



Ministry of Industry and Trade



Supported by:



Federal Ministry
for Economic Affairs
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on the basis of a decision
by the German Bundestag



STUDY TOUR ON GREEN HYDROGEN IN GERMANY AND BELGIUM

General Information

WELCOME

It is our great pleasure to welcome you the study tour in Germany and Belgium from 24.06.2023 to 02.07.2023. The study tour is being conducted as part of the PtX activities of the Energy Support Programme of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH with funding from German Federal Ministry of Economic Affairs and Climate Action (BMWK) and German Federal Ministry for Economic Cooperation and Development (BMZ).

The goal of this study tour is to exchange experiences and knowledge on green hydrogen and Power-to-X (PtX) development, covering topics on technology, policy and legislation design.

The tour will cover prominent locations such as Cologne, Dortmund, Leverkusen, Belgium. Joining the tour, the delegates will acquire comprehensive understandings of green hydrogen and PtX value chains through meetings, manufacturing site visits, and firsthand experience at institutions working on the area of PtX industry. At the end of the tour, delegates will also have the opportunity to visit the European Commission and the Association of Municipal Companies in Brussels to gain insights into the legislative and policy development concerning hydrogen topics.

We look forward to insightful meetings, fruitful discussions, and rich experiences for all of us. It is our sincere hope that the study tour will facilitate the ideas for developing legal frameworks for governing the PtX industry in Vietnam as well as PtX projects.

Your GIZ PtX Outreach Project Team

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1. INTRODUCTION OF INSTITUTIONS TO VISIT

1.1. Covestro AG

Leverkusen/Perth Fortescue Future Industries (FFI), a global green energy and green industry company based in Australia, and Covestro intend to enter into a long-term agreement for the supply of green hydrogen (GH₂) and its derivatives, including green ammonia. According to the Memorandum of Understanding (MoU), FFI and Covestro will formalise an agreement under which FFI will supply Covestro with the equivalent of up to 100,000 tons of GH₂ per year. The arrangement will enable Covestro to reduce its greenhouse gas emissions by up to 900,000 tons of CO₂ per year, by replacing grey hydrogen and its derivatives with GH₂. The deliveries are earmarked for three potential locations – Asia, North America and Europe – and could commence by 2024.

Website: <http://www.covestro.com>

1.2. Covestro Chempark

Leverkusen is one of the world's most versatile locations for the chemical industry. More than 5,000 chemicals are manufactured here and, if necessary, disposed of safely. Hazardous chemical waste is handled expertly at our BÜRRIG Waste and Recycling Management Center, which is far from being just a regional facility.

The 480-hectare Leverkusen site offers excellent opportunities for all kinds of companies – from chemical and pharmaceutical industries to the high-tech sector. More than 5,000 chemicals are manufactured at CHEMPARK Leverkusen, mainly nitration and chlorination products, aromatics, fine chemicals, and silicon chemicals.

More than 31,500 people (as at: 5/2020) work here, ensuring that CHEMPARK keeps on developing as a skills center. Know-how, efficiency and responsibility are key to the success of this chemical park site. Here, environmental protection and safety are considered just as important as cost-effectiveness and product quality.

The Leverkusen site is also located in a part of Germany where both the standard of living and the quality of life are high – in urban and rural areas alike. It is located close to the major Rhineland cities of Cologne and Düsseldorf, the latter having the largest Japanese community in Germany. Both cities are important media centers and exhibition venues. With international schools and a superb choice of cultural attractions on their doorstep, CHEMPARK has everything a company and its workforce could wish for.

Website: <https://www.chempark.com/en/chempark-leverkusen.html>

1.3. Evonik partly of GET H2 Nukleus

Evonik Industries AG Evonik is a global leader in specialty chemicals. The Group is active in over 100 countries and in 2019 generated sales of 13.1 billion and a profit (adjusted EBITDA) of EUR 2.15 billion. Evonik goes far beyond chemistry to create value-adding and sustainable solutions as a partner to its customers. More than 32,000 employees are united by a common drive: They want to make life better, day after day.

Evonik has won the 2021 European Responsible Care Award® in the category "En route to climate neutrality" with the "GET H2 Nukleus" project. The European chemical association Cefic awards this prize annually.

