



**2019 北京国际模拟联合国大会**  
Beijing International Model United Nations 2019

# Background Guide

United Nations Economic and  
Social Council

Topic A: Promotion of Fuel Cell Vehicles and  
Hydrogen Society

Topic B: Sustainable Development for Future  
Housing and Community

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青年携手 大道同行

Young Partners for a Bright Future

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# Welcome Letter

Dear Delegates,

Welcome to the United Nations Economic and Social Council of BIMUN 2019. It is a privilege for us Directors to extend our sincere greetings to all delegates!

With the acceleration of urbanisation, transportation and housing are becoming more and more important, not only in terms of promoting the efficiency of a city but also improving people's living situation. With an increasing number of citizens yet limited resources, cities, especially metropolises, are bound to make a change to the traditional means of transportation and inject fresh impetus to the busy but stagnant urban life.

Targeting at supporting and facilitating the implementation of Sustainable Development Goal (SDG) 7 and 11, we are going to touch upon the promotion of Fuel Cell Vehicles (FCVs) and hydrogen society as well as the sustainable development for future housing and community. As a core UN agency, ECOSOC points out that reliable access to clean and renewable energy is key to a sustainable transport system. Also, transportation and community planning are integrated with each other to facilitate the development of inclusive urban spaces.

Here, as a participant of the Model United Nations Conference, you may make a change with your passion and commitment. Don't be afraid if you are a novice. Do what you can, and in a gentle way, you can shake the world.

The Background Guide offers the basic knowledge of this topic, putting forth suggestions for your further research. Therefore, independent study is of crucial importance. Should you have any questions concerning the topic or Rules of Procedure, feel free to contact us.

Best Regards,

Directors of ECOSOC

Beijing International Model United Nations 2019

# Introduction to the Committee

As one of the six main organs of the United Nations, the United Nations Economic and Social Council (ECOSOC) has been at the heart of the United Nations system to advance the three dimensions of sustainable development – economic, social and environmental ever since 1945.

Responsible for following up on all major past international conferences linked to sustainable development, ECOSOC guides and coordinates various UN entities including regional economic and social commissions, functional commissions facilitating intergovernmental discussions of major global issues, and specialised agencies, programs, and funds around the world. Recognising the said three pillars of sustainable development, ECOSOC has been dedicated to encouraging international exchanges around sustainable development compromise by organising all levels of forums and initiating dialogues (ECOSOC, 2016c).

As a platform for the coordination of policymakers, ECOSOC is an active supporter of partnership forums for innovation sharing. Moreover, ECOSOC maintains close contacts with civil society so as to include diversified voices and perspectives.

ECOSOC is working with policymakers, parliamentarians, academics, foundations, businesses, youth and registered non-governmental organisations, to help achieve the SDGs (ECOSOC, 2016a).

## General Introduction to the Topic

Amid the concerns for a future city plan arise the advocates of green energy transportation as well as new models for community design. With the acceleration of urbanisation, traditional petrol-powered vehicles, as an important means of transportation, face potential environmental and energy crisis. Meanwhile, hydrogen is a clean, efficient, safe and sustainable energy source and is believed to be the most potential alternative in the 21st century. In this way, fuel cell vehicle gradually becomes a hotspot which is believed to be a crucial alternative to save human beings from environmental degradation and even open a new era for hydrogen-based society, for which community upgrading and future planning are indispensable. However, potential threats to residential areas brought by rapid urbanisation push people to confront architectural deficiencies and diminished community commitment. It is of crucial importance to upgrade the existing housing with regards to the needs of urban expansion and provide systematic assistance for future community planning to improve the quality of public spaces. Through promoting hydrogen society and the sustainable development of cities and communities, we will help promote the 2030 Sustainable Development Agenda and contribute to the achievement of 17 SDGs.

# Topic A Promotion of Fuel Cell Vehicles and Hydrogen Society

## Current Situation and Past Actions

### Overview of the Current Situation

After the industrial revolution, petroleum has been recognised as the blood of a country and the key to modernisation. However, today it is a different story. As described in the Sustainable Development Goals of the United Nations, clean energy is the future. Among all the available alternatives to petroleum, the fuel cell is definitely one of the most critical choices.

Put on the agenda in the late 1980s, the development of FCVs represents a path towards not only zero-emission and high energy efficiency, but also the next generation of clean energy. Different from Battery Electric Vehicles (BEVs), which are also zero-emission vehicles, the core of the FCV is not the battery but rechargeable fuel cell, the refuelling process of which is comparable to conventional vehicles, much quicker than that of other Electric Vehicles (EVs).

Glamorous as they might seem, FCVs are still facing obstacles to becoming the mainstream of transportations, including costly research expenditures, unaffordable infrastructure constructions as well as the unfavourable market. Currently, there are only 39 hydrogen fuelling stations in America, compared to 19,000 electric charging points (Green Car Future, 2018). With a mere three companies offering FCVs ready for the customers to purchase, the price is relatively high compared with conventional vehicles or other EVs. In terms of market share, according to the latest data from the European Automobile Manufacturers Association, in the first nine months of 2018, the total number of registration of plug-in cars is 273,702, with plug-in hybrid electric vehicles accounted for almost half of the total registrations while BEVs accounted for another half. When it comes to FCVs, however, the registration number is relatively negligible (Kane, 2018).

Although critics have cast doubts on the feasibility of promoting hydrogen vehicles, FCVs are still reckoned as promising. Industrial tycoons like Bavarian Motor Works and Mercedes-Benz have already turned to develop FCVs. Officials in Europe have been backing campaigns to promote the popularity of FCVs and increase hydrogen fuelling stations in Europe. Despite all this effort, there still is a long way to go for FCVs to become the first choice of the customers.

## Past Actions

### Domestic Efforts

In British Columbia, the premier hinted that in 2019 the government would issue a requirement that by 2040 all new trucks and light-duty cars sold in the province should be run on electricity or zero-emission vehicles (Helgren, 2018). To achieve the goal of reducing the consumption of conventional cars, the government has announced to spend an additional \$20 million to expand the current charging network, including establishing more hydrogen fueling stations. Currently, citizens in British Columbia enjoy a discount for buying zero-emission vehicles. For instance, the FCV is granted \$6000 for each purchase.

In the US, the Energy Act of 1992 laid the groundwork for hydrogen development within the nation. Formed in 1999, the California Fuel Cell partnership is one of the first initiative aimed at promoting hydrogen vehicles in California. The organization has co-organized 16 hydrogen fuelling stations in California and has 15 more points planned (California Air Resources Board, 2018). The state government has long been working on reducing auto emissions. In the Governor Signs of California, it mentions a provision of \$20 million annually to fund at least 100 hydrogen stations (California Air Resources Board, 2018). The government has also initiated California Hydrogen Highway Network to work as the guideline for the construction of the hydrogen fueling stations in California (California Air Resources Board, 2018).

Similarly, in 2016 China National development and reform commission issued an action project which includes the guideline for the development of hydrogen technology. In 2018, Brazil successfully held the World Hydrogen Energy Conference. The country launched its national hydrogen projects back in 2006, but the conference attracted over 550 experts from all over the world and promoted the domestic research of Brazil to an international level (H2-International, 2018).

