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Article

Citizen government interface for SDG data management in Tosa Town, Kochi

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Abstract: This study focuses on Tosa Town, a small city in Japan that is struggling to address the challenges posed by an aging population and digital transformation. Through a literature review and interviews with residents, it explores how local governance and data management impact the citizen-government interface and progress toward the SDGs. Key findings include the development of Tosa Town's own "Citizen Participation Ladder Model," which emphasizes a progressive participation framework that moves from receiving information to participating in decision-making, with tools specific to Tosa Town. Furthermore, integrating data management with this model can enhance citizen engagement in data collection, processing, and utilization, thereby improving policy alignment with community needs. This study highlights the critical role of the citizen-government interface and strategic data management in advancing the SDGs, offering insights for similar cities.

Keywords: SDGs; citizen-government interface; small-sized city; data management; citizen participation; open government

1. Introduction

The Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030 [1]. However, with only six years remaining until 2030, the target year for achieving the SDGs, the current progress toward these goals is not optimistic. As it stands, a mere 12% of the SDGs are currently on track. The newest Global Sustainable Development Report 2023 summarizes progress on the 2030 Agenda as a "stagnation in the face of multiple crises" [2].

Considering these challenges, the importance of data-driven insights for achieving the SDGs is becoming increasingly clear. The UN emphasizes that data is the lifeblood of decision-making and the raw material for accountability. Big data analysis has already become a common practice in the private sector, offering consumer profiling, personalized services, and predictive analytics. These techniques could be adapted for public sector use, providing real-time insights into well-being and aiding targeted interventions for vulnerable groups [3]. Furthermore, the UN recognizes the potential of big data to enhance evidence-based decision-making at all levels—global, regional, national, and local—and drive the implementation of the SDGs [4].

Building on the foundation of data-driven insights for achieving the SDGs, another critical aspect emerges when focusing on the development of small-sized cities. Ozaki and Shaw [5] makes a point that achieving the SDGs requires the

participation of diverse actors. Promoting the involvement of these diverse actors is particularly necessary to encourage engagement at the citizen level. Among these goals, SDG 11, which focuses on sustainable cities and communities, plays a pivotal role. It emphasizes the importance of citizen participation in fostering sustainable cities and neighborhoods. Specifically, Target 11.3 of SDG 11 aims to enhance inclusive and sustainable urbanization and the capacity for participatory, integrated, and sustainable human settlement planning and management in all countries. Stockholm Environment Institute [6] mentioned that citizen participation is a powerful tool for empowerment and democratic inclusion, especially in small-sized cities where community ties are often stronger. Therefore, in smaller cities, the direct impact of policies makes citizen participation crucial. This engagement fosters empowerment, democratic inclusion, and stronger community ties, enhancing trust in local institutions and leading to a more effective citizen-government interface.

The synergy between data-driven strategies to achieve the SDGs and active citizen participation in small cities creates a robust framework for sustainable development. Therefore, this study focuses on Tosa Town, a small city in Kochi Prefecture, Japan. We aim to explore two key aspects of local governance in Tosa Town. The first objective is to analyze the effectiveness of the citizen-government interface and assess its impact on governance and community participation. The second objective focuses on determining the role of data management in strengthening local governance and contributing to the achievement of the SDGs. To achieve the research objectives, this study outlines two main research questions:

1) What is the current state of the citizen-government interface in Tosa Town, and how does it affect local governance and community engagement?

2) In what ways can data management practices contribute to the advancement of local governance and the SDGs in Tosa Town?

2. Methodology

2.1. Literature review

This study explores the concept of the citizen-government interface and the practical application of data management in governance, particularly in the context of small-sized cities, through a literature review organized into the following three sections:

1) We conducted a literature review to understand the concept of the citizen-government interface, citizen participation, and engagement. We also analyzed the classic models of the "ladder of citizen participation" and the "public participation spectrum," providing a theoretical foundation for understanding various levels and forms of citizen involvement in governance.