The "GET H2" partners bp, Evonik, Nowega, OGE and RWE Generation want to jointly build the first publicly accessible hydrogen infrastructure. The "GET H2 Nukleus" project connects

the production of green hydrogen with industrial consumers in Lower Saxony and North Rhine-Westphalia. The approximately 130-kilometre network from Lingen to Gelsenkirchen is to become the first H2 network with non-discriminatory access and transparent prices.

Website: <https://www.get-h2.de>

1.4. Fraunhofer UMSICHT

Fraunhofer UMSICHT is a research institute for Environment, Safety and Energy Technology UMSICHT. The institute is pioneering the way to a sustainable world. Their research covers the areas of climate-neutral energy systems, resource-efficient processes and circular products, making concrete contributions to achieve the 17 Sustainable Development Goals (SDGs) of the United Nations.

Fraunhofer UMSICHT develops innovative, industrially feasible technologies, products and services for the circular economy and brings them to application. The focus is on the balance of economically successful, socially equitable and sustainable developments.

The institute has sites in Oberhausen, Willich and Sulzbach-Rosenberg. In 2021, Fraunhofer UMSICHT generated a turnover of more than 57.8 million euros with a workforce of 608 employees. As an institute of the Fraunhofer-Gesellschaft, the world's leading applied research organization, we are globally networked and promote international cooperation.

Website: <https://www.umsicht.fraunhofer.de>

1.5. Wilo Company

The Wilopark is located in the south of Dortmund. Opened in February 2021, the new company headquarters combines environmental and economic sustainability with flexibility and space efficiency. The Factory is a bright and innovative production facility on the northern side of Wilopark. The Pioneer Cube is the administration building located in the southern section. It dominates the Dortmund cityscape as seen from the Herdecke district and represents the new gateway to Dortmund. The Wilo Future Office concept in the Pioneer Cube provides employees with ergonomic and modern workspaces. Here, employees enjoy ideal working conditions for a range of different activities, from quiet individual work to collaborative project work.

As the winner of the German Sustainability Award 2021 in the "Climate" category, Wilo is fully aware of its corporate responsibility and has reaffirmed its commitment to climate protection and sustainability. By providing products that counteract climate change and energy shortages, Wilo is promoting future-oriented, environmentally friendly solutions like the production of Hydrogen. Wilo pumps and systems will play an important role to make the production of green hydrogen even more efficient in the future.

Website: <https://wilo.com>

1.6. PtX Hub

The International PtX Hub is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Affairs and Climate Action (BMWK). Financed by the International Climate Initiative (Internationale Klimaschutzinitiative, IKI), the International PtX Hub is a contribution to the German National Hydrogen Strategy of 2020 and represents one of the four pillars of the BMUV's PtX action programme initiated in 2019.

PtX Hub consists of an interdisciplinary team from around the world, each with their own expertise, language skills, and work experience across a variety of sectors. They are a team of engineers, economists, and social scientists, from the private sector, academia, and international cooperation, which puts us in the position to see challenges from different angles. PtX Hub's mission is to catalyse defossilisation globally and reduce global inequality with Power-to-X. The PtX Hub currently partners with 13 countries. The cooperations include a Power-to-Liquid pilot plant in Morocco, developing strategies for the transformation of the South African coal industry and leveraging Argentina's renewable energy potential to become a frontrunner in Power-to-X. Starting in Kenya we will first focus on finding the most suitable narrative.

Website: <https://ptx-hub.org>

1.7. European Commission

The Commission's work is steered by a College of Commissioners, and led by its President. The Commissioners work on specific policy priorities that are set out by the Commission President

The Commission is organised into policy departments, known as Directorates-General (DGs), which are responsible for different policy areas. DGs develop, implement and manage EU policy, law, and funding programmes. In addition, service departments deal with administrative issues. Executive agencies manage programmes set up by the Commission.

DG ENER is responsible for the EU Commission's policies on energy: secure, sustainable, and competitively priced energy for Europe's DGs. DG ENER cover the topics: Energy efficiency; Renewable energy; Oil gas and coal; Markets and consumers; Infrastructure; Energy systems integration; Energy strategy; Finance; R&D; International cooperation.

