

Smart City

Creating Smart Cities to Achieve a Balance between Economic Development and Environmental Measures



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1. The Concept of a Smart City

First, I would like to give a simple explanation of the world energy picture using figures 2, 3, and 4. The world's population is 6.9 billion. 1.6 billion people (1/4 of the world's population) live without electricity. There are 2.4 billion people (1/3 of the world's population) in China and India. And the total oil output on the earth is 1/2 of the volume of Mount Fuji. What can we learn from these figures?

It is desirable to achieve a comfortable life, with electricity, for the 1.6 billion who currently live without electricity. When more people start driving in countries like China and India, where living standards are improving remarkably, the limited amount of oil may be used up before we know it. Thus, there is a pressing need for a stable supply of energy that does not depend on oil.

Also, from an environmental point of view, it is a global challenge to depart from using energy sources that emit carbon dioxide when burnt, such as oil, natural gas and coal. Natural energy, including solar and wind power, has enormous potential for realizing a low-carbon society and supplying energy equally among people across borders.

To this point, mega-infrastructure energy, such as fossil

fuel and nuclear power, has played a central role in transmitting and distributing electricity to where it is in demand, like cities and factories. In the future, however, consumers will be required to take in as much renewable energy as possible. It is expected that a new power distribution system controlled by both mega-infrastructure and consumers will be established. This is the "smart city" concept.

In particular, electricity will be generated by solar cells placed on the roof of each house to supply necessary power for households, and the surplus will be stored in electric vehicles. By embedding ICT (Information and Communication Technology) in home appliances and power meters, appliances can be controlled remotely. In this way, "smart houses" are created first, and then they collaborate to accommodate electric power needs, creating a "smart community." If smart communities have surplus power, they will be able to transmit green electricity with a light environmental load to metropolitan areas that consume a lot of energy. A "smart city" is defined as a society where an intelligent two-way power distribution system is in place and the use of renewable energy can be maximized.



2. Smart City Planning in Japan

At Expo 2005 Aichi, I took on the position of chief designer for the project that supplied 100% natural energy to the Japanese government's pavilion by building a micro grid* at the pavilion occupied by NEDO*, an external body of the Ministry of Economy, Trade and Industry. Through this project, the prototype of a smart city was demonstrated. At that time, Japan already had the requisite technology and was not behind the rest of the world in this field.

However, Japan began its official smart city planning only after being hit by the impact of President Obama's announcement of the Green New Deal. At about the same time, the Democratic Party of Japan started a new government and established a "Next-generation and Social Systems Committee" in the Ministry of Economy, Trade and Industry. Since I had been engaged in new energy policies from the time of the previous government, I was appointed a member of the committee to address the strategic challenges involved in demonstrating a smart city together with other members.

The strategic approach is to seek innovation that is about more than just finding solutions to energy issues and making our lives more convenient. Innovation means "a structural reform of the socioeconomic system led by new knowledge and technology." To be strategic, it must represent a scenario of economic recovery and technology development. In that sense, we are aiming at creating new business models and jobs and expanding business overseas by realizing the global standardization of related devices in collaboration with the U.S. and Europe. We are looking ahead to the future economic development of Japan.

To correspond with global standardization and to initiate a social system, we first urged NEDO to establish a "smart community alliance" without industrial barriers and then encouraged a number of private companies to participate in the alliance. More than 500 companies joined the alliance, which demonstrated the high level of public interest. In 2010, a project with an aim to build a Japanese version of smart cities in five years started, and Yokohama, Toyoda (Aichi), Keihanna Gakken City (Kyoto) and Kitakyushu were designated as model cities. Besides local governments, the project's acting members include companies from a variety of industries such as automotive and steel manufacturers, electricity and gas suppliers and telecommunication carriers. In addition to the 100 billion yen in public funds that the government will spend, member companies also plan to invest in the project to create smart cities.