### Universal Progress

As the Sustainable Development Goal 7 has pointed out, people have to enhance the efficiency of energy and make the next generation of energy clean and affordable for all humanity (IEA hydrogen, 2019). International Energy Agency, one of the leading international institutions of energy researches, has initiated the Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV) which enables the member parties of IEA to exchange information and discuss their shared interests for the development of EVs. Apart from that, the IEA has announced its Hydrogen Implementing Agreement which helped to frame the future of a hydrogen society (IEA hydrogen, 2019).

The world has demonstrated its willingness towards a lower emission of greenhouse gases in the Paris Agreement. The World Energy Council (WEC) has pointed out that hydrogen can be the cornerstone of constructing the future energy structure. At the same



time, WEC has issued a guideline of innovating urban energy, in which the WEC has once again pointed out the importance of hydrogen technology (World Energy Council, 2018).

Other international institutions and organisations like UNEP (now the UN Environment) and UNDP have also issued reports to back the development of hydrogen technology.

## Regional Attempts

The European Union has attached great importance to the development of hydrogen technology and FCVs. In 2008, the European Union announced the Fuel Cells and Hydrogen Joint Undertaking which guaranteed a commitment of over 9.4 billion euros in the joint research of fuel cells. The programme attracted more than 250 partners and gave birth to over 70 follow-up projects (FCH JU, 2008). In 2017, the reform of Hydrogen Europe marked the dawn of the next stage of hydrogen energy in Europe. The reform embraced 107 industrial enterprises, 68 research institutions, and eight national organisations to work collaboratively together to promote the popularity of fuel cell in everyday lives (Hydrogen Europe, 2017). In the past decade, the European Commission together with other private entities has invested more than 1.5 billion euros in the research of hydrogen energy and fuel cell technology (Hydrogen Europe, 2017).

Other regional organisations like the Association of Southeast Asia Nations (ASEAN) and Asia-Pacific Economic Cooperation (APEC) have also launched a project to promote the development of hydrogen technology based on their cooperation framework. Asia-Pacific Energy Research Center was established as one of the main research organs of APEC. The issued a report about the prospect of hydrogen in the APEC regions. The report showed a promising future of hydrogen development in APEC regions and the suggestions also worked as the cooperation framework for related regions (Asia-Pacific Energy Research Center, 2018).

The fuel cell is quite new in ASEAN renewable energy development. However, the first Annual Renewable Energy Week of ASEAN has drafted regulations to promote renewable energy development in ASEAN including hydrogen technology (Brent, 2018). Similarly, the first ASEAN Climate Change Partnership Conference also mentioned the importance of hydrogen technology, though critics have questioned whether it will make a change in Southeast Asia or not (JOSE, 2019).

## Future Trends

Generally speaking, the emergence of FCVs is very hard to make a difference in the market of private vehicles. The European countries have long been recognised as the frontline of phasing out conventional vehicles. However, only 86 FCVs were sold in EU member countries during the first two seasons of 2018. Despite this, governments and companies have never given up on FCVs.

As it has repeatedly mentioned in many reports, the market share of FCVs in private vehicles is not very satisfying for the moment, but we have to admit that FCVs are already getting more and more involved by becoming part of the public transportation system. China and UNDP have established a cooperation framework to build hydrogen energy bus lines, and the local government has drafted plans to deploy 1 million FCVs by 2030 (UNDP in China, 2018). Similar actions have been taken in places all around the world from Brazil to the European countries.

Through the projects and investment from all over the world, we have seen trust that people put in FCVs, and it is not that hard for us to visualise the future of it. IEA estimates that FCVs will make up 17.5% of the world vehicles. Moreover, by 2050, the estimated number will rise to 20% to 25%. At the same time, people will witness 30 million new jobs generated by the FCV industry (UNDP in China, 2018).

# Problems to be Solved

## I. Technological Barriers

### Hydrogen Production and Distribution

Like any other batteries, fuel cells also demand a recharging process. The difference is that fuel cells take in liquid hydrogen rather than electricity. In that case, a massive demand for liquid hydrogen is unavoidable in order to phase out conventional cars, which is by no means an easy task.

On the one hand, isolating hydrogen from natural compounds requires a large amount of energy which usually comes from fossil fuel, which is against the original intention of the hydrogen society to protect the environment (Meyers, 2015). How to isolate hydrogen in a clean and efficient way has become the Achilles' heel in the clean hydrogen society. The hurdle faced in producing hydrogen is huge and unavoidable. If more electricity is required to produce hydrogen, FCVs certainly lose the advantages over EVs.

On the other hand, hydrogen production via solar water splitting is one of the most promising solutions. However, scientists are still trying to find suitable material for the reactor. At the same time, the way to split hydrogen and oxygen at a high temperature is still unknown (Li & Li, 2017). Other attempts like biological hydrogen production, which is also receiving more and more attention, claims to have the highest speed and energy efficiency rate. However, like bio-hydrogen technology is barely in embryo, these projects still demand for years of trial and error. In that case, how to produce hydrogen in a clean and efficient way remains an unsolved problem.

### The Storage of Hydrogen

FCVs have a similar refuelling process like the conventional vehicles, which has brought about another technical hurdle, the storage of hydrogen. Hydrogen, unlike gasoline, is far more active with a lower ignition temperature and a higher explosion level, which makes it hard to be stored or transported. Currently, the hydrogen needs to be stored in expensive containers under extremely high pressures ranging from 5000psi to 10000psi. Otherwise, an intermediary chemical compound should be used as the container to store the hydrogen, and deconstruct the compound when needed. Scientists have gone to great length to find a suitable hydrogen chemical carrier, but none has satisfied all needs.

Similarly, this method also faces a tremendous energy loss in the compression step. Even after we find the perfect compound, without an expensive energy recovery process the loss of energy in the compression step is not easy to afford. When it comes to refuelling stations, the parallel problem still exists. The technology of building a cheap and safe energy container is long overdue.

For stationary hydrogen storage, the major concern is not the density of hydrogen, but the cost of construction. The container for large scale storage is not some cheap stuff. At the same time, finding a place in the city to place the giant container is also not easy. For some countries, they use some depleted oil and gas fields to store hydrogen. However, depleted oil fields aren't everywhere. If we can't find a cheap alternative to make the container, builders still need to bear the steep price of the construction.

### Case Study: The Cost of Infrastructure Constructions

The United States has 39 hydrogen stations currently, and all but four are in California. They serve roughly 39 million Californians, but for the rest of the country, they don't have any access to FCVs nor hydrogen stations at which to refill them (Voelcker, 2018). In order to promote its popularity, infrastructure construction is the most important. However, the cost is unbearable. Back in 2004, the United States has more than 168000 gasoline stations, based on research it will take half a trillion dollars to replace them with hydrogen stations (Romm, 2004). It can cost over 3 million dollars to establish one refuelling station (Penev, 2013).

Infrastructure construction is not all about hydrogen stations, the production and the distribution are also important factors. The current state-of-the-art technology in hydrogen transportation is based on three modes: Hydrogen pipeline, tube or container trailers for gaseous compressed hydrogen or the transport of liquid cryogenic hydrogen. However, the whole process from producing hydrogen to the storage is low efficient and pricy at the same time. Compared with BEVs, the mobility costs are unbearable before scientists have made the transition to renewable generation and storage. And even after the transition, we still need additional investments until the market is fully developed (Martin Robinius, 2018).

