

Insights on Shinchi Town's Sustainable Trajectory Through Community Input

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Abstract

Following the Great East Japan Earthquake, Shinchi, small town located in Fukushima Prefecture, adopted a reconstruction approach that played a notable role in the full restoration of its original population. This approach placed emphasis on restoring community bonds and generally increasing the overall quality of life of its residents through the improvement of information dissemination and the local transportation system. However, earlier studies that evaluated the extent to which Shinchi's residents are satisfied with these projects indicated that there are further improvements that need to be made with respect to the sustainable development of the town. In light of the issues identified, this study conducted a series of interview sessions, informal discussions and one workshop to gain insight on the local residents' perspective on key development aspects that could enhance Shinchi's attractiveness as a place of long-term residence. Furthermore, empirical field research was conducted to assess the feasibility of utilizing electric-assist bicycles as an alternative form of transportation within the boundaries of Shinchi Town. The findings highlighted the importance of community events such outdoor activities on the cultural education

of younger citizens and showed that electric bicycles can indeed increase the reliability of the transportation system in Shinchi.

Keywords: Rural communities; Community engagement; Sustainability; Shinchi Town; Transportation system

Abbreviations:

GEJE	:	Great East Japan Earthquake
JR	:	Japan Railways
LNG	:	Liquefied Natural Gas

1. Introduction

The Great East Japan Earthquake (GEJE) and subsequent tsunami significantly damaged many coastal communities in Japan's northeastern Tohoku region. In the aftermath of the disaster, the question of whether these communities should be rebuilt completely anew or in a manner that emulated their pre-existing states became a topic of intense discussion [1]. Many government-led recovery plans in the Tohoku region employed a top-down approach [2], and prioritized the reconstruction of physical infrastructure, the installation of seawalls, and group relocations to higher land [3]. These measures were based on the *Basic Act on Reconstruction in Response* to the GEJE and were generally favored by rural municipalities, as they were funded largely by the national government [2]. However, they were generally characterized as being rather inflexible to prefectural or local needs [4], and in many cases did not strive towards rekindling the local residents' sense of community that had been weakened by the GEJE and subsequent relocations [5]. In conjunction with the loss of employment opportunities, this drove a significant number of victims out of disaster-hit areas [6], thus accelerating rural depopulation [7]. On the other side of the spectrum, other areas also located in the Tohoku region adopted a different reconstruction approach.

A notable example is that of Shinchi, a small town located in Fukushima Prefecture, which successfully restored its original population [6]. This could be attributed in part to measures implemented by the local government, which placed particular emphasis on reinstating community bonds [8] and generally increasing the quality of life of its residence. These efforts culminated in 2013 with the introduction of information and communication technologies that improved the efficiency and overall resilience of the local power network, enhanced the previously nonexistent public transportation system [9], and increased the dissemination of information to and amongst its residents [10].

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In 2015, two studies conducted by the Japanese National Institute for Environmental Studies, together with Shinchi's local government officials, sought to evaluate the opinions of Shinchi's residents on the aforementioned initiatives and also the degree to which they were satisfied with them [11], [12]. The findings indicated that further attention needs to be given to the promotion of the town's sightseeings and cultural heritage to visitors and local residents (especially younger generations) [12], and the development of local public transportation networks [11].

Given that the progress of the initiatives that began in 2013 have since advanced significantly, the present work describes the process undertaken by a number of graduate students of The University of Tokyo to re-examine the state of and propose solutions to the issues identified in the two earlier studies. More specifically, this study is divided into two activities. The first collected primary information from local residents pertaining to their opinions on Shinchi Town's initiatives, the continuation and preservation of the town's cultural and historical heritage, particularly in the face of rural depopulation and other aspects relevant to daily life in Shinchi, such as their preferred transportation method and approximate commute time to and from their places of interest (e.g. sightseeings, supermarket, etc). These helped shed light on the areas of the town that are often visited by locals and tourists alike and were the basis of the second activity of this study. In brief, this second part focused on a feasibility analysis of a bicycle-sharing system which is proposed as an alternative form of transit that can enhance Shinchi's currently limited public transportation system. Although these activities were conceptualized and conducted by the authors, additional support was provided by Shinchi's local government.

