

A solutions
landscape for

Koobe Japan

The Urban Infrastructure Initiative – UII



wbcsd urban

Summary

The World Business Council for Sustainable Development (WBCSD) Urban Infrastructure Initiative (UII) considered 14 solutions to help Kobe city achieve its sustainability ambitions.

The solutions emerged from a study of four themes, which the UII team identified in dialogue with Kobe. They included energy efficiency and renewable energy production; sustainable mobility; knowledge networks and leadership in disaster resilience.

Kobe’s Environmental Future City Initiative already includes many proposals to advance the city’s aim of meeting the environmental, demographic and economic challenges it faces. However, the UII team worked with the city to identify additional measures, building on the city’s progress to date. By integrating UII recommendations with existing plans,

Kobe city will enjoy many opportunities to further advance progress towards its sustainability vision.

The UII engagement with Kobe benefited from the opportunity to utilize the CASBEE-City modeling tool. CASBEE-City provides a comprehensive evaluation of the sustainability performance of cities, using a triple-bottom-line approach of environment, society and economy. The tool proved to be useful for platform for dialogue on sustainable solutions and was able to quantify the additional potential benefits of the solutions proposed by the UII team.



Introduction

The city of Kobe engaged with a group of experts from leading global companies to identify solutions that will help meet the city’s sustainability vision.

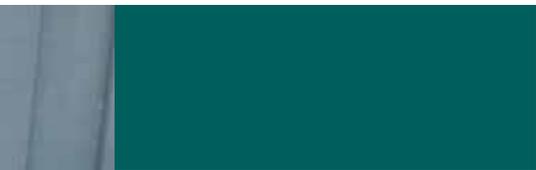
The companies are members of the WBCSD UII project, a unique project that provides multi-sector expertise to help transform a city’s sustainability vision into a practical, cross-cutting strategy.

The group of six global companies,¹ along with the WBCSD, worked with officials from several city departments to identify key sustainability issues and propose solutions.

The engagement began with a dialogue session in June 2012, which brought together city officials, the UII team and supporting experts.² Together, they discussed the city’s sustainability vision, challenges, plans and priorities. They then identified the “issues landscape” – the focus for the UII transformation study. The UII team later proposed practical solutions including energy efficiency improvements, sustainability mobility measures and enhancing knowledge-based economic development.

The project also demonstrated the value of providing multi-sector input early in the city’s strategic development process. This enabled city officials to consider a variety of ideas and engage with the private sector collectively, rather than only in relation to specific projects. Such holistic thinking is increasingly important for inclusive and sustainable urban development around the world.

Kobe city is one of eight cities or regions to engage with UII. Not only does it recognize the value of private sector involvement, it has also moved from vision to strategy and action on sustainability.





Kobe city's sustainability vision

Kobe city established the Fifth Master Plan in 2010, covering the period to 2025. Kobe city's plan aims to revitalize the city in harmony with nature. It envisages preserving the abundant natural environment, while striving for sustainable community development, and taking major steps towards a low-carbon society. Specific plans for the first 5-year period to 2015 emphasize creativity and innovation, local economic development, population and livelihoods.

In 2012 the city also launched the Kobe Environmental Future City Initiative. This initiative focuses on policy measures for the environment, a super-aging society and other challenges. It also visualizes what the city would look like in 2050. The aim is to create a human-centered city in which citizens can live healthy lives with disaster-resistant infrastructure. Primary elements of the future city vision include:

- **Environment.** Producing and efficiently consuming through renewable energy sources and smart energy savings. Targets include a 25% reduction in GHG emissions below the 1990 level by 2020, with renewable energy satisfying 10% of the city's demand and commercial and public offices using 30% renewable energy.
- **Aging populations.** Promoting healthy lifestyles for older people and a safety net to support those who are ill or need long-term care.
- **Disaster prevention and resilience.** Networking key infrastructure systems and setting up local voluntary disaster prevention organizations to make the city more resilient to future disasters.
- **Knowledge networks.** Promoting innovations in green industries. This includes initiatives such as the Kobe Biomedical Innovation Cluster, which is creating the largest biomedical cluster in Japan, and further applications of the "K Computer" supercomputer (see **Box 1**).

Kobe city also aims to make important contributions at the national and international level. This includes:

- Sharing its experience to help early reconstruction efforts in the district of Tohoku in Japan, which was devastated by the earthquake and tsunami in 2011.
- Using its knowledge industries to play a leading role in stimulating the broader Japanese economy.
- Contributing to international efforts in green industries using resources such as the Biomedical Innovation Cluster.

Box 1

K Computer

Located in Kobe city, the K Computer is one of the world's most powerful supercomputers. RIKEN and Fujitsu developed the computer as part of the High Performance Computing Infrastructure Initiative led by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT). The K computer will help to solve the energy, healthcare, climate change, industrial and space challenges facing society today.

Issues landscape

The dialogue session between the UII team and city officials covered a wide range of topics. Discussions touched on all three components of sustainability – social, environmental and economic.

When city officials presented their ambitions for 2050 – as set out in the Kobe Environmental Future City Initiative – they stressed the importance of considering social as well as environmental challenges to create a truly sustainable city. In particular, they covered the challenges Kobe city faces as a super-aging society.

The UII team then presented a modeling tool called CASBEE-City (see **Box 2**) which can be used to assess the sustainability performance of a city and model its likely development.

The CASBEE-City tool helps “visualize” a city’s sustainability performance into the future based on different scenarios and assumptions.

UII also highlighted the need to consider the social and economic progress of the region in the context of changing demographics.

As a result of the dialogue, UII and the city identified four major issues as the focus of the UII engagement:

Energy & energy efficiency

Kobe city’s CO₂ emissions in 2009 were almost 10 million metric tonnes, 11% lower than in 1990. While emissions from industry and transport have decreased over this time, business emissions have increased by 30% and household emissions by 10%. Therefore, actions clearly need to focus on energy saving options for offices and residences.

Renewable energy will further reduce emissions but currently accounts for only 4% of the city’s total energy consumption. This includes both major electric utilities’ large-scale hydro power generation and biomass generation. The city urgently needs cost-effective renewable energy projects to reach its targets, and the private sector may play an important role in scaling up renewable energy investment.

Sustainable mobility

GHG emissions from Kobe city’s transport sector constitute around 22% of its total emissions. Within the transport sector, automobile emissions account for around 75%. This is clearly a significant contributor to the city’s environmental impact and presents an important opportunity for reductions. At the same time, the social aspects of mobility are also important. For example, the city needs to ensure mobility options that are appropriate for the ageing population.