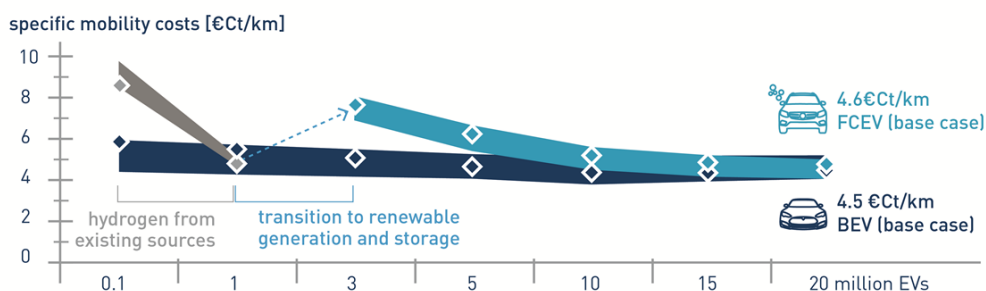


Figure 1 Comparison of specific mobility costs<sup>1</sup> (Martin Robinius, 2018)

<sup>1</sup> including all energy costs and annualised infrastructure costs; no margins, no taxes, no fees and no vehicle costs

## **II. Low Level of Public Acceptance**

### **Concerns over Safety Issues**

The safety issues of hydrogen technology range from the production to usage. The main concern for most people is its flammable nature. Hydrogen has the highest rating of the flammability when the gas is not one hundred per cent pure. The famous Fukushima nuclear accident, which resulted in over 1600 death, was attributed to a hydrogen explosion (Smith, 2013). Apart from its flammability, hydrogen can leak very easily, and with the slightest amount of air mixed in, the hydrogen can become very dangerous. For FCVs, stored in the hydrogen tanks under extremely high pressure, the colourless and odourless hydrogen is hard for human senses to detect once leaking. Once there is a leak, a tiny spark within the motor can cause an explosion. To prevent this from happening, an onboard hydrogen sensor is necessary, but that expensive equipment also creates another expenditure for the consumers of FCVs.

### **Lack of Hydrogen-Related Knowledge**

Hydrogen industry has long been considered as the by-product of the hydrogen bomb development, just because they share a similar name, which leads to a misconception that hydrogen vehicles are potential bombs with four wheels. Misperceptions like this are widespread in our society which reveals another fact that the general public lacks sufficient education about hydrogen-related knowledge. What is used in the hydrogen society is the most common type of hydrogen, also known as Protium. However, for hydrogen bombs, scientists have created a radioactive hydrogen isotope, which does not exist in the natural environment, to induce nuclear fusion reaction. (Hydrogen Europe, 2017).

In hydrogen-related accidents, people usually point their fingers at the utilisation of hydrogen. Although hydrogen is pretty dangerous, once it is treated correctly it will be no less safe than the conventional energy that we use.

### **Case Study: The Nightmare of Hindenburg**

For hydrogen technology, people never forget the year 1937 when the legendary airship Hindenburg crumbled to dust. With its top-class services and the state-of-the-art technology, Hindenburg was designed to revolutionise transportation across the Atlantic. The airship was initially designed for helium, but eventually, they turned to hydrogen because helium was hard to produce and obtain at that time (Grossman, 2010). Theatrically, it became the debut of hydrogen technology for the general public. However, the tragedy happened when the airship attempted to dock at the Naval Air Station Lakehurst on May 6, 1937. In the legendary life of this silvery giant, it has taken 63 commercial flights and crossed the Atlantic 37 times (Grossman, 2010). Wherever the airship travels, it will definitely grab the headline of the local newspaper. When it arrived

at Lakehurst, under 22 cameras and hundreds of eyes, it burst into a fireball. Hindenburg, the Titanic in the sky, marks the end of the airship era. Unlike other tragedies, the crash of Hindenburg was literally broadcasted to the whole world. On the other hand, no one but the survivors has witnessed the final moment of the Titanic. For the Hindenburg, the fire burned continuously for over 7 hours. The screams and pictures are deeply rooted in people of that generation. And the crash of Hindenburg which is somehow connected with the safety of hydrogen buries a seed of fear toward hydrogen in most people's mind.

### **III. Obstacles to Auto and Energy Companies**

#### **Research Expenditure and Financial Burdens**

In 2016, the US company Plug Power invested over 21 million dollars in the development of fuel cells (Statista, n.d.). Toyota also announced that there would be increasing recourses distributed to the development of FCVs for the years to come. However, the statistic of FCVs consumption reveals its nature as a game exclusive to a few industrial tycoons. The high research expenditure shut most of the small or medium-sized company out which has created a toxic atmosphere allowing the mega companies to monopolise the market of fuel cells and hydrogen technology.

Similarly, for energy firms, the expenditure of producing hydrogen and the investment of establishing refuelling stations is steep and unprofitable. It can cost over 3 million dollars to establish one refuelling station, and if we consider the operation cost, there will be a higher price to pay (Penev, 2013).

#### **Lack of Interdisciplinary Personnel**

The study of FCVs is an interdisciplinary subject which demands experts specialising in different domains. For automobile manufacturers, a handful of seasoned engineers are far from enough. For energy firms, applying hydrogen technology to automobiles seems beyond their power. The industry is badly in need of trained interdisciplinary personnel, the scarcity of which has caused cut-throat competition within the industry and made the situation even worse. Intercompany cooperation and the cooperation with the higher education institutions are required for further development of the FCV industry.

### **IV. Weakness of Motivation for Reform**

#### **Reliance on Conventional Fuels**

At the dawn of a new age, there are always people who prefer to live in the past. For countries like Japan and South Korea who only possess limited natural resources, there might be the perfect motivation for them to promote the technology of EVs. However, for

countries like Saudi Arabia whose economy heavily depends on the petroleum industry, the development of alternative energy will only be a threat to their national interest.

As for consumers, they will have thousands of options in hand if they want to buy a conventional vehicle. Options of FCVs, on the other hand, are thin on the ground.

Apart from that, it is much easier to find a petrol station than to seek a hydrogen refuelling station or a recharge station. At this stage, it is more convenient for consumers to use gasoline vehicles rather than FCVs.

## **Future Uncertainty**

The debate over the future of EVs has raged for decades. Which vehicle is the correct path towards the future media of transportation, FCVs or BEVs? For BEVs, they demand a long troublesome recharging process. Apart from that, the scarcity of cobalt, one of the vital materials needed when producing the on-board battery, is hindering the development of EVs. However, BEVs have a higher energy utilisation rate, and they are relatively cheap compared with FCVs. When it comes to FCVs, critics have argued that hydrogen is not a form of energy, but a form of storage, the tremendous energy loss during the production cannot satisfy the need for a higher energy utilisation rate. For decades, the debate has reached a complete deadlock.

In the automobile industry, the competition between Toyota and Tesla reflects the situation of FCVs and BEVs. Tesla, a company, targeting at renewable energy, has put their faith in the development of BEVs. In the fourth quarter of 2018, the global sales of Tesla have reached a record high of 90700 units (Tesla.Inc, 2019). Toyota, on the other hand, claims to distribute more resources to the development of FCVs. For Toyota, they believe the only hurdle of adopting FCVs is its steep price. So far, fewer than 6000 FCVs were sold by Toyota worldwide (Muhoro, 2018). Even for motor giants like Toyota, they have struggled to sale their FCVs. It is making things harder for other automakers to make up their mind to whether step into the industry or not.