2. Shinchi's background & reconstruction plan

Shinchi Town is located at the northerneastern tip of Fukushima Prefecture, within Soma County, bordering Miyagi prefecture to the north and facing the Pacific Ocean to the east. Historically, the communities that comprise Shinchi Town today were once divided into three separate, politically distinct villages, namely Komagamine, Fukuda and Shinchi (village). These were later merged in 1954, and this amalgamation impacted the locals to a great extent, with some noticeable effects remaining even today, influencing townspeople's constructed image of Shinchi as a whole (more information on this will be provided later). Shinchi today is a relatively small town with a population of around 8,000 on an area of 46.70 km² [13], which is at the forefront of an aging society with approximately 30% of its population comprised of elderly citizens (i.e. 65 years old or older) [14].

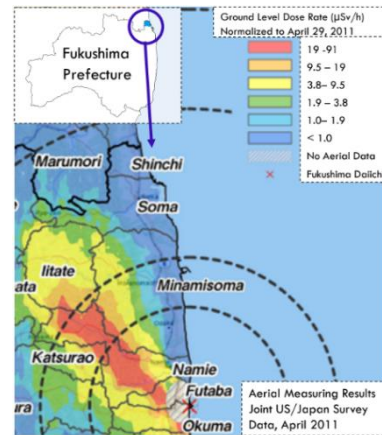


Figure 1 Ground level dose rate ($\mu\text{Sv/h}$) in Shinchi in April 2011 [15]

The GEJE, coupled with the subsequent tsunami that followed, severely affected Shinchi Town's agriculture and fishery sectors, and caused the total or partial destruction of 630 houses, 119 fatalities, flooding of around 20% of the town area, 40% of its agricultural land, interrupting the only train service that connected Shinchi to the Japan Railways (JR) network [16]. On top of this catastrophe resulting from a natural hazard, the nuclear accident that occurred at Fukushima Daiichi Nuclear Power Station, located approximately 55 km away from Shinchi (see Figure 1), raised multiple concerns regarding the safety of locally produced or collected food products, thus acutely affecting the reputation of the main industries of the town, agriculture and fisheries.

In the months after the disaster, Shinchi Town initiated a reconstruction plan which focused on vital, post-disaster components of town development and restoration such as housing reconstruction, disaster prevention plans, inauguration of relocation complexes and creation of public housing. A few years later in 2013, plans for the development of a smart city also emerged as a part of the "Future City Initiative" created by the Japanese government and prompted a *Basic Cooperation Agreement* between Shinchi Town and the National Institute for Environmental Studies [17]. This project aimed at creating a community in which environmental sustainability is pursued together with reconstruction and economic revitalization. Furthermore, this strategy was centered explicitly around the improvement of the central area of Shinchi, focusing primarily on reconstructing the area around Shinchi's JR station, and was subdivided into two domains.

Firstly, in an attempt to support the transition to a low-carbon and energy-saving society, a smart energy center was established [18]. The energy center draws liquefied natural gas (LNG) from the nearby Soma Port LNG Plant and supplies heat and power to the facilities around the station using a cogeneration system. This network also enabled the connection of Shinchi to the Niigata-Sendai line that makes it possible to link these LNG terminals. This in turn established a better network for stable natural gas supply and increased energy security.

Secondly, directly connected to the aforementioned energy center, numerous public and private facilities were established near Shinchi's JR station, all within close proximity to one another. Among these, a multifaceted public facility named Urban Design Center Shinchi (UDC Shinchi) was created in conjunction with the University of Tokyo to establish the groundwork for a new communication platform between the local government and the town's local residents [19]. Other notable examples of development projects around Shinchi's JR station include newly built commercial spaces (e.g. several restaurants and one hotel), public recreational spaces (e.g. a futsal court), a disaster prevention park, as well as other public spaces (e.g. a cultural exchange center) that are currently under construction. These facilities could be used for both recreational and educational purposes and have the potential to rekindle local residents' interest in community activities and enhance their knowledge regarding the maintenance of an equilibrium between human society and the local environment. Some of the key stakeholders involved were Shinchi's local government, Shinchi Smart Energy Co., Ltd., the National Institute for Environmental Studies and The University of Tokyo.

