, and since then the Internet business has been a steadily booming sector. In 2016, 128 mobile phone contracts and 46.6 mobile broadband Internet contracts were used in Vietnam for every 100 inhabitants [29]. Drivers of this development were initially Vietnam Telecom International (VTI) with the support of the Australian company Telstra Corporation, later the mobile phone companies, including Viettel as one of the fastest growing and with USD 11 billion (in 2015) strongest supplier in the country. With over 40% market share, Vietnam Datacommunications Company (VDC) is the leading Internet provider in Vietnam [32].

About half of the population is regularly on the Internet, about 10 million broadband Internet connections are registered [29]. Internet speed is still slow due to the government's built-in firewalls designed to block certain Internet sites, but the introduction of new A-DSL technology has already brought significant improvements [32].

Table 3.4: Information and communication infrastructure of selected countries (2016) (per 100 inhabitants)

Feature	Vietnam	Laos	Cambodia	Thailand	Germany
Landline connections	5,9	17,7	1,4	7,0	53,7
Mobile phone contracts	128	55,4	124,9	172,6	114,5
Internet users	46,5	21,9	25,6	47,5	89,6
Broadband Internet connections	9,9	0,3	0,6	10,7	38,1

Source: DESTATIS, 2018 [30]

As a growing problem, the uneven distribution of wealth and the aggravation of the disparity of urban centers and rural areas is emerging in course of developments. While the construction boom continues in the cities, infrastructure deficits in the surrounding area and even more so in more remote parts of the country remain omnipresent. In particular, ethnic minorities and mountain peoples continue to be severely affected by development progress and economic improvements. After all, however, almost all the population has access to electric light, and sanitary installations and drinking water supplies have become part of everyday life for more than 70% of the rural population, compared to only one third of these around 25 years ago [20]. Significant contributors to the rapid progress have been the numerous development and support programs of international donors and development banks.

Energy supply and prices

After computationally about 9,000 people were connected to the power grid every day over the last ten years, over 98% of the population now has access to the public grid [20], [33]. The country's capacities for power generation has also multiplied within a few years. In 2005, they were still 11.6 GW, compared to 34.1 GW in 2014 [33]. In this area too, the lending and support programs of international donors play and played an essential role. Within the World Bank's "2nd Rural Energy Project," more than 2.7 million people in Vietnam's poorest settlements were supplied with electricity [20]. In 2015, gross power consumption per inhabitant was 1,530 kWh [34].

According to the 2011 National Power Development Plan (PDP VII), an average annual increase in electricity demand of 10.5% is expected between 2016-2020 and 8% between 2021-2030. This would increase consumption to 506 TWh by 2030 and quadruple compared to 2014. As a result, capacities for energy generation are planned to increase to 57.7 GW by 2020 [33].

Vietnam's equipment with energy resources is very good due to the deposits of coal, oil and natural gas, but also high potential in the field of hydropower, biomass, solar and wind. The country is now a net exporter of energy.

So far, the tariff system for the energy supply has not been organized to cover costs. However, the government already executed acts in 2009 by Resolution No. 21/2009 / QD-TTg on a tariff reform. According to this, market-based consumption tariffs and performance-based tariffs for network transmission and distribution should ensure that costs are covered soon. As a first step, in 2011 the prices for real fuel costs, exchange rate differences and a power generation surcharge were included in the electricity tariffs. In addition, since 2013, tariff corridors with upper and lower limits and distribution keys for cost increases have been defined. Since then, the semi-annual rhythm has been used to determine the further adjustment mechanism [33].

In March 2015, the average VAT-free electricity tariff was VND1,622 per kWh. This amount still represented an approximate 30% underfunding of the actual cost of construction, estimated at VND2,100 per kWh. Thus, the electricity prices are still subsidized by the state today. Private consumers, in particular, are benefiting disproportionately, since the charging of higher electricity prices for industrial and foreign consumers gives them greater cross-subsidization. Renewable energies are also affected by government subsidies [35]. Electricity price regulations, such as that of the leading state-owned energy utility Vietnam Electricity, form the basis of different tariffs for different consumer groups [36].

Table 3.5: Individual electricity purchase prices from the energy utility Vietnam Electricity of December 2017

Consumer category	**Tariff rate per kWh in EUR (**conversion of the local currency at the time of entry)					
	first 50 kWh (0–50 kWh)	next 50 kWh (51–100 kWh)	next 100 kWh (101–200 kWh)	next 100 kWh (201–300 kWh)	next 100 kWh (301–400 kWh)	every next kWh (from 401 kWh)
Households						
Normal counter	0,0581	0,0600	0,0696	0,0877	0,0980	0,1012
prepaid card counter	0,0851					
	Normal load time		Secondary time		Peak load time	
Commercial connection						
<6kV	0,0922		0,0561		0,1586	
6kV-<22kV	0,0909		0,0535		0,1522	
>22kV	0,0845		0,0471		0,1470	
Production sites						
<6kV	0,0589		0,0376		0,1073	
6kV-<22kV	0,0563		0,0357		0,1034	
22kV-<110kV	0,0544		0,0344		0,1002	
>110kV	0,0537		0,0331		0,0963	
Hospitals, kindergartens, schools						
<6kV	0,0613					
>6kV	0,0574					
other public facilities and lighting						
<6kV	0,0658					
>6kV	0,0632					

Source: Vietnam Electricity, 2017 [36]

In the period from the beginning of the second half of 2017 to February 2018, fuel prices in Vietnam have risen continuously. Petrol prices increased from an average of VND 18,600 (about EUR 0,67) to about VND 20,700 (about EUR 0,75) and diesel fuel from VND 14,500 (about EUR 0,52) to VND 16,100 (about EUR 0,58)) per liter. By comparison, however, they are still below the global average price during the period in question. For petrol, this was equivalent to about VND 34,560 (about 1.24 EUR), for diesel fuel it was VND 30,935 (about 1.11 EUR) per liter [37]. Vietnam's fuel prices peaked in 2014 between 1995-2017 and were on average 50% above their current level [38].

Corruption index and Ease of Doing Business-Ranking

In the World Bank's Ease-of-Doing-Business Index, which evaluates the regulatory frame conditions for companies internationally, Vietnam is currently ranked 55th out of a total of 190 countries [56]. The country scores slightly better than the East Asia & Pacific region on average. In addition, there are further progresses compared to previous years. In particular, construction permits and lending receive a good rating. The possibilities to enforce contractual services and to be connected to the energy supply also have an above-average positive effect [14]. In the international ranking, Vietnam continues to push forward with such results, with the leap in the World Bank's Doing Business Report totaling fourteen places compared to the previous year, and also five places in the Competitiveness Index of the World Economic Forum [56].

Vietnam has made no significant progress in combating corruption. Although the government has already ratified the United Nations Convention on Combating Corruption in August 2009, it has barely managed to make any significant progress both in society and in the ranks of the party. In Transparency International's Corruption Perception Index on perceptions of corruption among public officials and politicians, Vietnam ranked 113 out of 176 countries [15]. Above all, the widespread practice in the public administration and enforcement apparatus, and in some cases massively practiced in connection with construction and approval projects, represents a significant problem. Even high threats of punishment and show trials have hardly brought about far-reaching changes [16].

3.3. ENVIRONMENTAL POLICY AND MANAGEMENT

Vietnam is one of the countries that have joined transnational efforts to protect the environment and the climate at an early stage. Vietnam has joined the most important international agreements in this field as follows (ratification date in brackets) [39]:

- Convention on Wetlands, Ramsar Convention (09/1989)
- London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (formal attention, but not yet joined)
- International Convention for the Prevention of Pollution from Ships, MARPOL Convention (05/1991)
- United Nations Framework Convention on Climate Change (11/1994)
- Vienna Convention for the protection of the ozone layer (01/1994)
- Montreal Protocol on Substances that Deplete the Ozone Layer (01/1994)
- Convention on Biological Diversity, Biodiversity Convention (02/1995)
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (03/1995)
- International Declaration on Clean Production (09/1999)
- Stockholm Convention on Persistent Organic Pollutants, also known as the POP Convention (07/2002)
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam Convention (05/2007)
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, short Kyoto Protocol (09/2002), Supplementary Protocol (06/2015)
- ASEAN Convention on Transboundary Air Pollution (03/2003)

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joining 2013)
- Paris Convention (10/2016)
- Minamata Convention (Mercury Convention) (06/2017)
- For more information on the individual laws, the degree of implementation of environmental objectives by the administration and the main administrative facilities, please refer to the individual chapters on the recycling and water management.

3.4. ACCESS TO THE MARKET

According to a recent assessment by the GTAI, in view of the increase in production costs in neighboring China, Vietnam's attractiveness is growing visibly for investors who want to tap alternative, cheaper production sites in the region. This raises the need for infrastructure development and also increases demand for a variety of services, including engineering services. At the same time, the country has the development goals and infrastructure planning of the government according to which the areas of energy generation and environmental technology (sewage treatment plants, waste disposal) should also be expanded. The World Bank, Asian Development Bank and the Japan International Cooperation Agency are the largest lenders with relatively constant credit and financial support. In addition to financial aid, Vietnam relies on foreign technology, know-how and advice in a large number of projects and services [43]. As a result, interest in business activities in Vietnam is growing among service providers and the German economy.

Technologies and products from Germany have enjoyed an excellent reputation here for a long time. However, the preconditions for the success of business investments and activities in Vietnam also include sufficient financial resources or careful hedging of costs and payments. In addition, it is also important to prepare for market entry well elsewhere and to organize it carefully (see also remarks in Section Business etiquette). When it comes to business, it is always a good idea to work with well-connected local employees or representatives with industry-specific market knowledge.

In particular, the Delegation of German Business in Vietnam can help German companies with their business concerns in the country. The delegate offices in Hanoi and HCMC offer members and customers a nationwide network of information and services (see Chapter 6 for contacts). This includes, for example, support in the search for qualified partners and employees, for commercial real estate or office space. Depending on the nature and extent, the services may be chargeable. Exchanging information with companies that have already worked in the country and are familiar with local market customs often proves to be valuable.

Distribution channels

Vietnam has been open to foreign trading companies since 2009. It is extremely helpful to thoroughly inform yourself about the environment and further frame conditions before investing and to gain a market overview. In the meantime, there is a lot of material available for this, however, especially in Vietnam, the dynamics of change are extremely high and the current exchange with nationally versed contact persons or the participation in and contact with market information trips, company presentations or in another context is very useful. To introduce yourself at regional trade fairs or conferences and / or flank a market entry is highly recommended. Trade fair activities in Vietnam are not yet widespread and in the build-up phase, however, international events are enjoying increasing

popularity. Real environmental technology fairs, frequented by Vietnamese interested parties, have so far provided the regional environment (Malaysia, Japan, Thailand, China, India).

Table 3.6 gives an overview of important professional and trade fair events in Vietnam, which at the time have points of contact with the recycling management, water supply and wastewater disposal, environmental technology and renewable energies. AHK informs about current dates via their respective websites [41].

Table 3.6: Measures for recycling management, water management, renewable energies, environmental technology

Fair	Topics	Place / period	Organizer
VIETWATER	Internat. trade fair for water and wastewater technology www.vietwater.com/	Saigon Exhibition and Convention Center – SECC *üblicherweise im November*	UBM Asia
PROPAK/ PHARMATEC/ PLASTICS & RUBBER VIETNAM	Internat. processing and packaging fair with conference event www.propakvietnam.com/	Saigon Exhibition and Convention Center – SECC *üblicherweise im März*	UBM/SES Vietnam Exhibition Services
Automechanika Ho-Chi-Minh-City	Internat. fair of the automotive supply industry	Saigon Exhibition and Convention Center – SECC *üblicherweise im April*	Messe Frankfurt New Era Business Media Ltd, Yorkers Exhibition Services Vietnam
SAIGON AUTOTECH	Internat. vehicle and transport technology fair	Saigon Exhibition and Convention Center – SECC *üblicherweise im Mai*	Asia Trade Fair & Bussiness Promotion - ATFA
PAPER VIETNAM	Internat. trade fair for the paper-producing industry with conference event	Saigon Exhibition and Convention Center – SECC *üblicherweise im Juni*	Minh Vi Exhibition and Advertisement Services Co., Ltd – VEAS
RUBBER & TYRE VIETNAM	Fair of the rubber-producing and tire-producing industry with conference event	Saigon Exhibition and Convention Center – SECC *üblicherweise im Juni*	Minh Vi Exhibition and Advertisement Services Co., Ltd - VEAS
ELECTRIC & POWER VIETNAM	Internat. electricity and power station fair	Saigon Exhibition and Convention Center – SECC *üblicherweise im September*	UBM/SES Vietnam Exhibition Services
VN PLAS	Internat. fair for Rubber and Plastics Production	Saigon Exhibition and Convention Center – SECC *üblicherweise im Oktober*	Vinexad HCMC , Yorkers Exhibition Services Vietnam, CHANCHAO International Co., Ltd
International Conference on Building Materials and Construction (ICBMC)	International Conference on Building Materials and Construction	Nha Trang *ICBMC 2018, 23-25.2.2018*	CBEES
International Conference on Environment and Renewable Energy (ICERE) & International Conference on Food and Environmental Sciences (ICFES)	Conference and exhibition events on environment, renewable energy and foond and environmental sciences	Da Nang *ICFES/ ICERE, 25-27.2.2018*	CBEES

Source: SECC Event Database [41], Conference Alerts [42] and AUMA Trade Fair Database [63]

Exhibition and brochure material should be provided at least in English. While communication in English is already commonplace at internationally attended events and is often dominated by entrepreneurial Vietnamese, it usually requires Vietnamese language skills or interpreter support for government contacts.

Tenders

In particular, the free trade agreement between Vietnam and the EU envisages facilitating market access for European service providers and ensuring the participation of European bidders in Vietnamese tenders. Although Vietnam has not yet signed the WTO Government Procurement Act, it has at least assumed observer status since 2012 [43].

From a legal and tax perspective, the investment conditions in international comparison enjoy in principle a good assessment. Nevertheless, the provision of services in Vietnam is accompanied by a complex need for clarification regarding investment, taxation and posting. Above all, the system of the "socialist market economy" with its strong influence by the Communist Party, which is hardly comparable with Western structures, represents a great challenge and can manifest itself in escalating administrative guidelines, controls and subordinated regulations. Besides, there are the ubiquitous corruption risks and widespread practices of taking advantage, including within government agencies and institutions.

Only in the recent past, Vietnam has revised and renewed many of its legal regulations governing foreign business and investment activities. These include e.g. The Investment Law (No. 67/2014 / QH13 of 26 November 2014), the Law on Businesses operating in Vietnam (No. 68/2014 / QH13 of 26 November 2014) or the Customs Act (No. 54/2014 / QH13 of 23 June 2014) and the Law on Public Procurement (No 43/2013 / QH13 of 26 November 2013) [43], [46], [51].

In the new investment law, in addition to numerous new provisions, existing investment bans were extended to cover a few additional business areas, but also other properties were added that are eligible for investment subsidies in Vietnam.

The aim of the new Law on Businesses operating in Vietnam is, in particular, to create a favorable investment environment and to align business activities with international practices. This includes, for example the choice of different company forms. For foreign start-ups in Vietnam, an investment certificate must be applied for in advance in accordance with the provisions of the law. In the case of a foreign investment in the form of share acquisition, however, the application for the certificate is no longer required in all cases. It only has to be applied for if an investment limit of 51% is exceeded.

In addition to the formal requirements and procedures for tendering and bidding procedures in Article 15, the Law on Public Procurement also deals with the conditions for international tenders and procedural issues for the settlement of protests and disputes.

Tendering procedures are carried out either in the form of an open tendering procedure or, in the case of technically demanding projects, in a restricted procedure. In the case of domestic tenders, Vietnamese is the compulsory offer language; in the international bidding process, the copy is in English or in Vietnamese and English. International bidders are only granted a sole right of implementation in the event that there are no qualified suppliers and service providers for any part of the call for tenders in the country. Otherwise, there is a basic obligation to cooperate with domestic companies (Article 5) [44]. International invitations to tender are only issued if certain criteria are met; these include, in particular, the request of the lender for such a tendering practice

and the lack of appropriate qualifications and providers at home. PPP projects will also be advertised internationally [47]. However, in the event that Vietnam is a contracting party to international treaties which contain provisions on procurement modalities that deviate from national law, Vietnam gives priority to these international treaties. A project value subject to publication is not mentioned in the law; in general, an amount of VND 100 million (approximately EUR 3,600) was used as a threshold in previous years [45].

Online tenders and offer submissions are increasing significantly in Vietnam. The Public Procurement Agency is anxious to expand this [46]. Further improvements in tendering procedures are expected in the already concluded free trade agreements with the EU and in the Pacific region.

The specific interests and views of the Vietnamese government are still not without influence on the extent to which foreign suppliers are considered and taken into account for large state projects. In addition, they also decide whether a project is considered with much or little official effort and in which time horizon it can be implemented. Especially in the services sector, Vietnam has many regulatory options and despite fundamentally modern legal foundations, the number of additional regulations is considerable and not easily manageable. Legally, it can cause some difficulties if these or their interpretation are contradictory, that is always the case.

Between Germany and Vietnam, there has been since 1998 a bilateral investment promotion and protection contract, which will be replaced with the entry into force of the EU-Vietnam Free Trade Agreement. By contrast, the United Nations Convention on Contracts for the International Sale of Goods (CISG) ratified by Vietnam entered into force at the beginning of 2017. Part of Vietnam's declaration of accession was the announcement that, in order to apply the articles of the CISG, a sales contract is generally required to be in writing [47].

Tendering information has recently been provided by the Vietnamese Government through the National Online Procurement Network System. This portal is currently available in Vietnamese and English. However, not all information in the English-speaking part has been translated from Vietnamese. The central publication of tenders in Vietnam is not yet a common practice. Instead, individual promoters (ministries / authorities) take over the announcement and tendering of projects in their departmental areas and are increasingly using their websites. For international tenders, the "Vietnamese Public Procurement Review" ("Dau Thau") is also used as the publication body.

Foreign actors gain knowledge about upcoming projects and tenders in Vietnam mostly through various international online portals. Several providers, including the service provider Anroh Global Services Pvt. Ltd under Global Tenders.com, operate online platforms with registration and partly fee-based access to international tender information and Vietnam as a country-specific option.

The international institutions, financial institutions and donor organizations usually operate their websites with special sections for tender announcements and documents. In Europe, the

- EU tender database TED
- Tender database EuropeAid
- Tender database dgMarket

create widespread access to tender information, which may also affect Vietnam. The

- GTAI-Database „Internationale Ausschreibungen“

also provides a comparative service to German interested parties in this regard. The opportunities for German companies exist in particular at internationally neutral measures, such as those of the World Bank or the Asian Development Bank. In areas where German companies are technologically a key player, there are also good chances of success in Vietnamese tenders. Since the beginning of 2016, the newly established multilateral development bank "Asian Infrastructure Investment Bank" (AIIB) has also commenced operations. Particularly in the infrastructure sector, business opportunities are likely to open up in the near future through this new donor bank.

Projekt financing

In order to realize its developmental goals and the associated infrastructural investments, Vietnam has limited resources from its own budget. In the environmental sector in particular, the taxation policy is far from providing sufficient financing. The demand for public subsidy contributions to the basic precaution alone is therefore immense. As a result, the country's progress and investment projects remain highly dependent on international financial assistance and foreign capital inflows.

International donor financing:

Japan is emerging as the largest financier of development cooperation with Vietnam. However, corruption cases and irregularities in the provision of credit and Official Development Assistance (ODA) from Japan to Vietnam have repeatedly led to suspension of financial transfers by this donor country. Often, the focus is on large infrastructure projects.

As international donor organizations, the World Bank and the Asian Development Bank in particular appear in Vietnam. In addition, Vietnam receives subsidies from the European Union. Together with the EU and the Australian Government (the Department of Foreign Affairs and Trade DFAT), Germany is also involved in project financing [49]. The UN is also involved financially and practically in the country with its important organizations.

For project participations of German companies, the internationally neutral tendering of these multilateral institutions offers the best chances so far. However, it may depend on the project financing which prospects actually exist. In the past, projects financed on a number of occasions with foreign development assistance were partly open, partly unofficial, reserved primarily to providers with corresponding origins in the donor country. According to the revised procurement law, however, it should no longer be possible to practice such restrictions.

Bilateral financial and technical cooperation with Germany:

Germany's bilateral cooperation with Vietnam is based on the strategy for promoting sustainable growth, or the so-called "green growth" strategy, proclaimed by the Vietnamese government in 2012. The Federal Government supports the targeted economic change with various emphases, such as in the field of renewable energies, the development of an energy-efficient power sector, in training, in resource conservation and in the establishment of a sustainable forestry and timber industry.

In order to continue this cooperation, Germany last made a commitment of up to EUR 161.45 million in 2017. Of this amount, EUR 28.20 million is attributable to the technical cooperation and the

remainder to financial cooperation. Most of the funds are made available in the form of low-interest loans [48].

The German development bank KfW is active in the field of technical cooperation as a service provider for financing funds, and the German Federal GIZ is a key implementation body on behalf of the Federal Government. There is close cooperation between GIZ and KfW in Vietnam. Project contracts and financing are awarded by the Federal Ministry for Economic Cooperation and Development (BMZ), the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU), Federal Ministry of Economics and Energy (BMWi) and the Federal Ministry of Finance (BMF) [49].