## **Case Study: Toyota, the Pioneer of the Industry**

Some automakers like Tesla and Nissan consider BEVs as the future alternative for gasoline vehicles, while Toyota has taken FCVs seriously. Every action that Toyota takes navigates the development of the whole industry. As the pioneer of the industry, Toyota has already spent millions of dollars in the research of FCVs, but what have they achieved? In 2017, the company recalled all 2840 Mirai FCVs that have been sold worldwide. The company claimed that it is due to some flaws in the software which might lead to the unstable output voltage. The bewildering explanation from the company makes the consumers question over safety issues of hydrogen technology (Tessier, 2017). As the company's executive board and manage group are restructuring, people are eager to see what will be the next step of Toyota's FCV development after this failure.



## V. Others

Hydrogen society represents the final stage of the development of hydrogen technology. For some, it is the only solution that can cope with the energy crisis that we face today, or we might face tomorrow. While for most of the pessimists, the hydrogen society is merely an illusion or even a marketing strategy.

Yoshikazu Tanaka, the chief engineer of the Toyota Mirai, says a hydrogen society "is a very challenging goal" (Hans Greimel, 2017). The government of Japan is always optimistic about the outlook for hydrogen society. In their vision, there will be some 80000 of FCVs on roads in Japan by 2030, along with 900 filling stations across the country to serve them (Hans Greimel, 2017). Why does Japan so desperately want to promote the development of hydrogen society? As we all know that Japan heavily relies on the import of fossil fuel, and that is the major reason for them to dig into some clean alternative energy that can be generated domestically. Then, how about countries in the middle east where refined oil is cheaper than clean water? How can they support the development of alternative energy that might strip off their source of livelihood? This is the first problem that people face when it comes to hydrogen society, lack of motivation to cooperate.

As regards hydrogen itself, it has stirred controversy for years. Primarily, hydrogen is not a form of energy but a carrier that people produce to carry the energy. In other terms, it is a production like a battery or petrol tank. People have to use electricity to produce hydrogen, and eventually turn it back into electricity when it is needed. In this case, what is the difference between hydrogen and batteries, or it is just another lie?

If people look back into history, they might realise that most of the conflicts are triggered because of some disputes over the ownership of some properties. Today, in most occasions the property we are discussing is fossil fuel, the blood of industrialisation and modernisation. If the vision of hydrogen society pans out, there will be no energy shortage nor conflicts about resources. To most of the critics, the concept is just another modern utopianism.



# Possible Solutions

## I. Infrastructural Changes Based on Existing Network

Adapting the existing infrastructure network to suit the demand of the hydrogen industry is relatively less of a challenge, as most related aspects are technologically mature and only require minor modifications to current infrastructure.

A hydrogen infrastructure network generally contains hydrogen highways, hydrogen stations and hydrogen pipeline transport. A highway equipped with hydrogen-filling stations along its way is called a hydrogen highway, on which hydrogen vehicles can travel. As of late 2014, governments of U.S. State of California, Germany, and Japan supported the construction of hydrogen fuel infrastructure (Eberle, Ulrich; etc. 2014). To transform a regular petrol station into a hydrogen fuel station, it only requires an extra hydrogen fuelling equipment and storage facilities. If the station is not situated near a hydrogen pipeline, it will require to get supply via hydrogen tanks or dedicated onsite production.

Hydrogen pipeline transport connects the point of hydrogen production with the point of demand. Its costs are similar to those of Compressed Natural Gas (CNG), with mature, proven technology. As of 2004, U.S. has 900 miles of low-pressure hydrogen pipelines and Europe has 930 miles.

## II. Government Efforts

### Promotion of FCV in Public Transportation

While there have only been a few prototypes manufactured by companies in the U.S. and Europe, the Chinese government has been a rather active promoter for the usage of FCV in public transportation, thus consequently led to its popularity in China. In 2016, the first demo public hydro-powered transportation line came into use in Foshan, Guangdong with 12 hydro-powered, 11-metre-long buses. Since then, several cities in China have put FCV into use in the public transportation sector, including Suzhou, Chengdu, Zhengzhou, etc. Such a nationwide campaign sparked quick construction of hydrogen infrastructure networks. For example, Shanghai alone plans to build 50 hydrogen stations and have at least 20,000 FCVs in active use by 2025.

### Favouring Policies for FCV Development and Hydrogen Research

Several countries provide favouring policies for FCV development and hydrogen research. The U.S. Congress raised the FCV tax exemption threshold to 8,000 U.S. Dollars in 2015; U.S. owners of FCV can also enjoy a tax-free quota of 4,000 U.S. Dollars in 2017. In Japan,

Tokyo Municipal Government reimburses FCV owners approximately 7,942 USD while the Japanese Government offers an extra subsidy of 15,884 USD. South Korea offers a 23,322-USD subsidy to all FCV owners while Denmark simply adopts a tax-free policy towards all FCVs until the end of 2018. U.K. Department of Transport provides 4,500 pounds of subsidies for each FCV buyers before March 2018. Department of Transport of Germany plans to invest 250 billion euros in the R&D sector of FCVs by 2019. In China, different local governments also adopt different subsidy policies towards FCVs.

地区	乘用车 (万元/辆)	大中型客车/中重型 货车(万元/辆)
北京	20	50
大连	14.4	36
青岛	4	10
襄阳	18	45
广州	20	50
深圳	20	50
佛山	18	45
杭州	20	50
武汉	20	50
郑州	12	30

Figure 2 Subsidy standard for FCVs in different Chinese cities  
(source:<https://nev.ofweek.com/2018-05/ART-71008-8420-30235432.html>)

### Case Study: Zero-Emission Vehicles in California

The Zero Emission Vehicle (ZEV) Programme sets goals for car manufacturers to promote clean car technologies including fuel cell, battery electric, and plug-in hybrid electric vehicles. First adopted in 1990, ZEV regulation is designed to achieve the state's long-term emission reduction goals together with LEV I standards and has undergone significant periodic modifications since that time (net, 2019).

At the time of adoption, Californian Air Resource Board (CARB) initiated specific requirements on the number of cars produced for sale in California. According to statistics, at least 2% of the vehicles produced in 1998 had to be ZEVs, the number of which increased to 5% in 2001 and to the later 10% in 2003 (net, 2019). In January 2012, more substantial requirements were included as part of the Advanced Clean Cars programme adopted by the CARB for the deployment of electric-drive vehicles, which was expected to be at over 10% of new vehicle sales by 2025.

### **III. Education at All Levels**

#### **Joint Programmes Between Companies and Universities**

AutoCar Professional reported in January 2017 that in order to further explore the potential utilisation of hydrogen energy, a joint research programme is to be established under the collaboration between Toyota Motor Corporation and Masdar, Abu Dhabi National Oil Company (ADNOC) in the United Arab Emirates (UAE) (AutoCar Professional, 2017). Targeting at the promotion of a sustainable and low-carbon society the programme is said to be based in Masdar Institute, an Abu Dhabi-based independent graduate university renowned for its researches on hydrogen. Toyota says it will conduct a complete range of driving and refuelling tests under unique conditions like extreme heat, dust according to the local environment using its hydrogen station to be finished in May 2017 (AutoCar Professional, 2017). The Japanese carmaker will also provide short-term leases to the UAE government institutions and opinion leaders to promote a better understanding of FCVs and hydrogen-based societies.

While in China, the Tsinghua-BP Clean Energy Research and Education Centre has been conducting research and development on FCVs since as early as 2005.

#### **Public Education Programmes**

Extensive public educational programmes have been conducted by both FCVs manufacturers to boost sales and governments intending to build a cleaner economy. Toyota has gone great length promoting their newest FCV product Mirai, featuring the Toyota Fuel Cell System and its characteristic of being "Fun to Drive" as a selling point to attract younger generations of consumers.