2) We reviewed reports from the national government of Japan and the local government of Tosa Town, specifically emphasizing SDG initiatives and other relevant governance matters. This review aimed to provide a practical perspective on the application and effectiveness of data management in Tosa Town's governance, particularly in driving sustainable development.

3) We focused on investigating the status of open data management in 30 cities selected as SDG Future Cities in 2020. This involved analyzing how open data is

presented on each municipality's official website, including the types, quantities, and formats of data. The goal was to develop a theoretical understanding of data management in small cities, providing insights into best practices, challenges, and opportunities for improvement.

2.2. Interview survey

2.2.1. Interview preparedness

Before the fieldwork, preliminary discussions were held with the head of the SDGs Promotion Office at Tosa town hall. These discussions offered valuable insights for formulating key themes for the interviews. The themes included understanding the types of information accessed by citizens, the challenges in information management and dissemination, and the relationship between citizens and the local government.

These initial discussions confirmed the focus of the interviews, and a list of key informants was subsequently compiled, totaling 36 individuals. The focus was placed on representatives from several key areas:

1) Local government officials.
2) Affiliated organizations.
3) NPOs and associations.
4) Local business and industry.
5) Youth perspectives.

From 22 August to 1 September 2023, interviews were conducted using a semi-structured approach that focused on six main topics:

1) Basic information.
   - Family background.
   - Reasons for residency in Tosa Town.
2) Work and professional (study) life.
   - Occupation or study.
   - Challenges and opportunities facing their professional or academic life.
   - Work or study is impacted by local government policies and initiatives.
3) Life in Tosa Town.
   - Daily routine.
   - Community involvement.
   - Disaster response and preparedness.
4) Information access and usage.
   - Sources of information.
   - Reliability and accessibility.
   - Use of information.
5) Collaboration and decision-making.
   - Participation in local governance.
   - Impact on decision-making.
   - Suggestions for improvement.
6) Reflections on local governance.
   - Strengths and weaknesses.
   - Future expectations.

While some themes and questions were predetermined, others emerged spontaneously during the interview. Initially, the study was explained to the participants, and their consent was obtained. Following this, participants provided essential information and engaged in an interview lasting approximately 60 min.

All interview sessions were recorded, and verbatim transcripts were subsequently created for a detailed analysis. This approach ensured a comprehensive understanding of the various perspectives and experiences within Tosa Town, significantly contributing to the depth of the research findings.

2.2.2. Interviewees

The fieldwork involved interviewing a total of 36 residents from Tosa Town. To ensure the participants' privacy, their names have been anonymized and are represented by numbers. The interviewees' occupations vary, providing a diverse range of perspectives. This includes six town hall staff members, four students, two individuals from the Social Welfare Council, two councilors, two nurses, two nursery teachers, five employees from organizations such as NPOs and General Incorporated Associations, five individuals involved in agriculture and forestry, six in various occupations including freelancers, self-employed individuals, and those holding multiple jobs, and two company owners.

The age distribution among the 36 interviewees varies: 8% are teenagers, 22% are in their twenties, and 25% are in their thirties, which comprises the younger demographic. The largest group consists of those in their forties, at 31%, followed by 14% who are in their fifties.

The interviewees include an equal number of individuals born in Tosa Town and those who have relocated from other cities. The gender distribution is also balanced, featuring an equal number of male and female participants.

2.2.3. Method of analysis

After preparing the verbatim transcripts from the interviews and translating them from Japanese to English, text mining was conducted using KH-coder for data analysis. Due to the small sample size, which did not allow for statistical analysis, the study employed a qualitative approach. Considerable time was dedicated to each interview as part of the key information survey and in-depth interview methodology. This enabled a detailed exploration of individual views and experiences, ensuring that the data analysis was rich in qualitative depth.