Vietnam is also the most important cooperation partner for the Federal Ministry of Education and Research (BMBF) in Southeast Asia. The signing of an agreement on scientific and technological cooperation in November 2015 in Berlin has created new foundations for this. In particular, the Vietnamese-German Office for Water and Sustainability in Hanoi forms a coordination and information platform for joint activities [50]. The BMWi has been cooperating with Viet Nam in promoting bilateral research and development projects for companies since 2013. Private foundations such as the Konrad-Adenauer-Stiftung, the Hanns-Seidel-Stiftungg and the Rosa-Luxemburg-Stiftung also operate in Vietnam activities in which German companies and experts participate in part and through which they can gain market insights and contacts.

Commercial business and export support:

German financial institutions are also involved in promoting business activities and exports in the region. In addition to KfW, AKA is the only financial institution that can lend under the Federal Government's ERP export finance program.

Through this program, long-term funds for refinancing export credits are provided by the financial institutions. The aim is to provide the German export industry with a tool that ensures the long-term refinancing of federally covered export credits. The export credits must be based on export transactions of German exporters, which the Confederation has classified as eligible under the program. For each export credit, which the bank refinances through the program, a Hermes cover and a guarantee of federal guarantee must be available. The program runs until the end of 2020. Further information can be found on the available leaflet at https://www.kfw.de/PDF/Unternehmen/Auftrag/Sonderaufgaben/PDF-Dokumente/Merkblatt-Refinanzierung-Exportkredite.pdf

Hermes cover (Export Credit Guarantee) provides protection against bad debts in export transactions. However, these guarantees offered by Hermes are not yet available for projects of public authorities, as they do not generally meet the required criteria. Further information can be found on the AGA portal of Euler Hermes Aktiengesellschaft at https://www.agaportal.de/laenderinformationen/laenderseiten/vietnam.

Specifically, in the ASEAN region to which Vietnam belongs, the German export industry and investors have a concrete contact with KfW IPEX-Bank and its representative office in Singapore. The representative office itself does not handle any banking business, but is exclusively supporting the head office in Frankfurt. Its central task is to initiate new business relationships and maintain existing contacts, including local banks. The increasing demand for local currency financings and the growing local content require the inclusion of local banks and regional credit insurers in the financing. KfW IPEX-Bank, through cooperation with a partner institute, offers financing solutions for smaller export transactions up to EUR 5 million (Small Ticket Europe Export Promotion for SMEs).

Other financing instruments of IPEX are as follows:

- Delivered export financing with and without ECA coverage,
- Investment loans at home and abroad (including investments of local municipal utilities),
- Structured and project financing.

Further information can be found at https://www.kfw-ipex-bank.de.

The private alternative to KfW is AKA Ausfuhrkredit-Gesellschaft mbH, whose shareholders are several German banks. As a secondary market institution, AKA primarily supports the shareholder banks in the realization and, if necessary, optimization of international trade financing. AKA offers financing, risk assumption and services in connection with short, medium and long-term export business as well as other international business transactions. Further information can be found at www.akabank.de.

Customs and other import regulations

Following its membership of the World Trade Organization (WTO) since 2007, Vietnam is in favor of the principles enshrined in the General Agreement on Tariffs and Trade (GATT 1994) on the equal treatment of third-country goods at the customs border and competition equality of imported goods in relation to domestic goods..

Customs agreements:

Import duties on goods originating in the ASEAN region have been largely eliminated in Vietnam through the integration of the country into the Association of Southeast Asian Nations and the ASEAN free trade zone agreed by it. Through the ASEAN association or bilaterally, Vietnam is involved in a number of other free trade agreements, which also provide for a gradual tariff dismantling.

As soon as the free trade agreement with the EU enters into force with the completion of national approval procedures, 65% of Vietnam's import duties on EU export goods will be immediately eliminated. For example, almost all machines and equipment originating in the EU can be imported duty-free into Vietnam. Immediate duty-free will also apply to a large proportion of exports of chemical products. Import restrictions currently still exist in motor vehicles and used machinery and equipment [46].

Customs requirements and procedures:

Vietnam strives to make the entire customs area much more efficient and innovative. A new Customs Law (No 54/2014 / QH13 of 23 June 2014) and revised tariffs have been in force since 2015. The binding customs information was introduced to increase legal certainty. An electronic customs portal (VNACCS / VCIS) allows the filing of customs declarations electronically. In the future, all import and export certificates and permits for the participating authorities and institutions can only be processed via a portal. Companies deemed to be trustworthy will be able to benefit from simplified clearance and levy procedures under the Authorized Economic Operators (AEO) program.

Depending on the import route to Vietnam (shipping freight, airfreight), different deadlines apply for advance notification of the goods, which, however, only take a few hours each. The actual customs declaration can be made within a period of 15 days before up to 30 days after the arrival. The registration process is linked with certain registration obligations of the importer at the Vietnamese Ministry of Industry and Trade (MOIT) and the submission of proper shipping accompanying documents. Here are a number of evidence relevant, which are set out in a special leaflet of the GTAI [51].

Temporary import arrangements allow for the temporary importation and use of fair and exhibition goods, scientific equipment and supplies and professional equipment without import duties.

Although the otherwise due import duties are initially charged as security, but reimbursed for re-export. Similarly, machinery, apparatus and equipment may be temporarily imported into Vietnam free of duty under leases for the purpose of carrying out production or investment projects while providing security. Corresponding applications require the approval of the MOIT.

With monitored customs warehouses, which are usually held at ports, airports or border customs offices of warehouse companies or freight forwarders, there are temporary duty-free storage options for goods which require new customs decrees or are in danger of not being re-exported within set deadlines. Special zones that are not part of the Vietnamese customs territory and are designated as export processing zones, industrial parks, economic zones or high tech parks have also been set up. The zones offer facilitated land use rights for companies as well as benefits in the taxation of companies.

Customs tariff regulations:

The Vietnamese customs tariffs are based on the jointly harmonized ASEAN tariff nomenclature ("ASEAN Harmonized Tariff Nomenclature - AHTN"). This is based on the international harmonized system for the description and coding of goods (HS, 8-digit codes). Basically, the transaction value, ie the price paid or payable for import duties for the goods, provides the basis for assessment. If not already included, the transport and insurance costs in Vietnam will be added up to the import customs office. In principle, the CIF value (Cost, Insurance and Freight) of the international terms of delivery (Incoterms®) is accepted as the customs value. Chapter 98 of the Customs Tariff (GD 122/2016 / ND-CP) lists those goods which special use is permitted by a tariff-based preferential tariff.

The Market Access database (http://madb.europa.eu) used by the European Commission to retrieve tariffs in recipient countries on the basis of the product number currently contains no data sets for Vietnam. Eventually, this will only change with the entry into force of the bilateral Free Trade Agreement. For example, insight into existing tariffs can currently be found in the leaflet on industrial goods imports - Vietnam provided by the GTAI [51]. The German customs administration provides detailed information on the export procedure from the EU.

Vietnamese legislation provides for a number of incentives for certain industries, including import tariffs, which are set out in the Customs and Excise Duties Act. As a rule, an application must be submitted to the Vietnamese Ministry of Planning and Investment (MPI) for claiming the preferential tariff. The current Law on Import and Export Customs from 2016 provides for exemptions from customs duties, etc. for the following areas:

- Machinery, equipment, components and materials for the creation of fixed assets for projects funded under the Vietnamese Investment Act;
- Raw materials, intermediate products and components that are not sufficiently available locally for use in production for specific projects (valid for a period of five years).

Legal and tax issues

After being imported into Vietnam, certain goods are subject to a special consumption tax (SCT), which in principle may be due once more when resold by retailers. In addition to stimulants, motor vehicles, petroleum products and certain technical installations (air conditioners) are also affected.

In addition, an environmental tax is imposed on the import and placing on the market of pollutants such as petroleum products (fuels and lubricants), coal, plastic bags and packaging and certain chemical preparations at specific rates.

In the case of importation or delivery of goods in the Vietnamese tax area, VAT is generally charged in Vietnam. The customs value plus all import duties (excluding VAT itself) form the basis of assessment for imports. The standard tax rate is currently 10%.

A reduced VAT rate of 5% applies among others for certain machinery and equipment for agriculture and the medical sector, teaching and learning materials or even laboratory equipment. In turn, import VAT exemption is applied in favor of certain machinery and equipment that is not produced in the country and that qualifies as business fixed assets or equipment which import is for research and development purposes [51].

In order to avoid double taxation, Vietnam and Germany have concluded an agreement on income and asset taxes [46]. Foreign companies operating in the country without a branch or permanent establishment and only for temporary projects are exempt from corporation tax in accordance with the double taxation agreement. However, according to the agreement, this exemption must first be applied for at the tax authorities. The provision of services in Vietnam remains subject to VAT. Another option is the payment of a so-called Foreign Contracors Tax. Especially with regard to short-term commitments of less than six months, companies generally prefer the Foreign Contractors Tax in the form of withholding tax. It can be determined and dissipated in a variety of ways. The Vietnamese contractor can regularly withhold 5 percent of the contract value and be transferred to the Treasury. With this payment, foreign companies fulfill their corporate tax and VAT obligations without being required to register for tax purposes in Vietnam [51].

The last example in particular shows that legal advice is advisable before starting an entrepreneurial activity in Vietnam. In general, it makes sense for important contracts to contain detailed rules on cooperation and to be bilingual. No sample contracts should be used or accepted without prior professional verification. Local law firms and knowledge holders, such as gic/AHK Vietnam employees, can assist with legal and tax issues or with the review of the necessary local partners.

Information on German tax consultants and lawyers can be found in Chapter 6.

Business etiquette

The Vietnamese company is very open to business activities and presents itself as an enterprising. Germany enjoys a high reputation in Vietnam, and the reputation for reliability and high-quality work often precedes German companies and providers. Meanwhile, the number of foreign competitors is constantly growing and only quality is often not enough to score in the election as a long-term business partner. Instead, setting up good personal contacts and establishing stable relationships with local partners and decision-making bodies often play a crucial role in entry into local business and successfully developing them. In Vietnam, as in other Asian countries, it is actually necessary to get involved in the country in as many ways as possible and to establish links with decision-makers early and maintain them over a longer period of time.

This takes time and patience, which should be enough for a market entry. The effort to establish and maintain sustainable relationships with business partners in Asia is often underestimated by German companies. Regular visits are currently being expected in Vietnam in order to build trust and drive successful business development. Communication by e-mail alone is often considered too impersonal and rarely proves to be sufficient.

As in any other country, there are additional cultural peculiarities and resulting behavioral rules. Anyone who strives for lasting relationships with locals and wants to make reputable and advantageous business deals possible should know and respect these rules.

In Vietnam, it is especially important to "keep your face", respecting and maintaining the dignity of the person. Anyone who fails here, commits a serious crime in Vietnam, which will hardly ever be forgiven again. For topics that offer a certain potential for confrontation, this includes, for example, the political situation, should be restrained and best approached only if a stable basis of trust has already been created.

The conversation habits and language have some peculiarities in Vietnam. For example, answers are always formulated positively, even if the facts actually speak against such a viewpoint. This can lead to confusion and create doubts about the honesty and reliability of the Vietnamese counterpart, even though they are in fact inappropriate. It should also always be ensured in conversations that you always remain polite and show no annoyance. Therefore, for business activities in Vietnam, it is always beneficial to use an interpreter who can be fully trusted and who knows the Vietnamese and German mentality well.

Using expressions like Xin Chao (Hello) and Cam On (Thanks) to speak the language yourself can be a door opener, but it's not expected. At the same time, despite increasing foreign language proficiency in the population, one can not assume that English is spoken about everywhere in Vietnamese business circles.

Greeting with a handshake and saying goodbye in Vietnam is common in Vietnam, often with a hint of bowing. Out of respect, the oldest attendees and the highest-ranking participants are always welcomed first. In addition, a friendly smile always helps to start a conversation easily. An integral part of the greeting ritual is the exchange of business cards. It is therefore advisable to carry these in Vietnam in sufficient quantity. The cards are handed over and accepted with both hands. Demanding quality and good design of the business cards underline the position of the owner, this is also taken to ensure that title and position(s) are clearly highlighting. Copies in English are mandatory.

Vietnamese interlocutor is referred to as "Mr. / Ms. (first name)". Names in Vietnam consist of three parts, the surname stands at the beginning, the first name at the end. As in Germany, the rule applies in Vietnam, too, that the last name printed on the business card is used for the personal salutation.

Discreet clothing is the usual outfit in Vietnam, and a short shirt with tie is often sufficient for normal business and meeting. Suits are worn only on very formal occasions. Suits and costumes should be made of lightweight fabric if possible, as sweating is considered improper. Attention should be paid to a well-groomed condition and correct fit in the case of haircuts, clothing and shoes, otherwise this may be regarded as a contempt for one's counterpart.

Germans and Vietnamese have in common that one starts events at the specified time and appears punctual. On the other hand, it usually takes a lot of time and patience to conclude negotiations.

Meetings are rarely conducted in a dialogue, but instead, a lot of presentations are used. Anyone who takes notes, scores as a particularly interested interlocutor. Documents for the interlocutor must always be in English.

The German partner should be prepared for the fact that he usually does not sit in opposition with decision-makers at the first personal contact. For public authorities in particular, "follow-up" at a higher level is therefore recommended. Because of the hierarchical company and business structure, it is important to always present your concerns at the right level. In large state-owned companies, the "second man" or deputy director is often the professional competent interlocutor due to the awarding of the highest positions from a political point of view.

A "yes" on the Vietnamese side means only that the business partner has understood the question or comment. Final agreement shows only an explicitly pronounced "I agree". Having to refuse something, even the word "no", is extremely difficult for Vietnamese. Disagreement is only indirectly, but always gently added. Problems should always be addressed with due caution and, if possible, dressed in formulas of praise and esteem. Nothing is more detrimental to cooperation in Vietnam than to humiliate the interlocutor. Disloyalty is never forgiven [52].

Other special features

Certain seasonal highlights should be respected for business planning in Vietnam. This certainly includes the period around the Vietnamese New Year Têt. In this period, business and administrative operations in Vietnam come to a virtual standstill, and official communication channels often remain silent during this period. The period around the Têt celebrations lasts several days. The date calculated according to the lunar calendar shifts from year to year and, according to the European calendar, lies between the 21st of January and the 21st of February. In 2019, Têt's celebrations will take place around the 5th of February, by 2020 around the 25th of January and in 2021 they will fall to mid-February. [32].

Public facilities and most shops and restaurants are usually closed for a full week during this time. Flights, whether inland or from Europe, are very difficult to get around the respective appointment, even with longer-term advance. In addition, prices increase considerably against other periods.

4. RECYCLING MANAGEMENT

4.1. WASTE ACCUMULATIONS AND DISPOSAL INFRASTRUCTURE

Waste accumulations

There are only a few comparable data on the amount of waste in Vietnam. Often, the details of various publications and authors differ on the same facts or refer to sources of older date. For this reason, the following data are to be considered with a certain reserve and as being of limited resilience and more as an orientation framework. According to the 2004 Vietnam Environmental Monitor, the total amount of waste produced in the country at the time of publication was more than 15 million tonnes, of which 12.8 million tonnes was attributed to municipal waste [93]. In terms of all types of waste, this would have corresponded to a population-specific amount of about 175 kg per year, with a share of 148 kg of municipal waste. Estimates in the following monitoring report 2011 provided for the total amount of waste of 44 million tonnes for 2015, or estimated the expected magnitude of municipal waste at 23 million tonnes. At the same time, however, the report indicates that municipal waste generated by 2007 is slightly less than 6.5 million tonnes, and only forecasts that the volume of municipal waste will reach 9.5 million tonnes by 2010 [116]. Thus, the amount in this segment would be significantly lower than the amount recorded in the monitoring report 2004. Survey or forecast values of recent date are, at least publicly, at present apparently not yet available.

The magnitude of amounts often repeated in publications, but sometimes projected on different time horizons, indicate considerable uncertainty in terms of quantification and a constant reference to forecast values in the replacement for the yet insufficient or insufficiently verifiable surveys on individual waste categories. Particularly conspicuous in this regard are the amounts for one and the same type of waste, which are not identifiable in the different parts of the environmental monitoring report 2011 [116].

Nevertheless, there is a relatively consistent statement regarding the overall significantly increased total waste volumes within a few years. Precisely because the data on settlement waste vary widely, growing population numbers and consumption are unlikely to provide the only explanation. Rather, this increase and the changed proportions will also reflect the recording and monitoring of certain types of waste increasingly effective in recent years. For example, when comparing the breakdown of quantities in 2004 and 2012, the proportion of industrial waste has more than tripled and the added mass of hazardous industrial waste increased more than tenfold [66], [93]. On the other hand, household waste and commercial waste remained more stable or even declined slightly. Of the 21 million tonnes of total waste generated in 2012, more than half fall in municipal waste, around 8.8 million tonnes are non-hazardous industrial waste and 1.8 million tonnes hazardous industrial waste. For the annual volume of hazardous waste from the medical sector, the available data range from around 11,000 tonnes up to 30,000 tonnes (see, inter alia, [53], [66], [93], [116], [117]).

Based on the different data, a population of 90 million inhabitants and a municipal waste volume of approximately 13 million t, the annual per capita volume of this type of waste in Vietnam is around 145 kg or 0.4 kg per day. There are considerable volume differences between urban and rural areas. While the rural population still produces less than 0.3 kg of daily generated waste, research indicates that in urban areas, more than 1 kg and more of waste is produced on average per person and day. As a result, the third of the population living in urban areas now produces more than half of the nationwide municipal waste.

The annual increase of waste in HCMC is 10-15% higher than in the rest of Vietnam (8-10%) and results from the expanding urban and industrial areas [87]. At present, the total daily amount of waste in the urban area of HCMC is 1,500 t industrial waste, 300-600 t hazardous waste and 8,300 t municipal waste [77]. In Hanoi, the daily amount of waste is now almost 6,000 t. It is estimated by the official authorities that the total waste volume will rise to more than 16,000 t by 2030 [106]. For Da Nang, the daily waste volume is currently estimated at 750 t [79].

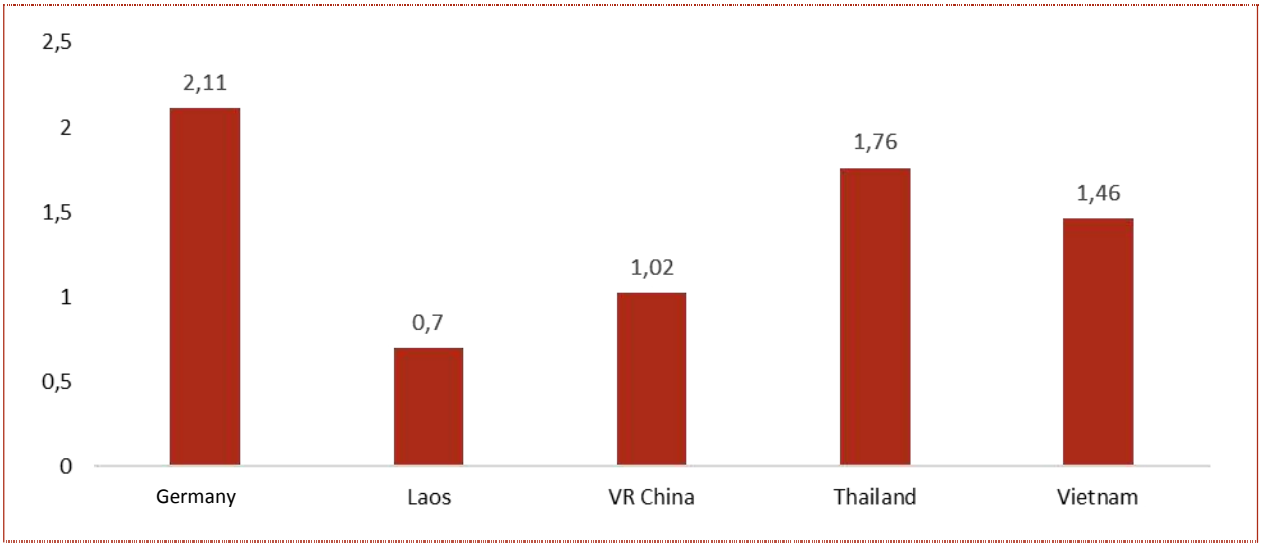


Figure 4.6: Municipal waste amount in urban areas per inhabitant and day in kg

Source: World Bank, 2012 [65]

The data on the regional distribution of waste generation show two roughly equivalent priorities in the north and south of Vietnam. The highest amount of waste is recorded in the southern part of the country with the conurbation center around HCMC, almost on the same spot is the densely populated and heavily industrialized region of the Red River Delta with the capital Hanoi. The third source of supply with significantly lower amounts of waste, however, is the area in the south of Hanoi and the coastal plain with its major port cities extending to central Vietnam.