The Chinese government adopts a multi-dimension publicity campaign for its growing usage of FCVs, introducing to the general public about the newest generation of FCV in newspaper, websites and community bulletin boards. Apart from these, buses powered by hydrogen fuels running in the cities act as a powerful advertisement for FCVs themselves as well.

### **IV. Further International Collaboration**

#### **Promotion of Technological Transfer**

Despite a substantial amount of joint research programs, so far there have been few cases of full-scale technological transfer between countries or company cooperation. This is mostly as a result of the complexity of FCV research and development technologies. However, delegates are encouraged to explore the possibility of such a practice in the

near future as it might lead to a win-win situation where FCV manufacturers gain profits while also promote its popularity outside the domestic markets.

### **Enhanced Agreement on Reduction of Emission**

Regulatory agreement on the reduction of emission has always been a strong incentive for the development of FCVs. While the international community often failed to have a unified regulatory agreement on reducing emission, regional, more exclusive organisations such as the European Union made more concrete progress in having an agreement on reducing emission with actual effects. It is also a common practice for countries to introduce regulatory documents on the reduction of emission within their own national boundary, thus encourage the development of FCVs.

## **V. Others**

Hydrogen society has long been a controversial topic, some calling it "the ultimate utopia of a clean society", while others dismissing it as merely a straight-up lie. There are still a lot of debates waiting to be settled. Is hydrogen society truly feasible judging from a technological perspective and is it worth doing so? How do we balance the interest of the traditional energy industry and the renewable energy industry as we proceed towards a cleaner society? Is hydrogen really the best choice for a renewable clean energy alternative? Delegates are more than welcomed to explore in these questions both in their research and during the conference sessions.

# Topic B Sustainable Development for Future Housing and Community

## Current Situation and Past Actions

### Overview of the Current Situation

Urban development is calling for more attention as statistics projecting that 60% of the global population will move into cities by 2030 (ECOSOC, 2016b). Because of this rapid growth of urbanisation, more and more problems occur in city life, threatening the sustainable development of especially megacities.

For many cities, city slums remain as the biggest barrier to further development, where social problems go together with a lack of planning. Run-down neighbourhoods not only increase the vulnerability of communities but also causes a decrease in community commitment without a good economic base or mutual trust between citizens and administrators.

Meanwhile, hardly does any megacity escape from the problematic city extension. For some, as cities expand far beyond their formal administrative boundaries, house prices rise drastically with too many people consuming the limited land space as well as local economy's strong reliance upon the real estate economy. For others, inadequate allocation of education or entertaining resources may give rise to traffic congestion, huge gaps among communities and diminished public life for citizens on an average level.

Fortunately, more and more experts begin to realise the importance of public life and address the necessity to provide affordable houses to back up the sustainable development of cities. Local governments are leading programmes to solve housing problems; community groups are uniting together to take part in policy-making processes; the United Nations is initiating global public space programmes. However, there is still a long way to go. With the advancement in transportation and communication technology, how and where should city extension remain unanswered. With the said problems yet to be solved, the future of urban development lies in the hands of our generation.

### Past Actions

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity (High Level Political Forum 2018, 2018). Although some of the goals were included in the Millennium

Development Goals (MDGs) issued when we entered the 21<sup>st</sup> century, the SDGs are comparatively more inclusive and specific, covering more issues emerging with the development of the world. In this process, urbanisation is an unstoppable phenomenon. According to the data of the HLPF (High Level Political Forum), the world's population living in urban areas has risen drastically over the past several decades, reaching more than 50 per cent in 2007, and is expected to reach 60 per cent by 2030 and 66 per cent by 2050. From 2010 to 2050, there will be 2.5 to 3 billion people moving into cities worldwide. At the same time, cities contribute to 80% of global GDP, consume 70% of global energy and discharge 70% of carbon emission around the world (High Level Political Forum 2018, 2018). Hence, cities play a crucial role in the implementation of SDGs and more efforts should be made to realise sustainable housing and community.

To achieve this goal, major international organisations and institutes have taken measures in the past decades. Early in 1970, the General Assembly of the United Nations already issued A/8037 Housing, Building and Planning: Problems and priorities in human settlements, which was a report to the Secretary-General. This report explicitly explained the role of human settlements in national development and also set a series of rules and principles guiding the planning and building of housing in modern communities (United Nations General Assembly, 1970). Besides, some major subordinate organs of the UN, including the ECOSOC, the Economic Commission for Europe (ECE), the Economic and Social Commission for Western Asia (ESCWA), the Human Settlements Programme (HSP) and other regional organs had issued corresponding documents and initiatives to address the sustainable development issue concerning housing and community.

From July 2014 to March 2015, with the support of the UNISDR (United Nations Office for Disaster Reduction), the stakeholder consultations issued the Sendai Framework. It is a 15-year, non-binding and voluntary agreement. Among seven global targets in this agreement, (c), (d), (e) and (g) mentioned relevant measures to reduce economic losses and infrastructure damage, as well as the multi-hazard early warning system, which are helpful for implementation of improving cities' resilience to disasters (UNISDR, 2015).

In May 2015, the Economic and Social Council issued The Geneva UN Charter on Sustainable Housing, presenting main challenges to sustainable housing and setting the goal, scope and principles concerning the sustainable housing and community (United Nations Economic and Social Council, 2015).

In October 2016, the United Nations Conference on Housing and Sustainable Urban Development was held in Quito, Ecuador. The New Urban Agenda is the outcome of this conference, representing a shared vision for a better and more sustainable future. It also proposes that, for both developing and developed countries, well-planned and properly-managed urbanisation will be a powerful tool to promote the full implementation of SDGs and sustainable development as well (UNHABITAT, 2016).

Under the auspice of the ECOSOC, the High Level Political Forum will be convened every year, serving as the major platform for the review and follow-up of the 2030 Agenda for Sustainable Development and the SDGs (High Level Political Forum, 2019). After each

year's meeting, there will be a report on the progress on achieving the SDGs, and it also lists major challenges and issues facing the whole world, especially those relevant to sustainable development.



# Problems to be Solved

## I. Lack of City Planning and Risk Reduction Measures

### City Expansion without Long-Term Plan

As we are going to enter the second decade of the 21<sup>st</sup> century, the physical city expansion speed is 1.5 times that of population growth, calling for better and more appropriate city planning. In the past 15 years, countries have upgraded part of the urban slums, moving millions of people out of substandard conditions and offering them adequate housing, which resulted in the world's population living in slums decreasing from 28.4 to 22.8 per cent. But meanwhile, the construction of a new home still lagged far behind the demand. During the same period, the number of people living in slums actually increased from 807 to 883 million. Most of these slum dwellers are located in Eastern and South-Eastern Asia (332 million), Central and Southern Asia (197 million) and sub-Saharan Africa (189 million) (UNHABITAT, 2018). So we can see from the above-mentioned figures, there is an urgent need to balance the demand for adequate housing and the population growth. When making plans on city expansion, not only the current need should be taken into consideration, but the further development as well, so as to avoid redundant construction and the low utilisation ratio of the existing urban facilities.