Knowledge network formation and internationalization

Kobe city’s economic stability depends on securing a place in the international knowledge-based economy. A sound foundation already exists because of work on the K Computer and measures to encourage internationalization of the city’s businesses. However, further development in this direction is needed to maintain Kobe city’s competitiveness. This includes forming and extending knowledge networks and using these networks to encourage local development of green industries and clusters.

Disaster resilience & reconstruction

The city has especially valuable knowledge in disaster resilience and reconstruction. However, it is not using this knowledge to its full potential – both nationally and internationally. This includes expertise on how to create resilient urban models that minimize the impact of disasters on communities and the local economy.

Solutions landscape

The UII team considered 14 solutions across the three broad issues identified during the dialogue. They collaborated with Kobe city officials to assess priorities based on two considerations:

- Degree of impact of each solution in achieving Kobe city’s ambitions
- Ease of implementation.

The results are summarized in **Figure 2**. Solutions that fall into the upper right of the figure have the highest priority because they are easy to implement and have a high degree of influence.

The **degree of impact** was scored considering:

1. Environmental load
2. Influence on the environment
3. Influence on the society
4. Influence on the economy.

Ease of implementation was scored considering:

1. Cost of implementation
2. Readiness of necessary technologies
3. Extent of coordination with other stakeholders required for implementation.

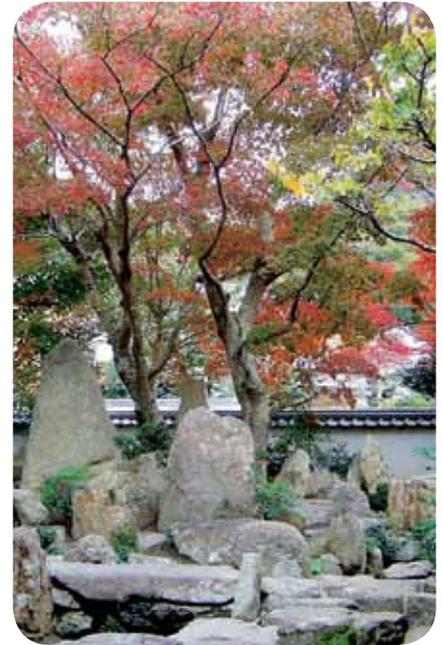
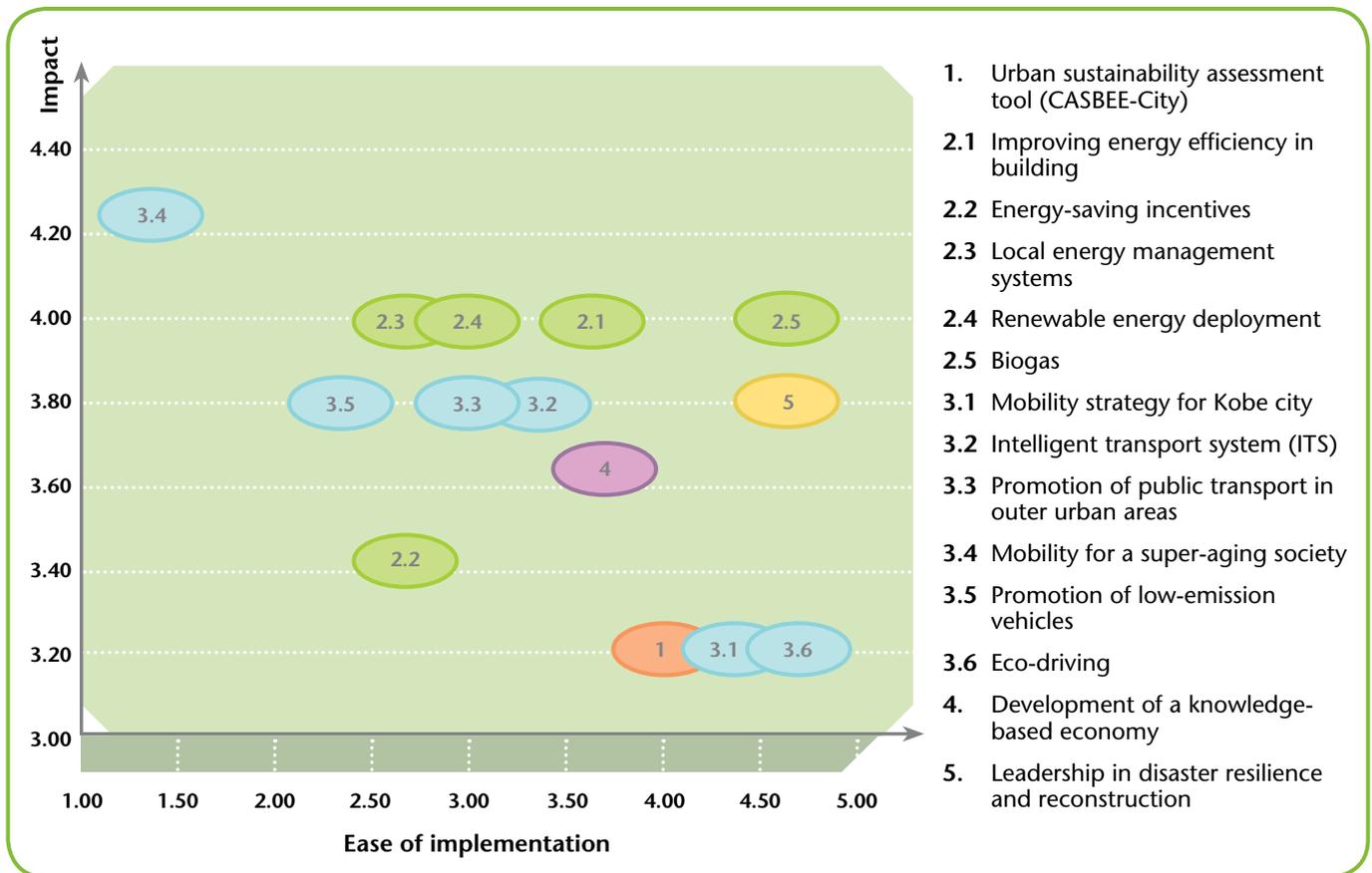


Figure 2: Solutions to achieve the vision of Kobe city and the priority to solve the challenges



1. Urban sustainability assessment: CASBEE-City

Establishing goals, policies and programs for improving the sustainability performance of cities has little purpose if there is no way of measuring progress towards goals. This is particularly important when trying to consider economic, environmental and social performance in an integrated fashion.

To address this challenge, an emerging set of tools and approaches can help cities measure sustainability performance. CASBEE-City is one example (see **Box 2**).

The UII team incorporated CASBEE-City into the dialogue process with Kobe city for two key reasons:

- As a **recommendation** to the city to consider the use of the CASBEE-City tool to assess its own sustainability performance and to evaluate and enhance the impact of new initiatives and policies such as the Kobe Environmental Future City Initiative.
- As a **platform** for evaluating the potential impact of the additional recommendations from the UII transformation team.

