

## Impact Objectives

- Explore the sustainability of daily life facilities in rapidly ageing mountainous regions
- Focus research on behaviour patterns and transportation

# Urban planning for the socially vulnerable

*Associate Professor Akemi Imagawa envisions villages, towns and cities where the elderly have the transportation means to thrive, and she is working to make this a reality*



### What inspired your involvement in the field of urban and regional planning?

When I was a high school student, I had a serious illness and began thinking about paradise, or the world after death. I learned that many books have been written about utopia and colonial cities have been built with the aim of becoming a utopia. I learned about the changes of all kinds of cities, including colonial cities. Then I came to realise that an environmentally friendly city is the type of city that will be needed in the future. Nowadays, the ideal community is one that not only coexists with the environment but also considers public welfare. I want to create a city that is a place where everyone can live a happy life.

### Why are sustainable society and environmentally friendly community development important?

I support the idea of the 11th goal of the Sustainable Development Goals, 'Creating cities where people can continue to live'. All of us are aware that this is a problem that affects us and our children, and recognise

that this is a social responsibility that we must fulfil. Working towards a sustainable society places a burden on those in charge in terms of time and effort, and it also costs money and personnel. Still, I believe that we must learn, think and act to keep our precious Earth from collapsing.

### Can you discuss your latest study?

We conducted an experiment that assumed the use of golf carts as a means of transportation in areas with a high elderly population. We believe that golf carts could be autonomously driven within villages by embedding electromagnetic induction wires into the roads. The carts can be driven even on narrow farm roads. They can be charged at the community centre, so there is no need to go out and buy gas. To achieve this, amendments to Japan's Road Act will be necessary. We need to thoroughly study the current situation and think about possible changes and solutions. Swift reforms are necessary to support the elderly.

### What are some of the main challenges for people living in ageing mountainous regions?

A key challenge is mobility. Living independently in these regions has its limitations. It is difficult to obtain daily necessities from the town. If they cannot drive, they will not be able to get to the hospital, as they would have to walk a mile from their house to the village centre to catch the bus to town, which runs four times a day. What if they cannot walk? That is why I am looking forward to using next-generation transportation in the last mile.

### You are using the Asahara District in Hatsukaichi, Hiroshima as a case study. Why is this?

Asahara, a village experiencing a rapidly declining and aging population, is a 40-minute drive from the city centre. Public transportation is limited to four buses a day, which makes it a typical 'disappearing village' in Japan. This beautiful hilly and mountainous area with tree-shaped settlements and rivers has a rich tradition and culture that we want to preserve for the future. They are currently building relationships by providing the local natural environment and orchard and other facilities to nursery schools in downtown Hatsukaichi that lack their own gardens. ►



# Supporting the ‘last mile’

*At the Imagawa Laboratory innovations in urban planning and development are equipping the elderly in ‘vanishing cities’ with transportation and health tools to enhance their quality of life*

There is a phenomenon called ‘vanishing cities’ occurring in Japan whereby ageing societies and depopulation are putting municipalities at risk of extinction. Inextricably linked to this is the sustainability of infrastructure as, in rural regions, the risk of depopulation is higher and, as it occurs, communities have fewer resources in terms of transportation and other public services. This places a burden on individuals within the community, many of whom are elderly.

The ‘vanishing cities’ phenomenon presents an opportunity to reconsider urban development, with a need for innovation and sustainability. Associate Professor Akemi Imagawa, based at Hiroshima Institute of Technology’s Department of Environmental Civil Engineering, has a keen interest in this topic. ‘I believe that the decline in population is an opportunity for compact area management to be possible through the development of regional bases,’ she highlights. ‘This is an inclusive solution that involves the creation of sustainable, efficient communities with improved liveability by concentrating resources in small and well-designed regional bases.’ In addition to helping address demographic challenges, this benefits people and

communities, putting resilience and environmental sustainability centre stage.

## A COMMON FOCUS

Imagawa is conducting research on environmental civil engineering, with a focus on sustainable development and community planning. She is also a regional planning advisor for the local government; a role that closely aligns with this work. A holistic approach is taken in her research, with key projects including: a survey of people flow and analysis of human behaviour patterns to promote the use of riverside green spaces; investigative research on the occurrence of crime victimisation of children and women and the spatial characteristics of the surrounding areas for crime prevention town development; consideration of environmental load reduction and disaster prevention effects through rainwater storage in river flood areas; and a comparative study of famous spots and landscapes seen in Itsukushima illustrations (published in 1842) and the current situation in order to inherit the cultural landscape and develop it as a tourism resource. These projects are connected by the common goals of innovation and sustainability.