Upon concluding 36 interviews, the audio recordings were transcribed verbatim into a transcript using transcription software. After transcription, proper nouns and terms with transcription errors were carefully corrected. Additionally, irrelevant text that would not affect the analysis results was removed. Given that the interviews were conducted in Japanese, the transcripts were subsequently translated into English using translation software. The initial translations were then double-checked for accuracy regarding proprietary and Japanese terminology (including names of people and geographical places). Each conversation excerpt was coded and assigned a unique identifier based on the respondent's gender, age, place of origin, and occupation. After thoroughly refining the interview transcripts, we analyzed the conversations of Tosa Town residents. Initial inferences on word frequency were made using the digital text mining tool KH-coder. A second analysis was conducted after excluding auxiliary

verbs, pronouns, and other non-essential words. The analysis involved examining the high-frequency words extracted from the transcripts of all interviewees, providing insight into the dominant themes and topics across Tosa Town. Furthermore, a correspondence analysis of words and variables was performed by categorizing the data into five groups: town hall-related, agriculture and forestry, company employment-related, NPOs and associations, and students. This part of the analysis helped identify and summarize discussions around predefined themes and emerging topics highlighted by interviewees.

3. Previous research

3.1. Review of the concept of citizen government interface

It is essential to recognize the broad nature of the citizen-government interface concept when defining it within the context of this study. While the term may not be commonly used in the existing literature, related concepts such as citizen participation and engagement are widely discussed. For this study, these terms are included under the scope of the "citizen-government interface".

First, an analysis of the context in which participation is handled in all the papers covered in this research shows that there are two main categories: those that explain the "need for citizen participation to achieve the SDGs" and those that explain the "requirements to promote participation and the effects of citizen participation." These are not necessarily clearly separated, and many papers include elements of both.

For the former, the categories of gender, health, and poverty are more frequently found. In the gender category, the promotion of women's participation in the labor market and other sectors is widely considered to contribute to the SDGs as a whole [7,8]. Also, in the health category, the promotion of participation in physical activity and sports is mentioned [9–11]. Among these, Guthold et al. [9] state that this requires intervention in social, economic, cultural, technological, and environmental inequities. "Effectively addressing the high prevalence of insufficient activity will require identifying, understanding, and intervening on the causes and inequities—social, economic, cultural, technological, and environmental—that can perpetuate the low levels of participation and differences between sexes."

On the other hand, for the latter, there are many papers in the citizen science and environmental categories. The paper on citizen science provides a comprehensive perspective, such as creating opportunities for participation through the formation of citizen science projects [12], improvement of civic literacy and human resource development through projects [13], gaining ownership through participation in research projects [14], and potential for monitoring SDG indicators through citizen science [15]. There are also issues such as securing funding for citizen science projects and treating projects only as a source of data; however, as Fraisl et al. [16] explain, "As a rapidly growing and transforming field, citizen science has considerable potential to interact with the fast evolving SDG process, not just as a source of data that could fill gaps or improve rapid response to disasters, but as a science-driven approach that places citizens at the heart of SDG monitoring. Citizen science provides the public with the means to inform policy, which could raise trust, credibility and ultimately accountability in the SDG monitoring process. Moreover, engaging with

citizens in the data collection process, and in research more generally, could create opportunities to stimulate citizen action. Implementation of the SDGs requires changes to existing decision-making procedures and practices across governance structures, economic sectors and society at large. Citizen science not only 'delivers' more complete and timely data but can also trigger shifts in governance structures and accountability, which imply changes for public authorities in terms of both the basis for their decisions (what evidence and how this is taken into account) as well as in their inter-actions with the public in terms of continuity and responsiveness" [17].

Citizen engagement in local or municipal government is generally characterized as the process through which individuals, groups, and organizations can participate in the decision-making that will affect them or in which they have an interest [18]. In participatory governance, citizen involvement can bring diversity and transparency, but challenges include a lack of information, digital skills, trust, and capacity constraints of the authorities [19]. Citizens can play an active role in all aspects of urban management. This includes reporting issues related to the maintenance of urban infrastructure or mobility, monitoring environmental parameters such as air or sound pollution, and sharing opinions on the performance of local authorities. These activities significantly contribute to the management and improvement of urban spaces. Moreover, several studies have focused on developing collaborative applications that directly involve citizens in decision-making processes. This includes urban planning, the selection of development projects, and the promotion of democratic values. Such collaborative efforts represent a more advanced form of citizen engagement in which citizens go beyond providing feedback to actively participate in developing policies and programs [20].