Website: <https://commission.europa.eu>

1.8. The DVGW

The DVGW, a competence network in the gas and water sector. The DVGW promotes the gas and water sector in all technical and scientific matters. In its work, the association focuses in particular on the topics of safety, hygiene, environmental and consumer protection. With the development of its technical rules, the DVGW enables the technical self-administration of the gas and water industry in Germany. In this way, it ensures a safe gas and water supply according to the highest international standards. Founded in 1859, the association has around 14,000 members. In doing so, the DVGW acts in an economically independent and politically neutral manner.

The DVGW Research Center at the Engler-Bunte Institute is a research institution of the German Technical and Scientific Association for Gas and Water at the Karlsruhe Institute of Technology (KIT), which has been conducting practical research on gas and water topics since 1907.

Website: <https://www.dvgw-ebi.de>

1.9. Association of Municipal Enterprises (VKU)

The Association of Municipal Enterprises (VKU) is the umbrella organisation of the municipal economy and represents the interests of the municipal supply and waste disposal industry in Germany including companies supplying electricity, gas, and heat.

The VKU bundles the interests of its member companies and actively participates in political decision-making and legislation. VKU is a pioneer in the municipal economy and supports its members with a comprehensive range of services. VKU ensures equal living conditions and

the protection of the health of all of us through continuously developed, high hygiene standards in urban and rural areas, for social cohesion and participation as well as a competitive business location. In this way, together with the municipalities, VKU forms the sustainable foundation for Germany. With their expertise, VKU continuously develops solutions for the challenges of this time. The aim is to make the country fit for the challenges of climate change, digitalization, and demographic change. And even in times of crisis, they are an anchor of stability at all times.

Website: <https://www.vku.de>

2. OVERVIEW OF GERMANY

Key General Facts¹

Official name

Federal Republic of Germany

Capital:

Berlin

Official languages

German

Government

Federal parliamentary republic

Population (2022):

84,228,855

Density (2022):

235.85/km²

Area

357,114 km²



Geography and climate

Germany is in Western and Central Europe, with Denmark bordering to the north, Poland and the Czech Republic to the east, Austria to the southeast, Switzerland to the south-southwest, France, Luxembourg and Belgium lie to the west, and the Netherlands to the northwest.

German territory covers 357,021 km², consisting of 349,223 km² of land and 7,798 km² of water. It is the seventh largest country by area in Europe and the 62nd largest in the world.

Most of Germany has a temperate seasonal climate dominated by humid westerly winds. The country is situated in between the oceanic Western European and the continental Eastern European climate. The climate is moderated by the North Atlantic Drift, the northern extension of the Gulf Stream. This warmer water affects the areas bordering the North Sea; consequently, in the northwest and the north the climate is oceanic. Germany gets an average of 789 mm of precipitation per year; there is no consistent dry season. Winters are mild, and summers tend to be warm: temperatures can exceed 30 °C.

Economy

- GDP: \$3.846 trillion (2020)
- GDP composition by sector (2020): Service 70%, Industry 23%, Construction 6% and Agriculture 1%
- Currency: Euro
- Top 10 exports: vehicles, machinery, chemical goods, electronic products, electrical equipment, pharmaceuticals, transport equipment, basic metals, food products, and rubber and plastics

¹ <http://worldpopulationreview.com>

Democracy

Germany is a federal state with 16 constituent states ("Bundesländer"). After the first free elections in the former German Democratic Republic (GDR) on 18 March 1990, the members of the Volkskammer (the GDR parliament) voted to establish five new states. On 3 October 1990, the GDR - and thus the states Brandenburg,

Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia - acceded to the Federal Republic of Germany. The eleven boroughs in the eastern part of Berlin were united with the State of Berlin.

Political Parliament

Parliament

German Bundestag. The deputies are elected in general, direct, free, equal and secret elections. The Bundestag is elected for a four-year term. Plenary sessions are chaired by one of the five members of the Bundestag Presidium. Parliamentary work is largely carried out by the committees of the Bundestag, each of which is responsible for a specific field of activities.

Head of state

The Federal President is elected by the Federal Convention (Bundesversammlung) for a term of five years. The Federal Convention consists of the members of the Bundestag, and an equal number of members elected by the parliaments of the Laender. The Federal President represents the Federal Republic of Germany in its international relations. His powers include the appointment of the Federal Chancellor, who is elected by the members of the Bundestag, and the appointment of the Federal Ministers, who are proposed by the Federal Chancellor. The present Federal President is Mr. Frank-Walter Steinmeier, who assumed office in March 2017.