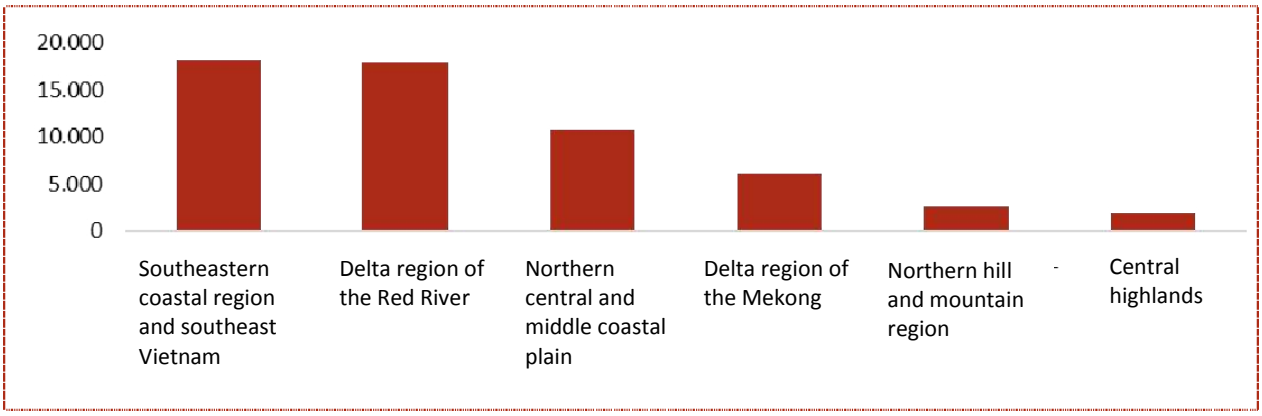


Figure 4.7: Total waste distribution volume per day and region in tonnes for 2012

Source: Thi Thu Hien Le, 2016 [66]

Disposal ways

Vietnam does not yet have a fully developed disposal infrastructure. Although it is becoming increasingly easier to collect most of the waste, they are almost exclusively dumped in landfills with often inadequate expansion and protection standards. While older figures indicate 450 or 520 landfill sites, more than 650 such sites in the municipal waste sector have recently been counted, only around one-third are found that basic sanitary requirements are respected [104]. Not infrequently, deposit sites are in use, which have very little or no technical security facilities and have no control and registration of the delivery quantities. As a result, the mixing of a wide variety of waste and waste sources in many landfills is normal case and the actual quantities is little known.

In particular, the activities of the informal collectors, some of which extend into the area of the landfills themselves, leads to that some of the waste remaining for disposal is already heavily depleted of valuable materials. As a result, the inert and biologically reactive portion in the deposited amounts is high, which often causes significant stress in the water body and the environment through dust and odor development. In some cases, the state pays compensation to neighbors of landfill sites for burdens and environmental risks [97], [118].

In addition to the deposits with frequently mixed waste from the settlement area and other sources, there are also a large number of industrial heaps, mostly directly adjacent to the respective production facilities. The widespread deposit practice is reflected in the assumption that this disposal path ultimately affects over 80% of the waste generated.

Only a small fraction of the total waste is therefore subject to waste incineration or composting. Although energy production from waste is increasingly being promoted and pilot plants are trying to push for large-scale implementation, significant progress in this direction can not yet be identified. Even with hospital waste, of which up to 300 t are produced daily and at least one sixth of hazardous and infectious materials exist, treatment in incinerators of more modern standards is often not yet guaranteed. Instead, manually operated combustion devices of the simplest type are still widely used in hospitals [53].

In Vietnam, mixed composting has long been used as a treatment path for municipal waste. Despite known problems of being able to market the compost substrates that have been obtained, this option is still being adhered to and invested in new plant capacities of this kind [70]. In a few cases, some newly established waste treatment centers have meanwhile taken up sorting activities on a larger scale.

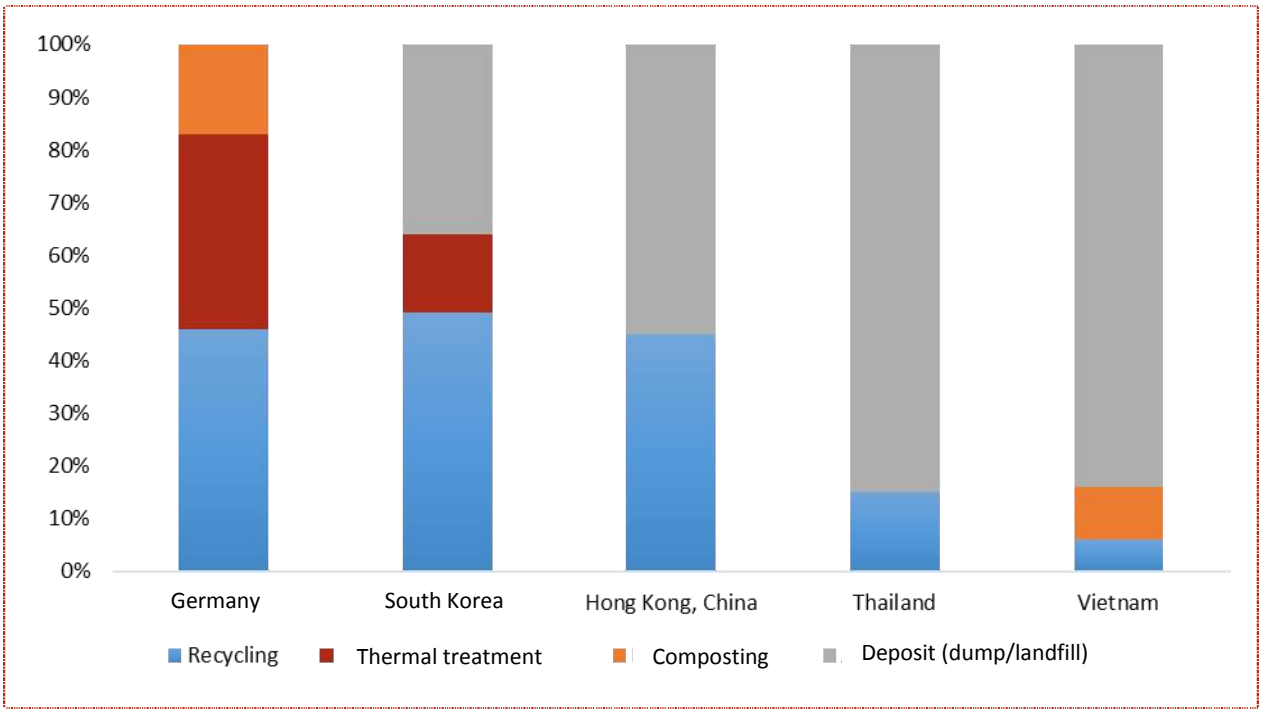


Figure 4.8: Disposal ways for municipal waste in selected countries in 2011

Sources: eurostat, 2018 [93]; World Bank, 2012 [65]; Vietnam Environmental Agency [53]

When it comes to waste management, the industrial and commercial sectors in particular are criticized for not doing enough justice to the responsibility assigned to them and often for avoiding this via inadequately supervised third-party agents or unauthorized disposal practices. So-called craft villages often create waste combusion points. However, the weak or corruption-enforced control system favors such practices and torpedoes serious waste management solutions and investments.

Composition of municipal waste

There are only few details available about the composition of the municipal waste collected in Vietnam, which coverage and methodical realization is little known. The majority of the published data are older investigations, which mainly relate to individual urban areas. The following figure shows the average of existing spans for the composition of municipal waste:

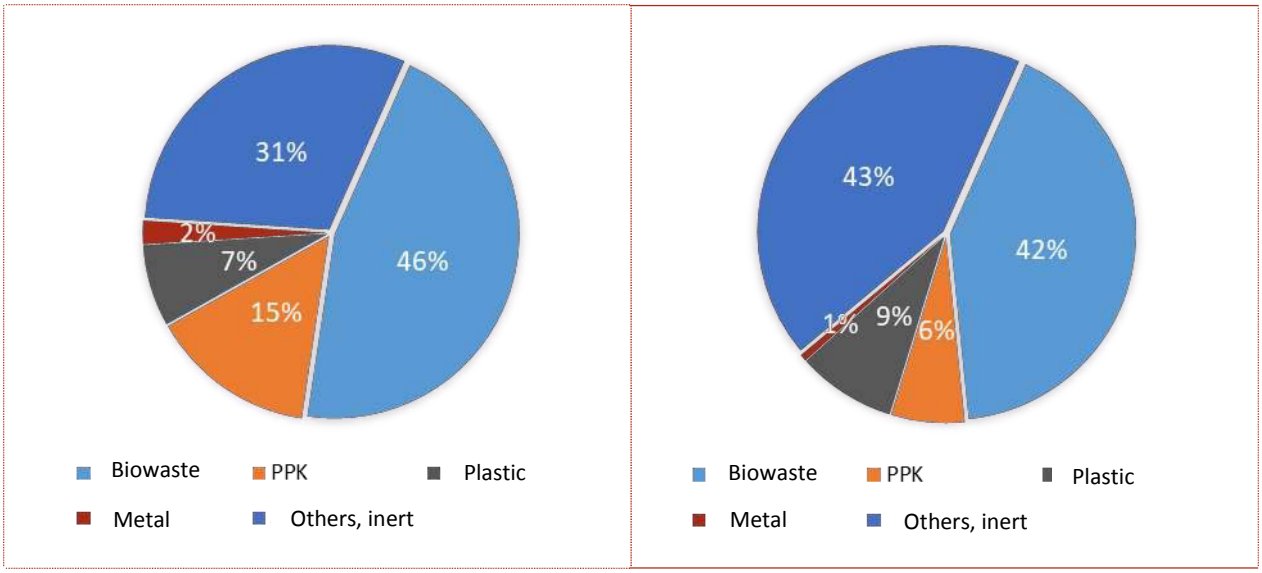


Figure 4.9: Composition of municipal waste in Vietnam, left big cities, right provincial towns
Sources: National Environment Agency of Vietnam, State of Environment in Vietnam 2001; Vietnam Environmental Monitor 2004 [93]

Irrespective of the urban structures, biodegradable waste and inert substances are the two dominant components of Vietnam's municipal waste. In the metropolitan areas, however, the greater commercial influence and the different consumption and disposal behavior are reflected in a higher proportion of paper and board in waste. Account should be taken of informal collection activities, through which, for example, glass, metals and some plastic products are siphoned off from waste to a significant extent even before they are handed over to regular waste collection. Because of the dominance of biodegradable waste, Vietnam has undertaken initial waste treatment activities, especially in the field of waste composting. In the meantime, the generation of energy from waste is increasingly being considered, although no large-scale plants exist for that purpose and are experimented or fanced with different technologies.

The high rates of biodegradable and inert waste are underlined by the waste densities identified at the time of collection. This showed a span of 420 kg / m³ for Danang; 500 kg / m³ for Ho Chi Minh City; 400 - 580 kg / m³ for Hanoi and Hai Phong the value of 580 kg / m³ (see average residual waste density Germany about 170 kg / m³) [68].

At the landfill Gò Cát operated in Ho Chi Minh City until 2007, the composition of the waste was recorded in December 2003 by the Vietnamese Institute for Tropical Technology and Environmental Protection (VITTEP). The composition of the later directly deposited waste is shown in Figure 4.10:

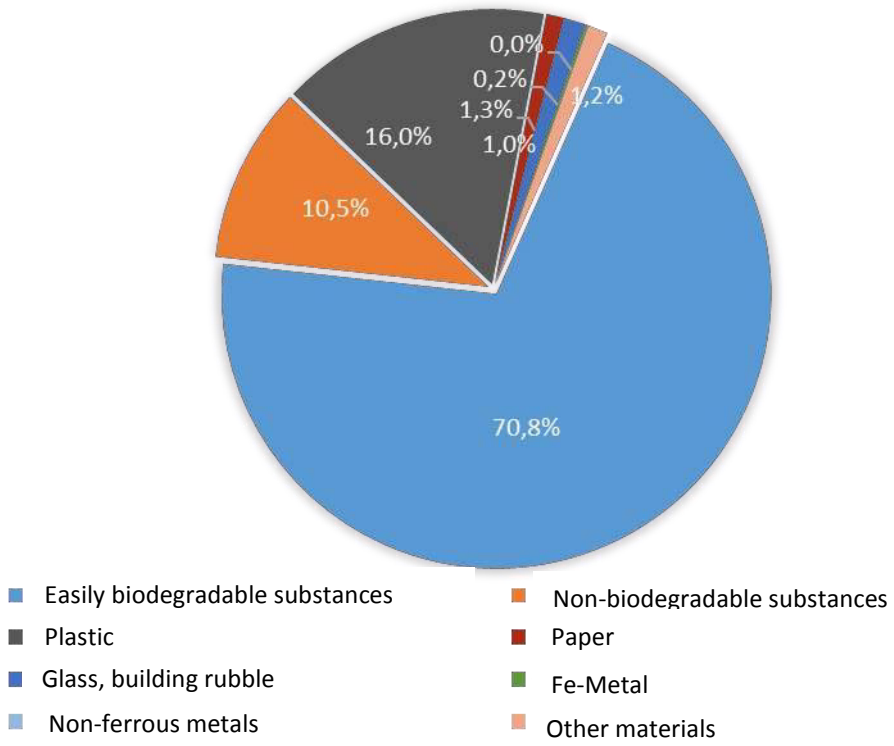


Figure 4.10: Composition of waste delivered to the landfill Gò Cát in HCMC at the end of 2003

Sources: VITTEP, 2003 reproduced in [88]

From this composition, a proportion of over 90% combustible rates was derived at the time of deposition. In 2015, it was determined by trial exvacation that the combustible rate was below 27% due to covering materials, decomposition and inertization [89].

Waste and recyclable material collection

Waste collection in Vietnam is not uniform organized and varies greatly in efficiency. However, the beginning of the disposal chain is determined by a basic scheme. It consists in collecting and merging household waste, smaller commercial units and manual street cleaning works by cleaners (often called "sanitation or hygiene worker") using the simplest carts. With these carts, the cleaners move through the gasses and streets of their assigned collection areas, taking up household waste. Often, the carts are pushed by hand, and in some cases bicycle or moped frames replace the substructure. When placing in the cart, the cleaners extract valuable materials from the waste according to their individual interests, for which they carry sacks or other containers. At fixed points, the collected waste is handed over for further disposal. In the case of valuable materials, these are intermediaries or self-operated depots; for the other waste, these are transfer points to large-volume removal vehicles. Complementing this "official" system by collectors and buyers, who also frequent the collection areas from a commercial drive and pick up specifically targeted pollutants from the households and commercial units (see also further explanations for example waste paper in the subsection "Recovery, Treatment and Disposal"). The quality of the collection varies depending on the staffing levels of the collection areas with cleaners and the frequent involvement of additional collectors. It can be exceptionally efficient and high, but also at a very low level, including the separation intensity and separation of various materials before tilting. Especially in rural areas, the latter is often the case, here waste is sometimes left over for days unkempt in the streets or accumulated in places where they are never taken back or picked up and are subject to rotting or runoff. For "unattractive" areas, with less than € 90 a month in basic salary, it is lacking sufficient street cleaners [72]. However, as the equipment with waste containers and the accessibility of many residential neighborhoods do not allow it to be otherwise, this waste management scheme is the only one possible and indispensable for the time being.

With the increase in the degree of urbanization and the modernity of urban structures, the frequency of the use of large waste containers and a motorized, at least semi-automatic waste collection is growing. Here too, however, all waste is handed over in mixed form to the collection. Only through the self-employed collectors and persons who search the waste for the existence of viable materials for resale, a recyclable material collection takes place separately.

In modern business districts and communal condominiums (in the form of so-called condominiums) with multi-storey buildings in the cities, special disposal solutions are used, including the installation of discharge chutes and press container units. As an innovation in public space, in April 2017, the first 30 "smart" waste containers were installed and presented by the tire company Bridgestone on the Nguyen Hue pedestrian passage in HCMC [77]. Some of these container systems, which are being promoted as recycling containers, have multiple functions, including the option of separating waste, street lighting, be used as a charging station for smartphones and urban greening. According to the principle, however, it refers to waste cabinets for receiving two waste containers, which have modular attachments for the other functions. The idea therefore is not so much a revolution in waste collection as it is an advertising and educational measure. After all, the system envisages the separate abandonment of dry recyclables and wet waste, thereby enabling waste streams more treatable. In addition to at least 70 other waste containers of this type, which were earmarked for HCMC's Old Town district, at least 50 of these containers are now also located in the downtown area in Da Nang.

Additional provinces and cities in the north of the country were also promised such containers by the sponsor Bridgestone Vietnam [78].

Waste collection and removal are currently carried out by private (70%) and public (30%) companies in HCMC [87]. In Vietnam, waste disposal services were not compulsorily tendered in the past but often only transferred by order to a service provider. In particular, every major city typically has its own Urban Environment Company (URENCO), which has hitherto been responsible for a large part of the waste management tasks. Hanoi just decided in 2017 to terminate the practice of power transmission by order and to award the services in the competition by means of a bidding process in the future. This should lead to much-needed efficiency improvements and possible savings. Nevertheless, the call for tenders should link high performance requirements to potential bidders [72].

In principle, the government is trying to increase the involvement of the private sector in the disposal tasks. For this purpose, it has created political definitions and regulations, which, however, have so far received little attention in practice.

Area coverage of waste and recyclable material collection

Regarding the are coverage of waste collection, the information available points to steady progress for Vietnam. In the meantime, about 85% of the urban population is connected, but in rural areas this has only risen from 30% to around 50%. A distinction between the wastes is often not made, i.e. waste generators usually hand over waste of any kind at the same time and mix it with the collection, or, same as with deposition, little attention is paid to the origin of the waste. However, the activities of informal recyclable material collectors and the interest of regular cleaning workers in making an additional profit ensure that recyclables are separated in the course of collecting the waste. Official figures on the share of the informal sector are scarcely available; in Hanoi alone, the number of informal garbage collectors in 1997 was around 6,000 [96]. In areas where waste collection is not yet organized or waste management services are offered, the population takes over self-disposal, which usually results in open burning of waste, construction of unorganized waste dumps and dumping in rivers and depressions or gullies.

Under the Vietnamese legislation, all waste producers have a general obligation to pay attention to the separation of waste and to be responsible for the disposal of the waste (financially). However, there are usually no further concrete requirements for implementation.

Disposal fees

In general, the Vietnamese municipalities levy special charges on residents and traders with regard to waste collection. The basis for this is the decisions of the local people's committees on the levy on sanitary services. The amount of the required payments varies greatly from region to region and also differs within the city depending on the residential location, type of building and use. For households the calculation is generally based on the number of persons, hotels are assessed according to the number of rooms or beds, restaurants according to the area served or number of tables, for market operators the market area or number of stands. Apparently, however, there is the practice that the standard prices are still renegotiated and adjusted by the individual participants.

Current price levels are unknown. Literature data are available for the period 2000 to 2011, with a monthly amount for households of VND 500 (former EUR 0.03) per person and for business units a range between VND 2,000 and VND 100,000 (about EUR 0.10-5.70).

At the same time, centrally located residential areas in cities are subject to environmental fees of between VND 10,000 and VND 20,000 (approximately EUR 0.5-1) per residential unit and month [96]. Larger commercial and administrative buildings or even public institutions are listed with monthly lump sums of up to VND 200,000 (about EUR 10) [99]. Regardless of the individual amount, to date taxes levied on environmental services in Vietnam generally do not qualify for cost coverage. Especially in the rural areas, there are also considerable difficulties in collecting the taxes, so that there is only a very small income here. The cost compensation takes place from the municipal budgets or allocations of the state.

In the metropolitan areas, in addition to the collection costs, the maintenance costs for the landfill plants and the costs for the service providers responsible for the pretreatment are particularly significant. In the absence of verifiable standards, transparent procurement practices and reliable control mechanisms, considerable price spreads arise. For example, assumption fees between the two HCMC-located waste management facilities, Phuoc Hiep and Da Phuoc, already differ by USD 5 (approximately EUR 4.58), and the Da Phuoc site's costs increased to USD 21.10 by 2016 (about EUR 17.93) per tonne of waste accepted, ie an additional USD 5 / t compared to the start of operations in 2007. Basically, at both sites, landfilling was carried out with the simplest processes of pre-sorting and partial immobilization of the delivery material, which did not materially change later [118].

The already decommissioned landfills also require an ongoing maintenance amount as far as they have the normally required safety equipment and treatment units for landfill gas and leachate. With entry into the decommissioning, this is for example for the location Gò Cát in HCMC approximately VND 50 million (at that time approximately EUR 2,000) daily [88], [89]. In addition, the cities of the population harassed by the landfill operation must pay partial compensation. For example, according to Vietnamese newspaper reports, local residents within a 300-meter radius of the landfill Gò Cát were temporarily compensated at a rate of VND 30,000 per person and month (about EUR 1.95 at that time) [98]. In particular odor problems but also deteriorated water quality are frequently detected or lamented in the vicinity of the landfills and linked to demands for compensation [97], [118].

Figure 4.11: Partial view of the decommissioned landfill Gò Cát in HCMC

Source: INTECUS, 2015

Recovery, treatment and disposal

Although the legislation in Vietnam pursues recycling management goals and includes appropriate collection and recycling targets, the practice continues to be largely characterized by mixed waste collection and dumping. The informal sector has hitherto been the most important player in the field of municipal waste recycling through the targeted collection and sorting of recyclables and their further processing or sale to industrial enterprises.

Since recycling activities provide a livelihood even in the simplest possible way, there is a pronounced demand in Vietnam for many material groups contained in waste, albeit at a very different level. In this way, waste paper has always been one of the most valuable materials in Vietnam and, without doubt, is one of the groups of substances which economic importance and demand or revenue prospects have steadily expanded in the country. Regardless of this, waste paper has so far rarely been collected in a targeted manner, at least in the context of municipal waste disposal. Instead, many small-scale collectors and buyers are involved in capturing the quantities of waste paper, especially from trade and commerce, which they then resell to wholesalers and recycling companies. The procedure is analogous to other materials that are in demand, whereby mixtures of substances in the intermediate step are sometimes further separated even in backyards and put together in batches of different market value (for example separation according to type of plastic). With the plant established in Hau Giang Province by Lee & Man Paper Manufacturing Ltd in 2007 as one of the largest (producing 400,000 metric tons of packaging paper), Vietnam has several large factories producing pulp and paper products using recovered paper. However, small-scale industrial settlements (craft villages) specialized in secondary raw materials are still a major source of acceptance in Vietnam. However, these often cause considerable environmental burdens, which are barely persecuted by the authorities or are tolerated against payments (contamination and bribes). The focus here is on inadequately clarified discharges into waters, sludges and other processing residues, especially in waste paper processing. Inter-trade activities in which imported waste paper in the country is prepared for re-export under sometimes inappropriate circumstances increase this problem.