3. Research design & methodology

This study was divided into two activities. The first collected primary data from local residents pertaining to their opinions on Shinchi Town's initiatives and other information such as the time they spend on commuting to and from their places of interest. Then, a feasibility analysis of the bicycle-sharing system proposed in this study was conducted and supported by the data collected in the first activity.

3.1 First activity – collection of primary data through interviews, a workshop and informal discussions

Semi-structured interviews were conducted with 12 informants over the course of three days (July 31st to August 2nd, 2019), in addition to the organization of a workshop that took place on November 14th, 2019 (see Figure 2), where 7 local residents attended with their children.

The interviewees and workshop participants were asked questions related to their daily lives in Shinchi and their perceptions of the current development plans for the area (these questions are presented in Table A in the appendix). Participants for these semi-structured interviews were gathered through a snowball sampling method, starting with initial, unmediated connections made by the research team together with Shinchi's residents. These residents in turn introduced the researchers to other residents, increasing the sample size by leveraging on connections. This methodology is commonly used to gain participants for interviews, particularly in small community settings [20].



Figure 2 Community engagement workshop

In addition to the semi-structured interviews, direct, unstructured conversations were also a source of insight. Information from such informal discussions was collected over the period of one year (January 2019 – January 2020) through conversations with over 100 local people. These interactions were facilitated by the participation of the researchers in several community engagement activities, organized by the Shinchi Town government as well as other community groups. The conversations that occurred during these times granted informal insights into residents' viewpoints and ways of life.

This activity provided the researchers with a general overview of the local people's opinions about Shinchi's developing projects, regardless of limitations pertaining to their demographics (i.e. parents had a hard time attending the interviews, but were able to attend our workshop).

3.2 Second activity – Enhancing Shinchi's transportation infrastructure

Besides private taxi services, the only government-led public transportation service in the town is limited to locals, has a limited number of predesignated pick up and drop off points, and operates on a demand-basis (i.e. the potential customer has to call them in advance) [21]. Thus it can be said that the current transportation system offers limited options to visitors and local residents that do not own or cannot operate a vehicle. This is particularly concerning in the face of an aging population, as many of the town's older residents do not, or will not in the near future, have a driver's license available due to age restrictions [22].

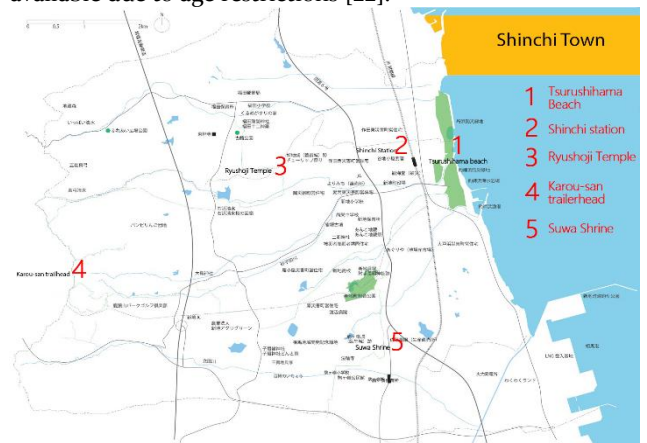


Figure 3 Map of Shinchi Town and the locations visited in 2019

A possible way of addressing this problem is through the implementation of a shared electric-assist bike system. These electric-assist bicycles could become available for rent through either ticket-and-cash payments or automatic app-based transactions. To collect empirical data and test the feasibility of using such bikes in the town, the team utilized electric-assist and traditional bikes to go to and return from previously identified “sightseeing spots”. Some of the most pertinent spots in Shinchi (according to the interviewees) are highlighted in Figure 3. These data were collected through a series of field trips that took place on August 1st to August 4th, and then again on November 14th and 15th, 2019. In the context of this study, “traditional” bicycles refer to human-powered, pedal driven bikes whereas “electric” bicycles refer to electric assist bikes that retain the ability to be powered by pedaling. The majority of the bicycles were ridden by “test performers” and one was ridden by the “test observer”. The first group consisted of 4 graduate students and 1 researcher, whereas the second group consisted of 1 graduate student (all of whom were members of our team). The “test observer” recorded the distance and time taken for each trip, focusing particularly on recording the frequency of key performance indicators as noted by the “test performers”. Moreover, after each trip the “test performers” completed post-ride surveys about the difficulty, perceived danger, aesthetic appeal, directional difficulty, and visitor appeal of the route, answering questions based on a 5-point Likert scale. Finally, the “test observers” recorded other important elements, such as the number of vending machines found along each route, the availability of bicycle parking at each destination, etc.