UII commissioned the Ikaga Laboratory of Keio University to perform an evaluation of key scenarios for Kobe city's sustainability performance.

Figure 3 shows the result of an assessment for 2012 and projections to 2025, including the potential impact of specific UII recommendations (combined with the city's current planned programs). The UII team also performed a historical analysis of Kobe city from after the 1995 earthquake to track the overall impact of the city's extensive reconstruction efforts (see **solution 5** on page 18).

Box 2

CASBEE-City: a sustainability assessment tool for cities

CASBEE-City is a modeling tool to comprehensively evaluate the sustainability performance of cities, using a triple-bottom-line approach of environment, society and economy. CASBEE-City is an extension of the CASBEE model for assessing the sustainability performance of buildings. The Japan Sustainable Building Consortium (JSBC) developed this tool in cooperation with the Promotion Council of Low Carbon Cities (PCLCC).

The tool produces a Built Environment Efficiency (BEE) index score for a city based on social, environmental and economic quality and activity divided by environmental load. The model gathers data under six major categories which are divided into 18 major subsets of indicators.

A higher index number indicates higher quality and activity in the city and/or lower external load (and therefore a superior sustainability performance). The outputs of the modeling calculations can be presented in a graphical format (see **Figure 3**) which makes them easier for a general audience to understand.

CASBEE-City can be used to evaluate past, present and future sustainability performance of cities. It is particularly useful for an initial quantitative assessment of the potential impact of new policies or improvement measures.

For more information please see:

www.ibec.or.jp/CASBEE/english/overviewE.htm

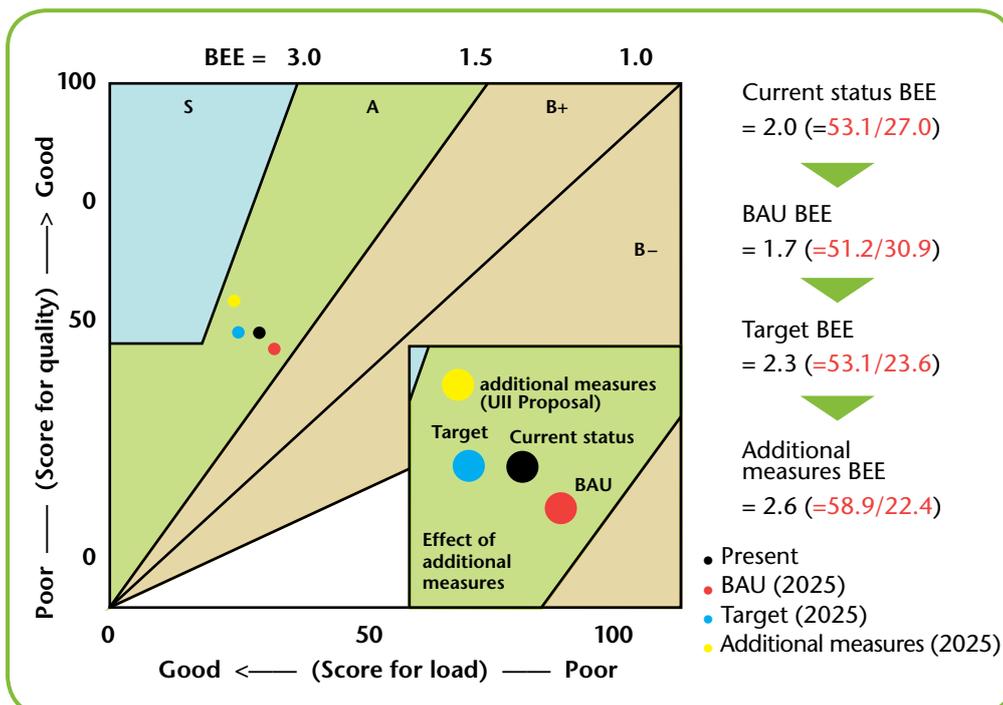
The current Built Environment Efficiency (BEE) for Kobe city 2012 is 2.0, and this will fall to 1.7 if no specific policy measures are undertaken by 2025 (BAU: Business-As-Usual). However, implementing the Kobe city Environmental Future city Initiative and the New Kobe city Master Plan will raise the BEE from the current level to 2.3 by 2025.

In addition, if the city includes the UII recommendations described in this report, it can further increase its BEE score to 2.6. This improvement comes from the following solutions:

- Actively promoting of retrofitting old residential buildings to improve energy efficiency (solutions 2.1 and 2.2)
- Scaling up district heating & cooling schemes and local energy management systems (solution 2.3)
- Using additional waste incineration to generate energy (solution 2.5)
- Improving traffic management and road safety via Intelligent Transport System (ITS) (solution 3.2)
- Further promoting of public transport (solution 3.3).

The modeling results of a system as complex as a city should always be used with caution, with an understanding of the strengths and limitations of the modeling approach. However, applying a tool such as CASBEE-City could add value to the city's programs and could become a useful tool for communicating to key stakeholders such as the national government.

Figure 3: Kobe city assessment using CASBEE-City model



Source: Ikaga Laboratory, Keio University (2012)

2. Energy & energy efficiency

Kobe city has set an ambitious target of 25% reduction in GHG emissions below the 1990 level by 2020, and has plans and initiatives in place to achieve this target. The UII team's collaboration with the city has also identified additional solutions and measures which can help accelerate progress.

2.1 Improving energy efficiency in buildings

Improving the energy efficiency of buildings represents a major opportunity for Kobe city. Although the city has a high proportion of modern buildings, many still have poor energy efficiency.

Globally, buildings account for 40% of all energy use. However, analysis by the WBCSD (see **Box 3**) has shown that it is possible to transform the market for energy efficiency in buildings to achieve a 60% reduction in GHG emissions from buildings by 2050.

Energy savings in buildings are often underestimated and the costs required to create efficiencies are often overestimated even by experts. Many measures can deliver attractive returns on investment, and a wider suite of measures collectively deliver long-term returns (paybacks between 5 and 10 years). However, experience has shown that policy measures are needed to help overcome financial, technical and behavioral barriers that inhibit these investments.