In the meantime, construction and operation of the first waste treatment centers in Vietnam has also started in which valuable fractions are separated, especially from market and industrial waste. However, to date, they prefer to carry out simple pretreatment steps in the form of coarse material selection, composting or immobilization (solidification by binders) on mixed-tendered wastes. For the most part, the waste treatment centers are connected directly to landfills, which continue to focus on the disposal process.

As the example of HCMC shows, the landfill development and supplementation of locations for smaller or larger waste treatment centers always go hand in hand. After the landfill Dong Thanh was filled with more than 3 million tons of waste in 2002 and the Gò Cát landfill was closed in 2007 with more than 5 million tons of sediment, the Phuoc Hiep and Da Phuoc sites were developed as new depository locations for waste. For the first time, treatment centers were also built at these locations. In connection with the further monitoring of the Gò Cát site, an object was also set up there for the temporary storage and treatment, in particular of industrial waste and hazardous substances. The facilities in Phuoc Hiep and Gò Cát were placed under municipal waste management CITENCO, while Vietnam Waste Treatment Company Limited (VWS), which was founded as an offshoot of the California Waste Solution Company (CWS), was given development responsibility for the Da Phuoc site.

Phuoc Hiep as main site should receive daily about 8,000 tonnes of waste from the HCMC urban area and the neighboring provinces Tay Ninh and Binh Duong and Da Phuoc should initially only treat waste from the southern HCMC and be developed as an alternative landfill site. Extensive environmental problems, however, provided the opportunity in 2015 to discontinue further operation of the Phuoc Hiep landfill and to use Da Phuoc as the main disposal facility from now on. Since then, more than 5,000 t of waste have been brought to this plant every day, while around 3,000 t have been subjected to a composting process at the Phuoc Hiep site. Finally, VWS was granted permission to increase its acceptance capacity in Da Phuoc to up to 10,000 t per day and to invest another disposal complex with a daily capacity of 20,000 t in Long An Province (Tân Thành, Thu Thua), which from 2020 should collect waste from the province and from HCMC together. The complex has an area of over 1,700 hectares and an initial investment of USD 500 million. The service life of the site is estimated at 75-100 years [73].

However, the phasing out and final decommissioning of Phuoc Hiep, with USD 50 million in financial losses and compensation payments to the contracted Korean construction company of at least another USD 20 million, is still a matter of great controversy [73]. Da Phuoc has already also devoured over USD 100 million in funding and has now turned 10 million tonnes of waste into a garbage dump of immense scale and environmental impact that will not be followed by another example [75].

Table 4.7: Deposits at the largest landfill sites of HCMC

Site	Landfill site	Construction period	Backfilled amount of waste
Dong Thanh	dto.	1991–2002	approx. 3,2 Mio. t
Gò Cát	dto.	2000–2007	approx. 5,4 Mio. t
Phuoc Hiep	Phuoc Hiep I	2003–2006	approx. 9,2 Mio. t
	Phuoc Hiep IA	2007–2008	approx. 1,7 Mio. t
	Phuoc Hiep II	seit 2008	approx. 18 Mio. t
	Phuoc Hiep III	2013–2014	approx. 4,4 Mio. t
Da Phuoc	dto.	seit 2007	approx. 10,8 Mio. t

Source: Schneider et al., 2018 [89]

In the absence of functional alternatives, direct landfill following the collection of waste in Vietnam continues to be the main disposal option, while in the HCMC conurbations around 80% and in Hanoi over 90% of the waste generated are affected. Da Nang will also receive financing for the construction of a new landfill and associated waste treatment facility by 2020 under an agreement with the World Bank. The current landfill will have reached its maximum assumption capacity by that time [79].

At some large landfill sites, the generated landfill gas has been and is still partially captured and converted into electricity. However, wear and maintenance problems have occurred over time with most gas-fired facilities, with the result that there have been frequent plant phasings out, increasing losses or difficulties in producing gas, and unattainable operating goals.

Table 4.8: Landfill gas utilization using gas generators at landfills in Vietnam

Landfill site	Reference year	announced energy production from gas generation in the reference year
Nam Son, Hanoi	2009	3,5 MW generator power
Dong Thanh, HCMC	2009	28.000 MWh
Gò Cát, HCMC	2007	16.000 MWh
Phuoc Hiep 1, HCMC	2009	14.000 MWh
Da Mai Tan (Thai Nguyen)	2009	1.360 MWh
Haiphong, Trang Cat	2010	2.800 MWh
Thuy Phuong, Hue	2009	1.630 MWh
Khanh Son, Da Nang	2010	3.200 MWh

Source: INTECUS, 2014 [108]

The waste composting that is often used as a treatment measure in Vietnam is implemented quite differently in practice. While some composting plants focus on market and agricultural waste and produce usable compost substrates, the total composting of mixed waste often takes place. An example is the composting plant of Hoi An town in Quang Ninh province. In 2011, being put into operation with a daily capacity of 55 t and the goal of producing marketable compost substrates, in 2013 still no success could be reported in this regard [70]. For this reason, plants repeatedly went out of operation or were abandoned or converted with the onset of obsolescence and equipment damage [93], [100]. While the 2004 Environmental Monitor Report refers to a total of 7 operated composting facilities in the country, a presentation by the ISPONRE institute in 2016 cites the number of 41 relevant facilities, of which 28 are in working order, 10 under construction and 3 closed [107]. Most of the plants are equipped with domestic technology and operate according to procedures that are considered national developments (see also subsection Environmental Technology Companies).

Table 4.9: Available information on waste composting facilities in Vietnam

* -Marking for installations that existed in 2004 and are also included in the more recent list.

Site	Start of operation	Capacity	Input material	Operating status
Hanoi, Cầu Diễn*	from 1992, in 2002 expanded	100 t/d	Market waste and street sweepings	in operation, distribution of compost substrates in 3 qualities
Nam Định City*	from 2003	165 t/d	Mixed waste	in operation, delivery of compost to farmers
Phuc Khan, Thai Binh	from 2001	75 t/d	N/A	N/A
Viet Tri City, Phu Tho Provinz*	from 1998	157 t/d	N/A	in operation, distribution of compost substrates in 3 qualities
HCMC, Hoc Mon	1982-1991	240 t/d	Mixed waste	Closure due to non-deductible process output
Phuc Hoa Tan Thanh	N/A	30 t/d	N/A	N/A

Haiphong, Trang Cat*	from 2004	150 t/d	Mixed waste, mud, fecal matter	in operation
Hue, Thủy Phương*	from 2004	200 t/d	Mixed waste	in operation, sale of compost on coffee and rubber plantations
Rạch Giá	N/A	200 t/d	N/A	in operation
Vietstar	N/A	600 t/d	N/A	in operation
Đồng Xoài	N/A	50 t/d	N/A	in operation
Tân Phú	N/A	50 t/d	N/A	in operation
Bạc Liêu	N/A	2 t/d	N/A	in operation
Ferroplan , Binh Duong Provinz	from 2013	420 t/d	Mixed waste	in operation, marketable compost output of 6t / h

Source: World Bank [93], ISPONRE [107]

A much newer topic in Vietnam is efforts to establish the energetic use of waste. So far, less attention has been paid to the classical methods of waste incineration and possible production of combustible fractions, but rather experiments with gasification and pyrolysis processes. Some smaller plants are currently in a pilot stage and are already being promoted as future-oriented technologies "Made in Vietnam" with potential for large-scale application. However, the evidence is still pending, in particular neither the immissions behavior nor the environmental relevance and safe disposability of the residues of these processes have been thoroughly investigated.

A pilot plant is located on the site of the former landfill site Gò Cát in HCMC and uses the existing infrastructure and connection to the national electricity grid there through landfill gas power generation. According to recent reports, this plant has thermally used about 500 t of industrial waste from the beginning to the middle of 2017, achieving a power generation capacity of 7 MW of electricity for the power grid. In the pilot phase, three synthesis gas generators of 550kVA each were used. CITENCO as the operator received a feed-in price of USD 0.0738 per kWh from HCMC Electricity Corporation. From the plant manufacturer Hydraulic-Machine Ltd., however, some technical problems had to be allowed in the pilot phase. However, after their solution was announced and the local people's committee was still to assess the efficiency of the process, they are now focusing on large-scale expansion with a daily treatment capacity of 1,000 t and power generation capacity of up to 20 MW and expects the application of corresponding investment projects by the process developers. The project follows a similar pilot test in the northern Ha Nam province by the same plant builder [101].

Other similar pilot projects have been announced for the region around Kien Giang with the island Phu Quoc [76]. There is also a recent letter of intent to build a plasma technology treatment plant in HCMC and an investment agreement of Can Tho city with China Everbright International Company to build a USD 48 million WtE plant [70], [102]]. By contrast, Finnish companies have announced investments in landfill and biogas conversion plants [102], [103].

WtE area also includes the project, which has already started in 2017, in the local place Nam Son (District Soc Son) of Hanoi. Here, however, Japanese technology of the manufacturer Hitachi Zosen is used and realized with a daily capacity of 75 t, a power generation capacity of 1.93 MW from industrial waste. In addition to the Japanese technology supplier, the company Sunny Vietnam Co., Ltd. is also active as an installation company and the municipal waste management company Hanoi Urban Environmental Company (URENCO) as the operator of this project. Around three-quarters of the estimated total investment cost of VND 645 billion (approximately EUR 22,81 million) is contributed by Japan's New Energy and Industrial Technology Development Organisation (NEDO) as a non-repayable grant, the difference amount comes from Hanoi's municipal budget.

Table 4.10: WtE-Pilot project in Vietnam

Location	Capacity	Output	Technology	Total investment	involved actors	Location
	at the experimental stage					
Hanoi, Nam Son	75 t/d	1,93 MW	Hitachi Zosen (Japan)	USD 29 Mio. (VND 645 billion) (EUR 22.8 Mio.)	Hitachi Zosen, URENCO, Sunny Vietnam Co., Ltd.	Admission Pilot operation April 2017
Hanoi , Son Tay	400-700 t/d (Target throughput)	N/A	N/A	USD 7.6 Mio. (VND 160 billion) (EUR 5.66 Mio.)	Thang Long Environmental Service JSC	Admission Pilot operation 2014
Ha Nam province, Dong Van 2 industrial park	208 t Total throughput	0,5 MW	Gasification (Vietnam Process Patent Nguyen Gia Long)	N/A	Hydraulic–Machine Ltd.	Admission Test operation September 2016
HCMC, Gò Cát	6 t/d 500 t Total throughput	7 MW	Gasification	N/A	Hydraulic–Machine Ltd., CITENCO	Admission Test operation April 2017
HCMC, Binh Duong	500 m3/h	1,6 KW	Doranova (Finland) Landfill gas power generation	USD 7 Mio. (EUR 5.65 Mio.)	Doranova, Binh Duong Water Sup- ply Sewerage Environ- ment Co., Ltd.,	Putting into operation December 2017
Hanoi	600 t/d (Target throughput)	N/A	Fermentation with biogas electricity	USD 30 Mio. (EUR 24.2 Mio.)	Watrec Ltd (Finnland)	Start of construction January 2018
HCMC	700 t/d (Target throughput)	N/A	Plasma Trisun Green Energy Corp. (Australia)	USD 520 Mio. (EUR 419 Mio.)	Enserco, Trisun Green Energy Corporation	Signed Memorandum of Understanding 02/2017
Kien Giang/ Phu Quoc	N/A	N/A	Gasification	N/A	N/A	N/A
Can Tho	400 t/d	N/A	N/A	USD 47 Mio. (EUR 37.9 Mio.)	China Everbright International Corp.	N/A Februar 2017 was announced as construction start

Source: Saigon Online [76]; Nanh Dan Online [77]; VietnamPlus [101], [102],VietNamNetBridge [103], [106]

In order to support the expansion of the WtE sector, the Vietnam Electricity Group (EVN) has begun to upgrade its network infrastructure in the respective areas. The company is currently paying a price of USD 0.0728 per kW (approx. EUR 0.059) for injecting the generated electricity into this grid [77]. By official request no. 32/2015 / TT-BCT of 08 October 2015, the Ministry of Industry and Trade MIT has increased the electricity purchase price for WtE plants connected to the public grid to VND 2,114 / kWh (EUR 0.075 / kWh without VAT). There is an investment guide recently drawn up with German support that aims to provide additional orientation and help with the initiation and implementation of WtE projects. It also mentions the Vietnamese master plan for the development of the WtE sector, which has announced the expansion of the corresponding installed total capacity to 302 MW by 2020, 268 MW by 2025 and 861 MW by 2035 [104]. The guide is currently in final agreement between the MOIT and GIZ and will be published subsequently [119].

Waste-to-Energy is still in its infancy in Vietnam. At present, there are many indications from the available press releases about the projects that companies are initially trying to position themselves on the Vietnamese waste disposal market in particular and exploiting the exploratory interest of political officials in alternative disposal solutions and Green Energy / WtE technologies. However, in view of the financial dimensions, proposed technologies and open environmental and economic aspects, a sustainable large-scale implementation in the near future may be doubted in a number of cases for the time being.

Nevertheless, it should be noted that the direction of investment in waste management in Vietnam is changing. It has been recognized that previous disposal and plant concepts have neither really solved the waste problem nor improved the environmental situation. The aim is to copy the processes of modern industrialized countries in waste treatment, but this is done in an environment of still unsustainable frame conditions, knowledge and experience. The need to continue to land waste on a large scale at the end will initially persist. Even sea dumping is still considered and used as a disposal option.

Overall, there are hardly any overviews or statistics that provide a consolidated overview of the waste management sector in Vietnam. In total, Vietnam counted just under 40 waste treatment facilities in 2006, as well as 50 small incinerators with a maximum capacity of 0.5 t / h, including the used crematoria and firing facilities for infectious materials and waste [68]. In February 2017, the Vietnamese Ministry for the Environment MoNRE announced a number of 102 approved facilities for hazardous waste management and also about 100 small incinerators [104].

Table 4.11: Non-verifiable overview of additional methods and capacities for waste treatment used in Vietnam

Method	Number of existing treatment units	Range of treatment capacity
Co-incineration in cement kilns	2	30 t/h
Consolidation	19	1-5 m³/h
Oil treatment (recycling)	20	3-20 t/d
Lamp treatment	10	0,2 t/d
Electrical appliance breakdown and treatment	6	0,3-5 t/d
Battery disassembly and treatment	9	0,5-200 t/d
Solvent treatment	13	0,25-1,2 m³/h
Metal recovery from salt treatment	4	0,1-1 t/h

Source: VEA, 2013 [105]

In order to implement its plan for the future treatment of waste, Hanoi has calculated a financing requirement of USD 523 million (approximately EUR 422 million) and estimated a total of 17 waste treatment plants, of which only eight are currently reality [106].

4.2. MARKET PARTICIPANTS - DISPOSAL, RECYCLING AND ENVIRONMENTAL TECHNOLOGY

Disposal plants

The spectrum of actors who deal with waste materials in Vietnam, trade in or use recyclables from waste, is very wide and difficult to survey. Likewise, countless companies are proclaiming that they can produce or provide technology or aggregates for waste collection and treatment. Among other things, the substantial fragmentation of the Vietnamese industrial sector and informal business activities complicate appropriate searches and reviews. There appears to be no harmonized central registry for the waste management of licensed or active companies and entities. Although the municipalities make individual registrations of the local waste management actors, the actual active enterprises show very different outcomes. From 2005, there are indications pointing to 95 waste management companies nationwide, including only two private service providers [66].

In practice, most larger municipalities today have a municipal sanitary and waste management unit or an environmental department that manages and entrusts people and service providers with practical waste management and urban cleaning tasks. Moreover, as a rule, there is still a circle of private individuals or companies offering services in the waste management sector to third parties or being contractually bound by companies, institutions or local authorities. Both municipal and private waste disposal service providers can determine activities in all types of waste. With regard to hazardous waste, it was determined, for example, that more than 74% of the companies concerned have legally agreed disposal of these waste materials by way of contractual agreements with licensed state or private disposal companies [66].

While in some places, waste collection is completely managed and carried out in urban hands, other areas now transfer significant parts to the privately organized sector or leave certain segments in the disposal sector with a relatively independent form of organization (eg dispensing kitchen waste as animal feed, recycling waste at disposal sites). Especially in the large cities, the official involvement of

private service providers in the disposal tasks or the proportion of their partial services has increased significantly compared to previous years. Of the total of 24 municipalities in HCMC, private companies are now collecting household and commercial waste in 22 districts, while the remaining services are provided by the HCMC Environment Company (CITENCO) in cooperation with a cooperative [104].

Municipal waste disposal companies or environmental departments entrusted with disposal tasks usually operate under the name URENCO (Urban Environment Company) in Vietnam, provided with a corresponding regional or local supplement. They could be found easily with own presentations or extended contact details on the Internet, for example::

- Hanoi Urban Environment Company, Ltd. (http://urenco.com.vn/en)
- HCM City Environment Company – Citenco (http://www.citenco.com.vn/)
- Danang Urban Environment Company (www.moitruongdothidanang.com.vn)
- Hai Phong Urban Environment Co., Ltd (http://urencohp.com.vn/)
- URENCO 11 Đại Đồng (http://www.urencodaidong.com.vn/)

The country's best-known and largest private-sector waste management company in term of disposal volume contracted in Vietnam is Vietnam Waste Solutions, Inc., which has been mainly active in the HCMC metropolitan area. The company operates mainly as the operator of the Da Phuoc disposal complex (Da Phuoc Integrated Waste Management Facility - DPIWMF) and also has the development contract for the future large-scale disposal complex Tan Thành, Thu Thua in Long An Province.

Recycler

In Vietnam, there are opportunities for exploitation of virtually all valuable components of waste, partly in the form of very simple and individually devised solutions. This means that the supply in the area of recycling is comprehensive but often not formally organized and designed for larger volumes. The main actor in recovery is the privately and informally organized sector.

A representative listing of private companies involved in waste collection or recycable material treatment can not be provided, which bases on their small business size or small size of the commercial area, with many of them acting individually. It is known that in the form of the so-called "craft villages" a number of locations or industrial and commercial settlements specialize in waste recycling activities. In the past, these included the settlements Minh Khai (Hung Yen), Da Hoi, Van Mon, Phong Khe (Bac Ninh). According to statistics, craft villages in the north of the country recycled in 2003 around 52,000 tonnes of PPP, 25,000 tonnes of plastics and 735,000 tonnes of metal scrap [105].

In individual waste segments, activities or commitments of larger individual companies are known. Some of them are companies that have not specialized in waste management so far but are trying to secure certain environmental services as a secondary business or additional economic pillar. Some researched examples are listed in Table 4.12.

Table 4.12: Selection of Vietnamese companies with a specific waste recycling portfolio

Activity	Vietnamese companies involved in implementation	Contact	Reference location
Construction waste recycling (supposedly use of German treatment aggregates)	Construction and Demolition Waste Treatment Environment JSC	Director: Dang Tien Thanh	Hanoi
Industrial waste recycling **Treatment of oil, metal salts and electronic components**	Hung Hung Green Environment Co., Ltd	Vice-Director: Nguyen Van Chien	Bac Ninh
Thermal waste recycling	Thang Long Environmental Services Jsc	k.A.	Hanoi, Son Tay
Thermal waste recycling for energy production	URENCO Hanoi; Sunny Vietnam Co., Ltd.	General Directors Nguyen Huu Tien; Ngo Minh Tien	Hanoi, Nam Son
	Hydraulic-Machinery Co. Ltd	Director: Nguyen Gia Long	Dong Van 2 industrial park Ha Nam Provinz, HCMC, Gò Cát
	Enserco	General Director: Nguyen Phuc Thanh	HCMC

Source: Own research, as of 02/2018; VEA [105]

Environmental technology companies

Vietnam's waste management has so far relied heavily on technical equipment, components and vehicle technology from Japan, Korea, China, the US and former East European "brother states" (for example Poland, the Czech Republic). Distribution organizations and commercial representations as well as licensees of local environmental technology providers are present and active in Vietnam. With the ODA funds flowing into the country, the corresponding technology providers often enter the market or sell their products.

As mentioned above, there are also many local companies in Vietnam which proclaim that they can produce or provide technology or aggregates for waste collection and treatment, or even provide recycling services. Own patents often play a role as well. Obviously, companies without actual waste management specialization appear in this way, trying to secure certain environmental services as a secondary business or additional economic pillar. In particular, the area of waste composting has been very heavily served by domestic companies in the past. An overview of this without any claim to completeness is given in Table 4.13.

In the meantime, they are also trying to find their way into the WtE market and the corresponding technology fields.

Table 4.13: Vietnamese companies that distribute proprietary composting methods and technology

Technology developers / suppliers	Technology description	Reference sites
Tam Sinh Nghia company	An-Sinh ASC	Thuy Phuong (Hue) Cu Chi (HCMC) Hon Dat (Kien Giang)
Seraphin company	Seraphin	Xuan Son (Soc Son, Hanoi) Dong Vinh (Nghe An)
Binh Phuoc company	Betid	Dong Xoai (Binh Phuoc)
Development mechanical enterprise	High speed aerobic compost	Ha Long Waste treatment complex Tay Ninh Envir. Company

Source: own researches, as of 02/2018; VEA [105]

Relative well-known environmental technology companies in Vietnam are also:

- Green Eye Environment – GREE
- Vnxanh, Vietnam Green Environment Co.,Ltd.