The locations characterized as “sightseeing spots” during this field experiment were identified through direct resident engagement (e.g. interviews and conversations) and a comprehensive review of available tourist-oriented material (e.g. pamphlets), combined with the researchers’ own experience as visitors in the area. The sites visited during the field trip are found in Table 1.

Table 1 Sites visited within and around the boundaries of Shinchi

Shinchi Station	Hotel Grado
Rokumangoku Hotel	Karou-san Trailhead
Tsurushihama Beach	Shinchi Fishing Park
Suwa Shrine	Fukuda Sakiwake Buddhist Monument
Tourinji Temple	Sanganichi Historical Landmark
Shirohata Ginko Tree	Komagamine Castle Trace
Hourinji Temple	Mayumi Shimizu Natural Spring
Café Hanajikan	Ajisai Cake Shop
Shinchi Shell Mound	Bonuru 66 Bakery
Botanical Park	Wakuwaku Land Family Park
Restaurant Haru	Karou no Yu Hotel and Onsen
Sui Shrine	Aguriya Local Food Market
Shinchi’s Town Hall	Disaster-Prevention Green Area
Ryushoji Temple	Ippai Shimizu Natural Spring
Shinchi Castle Trace	Ukon Shimizu Natural Spring

4. Results

4.1 Key findings of the first activity – people’s voices

4.1.1 Shinchi’s smart community area

Though the newly reconstructed area (e.g. a new hotel and the disaster-prevention “park”) is admired by a number of citizens of the town, some indicated that they could be improved even further. For instance, the restaurants around the JR station operate predominantly during the evening, which limits the available options for potential customers that want to lunch during earlier hours of the day. In addition, the parking lot of the smart community was noted as an area that needs further improvement as its layout and entry/exit system was described as confusing by several informants. Moreover, the development of a robust, reliable and welcoming transportation system responsible for circulating visitors in and around Shinchi was noted as an element of vital importance for the promotion of the town to potential visitors. The extension of the currently available on-demand bus system to include non-residents was mentioned as a potential solution, though its efficacy is questionable given current circumstances (i.e. limited number of visitors, uncertainty related to visitors’ desired destinations etc.).

4.1.2 Shinchi’s communal activities and rural depopulation

One interviewee noted that the local development plans (e.g. Shinchi Energy Center) are predominantly centered around Shinchi and Komagamine. As a consequence of the relative isolation from modern-day reconstruction measures, residents of Fukuda retained a more traditional lifestyle. Thus, although most people now identify as residents of “Shinchi Town” rather than their specific area of historical origin, some noted that they now choose to identify as residents of Fukuda in certain contexts. This disparity in how Shinchi residents identify themselves has grown larger since the completion of the reconstruction of the communities that were relocated en masse from areas that were destroyed, with distinctions rising between groups that were and were not relocated. Furthermore, there is a general decline of local participation in the town’s festivals and traditional cultural activities. For instance, a number of residents noted that although mochi pounding during the New Year’s holiday once occurred regularly as a means of educating children about local traditions, people have lost interest in participating in the event, as evidenced by the number of mochi tools sitting unused at people’s homes. Furthermore, the ability to continue certain local traditional festivals, such as the Kagura Festival at Suwa Shrine held annually in November, has come into doubt due to a lack of viable successors for key cultural practices (dance, performance, etc.) among younger generations. It was noted that if this trend continues, the possibility of completely losing some elements of Shinchi’s traditional culture could take place, as

the older, culturally knowledgeable generation loses both the audience and opportunities to pass these traditions on. Moreover, aside from people’s decreasing participation in local events, both older and younger residents of all communities expressed that economic factors drive many young people to move away from Shinchi Town after they finish high school, even if they inherit land somewhere in the vicinity of Shinchi.