In brief, the citizen-government interface encompasses a variety of interactions between citizens and government entities, ranging from basic information sharing to active participation in governance and decision-making. Although challenges exist for effective participation, the advantages of a more engaged and informed citizenry are likely significant, resulting in more responsive, inclusive, and democratic local governance.

The concept of citizen participation has been explored through various models. One of the most widely referenced and influential models is Arnstein's Ladder of Citizen Participation, proposed by Sherry Arnstein in 1969. Arnstein's typology of citizen participation is presented as a metaphorical "ladder," with each ascending rung representing increasing levels of citizen agency, control, and power. This typology includes a continuum of participatory power ranging from nonparticipation, indicating no power, through degrees of tokenism, representing counterfeit power, to levels of genuine citizen participation, signifying actual power [21]. The eight rungs of the Ladder of Citizen Participation are manipulation, therapy, informing, consultation, placation, partnership, delegated power, and citizen control.

The model also influenced subsequent frameworks, including the public participation spectrum developed by the International Association for Public Participation. It outlines five general modes of participation that exist on a progressive continuum of increasing public influence over decision-making in a civic engagement process. This spectrum can assist community groups in defining and determining the

public's role in a democratic decision-making process. The five modes of public participation include inform, consult, involve, collaborate, and empower [22].

3.2. Review on data management in the Japanese local government

Data management refers to the organizational and ongoing activities involved in managing data that an organization holds as information assets, ensuring that it remains in a state conducive for use in business and policy purposes, while also allowing for its evolution. Government agencies have recognized the importance of data management and have been studying and implementing it as an initiative [23]. Furthermore, to promote local SDGs, data collection, monitoring, and citizen participation are necessary, and "open governance" facilitates this. In other words, it is essential to create a transparent society that enables citizen participation. "Open data" is vital for achieving this, as it encourages citizen autonomy and stimulates business. The open governance issue has been discussed in Japan for some years, and several recent disasters have pointed out the importance of open governance [24,25]. Japan has promoted "data utilization" and "digital government" as the pillars of its strategy through the establishment of the Government CIO (Chief Information Officer) and the enactment of the Public-Private Data Basic Act [26–28]. However, the utilization of data has not progressed sufficiently in Japan due to low data literacy and strong concerns about privacy. According to the "Survey and Research on Consumer Attitudes toward the Data Distribution Environment" [28,29], variation in data formats and quality assurance are cited as critical issues in the use of digital data. In most cases, fundamental data of government are open as a PDF file, due to which it is difficult to use them as specific data for analysis. It is anticipated that the progress in the use of public data by a wide range of entities can help solve various issues through the promotion of public participation and public-private collaboration. Improving the quality of the data shall also lead to its effective utilization [30,31].

As of 1 June 2023, the open data implementation rate among Japanese local governments was approximately 81% (1449 out of 1788 local governments). In particular, the implementation rate for small municipalities, including cities with populations of less than 50,000, was 75% [32]. This indicates that municipalities across Japan are actively working toward digitization and greater transparency in information. The introduction of open data is progressing, especially among smaller municipalities. However, further efforts are needed, as approximately 25% of all small-scale municipalities are still not working to convert to open data.

Based on the data above, we surveyed the status of open data management in 30 cities selected as SDG Future Cities in 2020. In this research, we analyzed how open data is displayed on each municipality's official website and the type, quantity, and format of the data.

As a result, it was found that 18 municipalities have already published their own open data catalog site or a unified open data site with the prefecture, 10 municipalities have published open data on their websites, and the remaining two municipalities have promoted or are considering initiatives to utilize open data.