4.3. LEGAL AND INSTITUTIONAL FRAME CONDITIONS

Parent goals

Vietnam recognizes the great challenges of protecting the environment and coping with its waste problems, and attempts to address them through appropriate policy decisions, legislative initiatives and investment and technology supports. For this reason, the Law on Environmental Protection from 1994 was fundamentally revised in 2005 and 2014 and has been clarified and tightened in many areas. In 2016, the country's political leadership also announced its commitment to environmental protection in a development plan for the period 2015-2020 in the form of adopted sustainable development goals.

A national environmental protection strategy with the 2020 horizon (National Strategy on Environment Protection to 2020, with Vision to 2030) names a number of concrete contents, goals and proposed solutions for environmental protection. It includes a move towards the integrated waste management approach and, in particular, a stronger focus on implementing 3R measures (waste reduction, reuse and recycling).

Already in the revised Environmental Protection Act of 2005, the first reference to these three priorities for waste management policy and individual waste management measures showed an attempt to change the strategy from the traditional handling of waste. This was preceded by a Politburo resolution on Environmental Protection Requirements as part of the country's process of economic modernization and accelerated industrialization (Resolution No. 41 / NQ-C on Environmental Protection in the Period of Accelerating the Country's Industrialization and Modernization Process). Even the application of extended manufacturer obligations and the promotion of environmentally friendly products are discussed in the law. The government has allowed the law to follow a series of additional regulations for the waste management sector, but still too few steps that actually ensure better control over their compliance and increased waste management. Especially in the execution of environmental laws in everyday life, Vietnam proves to be relatively sluggish and inconsistent.

Vietnam's initiatives on Agenda 21 also reflect the intentions of the environmental protection law to anchor Vietnamese society in the medium term in a more conscious use of natural and energy resources and to increase the recycling of waste for further use. Vietnam is also trying to link economic progress and environmental concerns with a green growth strategy. In the energy sector, energy efficiency and renewable energies in particular have gained attention and have also brought waste as an energy source into the spotlight. Among other things, the political leadership has great hopes that WtE projects will enable it to tackle the waste problem more effectively and at the same time help to meet the growing demand for electricity. Politicians are currently working to create a favorable environment for this area and to provide it with significant support by encouraging technology development, providing incentives through specific feed-in tariffs for WtE-based electricity volumes and generous action by the authorities in pilot projects.

The National Strategy for Integrated Solid Waste Management (Decision No 2149 / QD-TTg of 17 December 2009) also specifically sets the target for the government by 2025 to cover at least the total household and commercial waste of urban areas and recycle 90% of them, including the use of energy.

The long-term objectives for the waste management sector have also been defined for years with the following points [96]:

- Increasing the treatment of municipal waste and investment in this sector
- Improving cost recovery and investment sustainability
- Expanding and improving regulation on hazardous waste
- Improving public information
- Increasing cooperation of municipalities in waste management
- Creating incentives for minimizing waste and recycling

Essential regulations

The legislation in Vietnam is the responsibility of the National Assembly, which is also responsible for the legal bases that affect the waste management sector. However, there is no real separation of powers, and so the National Assembly often acts merely as an organ that formally confirms the decisions of the Politburo. The inexperience of the deputies and the limited scope given by the political power of the Communist Party hinder genuine professional debate and parliamentary discourse, especially in complex fields such as environmental protection and resource conservation, which are often seen as barriers to economic progress. For this reason, the environmental laws on waste management contain only vague and superficial definitions; recycling responsibilities are more general and instead deal with administrative structures and procedural issues in more detail. On the other hand, some requirements are formulated (as for waste separation), which lacks any further relinquishment for practical implementation and as a control standard.

The overarching laws and decisions that directly address or affect the waste management sector include:

- Environmental Protection Act of Vietnam (Law 55/2014/QH13 dated 23/6/2014 on Environmental Protection)
- Decision No.1216 / QĐ-TTg of 5 September 2012 on a National Strategy on Environment Protection to 2020, with Vision to 2030
- Decision No. 798 / QĐ-TTg of 25 May 2011 on the approval of the waste treatment plan for the period 2011-2020
- Decision No. 1873 / QĐ-TTg of 11 October 2010 on the approval of construction plans in the Waste Zone, the main economic zone of the Mekong Delta Region to 2020
- Decision No. 2149 / QD-TTg of 17 December 2009 approving the national strategy for integrated management of solid waste up to 2025, with a vision to 2050
- Decision No. 1440 / QĐ-TTg of 6 October 2008 approving construction plans in the Waste Special Area No. 3 of the northern, central and southern main economic zones up to 2020
- Government Decree No. 155/2016 / ND-CP on Sanctioning Administrative Violations in Environment Protection with effect from February 2017 (Decree on Sanctioning Administrative Violations in Environment Protection). The Decree has the highest levels of environmental punishment ever, with penalties of up to VND 1 billion (about EUR 35,400) for individuals and up to VND 2 billion (about EUR 70,800) for corporations.
- Government Decree No.117 / 2009 / ND-CP of 31 December 2009 on how to deal with environmental breaches
- Government Decree No. 04/2009 / ND-CP of 14 January 2009 on Government’s incentives and supports on environmental protection activities (Decree on Government's incentives and support on environmental protection activities)
- Government Decree No.69 / 2008 / ND-CP of 30 May 2008 on incentives in the areas of education, health care, culture, vocational training, sport and the environment
- Government Decree No.59 / 2007 / ND-CP of 9 April 2007 on waste management
- Circular No. 12/2011/TT-BTNMT des Umweltministeriums vom 14. April 2011 zu den Bestimmungen über gefährliche Abfälle
- Government Decree No. 174/2007 / ND-CP of 29 November 2007 on environmental protection fees for solid waste
- Circular No. 46/2011 / TT-BTNMT of the Ministry of Environment for the environmental protection in craft villages
- Circular 36/2010 / TT-BNNPTNT of 24 June 2010 on the manufacture, distribution and use of fertilizers (regulates, among other things, the required quality of compost from waste)
- Circular No. 121/2008 / TT-BTC of 12 December 2008 on financial support for investments in the waste management sector

In addition to the superordinate laws and resolutions, there is a technical set of rules as well as stipulations and decrees that are made by the competent people's committees for a territorially limited area of validity. The most important national technical regulations for the waste management sector include:

- Decision No. 01/2001 / TTLT-BKHCNMT-BXD (18/01/2001) - Guidance on the selection of landfill sites,
- Technical standard TCVN 6705-2000 - Classification of non-hazardous waste,
- Technical Standard TCVN 6696-2000 - Ordinary landfills - Requirements for environmental protection,
- Technical standard TCXDVN 261-2001 - Landfill - Building Standard,
- Technical Standard TCVN 5937: 2005 national limit values for the maximum concentration of toxic substances in the ambient air
- Technical standard TCVN 5938: 2005 national standard for air quality
- QCVN 08: 2008 - technical specifications for surface water quality
- QCVN 09: 2008 - technical specifications for groundwater quality.

Implementation in practice

Vietnam continues to seek to enforce environmental protection largely on the basis of sovereign orders and the threat of punishment, but has so far lacked consistent monitoring, effective prosecution and punishment of violations favored by inadequate technical equipment and corruption susceptibility of state organs. The use of economic incentives and self-commitment instruments have so far hardly been realized.

The inconsistency in the procedure is expressed, for example, in the handling of contaminated sites. A decision by the Prime Minister of 22 April 2003 (Decision No. 64/2003 / QD-TTg), which listed more than two hundred highly polluted sites, was followed by few adequate measures, in particular at many landfills mentioned above. Nearly 50 sites were even identified as highly risky and should therefore be redeveloped by 2007. The national strategy for the integrated management of solid waste by 2025 reopens the unresolved problem and envisages the initiation of protection and remediation measures at the respective landfills by 2015. To this day, there is still a lack of evidence that these steps were taken and a relaxation could be achieved. In particular, the final settlement of the contaminated sites (complete landfill redevelopment or complete site restoration) as required by 2020 is not in sight. The effective pre-treatment measures and a safe deposit at 104 landfill sites in the time frame 2016-2020 are also far from being foreseen on the scale indicated. In addition to real will, Vietnam's authorities are missing in particular the necessary financing or investment funds for the implementation.

As a means by which the government seeks to ensure that environmental protection projects and the implementation of 3R measures are financially supported in Vietnam, since 2002 there has been a Vietnam Environment Protection Fund, which receives funds from the government budget. Another such fund was created with a so-called "Recycle Fund". The forerunner here was HCMC, where special recycling activities are promoted through this fund.

So far, HCMC is also progressing in the country with master plans in which the waste management sector plays an important role. It envisages significant investment in the development of treatment infrastructures, which will reduce the rate of waste dumping to at least 60% by 2020 and to only 25% by 2025.

The conditions for this should creat a so-called "classified" coverage for at least 50% of the waste generated at the point of origin and price subsidies for recycled products [108].

Authorities and their responsibilities

Vietnam's administrative system for environmental protection and waste management issues is very complex and associated with the involvement and (sometimes overlapping) division of responsibilities across several ministries and agencies.

The Ministry of Planning and Investment (MPI), for example, is the responsible administrative unit for the implementation of the Green Growth Strategy. In terms of investment in the waste management sector, other responsibilities lie with the Ministry of Construction (MoC). For selected fields of risk prevention, environmental protection, and waste management, the Ministry of National Resources and Environment (MoNRE), Ministry of Health (MoH), Ministry of Transport (MoT) and even the Ministry of Finance (MOF) has further responsibility. The MoNRE, as an independent ministry, was only spun off from the Ministry of Science in 2002. In turn, the Ministry of Industry and Trade (MOIT) has lead and policy competence in the process of developing technical capabilities, general environmental management or the development of the renewable energy sector [33]. The coordination of ministries with each other is sometimes very weak or at least suboptimal.
Table 4.14 shows the institutions that have significant responsibilities in waste management in Vietnam.

Table 4.14: State actors and division of responsibilities in the field of waste management

Institution	Assigned units	Municipal waste area	Medical and other hazardous waste area	Industrial waste sector
Ministry of Resource Protection and Environment, MoNRE	**Dept. of the Environment, DoNRE**	Planning, strategy development, legislative and regulatory initiatives and support at national and provincial level, monitoring tasks	Planning, strategy development, legislative and regulatory initiatives and support, monitoring tasks	
	Dept. of Environmental Impact Assessment and Appraisal	Testing and approval of environmental impact assessments and environmental impact surveys in connection with waste treatment plants and landfills		
	Vietnam Environment Agency, VEA CEM Center for Environmental Monitoring	Coordination of inspection tasks, landfill planning and enforcement obligations in the area of municipalities, environmental monitoring, technology advertising, education work	Environmental monitoring, coordination of enforcement obligations in the health sector	Environmental monitoring, coordination of inspection tasks enforcement obligations in the industry sector, education work

Ministry of Construction, MoC		Planning, strategy development and legislative initiatives for the construction of waste disposal facilities and the development of waste management infrastructure at national and provincial levels		
Ministry of Health, MoH		Risk assessments	Monitoring of disposal services in the health sector, planning, strategy development, legislative and regulatory initiatives and support for medicine. Waste	Risk assessments, workplace norms
Ministry of Industry and Trade, MOIT		Environmental management requirements, development of the renewable energy sector		Environmental management requirements, monitoring of industrial zones, guiding the industry in waste management and technical capacity building, development of the renewable energy sector
Ministry of Transport, MoT	**TUPW Dept. of Transporta-tion, Urban and Public Works**	Planning and monitoring of transport infrastructure and transport processes at national and provincial levels, guidance and supervision of URENCOs		
Ministry of Planning and Investment, MPI		Overall planning of investment projects and use of ODA funds for waste management		Planning the development of industrial and investment zones

Sources: own research, as of 02/2018, World Bank [93],INTECUS/GIZ [104]

At the regional level, the respective provincial and local governments are responsible for waste management with their waste management departments. Regulations and instructions on sanitary services and the levying of environmental taxes in the respective areas as well as on development plans and projects are usually issued by the competent people's committees.

Table 4.15: Actors and division of responsibilities in the regional Implementation of waste management

Institution	Assigned units	Municipal waste area	Medical and other hazardous waste area	Industrial waste sector
People's committees of the provinces and local people's committees		Planning and monitoring of environmental protection and disposal services in the respective territorial jurisdiction, policy competence and monitoring in the field of environmental taxes	Monitoring of environmental protection and disposal services in the respective territorial jurisdiction	Planning and monitoring of environmental protection and disposal services in the respective territorial jurisdiction, policy competence and monitoring in the field of environmental taxes
Local disposal utilities, URENCOs under the supervision of People's Committees, TUPW or DoNRE		Waste collection and disposal	Waste collection and disposal if assigned	
Industrial zone supervisory boards				Monitoring and guiding the industrial zones in environmental management tasks

Sources: own research, as of 02/2018, World Bank [93],

4.4. BUSINESS OPPORTUNITIES FOR GERMAN COMPANIES

Vietnam's waste management has a lot of catching up to do in order to ensure widespread waste collection and safe disposal, as well as to set up an integrated waste management system in the future. With the Green Growth policy for green economic growth and numerous legal bases calling for progressive waste management practices, the country has a favorable framework for providing and taking action in the environmental market. Ambitious goals, such as the implementation of the 3R principle and the associated efforts to reduce landfill and build formal recycling structures, the rehabilitation of landfills and environmental hotspots, and the strengthening of the waste-to-energy sector, require substantial investment. However, the time horizon until real large-scale initiatives are launched and government funds are used can take longer.

It requires process know-how and modern, solid equipment for virtually all sectors and stages of disposal, from waste collection to sorting, treatment with biological, physical and thermal methods, emission control, landfill control, landfill monitoring and landfill aftercare. The political decision-makers try to orientate themselves by modern technologies, but are often not well-informed about the cost-relevance and the best available state of the art, and thus are often not consistent with procurement measures and different investment opportunities. Not infrequently, long-term thinking, compromises to reduce costs, and the inclusion of inadequate technical and service components due to domestic providers who are to be served, also endanger the sustainability of investments.

In the past, German technology and equipment suppliers were not yet able to place a very strong position in the waste management sector in Vietnam. Occasionally, opportunities only existed in the transport and handling technology and composting segments. This situation is likely to change in the future and especially the waste-to-energy sector promises positive prospects in the coming years. Furthermore, the good reputation of German technology and plant engineering should also be favorable conditions for future exports. However, there is a relatively strong competition with technology suppliers and market players from the Asian region, especially from Japan, Taiwan and Korea.

Planning and consulting support from Germany has long been desired in many areas and will continue to be in demand, but the marketing of such services in Vietnam is proving difficult. Conceptual and planning procedures based on the German model hardly take place in the state or, in general, have a different significance. Frequently, technology decisions are made in advance and almost without any conceptual advance and technical consideration, and this is linked to the expectation that the selected plant suppliers will provide the necessary planning and that they are practically covered by the offer price.

Business prospects also open up ODA initiatives, which recently have boosted major development banks, such as the World Bank and the Asian Development Bank (ADB), back to the country in the environmental sector. For the ADB, for example, as part of its "Country Partnership Strategy for Vietnam", financial and technical support to identify and develop PPPs, especially in the waste management market, is a key priority for 2016-2020.

Germany has also provided ODA funds through the Kreditanstalt für Wiederaufbau (KfW) for the development of wastewater and waste disposal in selected provincial towns in the past. However, projects Nord I (Bac Ninh, Hai Duong) and Vinh as the program center 2016 had to be evaluated as only partially satisfactory [112].

An equally strong commitment to Vietnam has been and will be made in climate change research, water and energy, with pilot and demonstration projects supported by the International Partnerships for Sustainable Innovation Program under the Sustainable Development Research Initiative (FONA), with funds of the Federal and under supervision of the BMBF [55].

In the meantime, the GTAI has announced further updated insights into waste management and the developments in the Vietnam disposal market, which can be expected to be published at the latest in the second half of 2018. The publication will once again be part of the publication series "Branche kompakt" [113]. Interested parties regularly receive information on selected market segments in different target countries.

5. WATER MANAGEMENT

5.1. WATER SUPPLY AND WASTEWATER DISPOSAL

Water resources

The average rainfall in Vietnam is about 1,820 mm / a. The span ranges from 1,800-2,000 mm in the middle of the country to 2,000-2,500 mm / a in the mountainous regions in the north (Yunnan highlands, for example). The rainy season usually extends from April / May to October / November. During this time, usually 70% of the total annual rainfall fall. Very characteristic of the Vietnamese climate are heavy rain events (monsoon), in which large amounts of precipitation fall in a very short time. This leads to strongly fluctuating levels in the above-ground water resources (lakes, rivers), which often cause severe flood catastrophes. Furthermore, these extreme weather events greatly affect the availability of water resources for drinking water production. Due to the low rainfall during the dry season, the rivers produce only 15-30% of their mean water volume during this period [121], [135].

Vietnam has a dense network of over 2,350 rivers. The Mekong (area of the delta approx. 45,000 km²) and the Red River (area of the delta approx. 15,000 km² with a length of approx. 500 km on Vietnamese soil) are by far the largest watercourses. [142]

The climate in the north of the country is classified as subtropical, while the south is classified as tropical. Due to the large distance between north and south (maximum north-south extension 1,650 km), the regions differ greatly in the prevailing temperatures. While in the north temperatures of about 11 ° C occur in the winter months, the temperature in the south rises to 40 ° C. The middle of the country is often affected by storms that hit the mainland from the South China Sea [122].

The systems of the central drinking water supply are fed by different water resources. The demand for drinking water for the central supply systems in Vietnam is covered to 70% by surface water and 30% by groundwater. However, in certain areas, such as Hanoi, the use of groundwater as a resource for the provision of drinking water is gradually being reduced, as intensive use in the past has led to massive problems. Consequences of overuse are among others the sinking of the groundwater level, subsidence and (ground) water pollution [120]. The latter are potentiated by the rapid drop in the groundwater level, where toxic substances, such as Arsenic, are introduced in large quantities into the underground reservoirs and pollute them.

The renewable groundwater resources amount to approx. 71,000 km³ / a. About 90% are located in the northern and central parts of the country, while only 10% are in the south. The annual groundwater withdrawals amount to 6-7 km³ / a [122]. The total dam capacity in Vietnam is approximately 28 km³, with dams often subject to multiple uses: flood control, drinking water storage, fisheries and hydropower production, which accounts for 38% of the country's largest primary energy sources.

With more than 60% of the total renewable water resources generated outside the country, Vietnam depends to a significant extent on the decisions of the surrounding states [122].

The quality of groundwater resources is determined by numerous external influences, including the entry of leachate from legal and illegal landfills.

There are an estimated 650 landfills in Vietnam, of which 80-85% are improperly managed and thus classified as causing heavy pollution. [120] [143]

Water demand

Currently, the Vietnamese population (about 94 million inhabitants) is divided into a share of rural population of about 70% and a share of urban population of about 30%. The latter are distributed into more than 750 classified urban areas including the two special zones Hanoi and Ho Chi Minh City (HCMC) [120]. Urbanization in the country will continue to increase over the next few years, with an estimated 37% of Vietnam's total population living in urban areas by 2020 [132].

Much of the rural population in Vietnam earns a living in agriculture. It is not only one of the most important economic sectors in the country, it is also by far the largest consumer of water resources. Almost 93% of total water abstraction is needed for agricultural production including aquaculture. Vietnam is one of the largest rice and coffee producers in the world. In addition, cereals and sugar, but also meat and fish products are produced for domestic consumption and for export. All these agricultural productions require extensive irrigation, 99.9% of which is achieved by surface irrigation. Water withdrawal for industrial applications from surface water is 5% and for households 3% of total annual withdrawals. In urban areas, surface waters cover 70% and groundwater 30% of the water supply. The total annual water withdrawal is about 81 km³ [122], [132], [138].

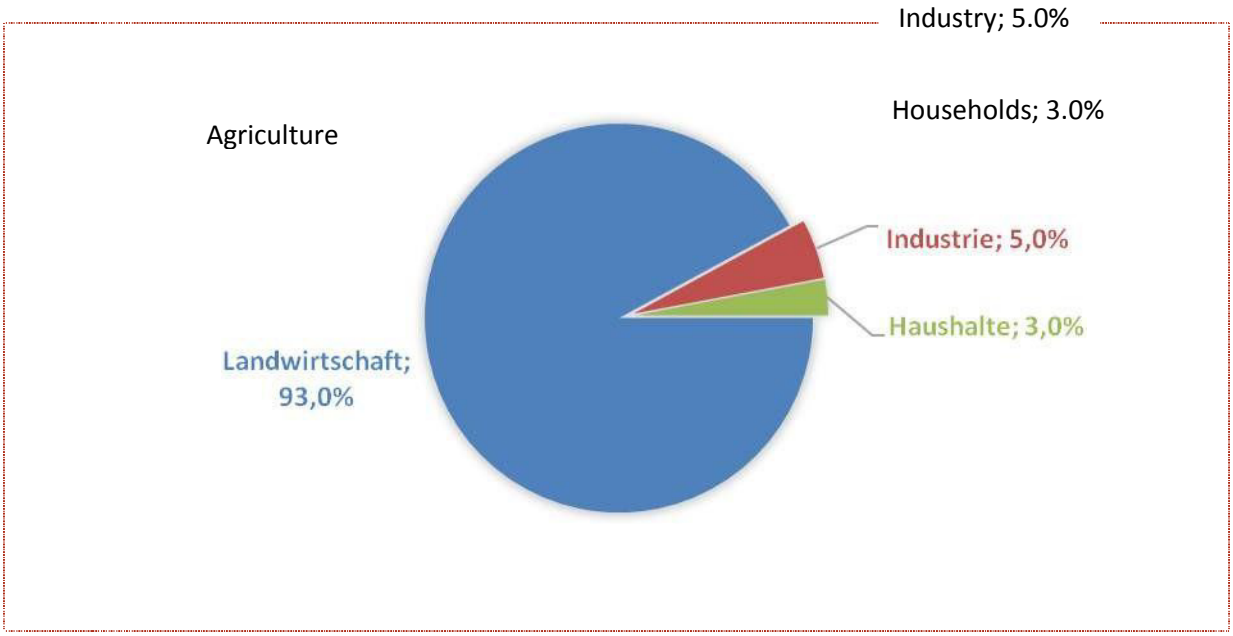


Figure 5.1: Annual freshwater withdrawal from surface waters by sector in Vietnam

Source: ADB, 2010 [132]

The water demand of households in urban areas is covered by groundwater (central supply and decentralized house wells) as well as river water. However, groundwater withdrawals play a very minor role nationwide (only 1.7% of all withdrawals in 2005) [122]. Information on the specific water requirement varies in part significantly. In city / urban areas, the specific water consumption is about 80-90 l / Ew * d, in large cities 120 l / Ew * d [120]. The direct reuse of purified wastewater plays a subordinate role in Vietnam. In 2005, the share was only 0.2% of total water withdrawal [122].