One of Imagawa’s key research aims is on the use of next-generation transportation in

the ‘last mile’, which refers to the walking route from a regional base to a villager’s home. The goal of this work is to deliver innovative transportation solutions to assist the elderly in this phase of life.

This focuses on the Asahara District in Hatsukaichi, Hiroshima, which is one of the mountainous ‘vanishing cities’ with a super-ageing population. Imagawa and her team conducted a survey in this region to analyse the lifestyles of the population and their transportation needs. They discovered and classified these behavioural patterns and requirements, with the goal to ascertain how best they can be served in terms of facilities and transportation and work to meet these needs through urban development. In the first instance, this involves the creation of sustainable regional development plans.

## MONITORING MOVEMENTS AND HEALTH

This project builds on previous research investigating aspects including activity levels, transportation choices and lifestyle behaviours in depopulated areas. However, these findings are yet to be transformed into the regional plans, making Imagawa’s work unique. She believes that it is important to consider the daily activities and mobility requirements of the elderly to ensure that new facilities and transportation

## The decline in population is an opportunity for compact area management to be possible through the development of regional bases

systems can effectively meet their needs and adequately support their lifestyles. Through her survey, Imagawa found that some elderly people need to walk for an hour from their homes to reach the nearest bus stop. She proposed the use of small electric vehicles to transport elderly people from their homes to bus stops. Residents will wear a wristwatch with a GPS logger to enable Imagawa and her team to confirm movement.

In addition to mobility challenges elderly people living in mountainous regions face, they also face difficulties relating to healthy lifestyles. 'These challenges can affect individuals who live alone or have difficulty accessing medical care,' describes Imagawa. 'We want to monitor the health management of elderly people, to support their daily health management and detect any changes in their health.' For this purpose, a wristwatch-type GPS will be used to check factors such as heart rate. Also, when a disaster occurs, the location can be confirmed. A long-term survey using this wearable GPS will be carried out to shed light on daily life behaviour. 'Previous studies did not capture records of individual geographical movement. By identifying the specific purposes and methods of movement in each region, we can develop more effective transportation and facility layout plans,' she highlights. Furthermore, Imagawa believes that it will be possible to monitor the health and safety of the person wearing the watch.

So far, the research has demonstrated tangible benefits both for Imagawa's

students and for the local elderly people who cooperated with the survey (Akiota District, Asahara District, Kujima village, Kaita Town) in terms of physical health and mental wellbeing. 'When young students visit the community, I am delighted at how the elderly residents come alive. It is gratifying to see students grow through research. It makes me happy that the elderly in the community are also enjoying seeing the growth of the students,' observes Imagawa. 'By not only checking the record of arrhythmia on the wristwatch and notifying the patient, but also consulting with a local public health nurse, the patient was able to prevent illnesses such as cerebral infarction.'

### CONNECTED PROJECTS

In another related project, Imagawa is investigating urban development concepts in environmentally sustainable sites, with attention on how planning practices can evolve in line with changing social and ecological needs. Through case studies and theoretical analyses, she is charting this evolution and identifying contributing factors, including green spaces, sustainable architecture and community involvement. Through this work the team has highlighted the need for flexibility and innovation to ensure that planning processes and practices effectively respond to environmental and social shifts, as well as needs.

Looking ahead, Imagawa plans to turn her focus to another vanishing city called Takehara city and will conduct a survey with a view to transforming this location

into a walkable compact city. Each of her closely connected projects ultimately seek to improve the urban landscape and, as her research progresses, these incremental changes are enhancing quality of life for elderly residents. ●

## Project Insights

### FUNDING

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### COLLABORATORS

Akiota Town residents, Akiota Town Hall, Asahara residents, Kujima residents, Hatsuoka City Hall, Kaita Town residents, Kaita Town Hall, Takehara City Hall

### TEAM MEMBERS

Team Imagawa (Environmental Design Lab) with third- and fourth-year university students and graduate students

### CONTACT

Associate Professor Akemi Imagawa

E: a.imagawa.vf@it-hiroshima.ac.jp

### BIO

Associate Professor Akemi Imagawa is based at the Hiroshima Institute of Technology where she focuses on teaching and researching civic design and urban planning. She studied urban design at the Mackintosh School of Architecture, Postgraduate School and earned her M-Arch at the University of Glasgow, UK. While working as the Chief Researcher in Urban and Regional Planning, PAO Environmental Design Institute, Inc., Imagawa earned her Doctorate in Engineering from the Kyoto University Graduate School.



Interviews of golf cart passengers provided positive results