Additionally, the types and formats of data visualized in the selected 30 municipalities are systematically categorized. The data categories encompass a broad

spectrum of societal and environmental aspects, including population, disaster risk reduction, education, culture, lifestyle, environment, and tourism. Other data categories, such as health welfare, financial affairs, and citizen surveys, are seldom or rarely visualized. The primary visualization methods for these data categories include maps, line graphs, and bar graphs.

In contrast, Tosa Town has not yet published its open data. Nevertheless, based on active advice and suggestions from residents, Tosa Town has outlined 10 sector-specific visions, complete with indicators and policies for each goal. The progress of these indicators is updated monthly and shared publicly. Furthermore, Tosa Town has developed scenarios that address issues such as forest degradation, terraced rice field abandonment, and solar panel maintenance. Plans are underway to construct a data platform that integrates various statistical data.

4. Study area

4.1. Overview of Tosa Town

Tosa Town is located in the central part of the Shikoku region, Japan, near the upper reaches of the Yoshino River.

This mountainous town is known for the Sameura Dam, a significant multipurpose dam in Western Japan, essential for the Shikoku region's water supply. The town's landscape features terraced rice fields and dense mountain forests, ranging from 250 to 1500 m. The climate of Tosa Town is characterized by high rainfall, with an average annual precipitation of 2700 mm.

Despite its natural assets, Tosa Town faces demographic challenges. The town has a high aging rate of 45%, and future projections estimate a population decrease to approximately 1869 by 2060. However, there has been a notable social increase since 2011, marked by an influx of new residents.

The economy of Tosa Town primarily relies on agriculture, utilizing the area's diverse elevations and temperature variations. The terraced rice fields are recognized for producing high-quality rice, including varieties used for sake brewing. Besides agriculture, Tosa Town serves as the main production area for Tosa Akaushi, a breed of Wagyu cattle [33].

4.2. Governance strategy

Tosa Town is currently focusing on two initiatives to achieve the SDGs while helping its residents lead more prosperous and fulfilling lives.

First is the Tosa Town Development Plan, a ten-year strategy to promote sustainable development in the town. The 7th Tosa Town Development Plan, completed in March 2021 and aiming for the year 2030, focuses on the vision of "a sustainable Tosa Town where no one is left behind." This plan was developed over two years in collaboration with residents and represents a resident-centered approach to development.

Second is the Tosa Town SDGs Future City Plan, an administrative strategy aimed at 2030. It focuses primarily on conserving and recharging water resources in the region. Tosa Town's strengths and values, as summarized by the local government,

include the active engagement of the elderly generation and the high birth rate supported by the working-age population, contributing to a "resident power" for the next generation. Additionally, Tosa Town is recognized as a "town of abundant water sources," supporting not only its community but also the lives and industries of other regions.

To continue leveraging these strengths and values, the plan identifies several key areas for development: a quantitative understanding of water source recharge functions, a redesign of the industrial structure, and the enhancement of learning environments to foster human resources capable of adapting to future challenges.

4.3. SDGs-related governance structure

As of 2022, the staff of Tosa Town totals 75 people [32]. The organizational structure of the town hall includes the Mayor and Deputy Mayor, followed by the accounting office and six departments: the General Affairs Division, the Residents Division, the Agriculture and Forestry Promotion Division, the Construction Division, the Health and Welfare Division, and the Planning and Promotion Division. Additionally, there are six committees, including the Board of Education and the Council. In response to the establishment of the 7th Tosa Town Development Plan, a new executive system has been established to vigorously promote the realization of SDGs and regional revitalization. Since 2021, an SDGs Promotion Office has been established under the Planning and Promotion Division. One or two promotion officers are assigned to each of the nine departments: General Affairs, Residents Division, Agriculture and Forestry Promotion Division, Construction Division, Health and Welfare Division, Health Committee, Accounting Office, Council Secretariat, and Planning and Promotion Division. Regular monthly meetings are held to share information, creating a cross-departmental promotion system.