The UII recommends that Kobe city takes the following measures to drive energy efficiency in buildings:

- **Public buildings.** The city can provide leadership by ensuring all buildings it owns or operates achieve the highest standards for energy efficiency. Improvement and retrofitting projects can also serve as showcase initiatives to encourage action in the commercial and residential sectors.
- **Private buildings.** The city should consider additional measures to encourage commercial and residential building owners to save energy. This would include enhanced building codes, labeling schemes, awareness campaigns, inspection and auditing programs. In addition, targeted financial incentives could complement these measures to accelerate action (see **solution 2.2**). They should develop these incentives in partnership with key local stakeholders, including business, to ensure community uptake and effectiveness.
- **EEB Manifesto.** The city could consider promoting a local version of the WBCSD Energy Efficiency in Buildings (EEB) manifesto⁴ for owners of major buildings. Requirements could begin with reporting annual energy and emissions, followed by measures such as performance targets and engaging employees in climate action. Once buildings begin to report energy and emissions performance, competition to do better than rivals may further stimulate action.





- **Coordination with other city programs.** The city has a number of programs related to retrofitting buildings to improve their earthquake resistance and enhance housing for the elderly. Coordination with these programs could ensure more effective delivery and best use of resources, while also making sure all construction and retrofitting activities incorporate the highest level of energy efficiency. It is promising that Kobe city is already developing cross-sector activities in this area. These include a reform for combined delivery of subsidies, registration and the introduction of trusted contractors, publication of best practices and suggestions for supporting financial services.
- **Energy efficiency roadmap.** To ensure appropriate coordination of all the elements proposed above, the city could develop a consolidated roadmap and action plan for promoting the transformation of energy efficiency in buildings. Such a roadmap should include a detailed analysis of key opportunities for improving, medium and long term targets, key policy measures, incentives and actions to achieve these targets (see for example **Box 4**).

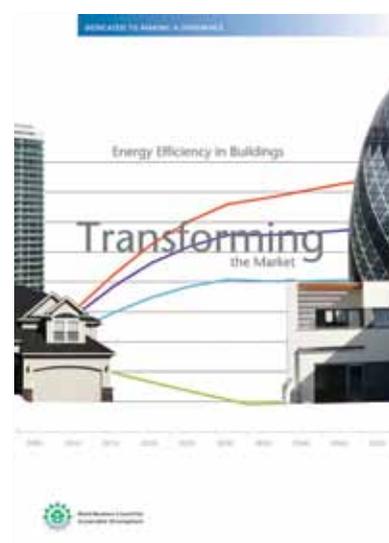


Box 3

WBCSD Energy Efficiency in Buildings : Transforming the market

Launched in 2006, the WBCSD Energy Efficiency in Buildings (EEB) project has focused on delivering an understanding of the international building sector's use of energy. The centrepiece of the project was the report: **Transforming the Market: Energy Efficiency in Buildings**. Based on the outcomes of a USD\$ 15 million research project, it showed how energy use in buildings can be cut by 60% percent by 2050 – and become essential to meeting global climate change targets. But this will require immediate action to transform the building sector.

The project took a bottom-up, market-driven approach to understanding the barriers to lower energy use, based on the most detailed view ever of the current state of energy demand in buildings. The team analyzed energy use by building type for millions of existing and new buildings and projected to 2050, accounting for differences such as climate and building design. Using computer simulations, researchers were then able to show the market response to various combinations of financial, technical, behavioral and policy options identifying the optimum mix to achieve transformation for each market studied.



2.2 Energy-saving incentives

High-performance equipment and systems for energy savings require additional initial investment compared to lower performing versions. Retrofitting a building for energy efficiency can also require additional expenditures and the payback period is often longer than financial criteria usually targeted by the private sector. Therefore, public financial support in the form of subsidies or grants for the initial investment can often be necessary to catalyze the necessary level of investment.

The government should study the incentive measures that lead to energy efficiency improvements in private buildings to encourage rebuilding and retrofitting the older buildings. For example, according to the WINDOW25 study conducted in 2011, significant energy-savings can be achieved for a private residence by retrofitting windows or frames with high thermal insulation. A well-targeted subsidy of financial incentive would stimulate such actions.

Kobe city already has an incentive scheme to help cover the installation costs for photovoltaic systems for residences. The city should consider a broader system of financial support for energy efficiency in new construction and in retrofits as these may be more-cost effective measures to achieve GHG emission reductions. As discussed above, such a scheme should be well-coordinated with related city programs, including caring for elderly people and disaster prevention.

2.3 Local energy management systems

Kobe city is running a pilot local energy management system, using Information and Communications Technologies (ICT). The system enables local energy production and consumption, including peak shift and demand response measures. The pilot scheme is seeking to demonstrate the benefits of the model and test the burden-sharing arrangements between energy suppliers, citizens, building owners and tenants.

If the pilot scheme achieves promising outcomes Ull strongly recommends that Kobe city seeks opportunities to scale up the deployment of local energy management systems. In fact, the Ull team's initial evaluation suggests that such schemes would potentially be viable in several areas in central Kobe. These include areas adjacent to under-exploited energy sources and to existing District Cooling and Heating (DHC) plants, which could form the core of future local energy schemes.

Box 4

WBCSD EEB project – Office buildings in Japan

The EEB project (Box 3) carried out detailed modeling to identify opportunities to improve the energy efficiency of office buildings in Japan.

This modeling identified that while Japan had made progress in recent decades, there were still major opportunities to improve performance, with an average 33% reduction in CO₂ emissions possible per building by 2050.

Key opportunities exist in improving space cooling and lighting equipment. However, the analysis found that strong coordination action in terms of policy, technology and financial incentives were needed to drive this potential improvement.





2.4 Renewable energy deployment

Kobe city aims to achieve a low-carbon society through an optimum energy use mix, including:

- Citizen participation
- Photovoltaic power generation
- Aggressive introduction of other renewable energy technologies including biogas directly injected to the city gas lines
- Use of hydrogen.