### Lack of Disaster Reduction Measures in Urban Areas

Disaster reduction also constitutes a sub-goal of Goal 11. To strengthen cities' resilience to natural disasters, some disaster reduction measures must be taken in cities and central urban areas. According to the statistical analysis of the UN-HABITAT, since 1990, the housing damage caused by disasters has been rising steadily. In the meantime, the number of deaths from small- to medium-scale disasters has also shown an upward trend. Because of the high exposure to hazards, vulnerable conditions and insufficient coping capacity, low-income households and small businesses are affected more easily and frequently compared with those high-income ones. In order to ensure people's equal rights, prevent and reduce the losses and enhance city resilience to disasters, public and private investors are supposed to take disaster reduction measures into consideration when investing in newly built urban projects (UNHABITAT, 2018). For instance, some countries and coastal cities have upgraded the drainage system in flood-prone areas, so as to reduce losses caused by flood and inwelling.



## **II. Pollutions and Energy Issues Brought by Urbanisation**

### **Solid Waste**

The expansion of urban areas also imposed pressure on the waste management capacity of the relevant administration. Among all kinds of pollutions, solid waste is still a big challenge for many countries and regions. These uncollected solid waste in cities will exert both direct and indirect influence on the health of urban residents, and the surrounding environment as well. As for the quality and efficiency of the collection of solid waste, the data collected from 214 cities and municipalities indicate that approximately three-quarters of the municipal solid waste is collected. Compared with this figure, the collection efficiency in cities in sub-Saharan Africa is quite amazing. Only 50 per cent of the solid waste generated in cities is collected, which requires more efforts to enhance the implementation of related measures (United Nations Economic and Social Council, 2018).

### **Air Pollution**

The expansion of urban areas witnesses the much clearer partition of areas with varied functions, the increase of vehicle ownership and the large-scale influx of rural population. These changes all lead to the rise of carbon emission, which consists of unprocessed flue gas emitted from factories, car exhaust from the public and private transportation, and the waste gas from the daily life of every urban resident. These gases directly emitted to the atmosphere exert combined influence on the air quality, making it less suitable for people to live by and causing environmental issues such as dense haze and smog, and also some respiratory diseases like pneumonia and tuberculosis. According to the data of WHO, in 2016, 91 per cent of the urban population still breathed air that was much lower than the quality guidelines for particulate matter (PM 2.5), which was released by WHO, and meanwhile, over half of them was exposed to air pollution whose level was at least 2.5 times above that safety standard (United Nations Economic and Social Council, 2018).

### **Water Pollution**

The growing population and the development of manufacturing sectors are followed by greater demand for water resources. Although the awareness of water recycling and conserving has been widely spread to the public, the high development speed is imposing tremendous pressure on the limited amount of water resources. During the process of expansion, the relevant administration and supervision mechanism may be neglected for the convenience of factory owners and some private businesses. Both the daily sewage and the contaminated water discharged by factories will definitely lead to irreversible water pollution, which will in turn impact the health of urban residents.

## **Low Sustainability in Energy Utilisation**

Although the definition of energy sustainability has not been achieved, the general understanding on it is quite identical: everyone has access to affordable and acceptable energy services that are not detrimental to the environment surrounding them, and at the same time, the energy utilisation will not harm future generation's ability to obtain energy resources. A society in pursuit of sustainable development should take energy sustainability into consideration. However, since all energy resources currently applied in our society can cause environmental impact, only through improving energy efficiency and environmental stewardship can the concerns over this issue can be solved (Rosen, 2009). What's more, utilising renewable energy such as wind power, water power, solar energy, hydrogen energy and nuclear energy also contribute to the improvement of energy sustainability.

## **III. Low Mobility**

### **Separation of Residential Places from Functional Areas**

During the expansion of urban areas, the agglomeration effect tends to separate areas with different functions, so as to maximise the efficiency of certain fields. As a result, the residential community and different functional areas are separated. However, this trend also leads to undesirable consequences, such as difficulty in transportation, the increase of traffic expenses, the increase in business costs, and idle functional areas, wasting public resources. Hence, how to balance the planning of residential community and functional areas should be paid attention to.

### **Traffic Congestion and Poor Public Transportation**

The city planning usually experiences three stages, namely the formation, development and satellite city periods. In the first and second stages, the development of the urban area accords with the original design of competent departments of the local government. Once the plan is implemented, the infrastructure system is able to meet the demand for decades. However, as the expansion of the city continues, the current demand is beyond the carrying capacity of the existing traffic system, leading to traffic congestion and poor public transportation. In doing so comes the third stage, the satellite period. At this time, several sub-centres will be established to reduce the pressure on the urban traffic system, which is mainly caused by the continuously growing population. However, the establishment of satellite cities is not the approach that is done once and forever. With the expansion of the satellite cities, they will be integrated into the old urban area, forming a much bigger metropolitan. As a result, the same problem will appear again and again, which constitutes a circulation (Patrick Moriarty, 2008). Hence, how to design a traffic system that can adapt to the expansion of cities is worth thinking about.

## **IV. Diminished Community Identity**

### **Loss of Social Interaction in Local Community**

As is known to all, social interaction serves as the foundation of one society, composing different rules, systems and relationships in it. As more advanced technologies appear, our daily lives are becoming more convenient, but at the same time, these technologies also cause some problems, including social isolation, which refers to the absence of social contact and the state of being cut off from normal social networks (No Isolation, 2018). It is these modern technologies that lead to this consequence. Although modern technology has allowed us to maintain thousands of friends with online services through mobile phone, computer and other portable digital devices and offered us more ways of entertainment than ever, we still have the need for face-to-face communication.

According to the research by Robin Dunbar, a British anthropologist and psychologist, the limited number of people's stable and supportive connections with others in a social network may be roughly 150 (The Guardian, 2010). What's more, a recent research by Cornell University's Bruno Goncalves studied Twitter data and concluded that although people are able to connect with vast number of people with the help of the Internet, they still need to truly maintain 100-200 real friends in their social networks, which is conducive to their psychological health and will promote social interactions within the local communities.

Hence, on the one hand, we cannot deny the advancement in modern technologies and have to give full play to them in pursuit of further social progress; on the other hand, it is required for us not to forget the demand of ourselves, which shapes us as human beings.

### **Poorly-Designed Public Space**

As we all know, public spaces, usually including gardens, boulevards, playgrounds, parks and streets, are crucial to social life, because they can provide places where people can interact. With the help of such spaces, the air in cities is much clearer and the city structure more walkable, conducive to residents' physical and mental health. According to experts in land planning, it is recommended that about 15 to 20 per cent of the land be allocated to public spaces, while 30 to 35 per cent to streets. However, data collected from 231 cities show that over 59 per cent of the land is occupied by public spaces, nearly half of which is occupied by streets, which blocks the normal function of the existing spaces and urban facilities (UNHABITAT, 2018).

The design and management trends have been influenced by the increasingly globalised model, which accelerated the exchange of ideas and management methods around the world. Currently, the designers, developers and their clients no longer stick to one particular location but launch their business across the region, state or even on a global

stage. As a result, their design of public spaces is repeated from one place to another, without taking consideration of the local contexts.

Meanwhile, to guarantee that the design and construction of public spaces are in line with the demand of the local governments, they usually embed their own ideas into the design process. However, these ideas are not innovative and original at all. Rather, they usually come from the fashionable trends of the globe, including some guidelines, principles and unified standards which have been extensively adopted in many cases of public space design and management (Carmona, 2010).

These two above-mentioned phenomena will lead to the same consequence—the homogenised public spaces, making them lack innovation, waste the public resources and reduce the interest of the public to be engaged in the interactive activities in local communities.