Federal Government

The Federal Government (Bundesregierung) consists of the Federal Chancellor and the Federal Ministers. The Federal Chancellor determines the general policy guidelines. Within the limits set by these guidelines, the Federal Ministers conduct the affairs of their departments on their own responsibility. The present Federal Chancellor is Mr. Olaf Scholz, who assumed office in December 2021.

Representation of the Länder (states)

The Bundesrat (Federal Council) is composed of members of the governments of the Länder. Each Land has at least three but not more than six votes. The total number of votes is 68. Through the Bundesrat, the Laender participates in the legislation and administration of the Federation. Where the Federal President is prevented from acting, or where his office falls prematurely vacant, his powers are exercised by the President of the Bundesrat. The heads of government of the Länder serve as President of the Bundesrat in rotation for terms of one year.

3. OVERVIEW OF ENERGY SECTOR IN GERMANY

Overview

The German economy is large and developed, ranking fourth in the world by GDP. Because of this, Germany ranked sixth in global energy consumption between 2004 and 2007. Germany was Europe's largest consumer of electricity in 2002; electricity consumption that year totaled 512.9 terawatt-hours. In 2021 Germany's net electricity generation reached 541TWh.

Key to Germany's energy policies and politics is the "Energiewende", meaning "energy turnaround" or "energy transition". Germany intends to eliminate current use of nuclear. Some plants have already been closed ahead of their intended retirement dates. It is presumed that fossil fuels, wind power, solar power, biofuels, and energy conservation will be enough to replace the existing capacity from nuclear power. The policy includes phasing out nuclear power, and progressive replacement of fossil fuels by renewables.

Government energy policy

Overall, the phase-out of coal has been a key aspect of Germany's energy policy,

During the early 2000s, Germany's energy policy focused on increasing energy efficiency and reducing greenhouse gas emissions through renewable energies. The government introduced the "Nuclear Exit Law" in 2000, which set a deadline for the phase-out of nuclear energy by 2022. The government also introduced various measures to reduce the country's dependence on fossil fuels, including coal.

With the launch of the "Energiewende" (Energy Transition) plan in 2011, the German government set a goal of phasing out nuclear and coal energy and reducing the country's dependence on fossil fuels. In the aftermath of the Fukushima disaster in Japan, the government decided to accelerate the phase-out of nuclear energy and to close all the country's nuclear power plants. During this period, the government increased its focus on expanding renewable energy sources and reducing its dependence on fossil fuels.

In 2018, the German government introduced the "Climate Protection Plan 2050," which aims to make Germany a carbon-neutral country by 2050. The plan includes a focus on phasing out coal and nuclear energy and expanding renewable energy sources. In 2018, the government also approved a plan to close the country's remaining nuclear power plants in mid-term. In 2020, the government approved a package of measures aimed at accelerating the country's transition to a green economy, including investments in renewable energy and the phase-out of coal.

Overall, the phase-out of nuclear and coal energy has been a significant aspect of Germany's energy policy, with a focus on reducing dependence on fossil fuels and increasing the use of renewable energy sources.

Renewable Energy Sources²

In 2021, solar and wind energy plants fed 161 Terawatt hours (TWh) into the public grid. The electricity production from wind turbines was 23%. Wind power remained the most important energy source in the mix with 112.7 TWh, Photovoltaic systems fed around 48.4 TWh into the public grid, an increase from the previous year. Solar power therefore had a share of 10% in electricity production, with solar self-consumption included and amounting to 3.8 TWh. Hydropower generated 19.3 TWh and around 43.2 TWh were obtained from biomass. In total, the renewable energy sources sun, wind, water, and biomass produced 224 TWh.