3. Real-life Smart City Examples in Japan

The smart city concept has been put into practice by the actual utilization of electric vehicles (EV). Lithium batteries commonly used in electric vehicles have the capacity to store about 1.6 days' worth of average household electricity consumption. Previously, we could not store the surplus electricity obtained through at-home power generation methods such as solar cells. By making smart houses, we will be able to start storing the excess power in electric vehicles. In addition, further improvements have been made to electric vehicles.

Toyota Motors, which plays a central role in the smart city project, has been developing an EV that is capable of exchanging electricity at supermarkets or convenience stores. Traditional electric vehicles could only discharge electricity for use in engines. In the future, high-performing batteries may enable EV to charge and discharge freely. If that happens, for instance, when we go to a supermarket and spend a certain amount of money, we might be able to charge our EV with electricity generated through solar cells on the roof of the supermarket, free of charge. Or, we may be able to sell the electricity stored in our EV. During peak demand, it may be possible to sell our electricity at a high price.

We are also working on this project from the viewpoint of liberalizing the regulation of the household use of electricity. At present, power companies are allowed to purchase only highvoltage power (over 50KW). Meanwhile, domestic low-voltage power is supplied exclusively by local power suppliers. However, because of the change in government, we are currently in an environment where deregulation seems to be more easily accepted. If the regulation of the power supply and demand system was reformed, it would increase the chance that new types of electricity businesses would be created.

4. Cutting-edge Technologies Used for Smart Cities

When talking about the new technologies in the smart city project, the EV technology is most likely to be pointed out first. However, I would like to introduce something else that deserves attention: the potential of navigation systems. Tom Tom International BV in the Netherlands, which has about 40% of the world market share of navigation systems, is aiming to build a new energy system with navigation at its core. The power generation capacity of solar cells and wind mills largely depends on weather. The new system uses a GPS system to check the power generation status of each area in order to enable mutual accommodations of green power. High expectations are placed on the ripple effects of the new system, particularly because it is implemented by a navigation company.

Also, the importance of smart meters should not be forgotten when discussing the smart city concept. Smart meters are power meters with a communication function. When conventional meters are replaced with them, we will be able to measure power capacity and control home appliances remotely. It will be necessary to embed ICT in home appliances, but the cost is estimated to be as low as 1,000 yen per appliance. There is no question that smart meters will make a significant contribution in the streamlining of our life styles and ways of managing energy consumption. Fig. 2: Cutting-edge Technologies Used for Smart City - Basic Concept



5. The Social Change Created by Smart Cities

It is clear that a new energy system utilizing green power alone cannot fulfill the power demands of our society. In industrial areas, natural energy on its own will not be sufficient. It is important to use the new energy together with existing mega infrastructure. Still, the new energy is expected to bring about a dramatic change in our social life. For instance, the widespread utilization of smart meters may create new business models, such as a "home doctor" who analyzes each home's power usage data and gives advice on how to use energy more efficiently. Also, as ICT is embedded in all electric devices, the comprehensive life-and-environment-related service industry, including elder care and food supply, will have great growth potential. As for urban planning, ensuring a natural energy supply will gain more importance. For example, determining solar rights will involve not just the issue of how much sunlight we can get, but the issue of how much money we can get out of solar energy. Probably, building a social system for sharing generated power, such as carpooling at the community level, will be essential to urban planning. By utilizing all the natural energy available, economic development and environmental objectives will be simultaneously achieved. And, by making intelligent cities, we will be able to have a more comfortable and convenient way of living. To actualize our grand design by 2050, we have been striving to build a new energy system in 10 to 20 years through collaboration between industry, academia and government.

(This article was created based on an interview with Professor Takao Kashiwagi on Jan. 12, 2011.)

- *NEDO: New Energy and Industrial Technology Development Organization, administered by the Ministry of Economy, Trade and Industry. The organization aims to solve energy and global environment issues and to strengthen Japan's competitiveness in industrial technologies.
- *Micro Grid: A small-scale power generation network that has both energy supply source and energy consumption facilities.