# Possible Solutions

## I. Enhanced Infrastructure Construction

### Global Public Space Programme

Key to coping with densely populated urban centres and the decreasing community cohesion, public space is gaining more and more attention ever since UN-Habitat launched the Global Public Space Programme in 2011, involving the majority of accessible sites like markets or parks (Pontus, 2017).

In order to better utilise the resources and prevent the development of public space into either an under-managed or an over-managed state, there is a need for a global platform accompanying regional hubs (Carmona, 2010).

On the one hand, a global platform shall prevent the invasion of public space especially by the expansion of transportation or segregation intentions. In this way, local government should be regarded as the main counterpart and primary partner so that the design of public space could be integrated into the regional development goals.

On the other hand, nor will homogenised spaces or privatisation of public spaces be favourable. In such cases, the global platform shall not only pay attention to elements beyond the space itself, including the function and form but also explore innovations to better engage the private sectors.

### Regular Upgrading for Public Facility

Space design and public facility go hand in hand. Malfunctioned facilities should be replaced on time so as to better serve public space. In the meantime, outdated facilities could only evolve into barriers in the long run.

To guarantee the upgrading, there are two fundamental steps, with the former, periodical tests, and the latter, stable funding either from private means or government investments. Apart from encouragement for the appliance of new technology, the methodology for gathering data is equally beneficial for guiding the upgrading process. Besides, land value capture is also applicable so that public spaces may enter a virtuous cycle to generate private values for future development.

## II. Promotion of Community Groups and Housing Associations

## **Energy Conservation Measures for Residential Accommodation**

A high level of energy efficiency for individual houses benefits both the natural environment and people living in them. To realise the aim for domestic energy conservation, efforts should be taken to improve designs and tackle existing problems.

The first and most important task for local governments is to identify the most suitable measure for energy conservation based on their environment. Then, there is a range of other measures to be taken, including the promotion of energy services packages, community heating schemes, particularly those using combined heat and power technology, public education and the promotion of energy-efficient products.

## **Regeneration of Existing Housing**

The fundamental goal of sustainable communities is to foster healthy communities. However, since many of the current houses, the condition of which is closely linked to people's health, are too poor to meet the housing fitness standard, detailed standards and requirements should be introduced to provide a more effective mechanism for identifying and targeting action on the worst housing (Brian & David, 2010).

Meanwhile, the regeneration process is not limited to estates, but empowering people with assistance from organisations like community groups and housing associations. With the said new partnerships, it is more about bringing opportunities and choices to the previously excluded areas.

## **Encouragement for Local Economy**

A place-based economy can become a huge asset if properly organised. Resources, either natural or artificial, can be utilised to boom local manufacturing or tourism industries. To sustain the regional development, rules or regulations should be implemented to ensure that the economy operates within natural system limits. Precise calculation system should be adopted to evaluate the resource base, keep a balance between the depleting rate and renewing rate and oversee waste discharges to avoid deterioration and over-consumption.

The local economy should also produce built environments that meet locally defined needs and aspirations. It should create diverse housing, and infrastructure that enhances community liveability and the efficiency of local economic activities (Berke, 2002).

## **Case Study: Inner-City Slum of Hope: El Centro**

As one of the most densely populated sections of Mexico City, El Centro was once filled with low-income families (Susan, 1990). However, joint efforts taken by the local residents and the government converted it into a slum of hope.

The government introduced the rent-control legislation so that tenants were able to stay and even make improvements to the formerly ill-equipped apartments in the 1960s (Susan, 1990). Local residents seize El Centro's advantage of locating at the centre and commerce was extraordinarily lucrative. In the 1970s, the dwellers earned more money by doing small scale independent works than educated residents in the squatted settlements (Susan, 1990). Besides, the local residents had a strong sense of commitment to their community supported by their subculture. As a result, neighbourhoods were closely connected, and their broad network of friends and relatives brought them with a wide range of job contacts.

The social and economic life of people in El Centro suggested that there is no need to be over-pessimistic about life in city slums. Yet peoples' rights to affordable housing and opportunities to generate income can explore the potential possibilities of community dynamics.

### **III. Planned City Extension and Decentralisation**

Although many communities are now embracing the concept of sustainable development, the explicit inclusion of the concept has no effect on how well plans actually promote sustainability principles without thorough understanding of sustainable planning or political commitment to put it into practice. For policymakers, it is important to address that sustainable community is beyond creating more liveable built environments but taking a balanced, holistic approach to guiding city extension and moving toward sustainability. In the meantime, the development of public spaces presents a realistic path to the reconstruction of functional areas. It is possible that in the future, rather than gathering in specific parts of a city, resources of all kinds could be allocated to different communities, moving on to a process of decentralisation. In this way, problems like traffic congestion and unbalanced urban development could thus be eased.

### **IV. Improving the Interface between Policy and Science**

Scientific research is key to the transformation towards an inclusive and sustainable community which requires complex planning across sectors for not only solutions to the current risks as mentioned earlier, but also controls over future risks (ECOSOC, 2018).

For resilience building, a systematic and long-term approach based on scientific observation provides advanced analysis for cities as well as warning systems in case of hazards or shocks. Consultation from expert and coordination among a wide range of stakeholders should be promoted especially on a local or regional level for the implementation of plans. Meanwhile, the said urbanisation plan of local authorities should be integrated into national development planning for strategic purposes.

Technology and data are also important for urban planning. With a considerable number of countries lacking vital statistic systems, 47% to be specific, there is a crucial need to not only allocate budgets for improving data collection and management, but address the use of disaggregated data and demand for actionable data (ECOSOC, 2018). New technologies like artificial intelligence and big data should be integrated into the process of improving resilience and coordinating various sectors involved in the process of urban planning innovatively.

## **V. Others**

For urban planners, strategies should vary in accordance with local conditions while catering to all social groups. For instance, island countries will certainly hold different policies compared to inland nations in terms of clean energy sources, hazard prevention measures etc. By the same token, nor could countries at different financial status adopt a uniform approach. As a result, although the current peer learning at regional levels is a good opportunity for the share of experiences, local conditions should never be underrated.

Besides, the process of urban planning involves a variety of social groups and it is important to cater to special groups like women, children or people with disabilities to enhance inclusiveness and accessibility (The High-level Political Forum, 2018). Also, for regions with a strong indigenous cultural background, bottom-up approaches are needed to incorporate indigenous knowledge into modern planning so that connectivity for isolated cities could be enhanced.



# Bloc Positions

## The United States

In 1973, the Arab coalition imposed an oil embargo targeting the United States and countries that supported Israel during the Yom Kippur War. The effect was immediate, the price of oil quadrupled by 1974 (Office of The Historian, 2013). And in 1973, the US's production had declined drastically. The country finally realised the importance of alternative energy.

In 1992, almost 20 years later, hydrogen technology finally started to receive attention from the federal government. The Energy Policy Act of 1992 initiated the research of hydrogen on a national level. The 1992 policy, followed by the Energy Policy Act of 2005, together with other regulations they have constructed a well-established system for the further development of hydrogen technology. However, the policy varies greatly between different states. For instance, the government of California attached great importance to hydrogen technology, while states like New York and West Virginia focused on the development of BEVs. At the same time, electricity is just one of the alternatives for the United States. The shale gas revolution in the country has significantly downward the pressure on gas and oil price which is also a solution to avoid another energy crisis (Stevens, 2012). With different options in hand, it will be a tough choice for the government to make.