This system consolidates regional revitalization and SDGs-related measures, which were previously implemented separately by each department, under the charge of the "Regional Revitalization and SDGs Division Head." It also establishes an operational unit called the "Regional Revitalization and SDGs Promotion Section" for integrated policy planning, execution, and progress management. Furthermore, to monitor the progress of initiatives and facilitate decision-making, the "Regional Revitalization and SDGs Promotion Headquarters" is established, composed of department heads and higher-level members.

Additionally, the "SDGs Promotion Council," composed of Tosa Town residents, has been established to promote SDGs from the residents' perspective. In collaboration with the Regional Revitalization and SDGs Promotion Section, this council promotes initiatives and meets quarterly to discuss the evaluation and verification of Tosa Town's SDGs, review indicators, and revise policies for their realization. An "Expert Evaluation Meeting" is also established to assess the implementation status of SDGs initiatives. It primarily comprises members from academia, government, finance, labor, and media.

5. Results of data analysis

The study utilized the KH coder to analyze the prevalence of high-frequency words in the interviews and the correspondence between words and occupational classifications. **Figure 1** visualizes the high-frequency words from the interviews through word clouds, with the size of each word correlating with the relative frequency of its occurrence. The words 'community' and 'activities' stand out most prominently in the font, suggesting that community engagement and activities were pivotal in the discussions. The high frequency of the words 'student', 'child', 'member', and 'resident' underscores the importance of education, family life, organizational membership, and resident affairs in community conversations. In economic discussions, terms such as 'agriculture', 'forestry', and 'industry' highlight essential local economic sectors, while 'products' and 'sales' emphasize the significance of commercial transactions and market activities. Additionally, "jobs", "work", and "business" reinforce the central role of employment and business activity in the community's economic discourse.

Furthermore, the terms 'life', 'support', and 'health' emphasize the importance of living standards and well-being in the community agenda. They attest to the critical role of community support networks and health services in improving residents' quality of life.

The presence of terms such as 'land', 'water', and 'forest' suggests the importance of natural resources in community dialogues, possibly linked to themes of sustainable development and environmental protection. Finally, the occurrence of words such as 'information', 'management', and 'issues' indicates that awareness of information dissemination, organizational management, and relevant issues plays a key role in the decision-making process.

Figure 1. Word cloud analysis of the interview.

Figure 2 presents the correspondence analysis chart. It is divided into five groups: student, NPOs and associations, agriculture and forestry, company employment-related, and town hall-related, along with the associated keywords. Below is an analysis of these groups and their respective keywords:

1) Students group: The keywords "study," "student," "school," and "scholarship" in this quadrant indicate that education-related activities and concepts are highly

relevant to the student group. The terms "summer," "friends," and "programs" relate to students' summer activities, social life, and academic programs.

2) NPOs and Associations Group: The words "service," "community," "support," and "gatherings" highlight the role of nonprofit organizations in community service and support.

The association of "nonprofit organizations and associations" with the terms "activities" and "membership" highlights the significance of these organizations in organizing events and attracting members.

3) Agriculture and forestry group: Keywords closely associated with this cluster include "farm", "rice", "landowner", and "cattle", which are central to the agriculture and forestry sector. The terms "management," "technology," and "price" indicate that management practices, technology application, and market pricing are the focus of discussion in agriculture and forestry.

4) Corporate employment-related groups: The words "business", "product", "production", and "work" relate to business activities and corporate employment. The distribution of these terms indicates that company-related discussions likely focus on product development, business strategies, and employment opportunities.

5) Municipality-related groups: Words such as "residents," "local," "children," and "education" refer to municipal services and the quality of life for residents. Terms like "council," "staff," and "policy" highlight the significance of municipal decision-making, administration, and policy development.