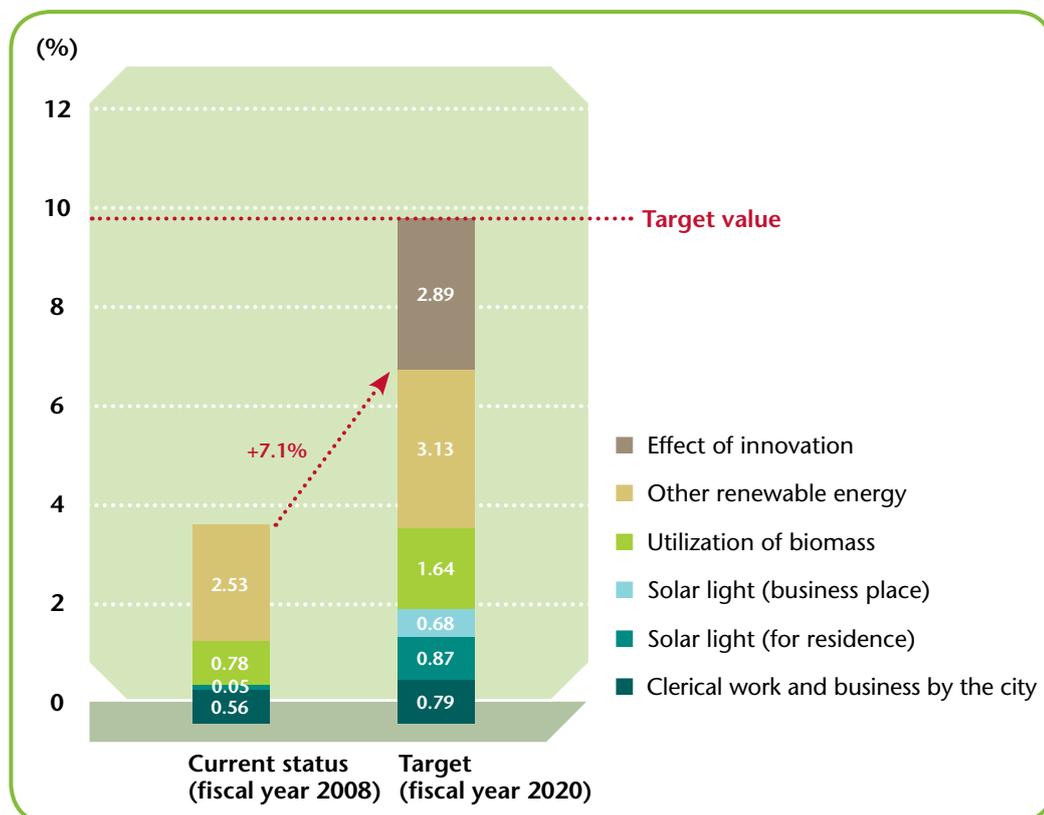
Solar energy currently accounts for a significant proportion of total renewable energy supplies as a result of aggressive financial assistance for citizens installing photovoltaic systems.

The UII recommends that Kobe city further promotes the use of renewable energy by enhancing its Global Warming Prevention Execution Plan. Including an investment roadmap could help stimulate coordinated action, while promoting private sector investment. Private sector investment will be particularly important for achieving the city's target to have 30% of energy for buildings coming from renewable sources.

The investment roadmap could identify current barriers to private investment and analyze how these barriers can be overcome. It could also address issues related to integrating renewable technologies into the energy grid. At the same time, it could explore opportunities to further introduce smart grid technologies, possibly in combination with existing or expanded local energy management schemes (see [solution 2.3](#)).



Figure 4: Introduction target of renewable energy in Kobe city



Source: Kobe city's Global Warming Prevention Execution Plan

2.5 Biogas

Kobe city is taking a leading role in the sustainable management of wastewater resources. The city is actively working on projects to retrieve phosphorous from sewage sludge for use as fertilizer and to regenerate wastewater for reuse.

The city has also actively pursued the use of biogas generated during sewage treatment as a source of energy. Targeting 100% use of the gas, Kobe city has successfully refined Kobe biogas, which contains around 98% methane and can be used as fuel in natural gas automobiles and as city gas. The injection of the biogas into the city gas pipeline started in October 2010 – a first in Japan. This renewable energy technology can be transferred both inside and outside the country.

The UII endorses Kobe city's leadership in this area. It also recommends that the city further explore the potential use of Kobe biogas in transport. The opportunity to deploy this fuel in vehicles in the city (both the public and private vehicle fleet) could be a key consideration in developing integrated mobility approaches for the city ([solution 3](#)).

3. Sustainable mobility

The Kobe Environmental Future City Initiative seeks to establish “a transport system friendly to people and environment”. The city is already taking a number of measures to achieve this objective, including the further promotion of public transport. The city is also trying to understand the implications of the rapidly aging population for the design and development of transport systems over the long term.

The UII team has identified a number of potential solutions to help Kobe city provide safe, reliable and environmentally-friendly mobility for the citizens of Kobe city both now and in the future.

Kobe city has a unique urban layout with a number of distinct elements, presenting both opportunities and challenges for sustainable mobility. To assist the city in thinking about these issues, the UII has collaborated with the city to develop an integrated mobility strategy that considers these individual elements and the linkages between them ([solution 3.1](#)).

Figure 5: Using biogas to refuel a natural gas vehicle



To support the implementation of such an approach, the UII proposes a number of specific mobility-related solutions:

- Further deploying of Intelligent Transport Systems (ITS) to improve the efficiency and safety of road transport, as well as the interface with public transport and other modes of travel ([solution 3.2](#))
- Promoting public transport through improved user information and awareness ([solution 3.3](#))
- Specifically considering older people in transport planning and developing both public and private transport options ([solution 3.4](#))
- Promoting of the deployment of low-emission vehicles ([solution 3.5](#))
- Identifying opportunities to increase public awareness of eco-driving practices ([solution 3.6](#)).



3.1 Mobility strategy for Kobe city

Kobe city aims to establish a transport structure with public transport at the centre, in which pedestrians, bicycles and automobiles are combined in a balanced manner.

Figure 6 presents an overview of mobility strategies for key areas of the city. Kobe city consists of a central commercial and urban area called city-center-water-front, which extends along the seaside, and residential districts extending from the railway line to the foot of mountains. The Rokko Mountains, which have tourist resorts such as Mt. Rokko and Mt. Maya, are behind the city. Kobe city also has a number of urban areas to the North and West of the centre, as well as a number of “new town” developments that are concentrated around train stations on the local rail network and are surrounded by rural areas.

In the central urban areas, there is already a well-connected public transport system with good facilities for walking and cycling. However, the area experiences traffic congestion. To improve overall system performance and to support economic revitalization of business activity in the center, the UII recommends several measures :

- Rerouting through traffic away from the city-center-water-front area
- Enhancing the city’s provision of Park-and-Ride (P&R) facilities away from the centre and further promoting car-sharing schemes
- Increasing use of ITS (see solution 3.2) to improve traffic flow, support by smart parking approaches
- Considering vehicle entrance restrictions in some central areas, possibly focusing on prioritizing access to low-emission vehicles. This could become a key measure to further promote the use of these vehicles within Kobe city (see solution 3.5).

Figure 6: Mobility strategy for Kobe city



Source: Kobe city

The tourist resorts of Mt. Rokko and Mt. Maya are key attractions for visitors to the city and play an important role in the local economy. However, there are opportunities to further improve transport access to these sites and reduce local congestion. For example, a Park-and-Ride (P&R) model may be particularly useful given the restricted availability of parking opportunities in these areas.

In the outer urban areas and new towns there are also opportunities to further encourage the use of public transport (see [solution 3.3](#)), walking and cycling for short trips. These areas can also improve connectivity between different transport modes and enhance traffic management (see [solution 3.2](#)). In addition, the city should further explore the feasibility of encouraging a shift to low-emission vehicles through coordinated development of facilities for these vehicles in the main transport hubs (e.g. new town areas).