Profile of Professor Takao Kashiwagi

Born in 1946. Graduated from the Tokyo Institute of Technology. Obtained a Ph.D (engineering) in 1979. Worked as an NBS-invited researcher of US Department of Commerce from 1980 to 1981. Became professor of engineering at the Tokyo University of Agriculture and Technology in 1988. Professor at the Integrated Research Institute of the Tokyo Institute of Technology from 2007 to the present. The 21st chairman of the Japan Institute of Energy and a principal member of various energy-related councils administered by the Ministry of Economy, Trade and Industry. Professor Kashiwagi is the author of numerous books and articles.

International Research Center of Advanced Energy Systems for Sustainability http://aes.ssr.titech.ac.jp/english/greeting.html

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An interview with the Ambassador of the Republic of Palau to Japan

Embassy Visit & Interview

The Republic of Palau, Showing Gradual Change Following Capital Relocation

Palau Embassy - Tokyo, Japan His Excellency Dr. Minoru Francisco Xavier Ueki, Ambassador

Regarding the relocation of the capital to Melekeok

In 2006, the capital of your country was moved from Koror State to the state of Melekeok on Babeldaob Island. Please tell us about the meaning and reason for this relocation.

The "Republic of Palau" gained independent governance in 1981 and the constitution was ratified. The immediate reason behind the capital relocation is that the constitution stipulated that "the capital shall be relocated within 10 years". The citizens of Palau had long sought to move the capital toward the center of its territory. That is to say, while Koror had long been the capital of Palau, it had always been controlled by Spain, then Germany, then Japan, and finally by the United States of America during the trusteeship period.

Further, as Koror had long been the capital, the population became too concentrated, as a result of which economic activity and central functions such as schools also became too concentrated. Also, at the time, boats were the main form of transportation in Palau, so planning was done to proceed with new infrastructure such as bridges and roads. That also became an incentive to realize the relocation of the capital to the nation's center. We wished to reduce the population density of Koror through the capital relocation. We also wished to distribute economic functions so that other regions could receive the benefits thereof.

Why was Melekeok chosen as the new capital?

The final reason that Melekeok was chosen was that the land was provided to the government free of charge. The area where the New Capitol Building currently stands is land owned directly by the national government, much like Washington D.C. in the United States of America. Melekeok is a town with high elevation located almost at the center of Palau, from which one can look down to the ocean in the east and jungle to the west.

Regarding the process leading to the realization of the capital relocation

While the 1981 constitution stipulated that "the capital shall be relocated within 10 years", it was actually relocated in 2006, so it took 25 years. Were there many problems during that time?

The wording of "within 10 years" meant the designation of candidate sites. This was not a stipulation of the period within which the relocation should be completed.

What process was taken between choosing Melekeok as the site and the actual relocation?

The capital relocation was a major project carried forward by the previous presidents, and had been carried forward since our 3rd President Lazarus Salii took office, but Melekeok provided the land in 1993 when President Kuniwo Nakamura took office, and then the United States of America provided 2 million dollars for the relocation, so that was a period when many factors came together. President Nakamura took office under those conditions, so he had to move forward with it very quickly.

Thus President Nakamura gave a presidential order to establish a capital relocation advisory committee. Then in 1996, the law for the capital construction was passed and the official committee for capital construction was formed. Melekeok and Koror had a relationship of rivalry in the past, but a time of peace was entered when the Japanese took control of government. Thus, while there was some political discussion regarding the capital relocation, it was peaceful. By the way, we are all Palauan who speak the same language and practice the same customs.

The design for the New Capitol Building was then decided in 1997. Thus President Nakamura took office during a period when the capital relocation project was being actively moved forward.

Construction on the New Capitol Building was begun in 1998 and I believe it was completed in about three years. However, it was not used right away, and the actual relocation was achieved during the term of the next President, Tommy Remengesau, in 2006. Because at the time, gasoline was expensive and many thought that commuting would be a burden, and further, there was no electricity, so it could not be used right away.