Policy makers are also facing a dilemma when it comes to urban construction. The explosion of the urban population looks set to continue through the twenty-first century. For some, they think urbanisation is the only way to cope with this problem, while others think it is better to upgrade the current city communities. History has proven that unorganised urbanisation can be a disaster. As the most densely populated county, Los Angeles county possesses the second largest metropolitan area in the United States after that of New York City (United States census bureau, 2013). However, the infrastructures were not keeping pace with the urbanisation. Instead of skyscrapers, citizens need more parks. Instead of self-driving cars, people need more safe and seamless transportation options. Instead of some fixed community designs, a wide range of housing options would be a better choice for the local housing stock so as to attract people of all ages and income levels (Mayer, 2018).

The cultural diversity of the United States has also given challenges. The community needs to embrace all kinds of culture. Currently, the special segregation between the white community and the black community seems unbreakable.

## European Countries

The EU Regional Policy constitutes the largest part of the EU budget for 2014-2020 (€351.8 billion out of a total €1082 billion), which was set up for the social and economic progress of the EU member states and other European countries. Based on the European Union's Regional Policy 2014-2019, all European countries are classified into three categories: less developed regions (GDP less than 75% of EU-27 average), transition regions (GDP more than or equal to 75% of EU-27 average but less than 90% of EU-27 average) and more developed regions (GDP more than or equal to 90% of EU-27 average) (European Union, 2014).

According to the differentiated demand of these regions, the investment from the budget will be used to achieve such goals as an environmentally friendly economy, promotion of innovation, support for small and medium-sized enterprises (SMEs), the construction of a more inclusive society and so on, some of which have been included in the sustainable development of future housing and community.

Among the major investment areas of the European Regional Development Fund (ERDF), it invested almost €27 billion in green or sustainable economy in 2014-2020, which increased the use of renewable energy in both public and private sectors and boosted the energy efficiency, enhancing the eco-friendly level of housing and buildings and contributing to low-carbon economy (European Union, 2014).

According to one report published by the European Political Strategy Centre, *Where EU Governments Spend—A Comparative Overview of Public Expenditure in the EU Member States*, the government expenditure in the EU-28 contains €91 billion spent in housing and community amenities, accounting for 0.6% of the total GDP. In this category, the government these member states invested respectively €27 billion in housing development, €39 billion in community development, €11 billion in water supply, €8 billion in street lighting, €1 billion in R&D housing and community amenities and €6 billion in housing and community amenities (European Political Strategy Centre, 2018).

Besides what is mentioned above, the European Union also played a constructive role in contributing to the realisation of SDGs, especially to its tasks relevant to sustainable housing and community. It launched a series of programmes to offer help and financial aid to less developed countries in other continents like Africa and Southeast Asia to meet their basic needs concerning housing and community, such as the Sustainable housing and community development programme 'On the pathway of entrepreneurship' in Egypt (European Union, 2018). The EU is utilising its advanced technology and strong economic power to inject new dynamism to the lofty cause benefiting all human beings.

## China

China has been a very active participant in promoting FCVs and the vision of a hydrogen society. Chinese government offers huge subsidies and favouring policies to encourage Chinese automobile manufacturers to development FCVs as a vital part of "reviving the nation's automobile industry." China is also one of the few countries to widely put FCVs

in its public transport system. In several cities of China, at least there are now mature refuelling networks for its public FCV buses, a tangible first step towards the hydrogen society China has been promoting for years. However, China also faces the similar disadvantages of FCVs, such as expensive costs of manufacturing a hydrogen fuel cell battery, the collateral damage inflicted upon the environment when producing hydrogen fuels, and the safety of hydrogen fuel cells. A wholesome solution is yet to be discovered.

For housing problems, China has carried out housing reform programmes which target at low-to-medium households. Till now, problems brought about by the skyrocketing housing prices could hardly be solved by this sole approach considering the large-scale urbanisation. However, the public investment in China allows the integration of sustainability considerations rather than a pure pursuit of investment return, which proves to be effective from a long-term perspective and is worthwhile learning.

## Japan

Japan is a leading country in developing FCV technologies, thanks to the country's strong automobile industry. The Japanese automobile giant Toyota possesses some of the most advanced technologies in FCV manufacturing; it has started to develop FCV technologies since as early as the 1960s. Being a small island country with a rather limited choice of natural resources, Japan has always had a strong incentive in developing a renewable energy alternative to alleviate its dependence on imported oil. However, a reliable source has pointed out that, despite being one of the most technologically mature FCV consumer products in the world, the Toyota Mirai is not bringing in any profit for the company. Its high costs lead to a 3000 USD deficit every time the company sells one Mirai, forcing the company to consider giving up the project as a whole.

In Japan, land readjustment (LR) has been regarded as one of the most important urban development projects, which, in essence, gathers the scattered lands for road and infrastructure building from landowners, who in turn, benefit from the rise of the land price. The self-financing nature of LR makes it a model for many developing countries, especially small countries (Sorensen, 1999). However, as time passes, the increasing needs for advanced infrastructure make it a burden for the retrofitting of the narrow roads suffering from severe congestion. The problems revealed are yet to be tackled by new approaches.

## Africa

For African countries, one particularly abundant resource is solar energy, which means that if renewable energy could produce hydrogen on a large scale, the promotion of FCV and hydrogen will bring an economic boom to equatorial Africa. However, currently, many African countries hold a relatively low efficiency in energy consumption, relying on burning wood, which is less environmental-friendly.

For housing and community development, housing affordability and poor infrastructure are the main concerns for most African countries. In Sub-Saharan Africa, for instance, 55 per cent of people spend more than 30 per cent of their income on housing (ECOSOC, 2018). Deprived traffic condition gives rise to the high rate of road accidents in Africa.

Recently, the Africa Regional Forum is highlighting practices made to tackle slum problems and conduct resilient structural transformation (ECOSOC, 2018). Yet still, further integrated national frameworks to foster alignment of urban policy with the SDGs.

## Others

For many developing countries like India, there is a substantial amount of natural resource that is potential for hydrogen production including coal and wood. For these countries, the current measures adopted to utilise the primary resources are detrimental to the environment. As a result, troubles like air pollution and water pollution are evident. More and more countries are intended to shift their way of consuming energy with assistance from the international community.

When it comes to urban problems, one shared problem for a majority of Latin American countries is the urban slum caused by large-scale migration during the 1960s. Some communities overcame it because of their strong sense of community and strong family or neighbouring ties. Others, by contrast, are still trapped in the vicious circle of bad environment-poor education-difficulty in changing their situation. One crucial reason is the lack of professional guidance for community development. It is never a wise choice to simply pour money into urban slums. What is more important than financial assistance is innovation to get them out of the dilemma.

## Questions to Consider

1. How to make oil exporters cooperate on hydrogen technology?
2. To what extent will the hydrogen alter the role of oil in the energy domain. Which one do you think has a brighter future, FCV or BEV?
3. What are the advantages of FCVs when compared to Electronic Vehicles?
4. Which type of FCVs should be introduced first to a new market, the FCV for personal family use or the FCV bus for public transport?
5. What can be done to further increase the popularity of FCVs in today`s society?
6. What kind of role should the government and community groups play respectively when it comes to urban development?
7. Is it workable to include community leaders into the policymaking process?
8. Different national situations lead to different development plans. What kind of experience should countries share when it comes to the design of public spaces?

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