3.2 Intelligent Transport System (ITS)

Traffic congestion typically accounts for 11% of transport energy consumption. Therefore, the deployment of ITS is a key approach to reduce GHG emissions while using the existing transport infrastructure more efficiently. The introduction of ITS technologies into existing vehicles and transport systems reduces both fuel use and GHG emissions by monitoring and controlling traffic flow, easing traffic congestion and presenting alternative routes for drivers. The ITS should also integrate with the public transport system to enhance the connectivity between the two systems.

ITS and infrastructure technologies hold great possibilities for the evolution of the road traffic system in urbanized areas. Kobe city should investigate and expand its use of these technologies where practicable, using existing knowledge and expertise within Japan. The country is already deploying several technologies to decrease congestion, improve road safety and reduce GHG emissions:

- Vehicle Information and Communication Systems (VICS) deliver real-time traffic and travel information to drivers (e.g. traffic congestion, information on road works and accidents, data on availability of services like fuel stations, restaurants and parking areas).
- Driving Safety Support System (DSSS) help drivers to drive safely via a message display in the vehicle. With the help of sensors, DSSS can detect cars, motorcycles, and pedestrians that are not in the driver's sight, or alert them to upcoming sharp curves and slippery patches.

- A service called Dedicated Short Range Communications (DSRC) provides real-time traffic and travel information among vehicles and with infrastructure devices. E-parking and toll payment systems are also able to communicate using DSRC.

ITS systems demonstrated their utility after the major earthquake and tsunami which devastated Eastern Japan in 2011. These systems continued to function and played an important role in managing post-disaster traffic, supporting the efficient movement of emergency services transporting and distributing essential equipment and supplies (see [Figure 7](#)).

3.3 Promotion of public transport in outer urban areas

A specific mobility challenge in Kobe city is that many people in urban areas north and west of the Rokko Mountains use their personal automobiles for longer distance transport even if there are efficient public transport facilities available.

The city should investigate why there is low take up of public transport in these areas. Outcomes could be used to improve services and complemented the provision of additional real-time service information to citizens using the latest ICT options (e.g. mobile phones, internet). While the deployment of ITS (see [solution 3.2](#)) can increase private vehicle use through reduced congestion, it also provides an opportunity to improve the connectivity between private and public transport options in outer urban areas.

Figure 7: Traffic map after the great East Japan Earthquake, using probe technologies



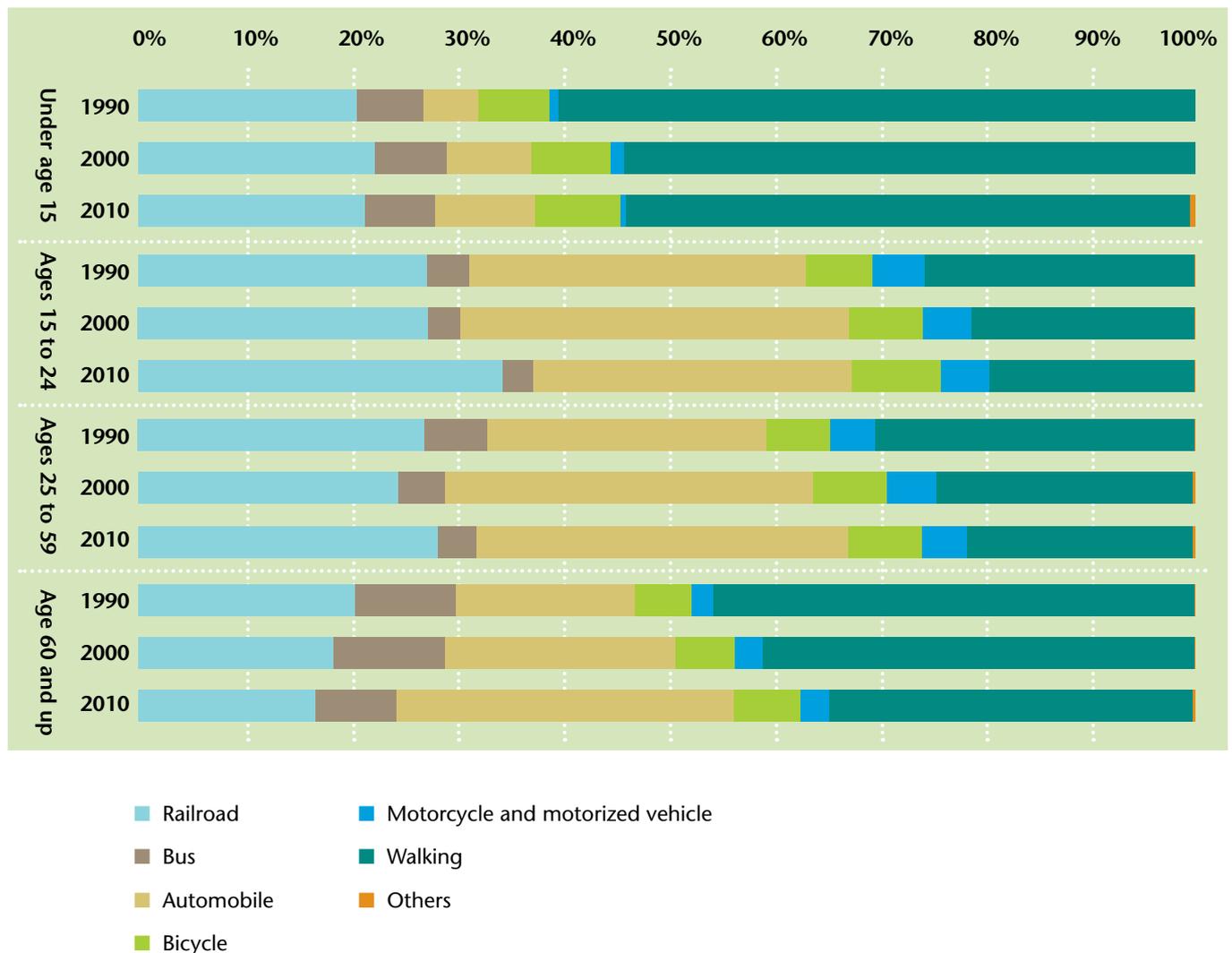
Source: Honda website



3.4 Mobility for a super-aging society

Providing mobility for the super-aging society is a major challenge for Kobe city. For example, a study on transport patterns in the Kinki area of Kobe city revealed that while people aged up to 24 are using automobiles less, those aged 60 or older seem to be increasing their use of automobiles. Meanwhile, walking and using public transport is decreasing.