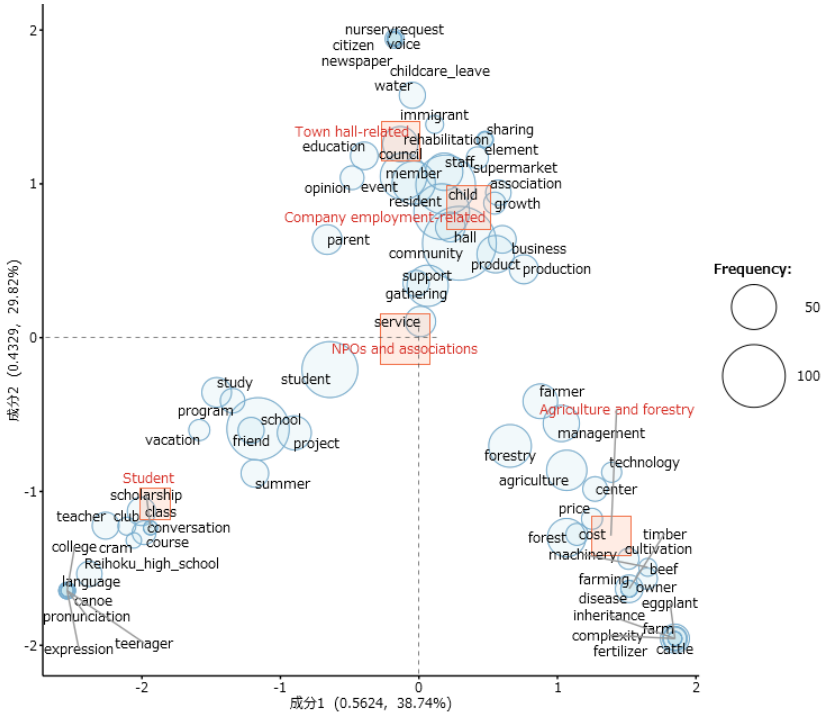

Figure 2. Correspondence analysis of words and variables.

6. Discussion

6.1. Ladder of citizen participation in Tosa Town

The Ladder of Citizen Participation in Tosa Town was developed based on interview responses. This model (**Figure 3**) outlines a framework for engaging citizens at three progressive levels of involvement in local governance.

At the basic level, the model centers on the "informing" phase, which is characterized by one-way communication. This phase aims to inform citizens about local activities, policies, and initiatives. Tosa Town utilizes tools such as town broadcasts, flyers, and social media platforms to reach a wide audience. A key focus is the promotion of Line accounts to facilitate residents' access to local government information via their cell phones. This foundational phase is critical in ensuring that all community members have access to essential information, thereby promoting inclusiveness.

In the intermediate "consultation and involvement stage," Tosa Town's model transitions to a two-way, dialogic exchange. During this phase, residents move from being mere information recipients to becoming active contributors. They are invited to provide feedback and ideas through various channels, including workshops, focused discussions, and digital platforms such as social media. A key initiative in this phase is the "Reihoku High School attraction project," which incorporates ideas from young people to address the challenges facing Tosa Town. In addition, the Participatory Consensus Formation Program "Liqlid" facilitates the participation of residents in the stages of "Advocacy," "Co-documentation," "Intentional Inquiry," and "Expression and Preservation of Results." The program fosters co-creation and deep engagement between residents and the administration. Through these platforms and initiatives, Tosa Town not only gathers community input but also promotes a culture of active citizenship that incorporates diverse perspectives into the decision-making process.

At the highest level of the Tosa Town model of "collaboration and empowerment," residents are transformed from mere contributors into key decision-makers who directly influence policy and outcomes. An example of this level is the establishment of the Tosa Town SDG Promotion Council. The council is a diverse organization made up of residents, including town officials, NPO staff, council members, post office employees, company managers, and outside professors.

The organization meets quarterly to discuss, evaluate, and validate the Tosa Town SDGs, reviewing various indicators and measures necessary for their achievement. The council's membership is inclusive and diverse, ensuring a holistic perspective in governance and decision-making processes. This model encourages residents' direct involvement in guiding Tosa Town towards the SDGs by integrating diverse community stakeholders.