Drinking water management

By prioritizing investments in modernization and new construction, great efforts could be made to successfully improve the drinking water supply in Vietnam. Nevertheless, two-thirds of small towns did not yet have a central water supply in 2009 [120]. In total, 27% of the Vietnamese population is served by a public drinking water network [121]. Of the urban population, 85% have access to the central public drinking water network. In rural areas, 94% of people have access to clean water, which meets the requirements of the Vietnamese Ministry of Health (MoH). However, only 9% of households have their own connection to the drinking water network [124].

However, the capacities of the water supply plants are often not used to the extent possible, although at the entry points into the networks (waterworks) good, ie hygienically safe drinking water qualities are achieved. So waterworks are partly operated only with 50% of the planned capacities. This results from the low connection rate of the population resident in the coverage area. In addition, many households use tap water only for drinking and cooking. For other purposes, still others, partly unhygienic, local sources are used [120].

There are a total of 68 water companies in Vietnam. Information on water losses from public drinking water networks is subject to a considerable range. On average, values of approx. 30% are stated as water losses due to leaks (so-called "non-revenue water"). In the urban special zones Hanoi and HCMC, the values of water losses caused by leaks are sometimes up to 40% [120], [135].

The losses in the drinking water systems also lead to a deterioration in drinking water quality. In sections of piping systems with low supply pressures, leaks cause incoming water to infiltrate the piping system and sediment to enter. According to studies by the VWSA, only 50% of the pipeline systems comply with the limit values for drinking water [120]. This, in turn, means that there is no great reliance on the quality of the drinking water from the drinking water network on the part of the population.

For the treatment of surface and ground water to drinking water, the following procedures are used [120]:

- Ventilation (to remove iron or arsenic compounds)
- Flocculation using lime or polymer compounds
- Sedimentation
- Filtration
- Disinfection with liquid chlorine

Due to the regional / local increasing salinisation of freshwater reserves by seawater, some measures for the desalination of the surface water are necessary in addition to the methods mentioned, such as in the Da Nang region and the Thua Thien Hue province.

In the rural area, there is a very differentiated situation with regard to the supply of drinking water to households. As no nationwide supply of centrally prepared tap water has been developed here, various diffuse sources are used to withdraw water resources. The decentralized generation of water for household use in rural areas also draws on rainwater or the water of stagnant water (such as ponds). An overview of the origin of rural water withdrawals for household use and its percentage share is given in Figure 5.2.

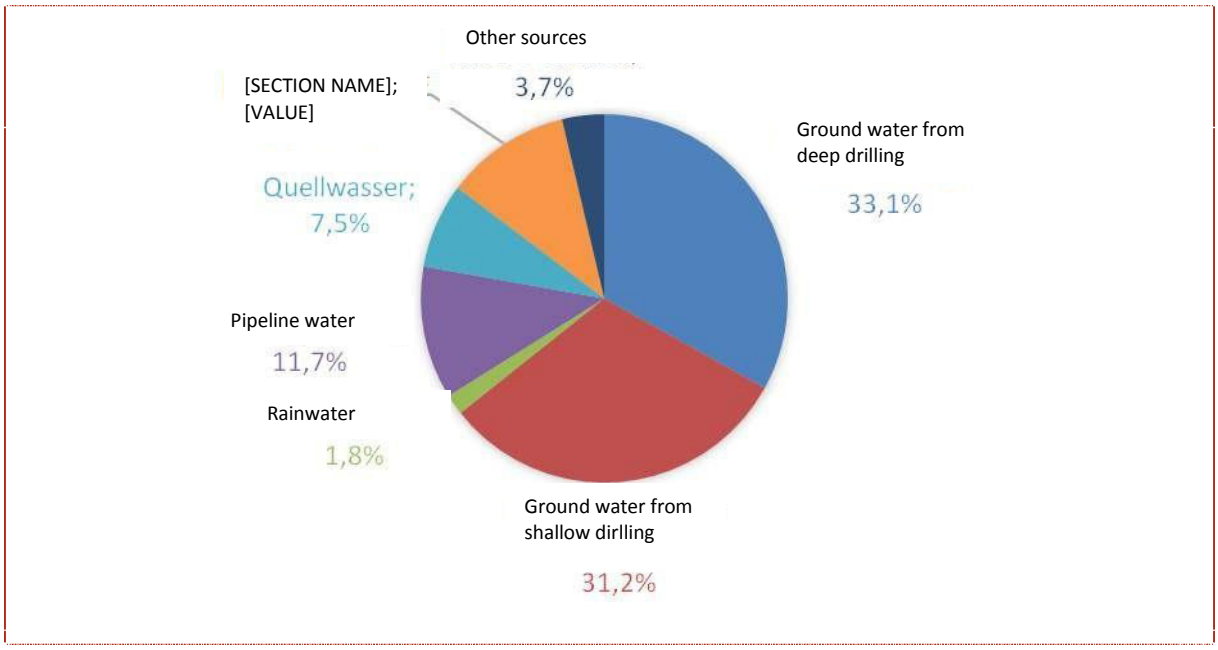


Figure 5.2: Origin (drinking) water of rural households in Vietnam

Source: HEMA & WHO, 2011 [120]

In the past, large-scale pollution of groundwater with arsenic (- compounds) was detected. The causes for this are mainly due to the geological soil structures. Due to leaching out of the rock strata due to sinking groundwater levels, pollutants are introduced into the underground reservoirs. In addition, the entry of arsenic plant protection products from agriculture and the chemical industry also contributes to the pollution of water resources [120].

Furthermore, in the past microbiological contaminants such as e.g. E. Coli were determined at the withdrawal points (household connections) of the drinking water network. Many residents of Vietnam therefore boil off the water before household use, as there is a legitimate lack of trust in drinking water quality [131].

Wastewater management

At present, the improvement in sanitation compared to water supply is still below the target levels set.

A special feature of the Vietnamese water industry is the separation between operation and ownership of the facilities / infrastructures. Owners of the assets are the people's committees, ie the provincial or municipal administrations. The local governments, in turn, engage drainage companies to operate and manage the urban drainage systems. In turn, companies finance their infrastructures directly from a defined city or municipal budget [132].

Especially in the fast-growing urban centers, population pressure is so strong that infrastructure development is barely able to keep up and is therefore at its limit. In addition, there are the special climatic and meteorological conditions for Vietnam, which are reflected in heavy rainfall events and additionally burden the wastewater infrastructure. The overloading of the sewer system during heavy rainfall events regularly leads to widespread flooding in the urban area. This is due not least to blockages in the sewer network due to illegal waste disposal and the associated delay in wastewater discharge. Also, the continuously increasing sealing rate of soil surfaces due to continuous urbanization is also responsible.

Illegal connections to the (sewage) sewer system, as well as the uncontrolled, improper and in part unprofessional expansion of the sewer system, contribute to a worsening of the drainage situation. For reasons of cost, the first discharge systems have been used as a mixing system, ie for the joint discharge of dirty and rain water. This type of construction requires the presence of only one sewer network. However, these systems were installed almost exclusively under the primary traffic routes (highways and main roads). As a result, secondary roads seldom had sewer drainage, neither for rain, mixed nor dirty water. In these areas, the discharge of rainwater is still often uncontrolled on aboveground paths through the sealed and unsealed areas.

More recently, new sewer systems have been set up as a segregation system, in which dirty and rain water is discharged in separate channels. But even in this system concept, uncontrolled connections lead to operational problems such as overflow or blockages [120]. So household connections are not connected to the dirty water system, but to the rainwater network, since this is normally installed in a lower installation depth and thus costs for underground construction can be saved.

At present, only a few urban areas have functioning municipal wastewater treatment plants. These include Hanoi, Ho Chi Minh City, Danang, Da Lat, Buon Me Thuot and Ha Long. It is estimated that only 10% of all Vietnam's wastewater will be purified.

At the end of 2016, there were 69 wastewater treatment plants across Vietnam with a total treatment capacity of 2.3 million m^3 / d. Of these, 41 were in actual operation (0.9 million m^3 / d). 28 wastewater treatment plants with a capacity of 1.4 million m^3 / d were under construction or in trial operation. 21 of the 63 provinces in Vietnam do not have a wastewater treatment plant [125].

The degree of coverage in terms of development with a sewer system for the orderly discharge of wastewater is only about 1.7% based on the number of inhabitants [130]. Nevertheless, 91.2% of the population has access to basic sanitation, which is therefore mainly realized through decentralized systems [123].

Technologies used to clean wastewater at central wastewater treatment plants in city / urban areas include:

- Activated sludge plants in the run (often to be found)
- SBR / Sequencing Batch Reactor (activated sludge system in the backwater plant)
- Ventilated or non-ventilated wastewater ponds (low cost)

A lack of understanding and know-how for suitable technical solutions, even taking into account limited area availability on the part of the responsible administrative decision-makers, that are often only available for the sewage treatment plants, has led to a widespread use of more expensive and more complex technology facilities. Plants with low energy consumption or reuse of purified waste water enjoy currently a low priority in Vietnam. This is all the more serious since replacement investments in complex systems over the life cycle are significantly more cost-intensive. The use of near-natural processes in wastewater treatment has hitherto only been limited. However, in view of the achievement of the objectives set for the development of sanitation in Vietnam, these facilities will increasingly be used, especially in rural decentralized areas.

A common problem with the operation of existing central treatment plants is the utilization of existing capacities. Due to a low degree of connection of the existing population to the network, a not fully developed sewer system or exfiltration through leaky canals, the constructed sewage treatment plants are rarely fed and operated according to their design.

This can lead to poorer operating results due to reduced cleaning performance and to relatively high specific energy consumption of the units used.

Also, the design of the plants does not always take into account the actual local conditions, e.g. at the inlet concentrations of the organic loads in the wastewater. Usually, all household wastewater is fed to a central sewage treatment plant. These have typical concentration values, by means of which the purification stages are measured. In Vietnam, however, the existing sewage system is different.

The basic equipment that 80% of Vietnamese buildings have, are septic tanks. These, compact settling pits, are usually located immediately below the flush toilet or under the house. The overflow of the tanks usually leads to an open channel and then to a receiving water or water. Due to the low development rate, the overflow of the tanks is rarely discharged into the sewer network and, in even less cases, then fed to a biological sanitation on a central wastewater treatment plant. In many places, the absence of a sealed sole area in the settling pits also leads to immediate infiltration of the sewage on site. The use of settling pits prevents the entered solids from being entered into the environment in the form of sewage sludge. However, this is only possible if there is regular disposal and proper treatment of the sludge. This is the case in the least situations, so that the sewage sludge of the settling pits pose a great potential for environmental pollution. The settling pits are not desludged for years or decades, so that the sewage sludge is discharged through the overflow into the downstream system due to the maximum fill level. This can lead to deposits and odor problems. This is also negatively favored by the fact that access to the settling pits is very difficult or even impossible due to the close access (gas, routes) or due to the installation underneath the building. A mechanical desludging is therefore not possible in many cases. If it is possible to desludate the settling pits, this is usually done by private companies that have the appropriate equipment. State control or removal of the sludge by the responsible municipal institution is normally not executed.

After the desludging, usually the pumping out of sewage sludge from the settling pit by means of negative pressure, this is disposed of in the subsequent step, but professionally in the rarest cases. Due to a lack of treatment capacity as well as cost saving reasons, the sewage sludge in rivers or lakes is released into the environment untreated. Even if treatment capacities such as on central sewage treatment plants are available, these are not used, as this is associated with longer transport routes and disposal costs.

The use of settling pits in the household area is also the main reason for the achievement of the United Nations Millennium Development Goals on the part of sewage disposal [124].

Around 30% of rural households use human excrement for agricultural production (including food for direct consumption such as vegetables) or aquaculture (fish farming). A previously necessary composting for sanitization does not take place or only rarely sufficiently. The direct use of treated or untreated wastewater for the mentioned uses is also widespread due to the high concentrations of nutrients (N, P, K). The concomitant contamination of heavy metals and pathogens, however, has a negative impact on human health. In addition, there is also a high risk of long-term water pollution at the point of entry [120].

Special case hospitals:

In Vietnam, as in other emerging economies, hospitals are a major point source of wastewater pollution. Only 9% of hospitals have their own wastewater treatment system in operation [120].

Special case craft villages:

In Vietnam there are a total of about 5,000 so-called craft villages in which special products from food processing (such as pasta products, etc.) or textile dyeing are produced. It is striking that almost all families of craft villages pursue the same craft. This partially creates large sewage-bound loads. The craft villages do not have their own sewage treatment plants.

Special case industrial zones:

Industrial plants and companies in Vietnam are usually grouped into industrial zones managed by a management board. In total, the approx. 325 industrial zones in Vietnam have their own wastewater treatment plant. Information on the cleaning services and capacity utilization of the facilities are not available. In contrast to the municipal sewage treatment plants, which are operated by state-owned enterprises, the operation of the plants of the industrial zones is in the hands of private companies, partially also with the participation of foreign companies. The total amount of sewage water from Vietnam's industrial parks is 3 million m^3 / a.

Special case agricultural wastewater:

As we have seen, agriculture is by far the sector with the highest water consumption in Vietnam. A special feature is the decentralized structuring of this sector.

Livestock as a form of agricultural production is in the hands of many small producers (farmers) and not in large-scale industrial enterprises. The households as place of residence and the livestock are often on a property. Since these often also border directly on agricultural areas, in particular rice fields, it is not uncommon for diffuse, but to record high, pollutant inputs in waters in total. As part of state subsidy programs, more than 1 million decentralized biogas tanks (plastic, precast concrete, steel-tested concrete) were built in order to treat wastewater from livestock farming.

The use of treated sewage sludge from central sewage treatment plants as a cultivated substrate / fertilizer substitute in agriculture has so far played no role or a minor role. However, initial approaches / business models for the conversion and use of sewage sludge as a source material for a fertilizer substrate for agriculture and fish farming (composting, fermentation) are available in the private sector. As a rule, the treated sewage sludge is classified as dangerous goods due to the legal requirements and disposed of together with other waste at a central landfill. It can therefore be concluded that there is no adequate and sustainable sewage sludge management in Vietnam.

There is also no intersectoral cooperation in Vietnam in the field of recycling of purified waste water.

5.2. MARKET PARTICIPANTS IN THE WATER MANAGEMENT

Distribution of imports

The total share of German products and goods in Vietnamese imports in 2016 was USD 2.85 billion (approx. EUR 2.29 billion [136]). This puts Germany in 10th place in the world. In terms of import volumes for filter and water treatment technologies in Vietnam in 2016, Germany accounted for 4% (USD 2.85 million / EUR 2.29 million [136]), being in fifth place of all exporting countries, behind Japan (5%), USA (5%), China (39%) and South Korea (47%) [123].

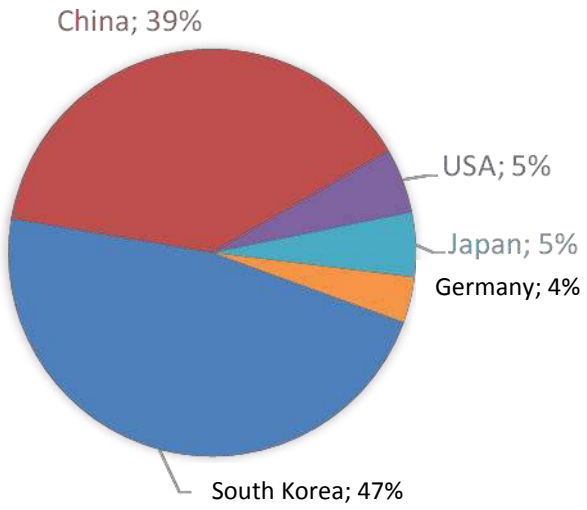


Figure 5.3: Distribution of Vietnamese imports of filter and water treatment technologies (HS Code 8421212) in 2016 (in%)
Source: FAO, 2018 [123]

When looking at Vietnamese imports for this category of goods, it shows a continuous growth. In the period from 2012 to 2016, German exports have more than doubled.

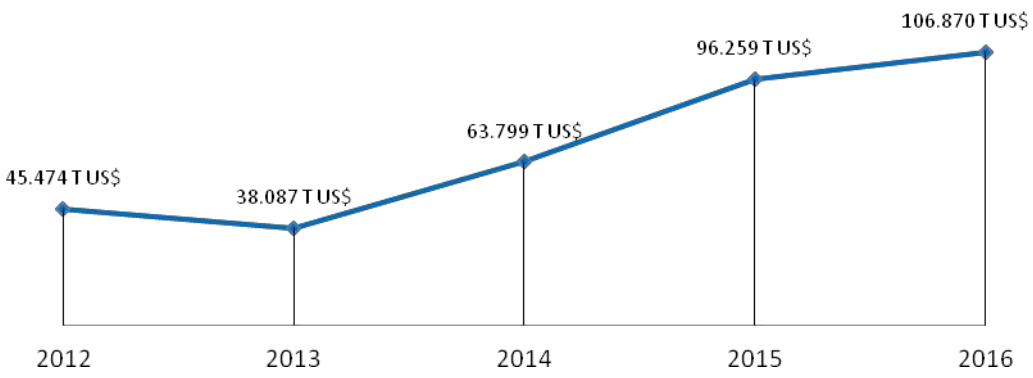


Figure 5.4: Distribution of total imports of filter and water treatment technologies 2012 - 2016 (HS Code 8421212)
Source: UN, 2018 [134]

A similar picture can be seen in the equipment for lifting / transporting water. As the sum of the product groups of power-driven liquid pumps (HS Code 841381) and lifting equipment for liquids (HS Code 841382), the import share of German makes can be determined, even if there is no exclusive allocation of pumps for water and wastewater to these categories. With a share of 7%, Germany (USD 5.15 million / EUR 4.15 million [136]) ranks fifth among all exporting countries, behind China (10%), Indonesia (15%) and USA (19%) and South Korea (47%) [134]].

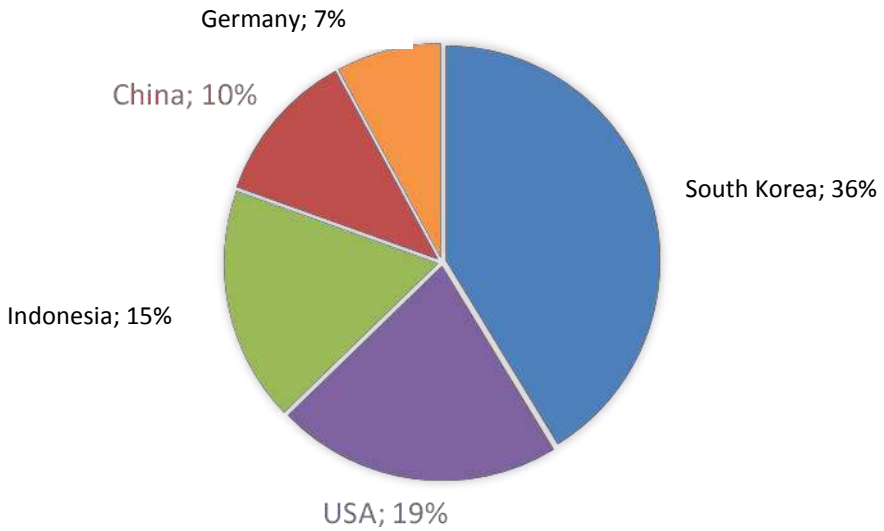


Figure 5.5: Distribution of vietnamese imports for power-driven liquid pumps (HS Code 841381) and lifting equipment for liquids (HS Code 841382) 2016 (in%)
Source: UN, 2018 [134]

Market participants in general

100% of the companies that were previously responsible for the water supply and sewage, are state-owned enterprises which, in addition to the operation of the water and wastewater infrastructures, often also carried out the municipal tasks of green maintenance and waste disposal („City business"). By the decision of the (partial) privatization of these public enterprises (Decree No. 126/2017 / ND-CP) since the year 2005, a sale, in some cases also of majority shares, of public enterprises to private investors takes place. However, public / state water and wastewater companies started much later with the initiation of (partial) privatization processes, so that the process in the sector has only gained momentum for about 5 years. Already privatized companies from the sector continue to follow the plan for the sale of state capital in the period 2017-2020. Even though they have some difficulties and problems (selection criteria of private investors, lack of transparency in price negotiations, etc.), the situation of the already (partially) privatized companies have developed fundamentally for the better. In particular, the financial situation of companies in general should be mentioned. However, far-reaching positive effects on the efficiency of businesses through (partial) privatization have not been achieved so far. This is also due to the fact that the competencies for adjustments to tariffs for water and wastewater are still with the respective People's Committees of the provinces and that price adjustments to increase the efficiency of public / private enterprises can not be directly implemented [136].