4.1.3 Shinchi’s public transportation system

Many residents expressed that they do their primary grocery shopping in Soma city (20-30 minute drive from central Shinchi), and other main shopping in either Soma or Sendai city (1 hour drive) due to the lack of a large supermarket within the town. Some elderly residents expressed that it would become particularly difficult for them to continue living in Shinchi as they may have to forfeit their driver’s license in the near future. Given this scenario and the lack of public transportation in the area, people often feel overwhelmed and do not have a clear idea about how to maintain their daily life routine in the future. Though the currently available taxi services could be of some use, it may be an expensive option for some residents if it is the only reliable public transportation system available.

4.2 Key findings of the second activity – enhancing Shinchi’s transportation system

The primary objective of this activity was focused on determining the general feasibility of using traditional / electric bicycles as an alternative form of transportation to and from Shinchi’s most visited spots and sightseings. The battery of the electric bikes that were utilized throughout this experiment lasted 2 days of consistent riding (i.e. more than 8 hours per day). This means that every two days users would need to return the bikes to their charging ports, so the ports must be readily accessible and located in a central area (e.g. station area).

With respect to the empirical data collected, Graph 1, safety, and Graph 2, exhaustion, indicate a large number of negative responses, whereas Graphs 3-6 show overwhelmingly positive responses (see Figure 4). Graph 2 shows the level of exhaustion experienced by bikers after doing a route using a “traditional” bike. It should be noted that this exhaustion compounded over the course of a day. When only the results from electric bikes are plotted, as in Graph 3, the negative results drop to only 27%. From the comparison of Graphs 2 and 3 it is possible to see the benefit of electric bikes. Although a higher sample size is required to generate statistically significant data, the preliminary data can be used as proof of concept for further testing and implementation. From Graph 4 it is possible to see that the average difficulty of any route was perceived as not very challenging, both for normal and electric bikes. This shows that the tourism sights in Shinchi are readily accessible by bike. From Graphs 5 and 6 it is possible to say that the quality of the routes and destination sites, respectively, is high and are ranked as worthy of visiting. It should be noted that all

answers were subject to some bias due to the non-random sampling of testers (skewed towards young and female), as well as implicit bias regarding an affinity for Shinchi Town’s sightseeing areas.

The most significant result is shown in Graph 1. Here we see that safety along the route(s) is often questionable. This was repeatedly reflected in the “open answer” section of the survey as well. The most often cited reason for safety concerns were large, multi-lane roads that lacked crossings and traffic lights and the existence of a number of barriers and rough pavements along roadsides. These issues are reflected in the pictures contained within Figure 5.