² Retrieved at <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-ermarket-reform-germany.pdf>

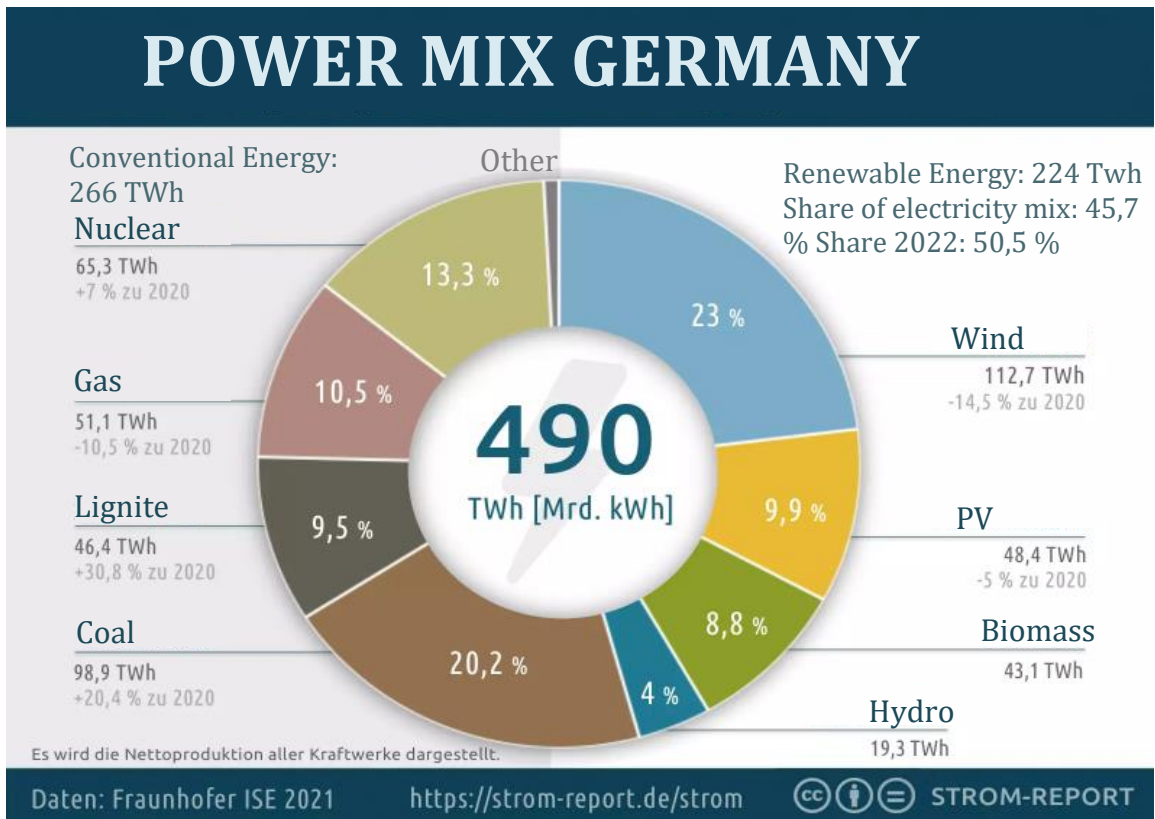


Figure 1: Power mix Germany in 2021

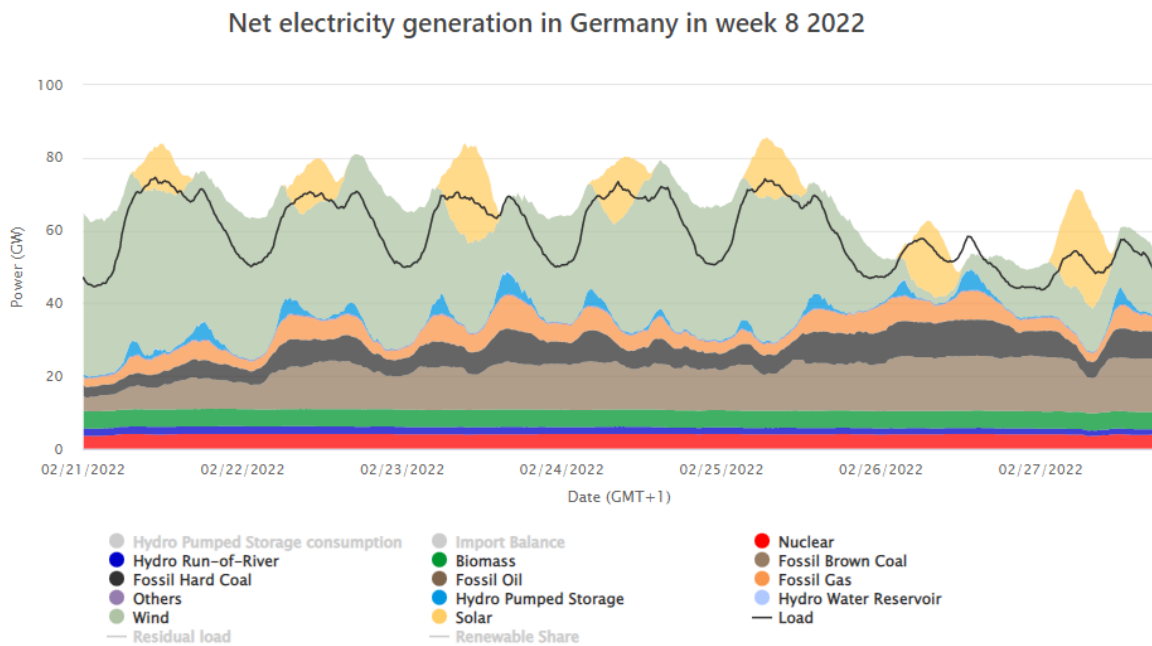


Figure 2: Net electricity generation in week 8 2022

4. GENERAL INFORMATION FOR TRAVELLERS

Basic Safety Advice

Western Europe is a safe region for tourists, especially when certain precautions are taken. Crime rates are not particularly high and there are few instances of violent offenses. It is still important to stay attentive and prepared; in particular, with regard to pickpocketing.

Hotel safety

Never leave your luggage and other possessions unattended. Know where your things are. Remember to store valuables in the safety deposit box and keep your room locked at all times. Don't leave your room keys lying around; rather hand the key in at the desk when you leave.

Transport safety

Avoid changing money at airports, as thieves could be watching you. Do not accept or carry items for strangers.

Lost passports

It's a good idea to travel with certified copies of your valuable documents, keeping the originals in a safe place. If you lose your passport, report the loss as soon as possible to the Germany Police Service, as well as Vietnam Embassy in Berlin (see details at the end of this booklet).

Emergency Phone Numbers

- Police 110
- Fire Brigade 112
- Ambulance 112

Embassy of the Socialist Republic of Viet Nam in Berlin

Address: Elsenstrasse 3
12435 Berlin
GERMANY

Phone: +49 (30) 5363 0108; 5363 0113; 5363 0119

Website: www.vietnambotschaft.org/