There is only limited cooperation or exchange of information between the actors in the areas of water supply and wastewater disposal both at the municipal level and in the area of industrial parks / zones, such as for example in the sense of the German approach of the sewage treatment plant neighboring DWA. Experiences from the operation of the infrastructures and plants therefore remain in the respective company. Each company / institution thus usually develops its own individual strategy in the management of the plants [120].

An overview of the domestic private and public actors in the field of drinking water / wastewater in Vietnam is given in Table 5.1.

Table 5.1: Overview of public and private enterprises in the drinking water / wastewater sector in Vietnam

Enterprise	Website
CAMIX Co. Ltd. **General contractor in the drinking & wastewater sector**	http://camix.com.vn/en/
GOSHU KOHSAN (VIETNAM) CO., LTD. **Engineering Services**	http://www.goshukohsan.com/
Green Eye Environment (GREE) **Consulting company in the environmental and water sector**	http://www.gree-vn.com/indexeng.htm
GreenField consulting & development (GFD) **Consulting company in the energy and water sector**	http://www.gfd.com.vn/en/
Hanoi Water Limited Company (Hawaco) **State water provider in Hanoi**	http://hawacom.vn/
Organo Vietnam **Solutions for drinking and wastewater treatment**	http://organovietnam.vn/en/
Teral Industrial Equipment Supplier Company **Solutions for drinking and wastewater treatment**	http://teral.vn/
TOHIN VIETNAM INDUSTRY **Pumps & ventilators**	http://www.tohin.asia/en
Viet An Environment Technology **Measurement & Monitoring**	http://www.vietan-enviro.com/en/
Saigon Water Corporation (Sawaco) **State water provider in Ho Chi Minh City**	http://www.sawaco.com.vn
Vietnamchemtech **Chemicals for drinking and wastewater treatment**	http://www.vietnamchemtech.com/
Waterchem JSC **Solutions for drinking and wastewater treatment**	http://www.waterchemvn.com/vi/

Source: Own illustration, 2018.

The water supply and wastewater disposal in Vietnam is under strong state control. Foreign companies, including Germans, can not operate without restrictions on the Vietnamese market. Nevertheless, a number of German institutions and companies, including joint ventures, are already active in the Vietnamese water sector (see Table 5.2).

Table 5.2: Overview of German companies and institutions in the Vietnamese water industry

Enterprise	Website
Aerzener Maschinenfabrik GmbH Blowers & compressors for sewage & water industry	https://www.aerzen.com/
Analytik Jena AG Measuring technology	https://www.analytik-jena.de/
BWT Water filter	http://www.bwt-group.com/
Biogest international GmbH Wastewater treatment	http://www.biogest-international.de/
DAS Environmental Expert GmbH Wastewater treatment technology	https://www.das-ee.com/de/
EWEC WATER GmbH Engineering services	http://ewec-water.com/
Festo AG & Co. KG Automation solutions for water treatment and wastewater treatment	https://www.festo.com/water
GKW Consult GmbH Engineering services	https://www.gkw-consult.com/en/home.html
Grundfos High performance pumps for water supply	https://de.grundfos.com/
HOMA Production of pumps	https://www.homa-pumpen.de/
Huber SE Solutions for wastewater treatment, sludge treatment and drinking water supply	http://www.huber.de
Jäger Umwelt-Technik Wastewater treatment solutions	https://www.jaeger-envirotech.com/
KSB SE & Co. KGaA Environmental, water, wastewater technology	https://ksb.com
Merck Measuring technology	https://www.merckgroup.com
OTT Pipelines and membrane fans for sewage treatment plants	https://www.ott-group.com/
Passavant Energy & Environment GmbH Water and wastewater treatment	http://www.passavant-ee.com/

Prominent GmbH Solutions for drinking water and wastwater treatment	https://www.prominent.at/de/
ribeka GmbH Ground water management	https://www.ribeka.com/
SFC Gruppe Planning and delivery of water and wastewater treatment processes	http://www.sfcu.at
Stadtentwässerung Dresden Training program for specialists in wastewater technology	https://www.stadtentwaesserung-dresden.de
Tilia GmbH Consultation of municipal and private companies in the field of water and wastewater treatment	https://www.tilia.info
VEGA Grieshaber KG Measuring technology	http://www.vega.com/
WaterSam GmbH & Co. KG Measuring technology	https://www.watersam.com

Source: own research, 2018

In addition to German players, a large number of other international companies are also active in Vietnam, in particular from Japan and South Korea, but also from EU countries such as the Netherlands or Denmark. An overview of international companies is given in Table 5.3.

Table 5.3: Other foreign market participants in the Vietnamese drinking water / wastewater sector

Enterprise	Website
Biwater Holdings Ltd. Services and equipment for specialized water and wastewater treatment	https://www.biwater.com/
De.Mem Pte Ltd. Construction of three water treatment plants in VN	http://demembranes.com/
De Nora Water Technologies Disinfection and filter technologies	http://www.denora.com/
Hydria Water Solutions for wastewater treatment	http://hydriawater.se/om/
Kurita Water Industries Ltd. Solutions for wastewater treatment	http://www.kurita.co.jp/english/
Landustrie Sneek BV Production of water pumps	http://www.landustrie.nl/de/home.html
Manila Water Company, Inc. Service Provider Water Supply & Wastewater Treatment	https://www.manilawater.com/

Myron L Company Solutions for water quality analysis	http://www.myronl.com/
Saint Gobain Supplier of water pipelines	https://www.saint-gobain.de/
Superior Tank Co., Inc Production of water tanks	https://superiortank.com/
SWAN Analytical Instruments Measuring technology	http://www.swan.ch/
Swing Corporation Planning and construction of water and wastewater treatment plants	https://www.swing-w.com/eng/
Veolia Construction and operation of wastewater treatment plants (including the expansion of a large wastewater treatment plant in Ho Chi Minh City)	http://www.veoliawatertech.com

Source: own research, 2018

German and international companies with activities in the Vietnamese water industry present themselves widely at fairs and events. Two main events can be found in Table 5.4.

Table 5.4: Fairs and events related to the Vietnamese water industry

Event	Website
VietWater (Saigon)	http://www.vietwater.com/
Vietnam International Water Week (Hanoi)	http://viww.vaci.org.vn/

Source: own research, 2018

5.3. LEGAL AND INSTITUTIONAL FRAME CONDITIONS

Strategies and programs

According to reports, in the period 2015-2020, VND 35,000 billion (EUR 1.24 billion [136]) will have to be invested in the expansion and new construction of the drinking water infrastructure. The necessary measures include the construction and expansion of water treatment capacities, the expansion of the pipeline network and the replacement of old pipelines to reduce water losses.

In order to improve wastewater disposal in an urban context (completion of wastewater treatment plants and sewers in major cities such as Hanoi, HCM City, Danang and completion of drainage systems in cities of category IV and higher), the investment needs are estimated at VND 70,000 billion (EUR 2.5 billion [136]) [120].

Public enterprises' investments in urban drinking water projects can be funded from a variety of sources: government budgets, companies' own budgets, and international development cooperation grants and loans (such as the Vietnamese Development Bank) [120]. In the wastewater infrastructure sector, more attention is being paid to the involvement of private investors.

International organizations (eg WHO), donors (eg KfW) and foreign partners play an important active role in financial and technical support, technology transfer, water supply and sanitation, and provision of knowledge and information ("capacity building ") In Vietnam.

Table 5.5: Overview of foreign institutions involved in water and sanitation projects in Vietnam

	AFD	JICA	KEXIM	KfW/GTZ	World Bank	Others
Water supply	X		X		X	Danida, Finida
Wastewater and disposal	X	X	X	X	X	Danida, AusAid
Drains				X	X	

Source: ADB, 2012 [138]

These foreign resources for water supply and wastewater disposal have a major impact on the transformation and conversion of Vietnam's infrastructures. However, problems still exist in project coordination, financing and increasing the effectiveness and allocation of resources. In the period 1998-2012, foreign investment totaled USD 1.0 billion (USD 0.81 billion [136]), representing 80% of the total budget (USD 1.2 billion – USD 0.97 billion) [136]) for the construction and modernization of water supply systems [120].

In 2016, the level of investment in water and wastewater projects with private participation in Vietnam was USD 0.09 billion (EUR 0.07 billion [136]). The timing of investments in water and wastewater projects with private participation in Vietnam is shown in Figure 5.6. Due to the inconsistent database, it is only possible to make limited statements about the development over time of the investments.

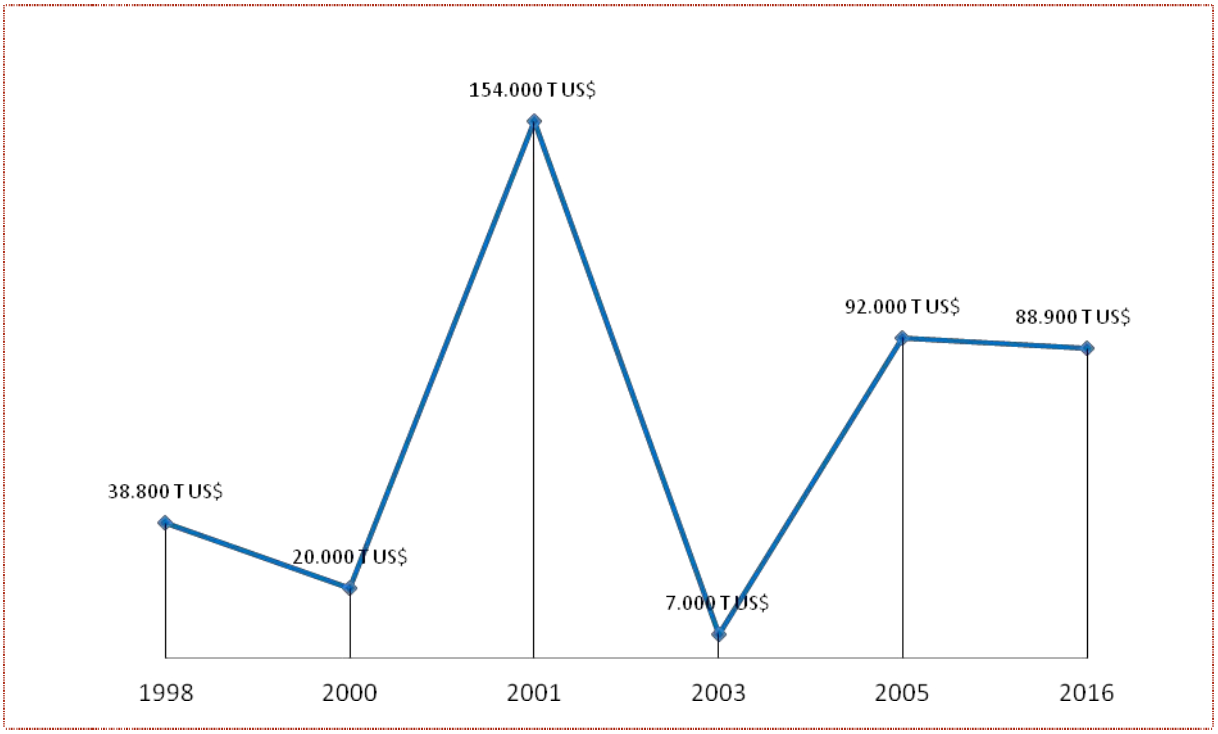


Figure 5.6: Investments in water and wastewater projects with private participation
Source: World Bank, 2018 [123]

Total cumulative direct investment in Vietnam in 2017 was USD 318.7 billion (EUR 256.6 billion [136]). German direct investment contributed USD 1.76 billion (EUR 1.42 billion [136]) in the same year, accounting for only 0.6% of direct investment [128].

Significant financial efforts are needed to achieve development goals in the water and wastewater sector by 2020. Using a differentiated mix of technologies with characteristic investment costs for each technology, as well as a specified population development, USD 1.56 billion (EUR 1.26 billion [136]) are allocated annually to the drinking water supply (67% for urban areas / 33% for rural areas) and USD 1.14 billion (EUR 0.92 billion) for wastewater disposal. The allocation foresees 68% for urban and 32% for rural areas. However, the demand and the available financing options differ significantly. These are USD 208 million (EUR 167 million [136]) for water and USD 231 million (EUR 186 million [136]) for wastewater. In practice, only a fraction of the investment needed to meet the development goals set is available [126].

All in all, more than 40% of all investment funds are needed for replacement investments in the area of water and wastewater. This leads to the conclusion that the existing plants already have a high degree of technical degradation. Consequently, maintenance measures to maintain or prolong the technical service life have not been adequately implemented in the past [124].

On the side of operating costs, it also shows that the urban area is relatively more financially dependent on the water supply and wastewater disposal sector than on rural areas (see Figure 5.7). This is due, among other things, to the fact that plants at rural areas are usually not operated by a central public institution, but often by the households themselves and partly also financed. In the rural area, the plans under the responsibility of public enterprises are also more likely to be assigned to the low-tech segment, where specific operating costs are generally lower than for complex centralized systems. Added to this is the lower number of technical facilities in rural areas.

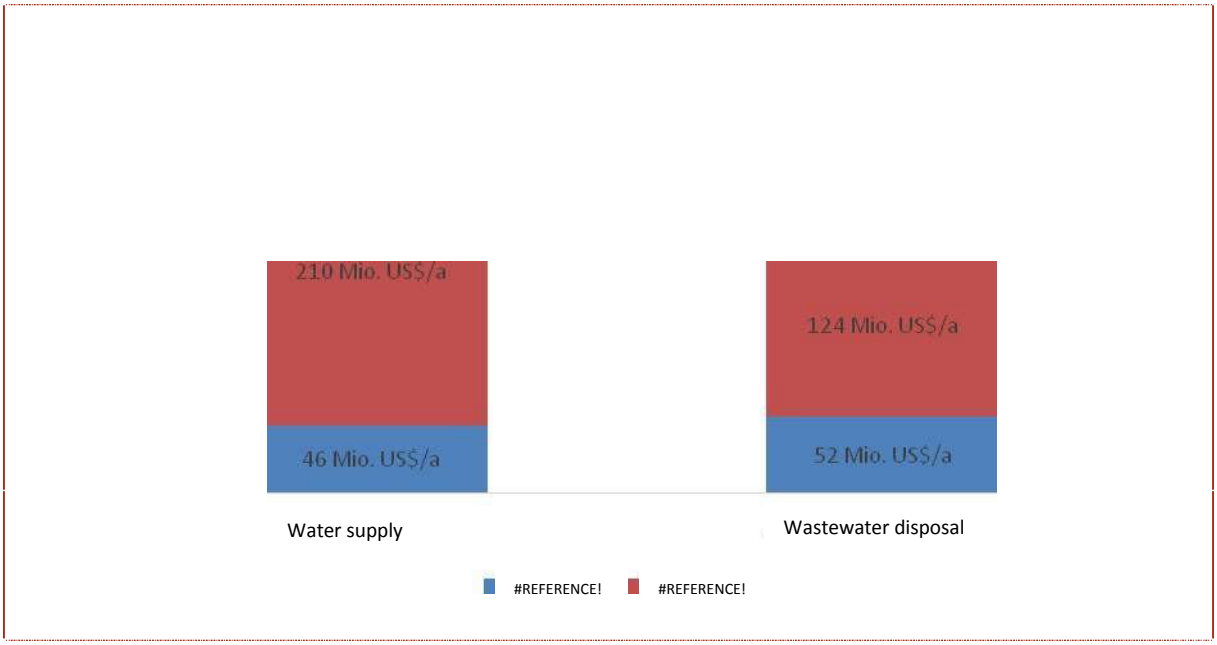


Figure 5.7: Annual expenses for operation and maintenance of water supply and wastewater disposal in rural and urban areas in Vietnam
Source: World Bank, 2014 [124]

Since the Vietnamese economy has experienced a clearly positive development in recent years and thus more own financial resources will be available, the availability or, from the perspective of external financiers, the necessity of foreign funds (grants, low-interest loans, etc.) decrease in the next few years. Support from foreign institutional donors will therefore focus on providing credit financing for infrastructure projects.

According to the plans of the Vietnamese government, by 2020, the share of so-called "non-revenue water" through illegal withdrawals and water losses in the drinking water network should be reduced to 15%. By 2025, water companies should be economically self-sufficient, ie they should be cost-effective [132].

Essential regulations

From a regulatory perspective, Vietnam has taken over the past few years a significant step to secure the resource water in the long term. The most important regulations and laws of the Vietnamese water sector are listed in the following table:

Table 5.6: main regulations and laws related to the Vietnamese water sector

Regulation/law	Main topics
Decree No. 124/2011 ND-CP	Drinking water production, supply and consumption in centralized water supply systems in urban and rural areas, industrial parks, export processing zones, high-tech zones and economic areas
Decree No. 117/2007 NĐ-CP	Production, supply and consumption of drinking water
Decision No. 1929/QĐ- TT	Orientation for the development of water supply in Vietnam in urban areas and industrial parks to 2005 and the vision to 2050
Decision No. 1566/QĐ- TTg (09.08.2011)	Safe drinking water supply for the nation, period 2016-2025
Decision No. 22/QĐ- BNN-TCCB (05.08.2018)	Drinking water supply for rural areas
Decision No. 2038/QĐ- TTg (15.11.2011)	Guidelines for waste management in health care in the period 2011-2015 and alignment for the year 2020
QCVN 01:2009/BYT	NATIONAL TECHNICAL REGULATION ON DRINKING WATER QUALITY
QCVN 02:2009/BYT	NATIONAL TECHNICAL REGULATION ON WATER QUALITY (Limits for quality criteria on water for household use but not for direct drinking or processing of food)
QCVN 08:2008/BTNMT	National standards on surface water
Decision No. 16 / QĐ – BXD	Water safety regulations and implementation of a Water Safety Plan (WSP)
Decree No. 80/2014 NĐ -CP	Drainage, sewerage and wastewater treatment in centralized water supply systems in urban areas, industrial parks, export processing zones, high-tech zones and economic areas

Source: own research, 2018

In summary, from a regulatory point of view, the basic prerequisites for the implementation of a sustainable and economic water and wastewater industry have been created. However, there are often difficulties in implementing the regulations, especially at the downstream levels. Predefined limit values, for example, for the effluent from sewage treatment plants are only checked at intervals of very long periods, so that only limited statements can be made about the cleaning performance of the plants. Based on Decree No. 80/2014 NĐ -CP (see Table 5.6), in particular, the participation of private investors and consulting companies in the water and wastewater industry is to be promoted. In the practical implementation, however, this has hardly been done so far. The public enterprises in the sector have, as described above, earmarked budgets allocated by the People's Committee for the operation of the facilities. From these budgets, it is simply not possible for companies to hire external companies for support because these positions are not in the budget.

Authorities and their responsibilities

In the water and wastewater sector, various state ministries have responsibilities in the management of water resources.

Table 5.7: Ministries of Vietnam with relevance to water management

Authority/ministry	Responsibility
MoC - Ministry of Construction	Development planning, introduction of technologies, approval of regulations and construction standards
MoNRE - *Ministry of Natural Resources and Environment*	Water resources in general, planning and management, monitoring, issuing of water rights, legal foundations
MoH - Ministry of Health	Water resource protection, catchment areas, environmental control, wastewater parameters
MARD - Ministry of agriculture and rural development	Wastewater disposal in rural areas and in agriculture.
MoST - Ministry of Science and Technology	Management of research and development in the field of water resources
MPI - Ministry of Planning and Investment	Investment planning and decision for the development of water supply and wastewater disposal

Source: own research, 2018

For the municipal water supply and disposal sector, the MoC is the lead ministry with extensive responsibilities.

The structure of the ministries at the state level is reflected analogously at the provincial level. On this the ministries have corresponding departments and subordinate offices.

Water and sewage tariffs

In general, the tariff system for water and wastewater has not existed for a long time, especially as wastewater disposal, as part of the provision of essential services, does not last long as it is today. For example, based on Decree No. 117 / NĐ-CP 11.07.2007, many water utilities have for the first time carried out an accurate and adequate calculation of all costs and the formation of a resulting water tariff [120].

The consumption of drinking water is calculated on the basis of the actual consumption of households. The prices are subject to a range of USD 0.20 - 0.70 / m³ (VND 4.500-15.900 / m³; EUR 0.16-0.56 / m³ [136] 106). The wastewater disposal fee (if any) is typically only 10% of the drinking water charge, with a household wastewater charge of 100% ("return factor") of drinking water consumption.

These fees usually cover only max. 20% of the operating costs incurred for the wastewater infrastructure. A cost-covering operation can therefore not be expected. Even proactive cities such as Soc Trang can not fully cover their operating costs through the collection of wastewater charges. The operation of the infrastructures is financed from the budgets of the municipalities or cities, which are set for each year. However, this budget (for both water and wastewater) usually does not include the cost of depreciation, replacement investment or repair costs, but only personnel, energy, resources, etc.

This means, on the one hand, that the incentives to cut costs on the part of public enterprises are low, as they are allocated fixed budgets each year. Measures to save energy, recover nutrients or reuse are therefore not yet given any significance in the public sector. However, the involvement of private partners in public enterprises will increase the pressure for cost reduction in the future.