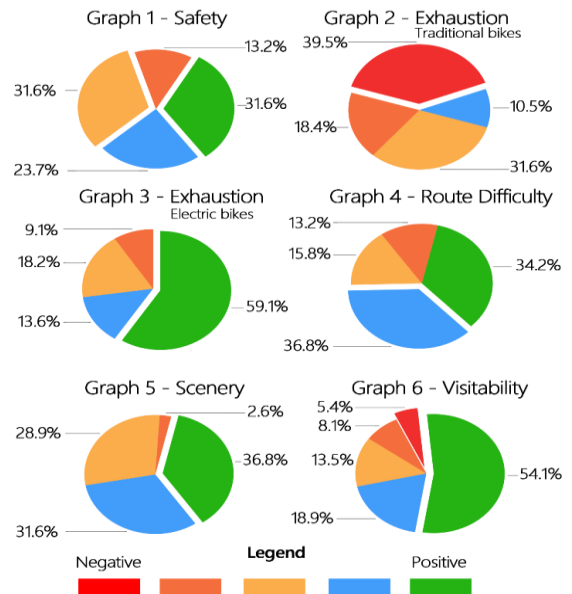


Figure 4 Most pertinent results of biking survey

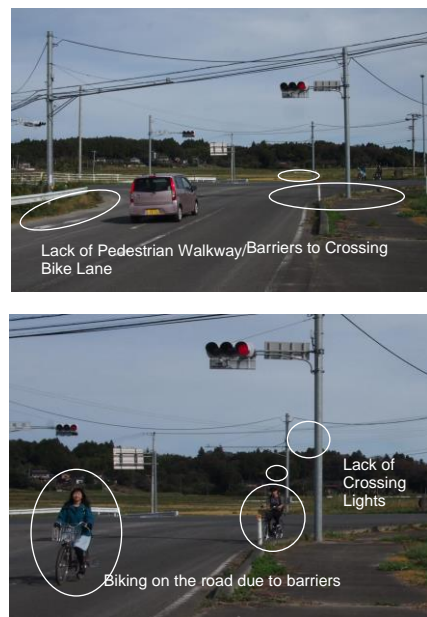


Figure 5 Lack of crossing lights and dangerous resultant actions

5. Discussion

The negative long-term effects of depopulation and an aging society have become more pronounced in rural Japanese communities. The prospect of creating new jobs as promised by the infrastructure development projects centered around Shinchi Station (e.g. construction of hotel facilities) may attract young workers and their families to live and work in Shinchi. However, it is critical to consider how these new residents could be retained once they migrate to Shinchi. Systems designed to promote the town's qualities could be useful for tackling these issues, such as markets where local agricultural and fishery products are bought and sold alongside homemade handicrafts. These could bolster the local economy and also serve as gathering places that fosters community engagement.

Community engagement is particularly important in the context of Shinchi, as it enables intergenerational transfer of cultural identity and traditions. However, people's participation in events that fostered this knowledge dissemination has slowly declined over the years following the GEJE. This was caused partially due to concerns related to radiation exposure, which still linger to some degree in Shinchi. Given that at the time of writing terrestrial radiation levels in Shinchi are considered safe (less than 1.314 mSv per year) [23], it is recommended that the town continues fostering solidarity by organizing regular community events. Events related to outdoor activities such as sports could be enacted in order to make best use of Shinchi's natural resources and provide the residents with the opportunity to get to know one another better. Simultaneously, such activities can help locals pick up and maintain an active lifestyle and revitalize their interest in Shinchi's natural environment. Other events that could be organized to accommodate the needs of these people could take the form of "food festivals". These would once again allow the residents to communicate with other people and could grant them the opportunity to innovate and think outside the box in an attempt to enhance Shinchi's local products, which are as of yet quite limited in the perception of local residents. Furthermore, such festivals and events should also center their attention towards the cultural education of young school children in order to foster a sense of attachment and belongingness towards Shinchi, which will, according to a number of locals, play a role of utmost importance in the future development of the town.

On a different note, the results from the interviews conducted highlight the need for increasing the number and diversity of transportation options within Shinchi for both residents and visitors. The implementation of a publicly available bus or shuttle service, either privately contracted or run directly by the town's government, would provide an immediate relief both for residents who lack the ability to drive due to age or other restricting factors, and visitors who choose to travel to Shinchi by train, although the potential cost to both the town is acknowledged to be a prohibitive factor. The implementation of such services also has the

potential to create new and varied jobs for local residents. One imagined potential is that a ridesharing service could be implemented in Shinchi. This would rely on aging residents that have the ability to drive, own a car, and have free time to spend taxiing passengers around town. These passengers could be residents, in which case such a service has the potential to introduce residents to one another, creating new connections and enhancing the sense of community within Shinchi. Alternatively, if the passengers are tourists, through this measure they would have the opportunity to directly interact with Shinchi's residents, who are knowledgeable about the town and can offer advice or recommendations as to places to eat and go sightseeing.