Incidentally, a bridge connecting Koror Island with Babeldaob Island was constructed in the 1970's, but it experienced complete structural failure in 1996, and a new bridge was completed later in 2002 using ODA funding from Japan.



The finished New Capitol Building looks like the Capitol Building of the United States of America. Was the architect an American?



(C) Embassy of the Republic of Palau in Japan

An architectural firm in Hawaii was hired to do the design. While it is an American firm, it is an architectural firm that is very active in the Micronesian region, and it was chosen by the committee in charge of the capital relocation.

Four different design proposals were submitted by the architectural firm. Many Pacific nations use a design that is very ethnic, and at first the committee apparently felt that a design should be chosen that deeply reflected the back-ground of Palauan culture. However, in the end, a design seen often in Europe and America featuring the Roman architectural style was chosen. As you can see it is very simple and elegant, and we like it very much.

Tell us the concept behind the design.

It uses the style of the Roman era, so it symbolizes civilization, democracy, and the freedom of the people. Palau was only just born as a nation, and from the standpoint of newly joining the world community, we wanted to express to all nations our freedom and independence through this elegant form.

Regarding changes following the capital relocation

How did Melekeok change before and after the capital relocation? For instance, I saw in the literature that the pre relocation population was 400 people. Did the population increase after the relocation?

As a bridge was built connecting Koror Island to Melekeok, it takes only 20 to 30 minutes to drive from the former capital of Koror, so it is possible to commute. Therefore, many of the people employed in government agencies have homes in the former capital of Koror and commute to Melekeok. Further, the President, Vice President, and many legislators are also commuting from Koror. Thus we have not seen a population transfer as great as we expected. However, while I am not aware of the exact numbers, it is undeniable that the population of Melekeok has increased a great deal compared to 400 people. The Executive, Legislative, and Judiciary branches have all relocated, so some people have moved their homes to Melekeok, and many people are working in Melekeok during the day, so new service industries such as the restaurant industry have been created. Currently, Koror has the largest population in Palau, followed by Airai where the airport is, and then Melekeok in third place. The road system to the State has been rehabilitated, a modern sewer system was built and is being used in conjunction with the Capitol Buildings. A tax free zone has been established 2 miles around the Capitol to include location in Melekeok as an incentive for business activities.

Have all functions related to capital functions been relocated?

In addition to Executive, Legislative, and Judiciary functions, the Council of Chiefs has also relocated to Melekeok. Originally, Palau was divided into states and each state was an independent organization with its own government and chief. The Council of Chiefs still exists today and fulfills the role of an advisory organization for the President, thus it of course needs to be located nearby.

However, conditions have not reached the point where foreign embassies are moving to Melekeok. The United States of America had only just built a new embassy in Airai, and the Japanese embassy is currently located in Koror and I doubt there is any plan to move. Of course Palau would prefer that they move to Melekeok, and if that is possible, we are ready to provide land for the purpose.

I guess that Koror has many facilities that play a central role in a city's functioning such as restaurants and hotels, and with the Pacific Resort nearby, the location is good and convenient. Further, Koror is only a short distance of 20 or 30 minutes from Melekeok by car, and has communications infrastructure centered around Airai, so perhaps they do not feel a need to move to Melekeok.

Of course, there are not many embassies in Palau to begin with. In addition to Japan and the United States of America, there are the Embassy of the Republic of China (Taiwan) and the Embassy of the Philippines.

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Regarding public opinion of the capital relocation

What is the public reaction and opinion of the capital relocation?