Figure 8 – Modes of transport usage by age – Kinki area of Kobe city



Kobe city should investigate this shift in older people's transport choices to understand how public transport and walking can be made more attractive for older people, particularly in urban areas. Key potential issues may relate to the accessibility and lack of facilities for older people and concerns about public safety.

Kobe city should also consider opportunities to support the use of existing and new technologies, which are designed to support the mobility of older people with low environmental impact. One idea may be the use of ICT to make it easier for older people to access and use on-demand bus services.

With Japan facing the challenges of a super-aging society nationally, both government and technology developers have taken significant action to explore new mobility tools. For example, in 2012 the Ministry of Land, Infrastructure, Transport and Tourism

started to evaluate ultra-small mobility units such as electric wheelchairs and motorized quad cycles for wide-scale use. The city should consider the implications of potential wider use of these technologies in transport planning.

3.5 Promotion of low-emission vehicles

The promotion of alternative-fuel and advanced technology vehicles can potentially play a major role in reducing transport-related GHG emissions. These include hybrid, plug-in hybrid, electric and fuel-cell vehicles.

These vehicles could also play an important role in the mobility strategy presented above. Kobe city has already integrated the promotion of low-emission vehicles in the Environmental Future City Initiative. This will include developing a Hydrogen Town Scheme

which would include hydrogen as an alternative transport fuel.

One other innovative potential benefit of some vehicle technologies is the potential to use them as an emergency electricity supply during large-scale disaster situations. Some vehicle manufacturers are already further developing this possibility in response to the problems experienced after the great East Japan Earthquake and tsunami event in 2011. This may provide further resilience for essential services, while supporting other measures the city is taking in this area (see [solution 5](#)).

The widespread market deployment of these low-emission vehicles will require a coordinated effort on behalf of all levels of government, as well as vehicle manufacturers, infrastructure providers, vehicle users and other key stakeholders. In addition, cities and local authorities will play an important catalytic role, particularly

Figure 9: Classification of ultra-small mobility tools



Source: Guideline for the introduction of ultra-small mobility tools, Ministry of Land, Infrastructure, Transport and Tourism (2012)



in supporting the development of the necessary infrastructure. This includes charging stations for electric and plug-in hybrid vehicles and an infrastructure to produce transport and supply hydrogen.

In the short-term, the city can consider a range of measures:

- Systematically evaluating opportunities to scale up the use of low-emission vehicles in the city's own vehicle fleet and the public transport network. This could build on current efforts to use Kobe biogas in public buses. It could also include finding collaboration opportunities with other potential major users of low-emission vehicles in Kobe city, such as logistics companies. Collaborators could then share the initial costs of infrastructure development.
- Identifying priority opportunities to support the use of low-emission vehicles particularly for short trips in urban areas (e.g. car sharing schemes) and also the local taxi fleet.
- Prioritizing access and parking facilities for low-emission vehicles in the city centre.

3.6 Eco-driving

Vehicle fuel consumption is strongly influenced by drivers' techniques and behaviors. Therefore, the city could raise awareness of the benefits of slow acceleration and eliminating excessive idling. Awareness-building activities could include public information initiatives, such as drivers' training or a fuel-efficient driving contest.



4. Development of a knowledge-based economy

The Kobe Environmental Future City Initiative establishes a vision of a future city "filled with energy and culture as a center for people, goods and knowledge". In developing this vision, the city has identified the opportunity to use its extensive knowledge and assets to become a centre of innovation for major global challenges such as green innovation, disaster resilience and medical research. By enhancing other key links to the global economy such as establishing Hanshin Port as a Strategic International Container Port, this innovation could provide a major platform for supporting both local and national economic development.

Kobe city has a number of important assets for growing its knowledge-based economy – especially the K-Computer (see **Box 1**) and the successful example of the Kobe Biomedical Innovation Cluster (see **Box 5**). These existing assets can be used to grow current industries and attract new industries and businesses.

The UII team welcomes the vision and actions of Kobe city in developing its knowledge-based economy. The UII recommends that the city continues its ongoing dialogue with domestic and international companies to identify and capture opportunities to promote business investment in knowledge-based sectors.

At the same time, the UII also highlights the growing importance of a city's sustainability performance as an attractor of business investment in green technologies. The team suggests that Kobe city further pursue integrating its sustainability and economic development objectives under the Environmental Future City Initiative. This will help to advance the city's leadership in developing a green economy.

5. Leadership in disaster resilience and reconstruction

Disasters resilience is becoming an increasingly important consideration for cities around the world as expanding urban areas face greater risks from natural disasters and the impacts of climate change. Kobe city has identified an opportunity to communicate and transfer its knowledge and experience of recovering from the 1995 Great Hanshin-Awaji Earthquake. This includes developing more resilient infrastructure and management systems to reduce the impacts of future earthquake events. The city hopes this knowledge transfer can make a major contribution to urban sustainability and resilience in Japan and around the world. This international contribution is an explicit objective of Kobe's Environmental Future City Initiative.

As an input to this process, the UII applied the CASBEE-City tool to historical data to track the overall impact of reconstruction efforts after the 1995 earthquake. From 1990 to 1995, Kobe city's BEE score went from 1.5 (grey spots) to 1.3, as a direct impact of the damage caused by the earthquake and stagnating economic activities (see [Figure 10](#)). Following Kobe's reconstruction, the BEE has improved to its current position. Although improvements over the decade from 1995 to 2005 appear small, the accumulation during this time may lead to the later improvement seen from 2005 to 2010. This in turn may indicate that even for a well-resourced city like Kobe (which was able to undertake a rapid and effective reconstruction program) it can take a long time for overall recovery

in social well-being and economic vitality. This also emphasizes the other important aspect of Kobe city's knowledge – the importance of developing resilient infrastructure systems to reduce the impacts of future disaster events.

Through the Kobe Crisis Management Center, the city is pursuing measures to establish resilience and minimize the negative consequences of a future disaster. These efforts include establishing disaster-resistant urban infrastructure using advanced technologies and enhanced building codes to improve structural earthquake resistance, and educating and mobilizing the power of local citizens.

In addition, the city has further networked its telecommunications, water and sewage systems to increase their capability to continue service delivery even when some elements are damaged. Kobe city is also promoting the strengthening of public facilities, such as schools and bridges, and intends to secure energy provisions during an emergency through the promotion of autonomous distributed power supplies using renewable energy.

Kobe city is already taking steps to transfer its knowledge and lessons internationally. For example, the city is co-operating with the Japanese International Development Agency (JICA) to establish community-based citizen organization groups in Indonesia, another country in the Asia Pacific region where cities face major earthquake risks.