On the other hand, users (end users) have little or no relation to the service they use, since the charge (s) are not directly related to the actual costs of operating the infrastructure.

In addition to the urban areas, frame conditions have already been created in many rural regions, in the sense of a detailed, cost-based accounting, for the introduction of cost-effective drinking water tariffs (operation, maintenance and depreciation costs). However, the management of drinking water supply systems still frequently shows deficits, so that in many places, there is still no way of talking about effective and sustainable operation.

The fixing of tariffs for water supply and wastewater disposal is the responsibility of the people's committees of the respective provinces on the basis of the frame conditions set by the Ministry of Finance (MoF).

5.4. BUSINESS OPPORTUNITIES FOR GERMAN COMPANIES

As a test, new technological approaches in Vietnam have already been tested and used. On the part of drinking water management and supply, the following is particually to be mentioned [120]:

- Use of Geographic Information Systems (GIS) to map facilities
- Application of SCADA / PCS (Supervisory Control and Data Acquisition / Process Control) systems for controlling and monitoring technical processes, e.g. on waterworks
- Installation of water quality control equipment in the drinking water network
- Regulating valves for reducing the pressure in the drinking water network
- Leak detection equipment (e.g., ultrasonic gauges)
- Frequency converter for pumping stations for power regulation of the flow rates in the drinking water pipeline network
- Cleaning the pipe systems

These technological approaches will play a more significant role in the future, with the result that sales opportunities for German companies will emerge. However, the long-term functionality of the infrastructures also requires training and advanced training in handling the new technologies. The management and the associated management know-how are an important element in the improvement of the Vietnamese water industry.

In particular, the following aspects are important in this context:

- Enabling and achieving full cost coverage for investment and service delivery through economic action scope and economic direction
- Enabling and facilitating tariff adjustments to create incentives for private enterprise participation
- Improving the independence and autonomy of water and wastewater companies (decentralization)

The priorities of projects and investment measures are mainly in the urban area. And in particular in the expansion of treatment capacities for wastewater treatment (sewage treatment plants). The investments for drainage and discharge of dirt and rainwater have so far been less advanced, so there is an even greater need for investment here.

However, in the more rural, partly poorer areas of Vietnam, there are still major deficits in both drinking water supply and disposal. Increased investment will be needed in future to achieve 85% sanitation in rural areas by 2020 [126]. Particularly cost-effective solutions for a large-scale deployment of semi- and decentralized systems are necessary here. There is therefore great potential for private sector involvement in this area, including for German companies [124].

There are potentials for the planning of new cost-optimized sewage treatment plants and pumping stations especially for urban wastewater disposal. So far, the technical conceptions only slightly took into account the operating phase. Energy-efficient wastewater treatment plants will therefore gain in importance with increasing decentralization and privatization (opening up of the market). The corresponding equipment and technical knowledge must be imported, as these new technologies are not yet available in Vietnam. Efforts by the government to expand capacities in the environmental industry, however, exist. By 2025, plants and technology for wastewater treatment from Vietnamese production should account for 70-80% of total wastewater treatment. To create the necessary capacities, great efforts are needed in technology and knowledge transfer. In particular, there are many opportunities for companies in the German water sector, both in the distribution of

components and equipment and in engineering services [127]. Pure consulting services are rarely directly commissioned, as is usually the case in other emerging markets. Normally, EPC contracts are awarded.

German products and goods enjoy a high regard in Vietnam, as in many other countries. Quality, longevity and technical innovation represent the added value of products, which should be emphasized in the market launch and distribution, because the growing competition with Vietnamese manufacturers will lead to increasing price pressure.

By 2020, at least 40 new central sewage treatment plants are to be built. The total capacity of these plants will be approximately 3.2 to 3.5 million m^3/d. According to estimates by the MONRE, investments of USD 10.2 billion (EUR 8.2 billion [136]) are necessary for this. In addition to international donors, such as the World Bank or the Asian Development Bank, private equity investments in the form of PPPs are the preferred sources of financing for the projects [127]. With a final expansion capacity of 830,000 m^3/d, the NLTN sewage treatment plant in HCMC will be the largest central treatment plant in Southeast Asia after completion [130].

In addition to major projects for central sewage treatment plants, there is also a substantial market for smaller wastewater treatment plants and solutions for wastewater reuse. Furthermore, solutions for the treatment of faecal sludge will become more important in the future.

In 2017, German companies invested USD 340 million (EUR 273 million [136]) in Vietnam, four times as many as the year before. From an economic point of view, the low labor costs, rising economic growth and a stable political system in Vietnam, especially in comparison with Germany, are positive. Growth in GDP was in 2017 + 6.7%. Growth of + 6.5% is forecast for 2018 [129].

The CPTPP (Comprehensive and Progressive Agreement for Trans-Pacific Partnership [139]) and the EU-Vietnam Free Trade Agreement (FTA [141]), which came into force on 8 March 2018, strengthen Vietnam's economic recovery. The latter will significantly simplify import conditions, making imports of goods from Germany to Vietnam significantly cheaper, which will in turn benefit the competitive advantage of German companies.

For goods from Germany, exports to Vietnam are currently subject to reduced customs duties (goods from Most Favored Nations - MFN) which will gradually disappear in the coming years, in whole or in large part due to the FTA with the EU.

In addition, there is an additional reduced tariff for certain goods, eg for those that are not produced in Vietnam and are imported as fixed assets. In general, the regulations governing the import conditions for goods from Germany to Vietnam are considered to be modest [128].

Obstacles to business development include the lack of skilled workers and, moreover, a non-transparent regulatory environment. Vocational or higher education can only boast about 16% of Vietnam's total workforce [128].

Important for the success of economic aspirations of German companies, as in other emerging markets, is the representation in the form of a branch or a joint venture in the country itself. It should be noted that the establishment of an official subsidiary or a new company in Vietnam of Germany is associated with a considerable effort, both in terms of time and cost. The situation is much simpler when it comes to founding a company with a local Vietnamese partner. The local presence of local Vietnamese (native speaker) staff is just as essential for economic success as for respecting cultural practices.

6. USEFUL CONTACTS

Foreign trade promotion and consulting

Organisation:	Delegation of German Business in Vietnam – gic/AHK Vietnam
Address:	*Office HCMC* 5th Floor, 21-23 Nguyen Thi Minh Khai Dist.1, Ho-Chi-Minh-City, Vietnam *Office Hanoi* Lotte Center Hanoi, East Tower 18th Floor, 54 Lieu Giai Street Ba Dinh District, Hanoi, Vietnam
Contact Person:	Office HCMC: Marko Walde Office Hanoi: Not known
Telephone:	Büro HCMC: +84 (28) 3823 9775 Büro Hanoi: +84 (24) 38251420
Email:	info@vietnam.ahk.de
Website:	http://www.vietnam.ahk.de/

Organisation:	GTAI - Germany Trade & Invest
Address:	Friedrichstraße 60 10117 Berlin
Contact Person:	Anna Westenberger
Telephone:	+49 30 200 099 393
Email:	Not known
Website:	http://www.gtai.de/GTAI/Navigation/DE/Trade/Weltkarte/Asien/vietnam.html

Organisation:	Trade section of the Embassy of the Socialist Republic of Vietnam
Address:	Elsenstraße 3, 12435 Berlin
Contact Person:	Not known
Telephone:	+49 30 53 63 01 08
Email:	tradesection@vietnambotschaft.org
Website:	Not known

Banks

Organisation:	KfW Entwicklungsbank
Address:	KfW Office Hanoi Hanoi Tower 12th Floor 49 Hai Ba Trung Street Hanoi, Vietnam
Contact Person:	Christian Haas (Director KfW Office)
Telephone:	+84 (24) 3934 5355
Email:	kfw.hanoi@kfw.de
Website:	https://www.kfw-entwicklungsbank.de/Internationale-Finanzierung/KfW-Entwicklungsbank/Weltweite-Pr%C3%A4senz/Asien/Vietnam/index.html

Organisation:	KfW IPEX-Bank GmbH
Address:	Representative office Singapore (ASEAN region) 6 Shenton Way OUE Downtown 2 # 20-11 Singapore 068809
Contact Person:	Klaus Sander (Office manager)
Telephone:	+ 65 6422 1568
Email:	Klaus.Sander@kfw.de
Website:	https://www.kfw-ipex-bank.de/Internationale-Finanzierung/KfW-IPEX-Bank/Unternehmen/Standorte/Singapur/

Organisation:	AKA Ausfuhrkredit-Gesellschaft mbH
Address:	Grosse Gallusstraße 1-7, 60311 Frankfurt am Main
Contact Person:	Not known
Telephone:	+49 69 2989100
Email:	info@akabank.de
Website:	www.akabank.de

Organisation:	The World Bank
Address:	Country Office Hanoi, 8th Floor, 63 Ly Thai To, Hanoi, Vietnam
Contact Person:	Not known
Telephone:	+84 (24) 39346600
Email:	vietnam@worldbank.org
Website:	http://www.worldbank.org/en/country/vietnam

Organisation:	Asian Development Bank (ADB)
Address:	Vietnam Resident Mission (VRM) - Asian Development Bank 3rd Floor, Cornerstone Building, 16 Phan Chu Trinh Street, Hoan Kiem District, Ha Noi, Viet Nam
Contact Person:	Not known
Telephone:	+84 (4) 39331374
Email:	Not known
Website:	http://www.adb.org/countries/viet-nam/main

Organisation:	Asian Infrastructure Investment Bank (AIIB)
Address:	AIIB Headquarters B-9 Financial Street, Xicheng District, Beijing 100033, P.R. China
Contact Person:	Not known
Telephone:	+86 10 8358 0000
Email:	information@aiib.org
Website:	http://www.aiib.org

Organisation:	International Finance Cooperation (IFC)
Address:	*Hanoi Office:* 3rd Floor, 63 Ly Thai To Street, Hanoi, Vietnam *HCMC Office:* 3rd Floor, Somerset Chancellor Building 21-23 Nguyen Thi Minh Khai St., District 1, Ho-Chi-Minh-City, Vietnam Tel: (+84) 8 3982 6100
Contact Person:	Kyle Kelhofer (Country Manager)
Telephone:	Hanoi Office: +84 (4) 3934 2282 HCMC Office: +84 (8) 3982 6100
Email:	kkelhofer@ifc.org
Website:	http://www.ifc.org/wps/wcm/connect/region ext_content/IFC_External_Corporate_Site/East+Asia+and+the+Pacific

TZ/FZ-Representatives

Organisation:	Deutsche Gesellschaft für Internationale Zusammenarbeit
Address:	GIZ-Office Hanoi 6th Floor, Hanoi Towers, 49 Hai Ba Trung Street Hanoi, Vietnam
Contact Person:	Jasper Abramowski (Country Director GIZ-Office Hanoi)
Telephone:	+84 4 39 34 49 50 / -51
Email:	giz-vietnam@giz.de
Website:	https://www.giz.de/de/weltweit/357.html

Organisation:	DEG - Deutsche Investitions- und Entwicklungsgesellschaft mbH
Address:	DEG-Foreign Office Thailand / Vietnam Office Bangkok Empire Tower 1905 195 South Sathorn Road / Yannawa Sathorn, 10120 Bangkok Thailand
Contact Person:	Jochen Steinbuch
Telephone:	+66 2 034 0771
Email:	jochen.steinbuch@deginvest.de
Website:	https://www.deginvest.de/Internationale-Finanzierung/DEG/%C3%9Cber-uns/Unsere-Standorte/Thailand/

Networks and associations

Organisation:	RETech - German Recycling Technologies and Waste Management Partnership e. V.
Address:	Kalckreuthstraße 4, 10777 Berlin
Contact Person:	Karin Opphard, Managing Director
Telephone:	+49 30 31582-501
Email:	karin.opphard@retech-germany.net
Website:	www.retech-germany.net

Organisation:	GWP - German Water Partnership
Address:	Reinhardtstraße 32, 10117 Berlin
Contact Person:	Julia Braune / Managing Director
Telephone:	+49 30 3001991220
Email:	info@germanwaterpartnership.de
Website:	www.germanwaterpartnership.de

Organisation:	EU-Vietnam Business Network (EVBN)
Address:	15th floor, The Landmark, 5B Ton Duc Thang, District 1, Ho-Chi-Minh-City, Vietnam
Contact Person:	Not known
Telephone:	+84 (0)28 3823 9515
Email:	info@evbn.org
Website:	http://www.evbn.org

Organisation:	German Asia-Pacific Business Association (Ostasiatischer Verein e.V.)
Address:	OAV – Business office Bleichenbrücke 9 20354 Hamburg
Contact Person:	Timo Prekop – Managing Director
Telephone:	040 - 35 75 59-0
Email:	oav@oav.de
Website:	https://www.oav.de/

Organisation:	VWSA - VIETNAM WATER SUPPLY AND SEWERAGE ASSOCIATION
Address:	Ngọc Khánh Plaza, 1 Phạm Huy Thông, Ngọc Khánh, Ba Đình, Hà Nội
Telephone:	04 39743457
Email:	office@vwsa.org.vn
Website:	http://vwsa.org.vn/en/

Diplomatic representations

Organisation:	Embassy of the Federal Republic of Germany in Vietnam (Deutsche Botschaft, Hanoi)
Address:	Embassy of the Federal Republic of Germany, B.P. 39, Hanoi, Vietnam
Contact Person:	Christian Berger
Telephone:	+84 24 32 67 33 35
Email:	info@hanoi.diplo.de
Website:	www.hanoi.diplo.de

Organisation:	German Consulate General in Ho Chi Minh City
Address:	126 Nguyen Dinh Chieu - Q. 3 Ho-Chi-Minh-City Vietnam
Contact Person:	Conrad Cappell
Telephone:	+84 8 38 29 19 67
Email:	info@ho-chi-minh-stadt.diplo.de
Website:	www.ho-chi-minh-stadt.diplo.de www.botschaft-konsulat.com/Konsulate/1418/Deutschland-in-Ho-Chi-Minh-Stadt

Organisation:	Embassy of the Socialist Republic of Vietnam in Berlin
Address:	Elsenstraße 3, D - 12435 Berlin
Telephone:	+49 30 53630108
Email:	info@vietnambotschaft.org
Website:	http://www.vietnambotschaft.org

German-speaking law firms and tax consultants

Information on tax advisory bodies and law firms is available from the Embassy of the Federal Republic of Germany in Vietnam and the Delegates of German Business in Vietnam. The last mentioned institution has a list online at http://www.vietnam.ahk.de/vietnaminfo/rechtsberatung/.

Organisation:	Rödl & Partner Vietnam
Address:	20F, CJ Tower, 2bis-4-6 Le Thanh Ton, District 1, Ho-Chi-Minh-City
Contact Person:	Stefan Ewers
Telephone:	+84 (28) 73 07 27 88;
Email:	stefan.ewers@roedl.pro
Website:	https://www.roedl.de/unternehmen/standorte/vietnam/

Organisation:	Duane Morris Vietnam LLC
Address:	*Office Hanoi:* Pacific Place, Unit V1307/1308, 13th Floor 83B Ly Thuong Kiet Street Hoan Kiem District, Hanoi *Office HCMC:* Suite 1503/04, Saigon Tower 29 Le Duan Street District 1, Ho-Chi-Minh-City
Contact Person:	Oliver Massmann
Telephone:	+84 24 3946 2205
Email:	omassmann@duanemorris.com
Website:	https://www.duanemorris.com/offices/hanoi.html

Organisation:	Grünkorn & Partner Law Co., Ltd.
Address:	*Office Hanoi:* 3rd Floor, Savina Building 1 Dinh Le Street, Hanoi *Office HCMC:* 12th Floor, TMS Building 172 Hai Ba Trung, Distrikt 1 Ho-Chi-Minh-City
Contact Person:	Wolfram Grünkorn
Telephone:	+84 24 7302 5770, +84 28 7302 5772
Email:	info@laywer-vietnam.com
Website:	http://www.lawyer-vietnam.com

Regional Economic Representations of Germany in Vietnam

Description	Internet address
Representation of the Free State of Bavaria in Vietnam	http://www.vietnam.ahk.de/vertretungen/freistaat-bayern/
Representation of the state of Saxony-Anhalt in Vietnam	http://www.vietnam.ahk.de/vertretungen/sachsen-anhalt/

Domestic contacts for target country information

Description	Internet address
iXPOS (Foreign trade portal of the federal government)	http://www.ixpos.de
iXPOS (Foreign trade portal of the federal government, financing and hedging)	http://www.ixpos.de/IXPOS/Navigation/DE/Ihr-geschaeft-im-ausland/finanzieren-und-absichern.html
iXPOS Export Community (Business opportunities)	https://www.ixpos.de/IXPOS/Navigation/DE/community.html
IHK zu Köln (Priority chamber Vietnam)	http://www.ihk-koeln.de/Vietnam.AxCMS?ActiveID=1904
IHK Pfalz/Ludwigshafen (Competence Center Vietnam)	http://www.pfalz.ihk24.de/international/Kompetenzzentrum_Vietnam/
European Chamber of Commerce in Vietnam	http://www.eurochamvn.org
Asia-Pacific Committee of the German Economy (APA)	https://www.asien-pazifik-ausschuss.de/de

Funding Information / Trade Programs / BMWi market development program

Description	Internet address
Institutions of foreign trade promotion, available on the BMWi website	http://www.bmwi.de/Redaktion/DE/Dossier/aussenwirtschaftsfoerderung.html
Förderinfo-Bund, Funding Advice for the Federal Government - Research and Innovation	http://www.foerderinfo.bund.de
Funding database - funding programs and grants from the federal government, the federal states and the EU	http://www.foerderdatenbank.de
Foreign trade fair program of the federal government	http://www.auma.de/de/tippsfueraussteller/foerderprogrammeausland/auslandsprogrammbund/seiten/default.aspx
BMWi market development program	http://www.ixpos.de/IXPOS/Navigation/DE/Ihr-geschaeft-im-ausland/Abnehmer-und-partner-finden/Kontaktveranstaltungen/bmwi-markterschliessungsprogramm.html

Portals for more specific target market information

Description	Internet address
Destatis – Data about the country	https://www.destatis.de/DE/ZahlenFakten/LaenderRegionen/Internationales/Land/Asien/Vietnam.html
GTAI Country information	www.gtai.de/GTAI/Navigation/DE/Trade/Weltkarte/Asien/vietnam.html
Agaportal	https://www.agaportal.de/main-navigation/schnellzugriff-aga-konsortium/laenderinformationen-aga-konsortium
iMOVE-Marktet information Vietnam	https://www.imove-germany.de/cps/rde/xchg/imove_projekt_de/hs.xsl/vietnam.htm
Kooperation International	http://www.kooperation-international.de/laender/asien/vietnam/

Selected Vietnamese partners in business and science

Description	Internet address
URENCO Hanoi	http://urenco.com.vn/
CITENCO Ho-Chi-Minh-City	http://www.citenco.com.vn/
Centre of Water Management and Climate Change (Vietnam National University – Ho-Chi-Minh-City)	Ansprechperson: Direktor Prof. Dr. Ho Long Phi, http://wacc.edu.vn/about/
Vietnam Association for Urban & Industrial Zone Environment Hanoi	Ansprechperson: Deputy Chair, Nguyen Van Hoa

Important Vietnamese authorities in economic and trade matters

Description	Internet address
Ministry of Industry and Trade (MOIT)	http://www.moit.gov.vn
Ministry of Planning and Investment (MPI)	http://www.mpi.gov.vn
Vietnam Chamber of Commerce and Industry (VCCI)	www.vcci.com.vn
Vietnamese Customs Department	http://www.customs.gov.vn
Foreign Investment Agency	http://www.fia.gov.vn
General Department of Taxation	http://www.gdt.gov.vn

Other relevant ministries and authorities

Organisation:	Ministry of Natural Resources and Environment
Address:	10 Ton That Thuyet-Cau Giay, Hà Nội, Viet Nam
Contact Person:	Mr. Trần Hồng Hà (Acting Minister)
Telephone:	+84 (43) 7956868
Email:	portal@monre.gov.vn
Website:	http://www.monre.gov.vn

Organisation:	Vietnam Environment Agency (VEA)
Address:	No. 10, Ton That Thuyet Street, Nam Tu Liem District, Hà Nội, Viet Nam
Contact Person:	Dr. Nguyen Van Tai (General Director VEA)
Telephone:	+84 (24) 39424581
Email:	admin@vea.gov.vn
Website:	www.vea.gov.vn

Organisation:	Centre for Environmental Monitoring
Address:	No. 556, Nguyễn Văn Cừ Street, Long Biên District, Hà Nội, Viet Nam
Contact Person:	Not known
Telephone:	+84 (4) 35771816
Email:	cemdi@vea.gov.vn
Website:	www.cem.gov.vn

NGOs

Organisation:	Water Solutions International (WSI e.V.)
Address:	Köpenicker Straße 375, Haus 201 12555 Berlin - Germany
Contact Person:	Frank Pogade
Website:	http://www.watersolutions-international.org

Vietnamese fair organizers and fairgrounds

Vietnam Trade Promotion Agency - VIETRADE		http://en.vietrade.gov.vn/
Vietnam National Trade Fair and Advertising - Vinexad		N/A
Saigon Exhibition and Convention Centre - SECC	Ho-Chi-Minh-City	approx. 9,200 m² of exhibition space
Tan Binh Exhibition and Convention Centre - TBECC	Ho-Chi-Minh-City	approx. 7.200 m² of exhibition space
Vietnam Exhibition and Fair Centre - VEFAC	Hanoi	approx. 8.800 m² of exhibition space
Hanoi Internat Centre for Exhibition - I.C.E	Hanoi	N/A

7. LITERATURE

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