The citizens of Koror were very happy when the relocation law was passed. Perhaps the reason is that while more than half the citizens live in Koror, many come from other villages, and their dream is that other areas develop economically in the future, that their home villages enjoy those benefits, and that one day they can return home to build houses there. Of course the people of Melekeok are happy that their home town became the capital. Perhaps there is not a sense at the moment that there was any drastic change. The trend remains of economic functions being focused in Koror. However, currently the President is organizing the village chiefs to carry out urban development and preparing a framework to accept investment so that economic functions can move to Babeldaob Island, where Melekeok is located. This has begun to invigorated economic activity in northern Palau so that the citizens there can enjoy the benefits of the capital relocation. These plans are becoming reality.



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Parliament Buildings around the World

Gothic Parliament Buildings on the Waterfront

United Kingdom (London)



Westminster Palace in London, which stands by the side of the Thames, is the parliament house of the United Kingdom. Its history goes back to the Middle Ages. With a 96.3-meter-high clock tower, known as Big Ben, it is also one of the most popular sightseeing spots in the country. The current building was reconstructed in 1857 after the previous palace burned down in 1834. The 286-meter-long massive structure has over 1,100 rooms, 100 staircases and 11 courtyards. This magnificent parliament building is an eternal monument to the UK's national identity - progressive and traditional - as represented by the Gothic Revival* style.

The Parliament Hous Building of United Kingdom

Republic of Hungary (Budapest)



Parliament Building of Republic of Hungary

The Hungarian Parliament Building is the only parliament building built in the Gothic Revival style outside of the United Kingdom. Looking onto the Danube, it boasts palace-like decorative exteriors. It is the largest building in Hungary: 268m long, 118m deep and 96m high. In 1883, during the dual monarchy of Austria-Hungary, planning began for the parliament building's construction. At that time, the movement for attaining independence from Hapsburg rule was gaining momentum in Hungary. It is said that Hungary built the gorgeous parliament building as a symbol of the country's national identity and to surpass the parliament building in Vienna.

*About the Gothic Revival Style

Gothic Revival was born as a reaction against the logical formalism of neoclassicism, which was common in the 18th century in Europe. It aimed to revive the medieval and decorative Gothic Style. The revival movement began in England to pursue essential beauty, which was different from the aristocratic and decadent Rococo Style that was in fashion prior to neoclassicism. Soon after, Gothic Revival reached the world of architecture.

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Relocation of Capital Functions around the World

New Capital Construction Triggered by Independence: The Commonwealth of Australia and the Republic of Kazakhstan

Commonwealth of Australia (Canberra)



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Upon attaining independence from the United Kingdom, Australia became one of the Commonwealth Nations in 1901. Sydney and Melbourne, which had developed into large cities during the 19th century, competed with each other to be selected as the new capital of the country; however, the government decided to build a new capital city. In 1908, Canberra was selected as the new capital by parliamentary vote. "Canberra" was derived from "kamberra," which means a meeting place in the language used by the indigenous Australians. The new capital, with a manmade lake in the center, was built based on a plan made by an American architect, Griffin, which won first place in an international competition. The construction of the new capital slowed down during World War One. In 1927, as a temporary federal parliament building was completed, minimal capital functions were transferred from Melbourne, where the interim government had been placed. After the tough times of the Great Depression and World War Two, urban development and facility construction moved forward at a rapid pace. In 1988, the new federal parliament building was completed. Canberra is the Australian Capital Territory and is run by the Commonwealth Government. The central district of the capital is divided into

two areas by the man-made Lake Burley Griffin: the south side, where government organizations are located, and the north side, which is a commercial area. Satellite towns have developed north and south of the capital. A green capital has been created through a Cluster Development Approach that avoids proximity between crowded areas. Canberra's population has increased from approximately 230,000 to 360,000 in the 30 years since 1980. It is expected to exceed 390,000 by 2019. Today, at its mature stage, the capital has become Australia's largest inland city and the home of the nation's primary functions of legislation, administration, and justice.

a Russian Federation Astana Mongolia Uzbekistan Turkmenistar Kyrgyzstan ikistar Iran People's Republic of China Afghanistan

Republic of Kazakhstan (Astana)