Box 5

Kobe Biomedical Innovation Cluster

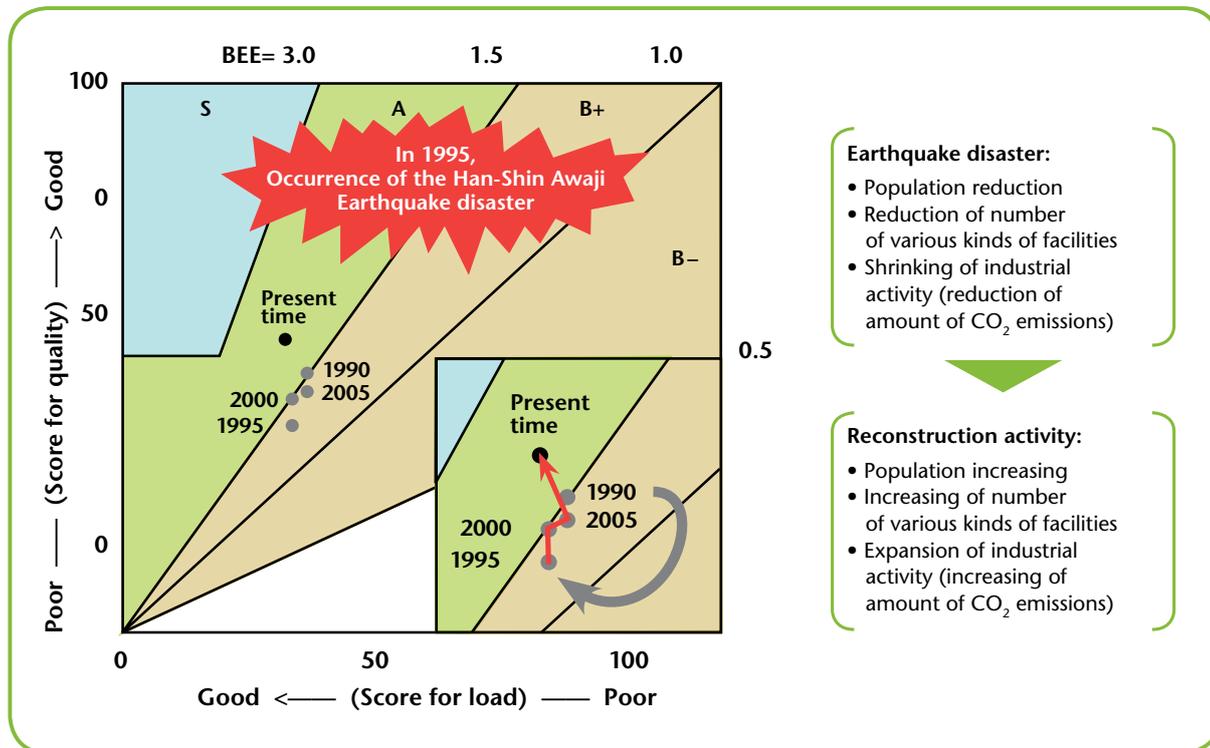
In 1998 Japan designated the Kobe Biomedical Innovation Cluster as a national project bringing together the Urban Regeneration Project and the Kansai Strategies Innovation Zone (joint application by six prefectures and cities in Kansai). By 2012, it had grown into to the largest bio-medical cluster in Japan, with 14 core facilities and more than 200 healthcare companies on Kobe Port Island.

The Kobe Biomedical Innovation Cluster promotes the accumulation of medical-related industries and the creation of new industries. It also addresses revitalizing Kobe's economy and supports improvements in local citizen welfare by provisioning advanced medical services.

UII recommends two additional measures to further support this international transfer of knowledge:

- Consolidating Kobe city's experience and lessons learned on disaster recovery and resilience into a single report or case study targeted at mayors and city managers who are facing similar issues and risks.
- Promoting the dissemination of the document through networks of major cities (e.g. CITYNET),⁵ supported by exchange visit programs, which allow other cities to see the actions Kobe has taken first-hand.

Figure 10: Time-series assessment of Kobe city with CASBEE-City



Source: Ikaga Laboratory, Keio University (2012)

Conclusion

The WBCSD's UII has worked with Kobe city to define steps towards the realization of a sustainable city. The key steps are:

1. Using the CASBEE-City sustainability assessment tool to clarify the route to improve the environmental, economic and social performance of the city and to visualize progress.
2. Reducing emissions from energy generation and use by promoting improvements in building energy efficiency; expanding the application of renewable energy technologies; and promoting the expansion of local energy management systems.
3. Providing safe, reliable and environmentally-friendly mobility for the citizens of Kobe city through implementing a sustainable mobility strategy, with a particular focus on meeting the needs of an aging population.
4. Contributing to business creation, and the vitality and appeal of Kobe city by facilitating the development of a knowledge-based economy.

Message from Dr. Shuzo Murakami

The concept of the Japanese government's Environmental Future city Initiative is to be "the city in which everybody wants to live" and "the city where everybody has vitality". From that stand point, many Japanese see Kobe city as full of charm, with a vigorous economy and having achieved full restoration after the 1995 earthquake.

Kobe city is transforming itself into a vibrant town because the local government and the citizens have a joint vision of where they are and where they want to go.

Kobe city attracts the world's attention because of how it has managed its reconstruction following the earthquake and is respected for its actions. I would like to recommend it to the world as a model of reconstruction and disaster resilience.

On economic and social issues, Kobe city has strengths in the biosciences and with its "K Computer" supercomputer. It is important to use its creative human resources and to clearly declare to the world that Kobe can be a leading centre of excellence for technology and innovation.

On transport issues, the city and the country are entering into a super-aging society, a fact that must be given serious consideration. Even with a well-functioning public transport system, older mobility-impaired people will still need to be taken into account in the design and operation of these systems. I hope that Kobe city will continue to explore new opportunities and models to improve the mobility of its older citizens.

CASBEE-City has been developed in Japan based on the triple bottom line of society, economics and the environment, and it appears to be universal in reach. Although each country has a unique situation, I think it is desirable that urban sustainability assessments be performed based on a similar index, with the capacity to customize it for local applications.

Dr. Shuzo Murakami, Chief Executive, Institute for Building Environment and Energy Conservation (IBEC) and Professor Emeritus, University of Tokyo

Notes

¹ AGC, Honda Motors, Nissan Motors, Schneider Electric, Siemens and Toyota Motor Corporation.

² The group was assisted by Dr. Murakami, Chief Executive of the Institute for Building Environment and Energy Conservation (IBEC) and Professor Emeritus of University of Tokyo, and Professor Ikaga of Keio University.

³ Kobe city (2011). "Kobe city Basic Environmental Plan".

⁴ <http://www.wbcscd.org/work-program/sector-projects/buildings/eeb-manifesto.aspx>

⁵ citynet-ap.org

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