Besides transportation options being limited to motor vehicles, the implementation of a bike sharing initiative, particularly one centered around the newly developing station area, could provide an alternative, enjoyable, and environmentally friendly mode of transport for residents and visitors, particularly in good weather conditions. To promote ease of use, especially for elderly residents and visitors, the shared bikes could be electric with solar charging stations located in close proximity to Shinchi's JR station or the energy center. In this way the unique nature of Shinchi's energy initiatives may be on display in an interactive manner. However, prior to the commencement of such initiatives, there are some actionable concerns that the town may need to address. Firstly, electric bikes have a limited energy capacity (2 days) and, as such, all charging stations should be in close proximity to the town's center. This issue becomes particularly important considering the current lack of public transportation within the town and the demographics of the people who would use electric bikes out of necessity (i.e. people with limited access to motor vehicles such as the elderly and teenagers). Thus, it is recommended to expand the charging system to include charging ports at a number of some of the most visited areas in Shinchi, such as the trailhead(s), for those interested in climbing Mt. Karou or following the Michinoku trail, which was designated by Ministry of Environment, Japan. However, this could create potential logistical problems of overcrowding at a single port, so a further design review is required to identify the most cost-efficient charging port locations. Secondly, by adding a higher number of crossings and traffic lights at major intersections, the town government can increase the interconnectedness of the different communities of Shinchi and make the attractive sites of the town more accessible. From oceanside to the mountain area and from north to south through the different historical areas (Komagamine, Shinchi, Fukuda), creating walkable and bikeable routes will benefit not only the current and future residents of Shinchi but also its visitors.

6. Conclusion

For the first research objective, formal interviews, informal discussions and a workshop were conducted to collect information from local residents pertaining to the areas that need improvement in Shinchi. Namely, these pertain to

Shinchi Town's a) smart community area, b) communal activities and rural depopulation and c) public transportation system. Although these vary in nature, they shared a common element; all were oriented towards improving the life of Shinchi's current and prospective residents, as well as its visitors.

More specifically, the respondents stated that they are interested in seeing the existing restaurants operate under a more flexible schedule (particularly when it comes down to hours of operation during lunch-time) and are looking forward to having a more driver-friendly parking lot in the surrounding area. Certain members of the group expressed their concerns regarding the lack of a well-established public transportation system within Shinchi. As of today, the large majority of residents in Shinchi own a private vehicle as means towards going about their daily life, though what the future holds is unclear, given that some elderly citizens may have to forfeit their driver's license as they age. This opens questions as to how these people will commute to and from their house from that point forward. Furthermore, the need to enact educational and community engagement initiatives was also raised during the informal discussions. In particular, local residents believe that though Shinchi has much to offer in terms of natural and historical value, these aspects are not promoted amongst the citizens in an engaging fashion (to the point that the very history of the local community and its upbringing is starting to fade away in the memories of its younger citizens). As such, it is recommended that further actions be taken by the local government in order to increase the community's engagement and interest in local affairs.

For the second research objective of this study, the authors assessed the feasibility of utilizing electric-assist bicycles as an alternative form of transportation in Shinchi. Firstly, some of the data collected in the previous activity helped shed light on the areas of the town that are often visited by locals and tourists alike. Then, empirical data were collected through field research using both electric-assist and traditional bicycles. The findings showed that the inclusion of electric-assist bicycles in Shinchi provides the opportunity for strengthened ties between all aspects of the town: newly developed and traditional areas; residents and tourists; station front and mountainside. The electric bicycles can provide an alternate means of transportation for young and older residents alike, thus increasing the reliability of the transportation system in Shinchi. However, in order to achieve these results, the town government may be interested in increasing the safety of biking routes by ensuring the existence of traffic and street lights, as well as barrier free crossings at major intersections. These findings illustrate that reconstruction, particularly in the context of rural communities that confront depopulation and population ageing, should transgress simply the reassembly of physical structures by incorporating community input into their design.

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Appendix

Table A Questions employed during the interviews and workshops

Items
Where were you born and where do you currently live?
Which places in Shinchi would you recommend? (e.g. restaurants, sightseeings, etc.)
Where do you usually go for shopping and eating? How do you get there? What do you think about these areas?
How does your family move in and around Shinchi and how often do you need to use a vehicle? (e.g. car / bike, etc.)
Do you think someone could live in Shinchi with only a bike? Why or why not?
What do you think of the development projects in Shinchi?
What do you know and what is your opinion about the smart community project?
In what ways has the city / quality of life in Shinchi improved since the commencement of the development projects in Shinchi?
Why do you continue to live in Shinchi and what are your concerns about the future?