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Kazakhstan used to be one of the republics of the Soviet Union. It became independent through the 1991 dissolution of the Soviet Union, and the country relocated its capital in 1997 from Almaty (Alma-Ata) to Astana (which means "great city" in Kazakh), formerly known as Akmola. Astana was chosen with the expectation of resolving the economic, geographic and environmental problems that the former capital, Almaty, faced. While Almaty was located in an earthquake zone, Astana was in the middle of the Eurasia plate with little chance of earthquakes. Also, being near the Chinese border, Almaty had security-related fears. Furthermore, the old capital, which was the largest city in Kazakhstan, suffered from air pollution and population congestion. Astana is located in northern Kazakhstan, where the ratio of Russians is high. It seems that the government intended to increase the Kazakh population in the capital area in order to achieve ethnic harmony in the country.

The capital construction, which was the first national project after Kazakhstan's independence, was based on a design by Japan's Kisho Kurokawa Architects & Associates, who won first place in an international design competition for the new capital in 1998. Astana's population, about 270,000 before the capital relocation,

was expected to double to about 570,000 in 2007 and to rise to about 1 million in 2030. Many issues are still unsolved in infrastructure development. Meanwhile, the new terminal of the international airport was completed thanks to an Official Development Assistance (ODA) loan from Japan, and the airport system has been organized as a gateway to the capital. "The palace of peace and harmony," a pyramid-shaped building with facilities such as a conference hall and an opera theater, and "Bayterek" (meaning "Tree of Life" in Kazakh), a 100-meter onion-bud shaped tower, have been completed. Also, luxury apartments are being built using foreign capital. As a construction boom is underway, Astana, previously just a commercial town in the middle of grassland, has been changing into a new city with 21st century amenities.

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Regional Information

Yuru Chara ® Festival Commemorating the Opening of the Entire North Kanto Expressway

Tochigi Prefecture

Prior to the opening of the entire North Kanto Expressway on March 19, 2011, a commemorative event was held on February 5 by NEXCO East Japan. The North Kanto District Regional Cooperation Promotion Council (comprised of the prefectures of Ibaraki, Tochigi and Gunma) participated in the event along with Niigata Prefecture and Fukushima Prefecture.

Many people enjoyed quizzes and photo sessions with Yuru Chara® (Japanese regional promotional mascots) as well as tourism PR events and the specialty shops of the participating prefectures.





<Participating Major Regional Promotion Mascots>



Regional Information

Shiga Prefecture – Home of Gou, One of Three Azai Princesses

Shiga Prefacture

Gou, one of three Azai princesses and the heroine of NHK TV's annual historical drama in 2011, was born at the castle of Odani in Shiga Prefecture. Besides Odani Castle, Shiga has many historical sites from the Sengoku (civil war) period including Otsu Castle, Omizo Castle of the Kyogoku family, which Hatsu, Gou's older sister, married into, and Azuchi Castle, which was built by Oda Nobunaga, the famous warlord.

Shiga Prefecture is taking advantage of the broadcasting of this popular TV drama, titled "The Story of Gou - Sengoku Period for Princesses," to promote its rich nature and valuable historic and cultural resources nationwide. In February 2010, a total of 64 groups including the prefecture's economic associations and tourist organizations established Shiga Prefecture's Promotion Council for "The Story of Gou," aiming to improve Shiga's visibility, attract more tourists, and revitalize the regional economy.



For additional tourism promotion, Shiga created the characters of the Azai Three Sisters - "Ogou-chan, Ochacha-chan and Ohatsu-chan" - cooperatively with Fukui Prefecture, which also has connections with "The Story of Gou." The characters are going on a nationwide tour.

In Nagahama City, where Odani Castle is located, exhibitions titled "Gou and the Azai Three Sisters" (from Jan. 5 to Dec. 4, 2011) and "Gou" (from July 23 to August 31, 2011) will be held. Throughout the year, there will be more events in connection with the drama. Shiga eagerly welcomes tourists.

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