Email: info@vietnambotschaft.org

Office hours: Monday-Friday 8:30 a.m. to 5:30 p.m.

5. LOGISTICS AND ACCOMODATION

For auditing reason GIZ is required to collect all original vouchers (e.g., boarding passes). Therefore, we kindly ask for your understanding that a GIZ staff member will collect the boarding passes directly after the flight. As the study tour has to be implemented in line with GIZ travel regulations we have to inform you that the consumption of alcohol is billable only within reasonable limits and according to the respective occasion. Unfortunately, GIZ cannot cover for liquor and spirits.

Daily Subsistence Allowance (DSA) shall be applied according to the rules and regulations of GIZ for the countries of the visit. Cost(s) relating to airport transportation (if any) shall be reimbursed according to GIZ rules and regulations with a lum-sump VND300,000/ route. Travel insurance for travelers shall be covered by GIZ according to the rules and regulations. This covers only insurance for acute illnesses (**e.g., it does NOT cover for tooth replacement and personal health check**).

Any other costs relating to personal expenses such upgrading air tickets, accommodation to higher class, telephone, laundry, mini bar, and entertainment, etc. shall be on traveler's responsibilities.

6. EMERGENCY CONTACTS

No	Full Name	Mr./Ms.	Institution	Phone No.	Languages
1	Markus Bissel	Mr.	GIZ	+49177 4060600	German, English
2	Nguyen Thi Thu Phuong	Ms.	GIZ		Vietnamese
3	Vo Thanh Tung	Mr.	GIZ		Vietnamese
4	Nguyen Duc Minh	Mr.	GIZ		Vietnamese
5	Logistic Ecostic		Berlin ID	+4915 209714124	German, English