Tosa Town's structured approach to civic engagement emphasizes collaboration and empowerment, reflecting the town's strong commitment to inclusive and participatory governance. It highlights the town's dedication to ensuring that the voices of all communities are not only heard but also actively engaged in driving sustainable development and shaping the future of local governance.

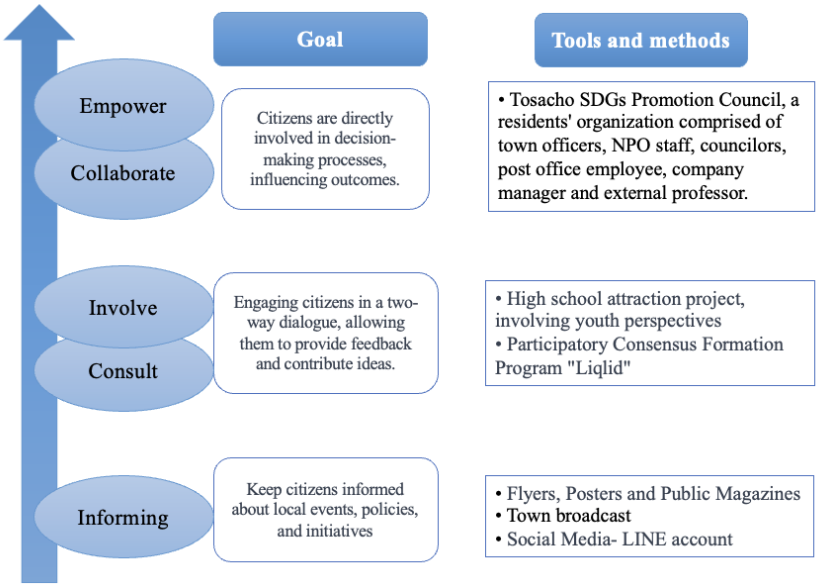

Figure 3. Ladder of citizen participation in Tosa Town.

6.2. Three-phase data-driven citizen participation framework

A citizen participation ladder model suitable for Tosa Town. Based on this model, data management that incorporates the three phases of collection, processing, and provision/utilization can significantly enhance the effectiveness of citizen engagement at all levels of local governance (**Table 1**).

In the basic information stage, the focus is on one-way communication and disseminating information about local activities, policies, and initiatives. During this phase, data management plays a crucial role in collecting data. Town radio, leaflets, and social media platforms serve not only as communication tools but also as means of gathering data on citizen engagement and feedback. For example, social media analytics can provide insights into which topics resonate most with residents, highlighting community interests and concerns. Targeted surveys through digital platforms such as Line can collect specific data about residents' needs and preferences, making messages more relevant and engaging.

As the process transitions into a consultation and engagement phase, the model evolves into a two-way, dialogic exchange that makes data processing an essential element. Data collected from workshops, discussions, and digital platforms is processed to understand the community's mood and concerns. This includes analyzing feedback, categorizing responses, and identifying trends or common themes. Residents are encouraged to participate in data processing through digital tools that enable them to visualize and interact with the gathered data. This participatory approach to data analysis is exemplified in activities such as the Reihoku High School Attraction Project or the Liqlid program, where participants can witness the impact of their contributions.

In the advanced stages of collaboration and empowerment, the availability and use of data become key. Tosa Town's SDG Promotion Council is equipped with comprehensive data analytics and reporting to ensure that decisions are based on accurate, up-to-date information reflecting broad community insights. Transparent data sharing involves making the data collected and processed upfront available to

council members and the public in a user-friendly format. This transparency builds trust and ensures that decisions are based on a collective understanding of community needs. Utilizing data in policy development means directly influencing policies and outcomes with data. This may include developing data-driven strategies to achieve the SDGs, measuring progress with quantitative indicators, and adjusting policies based on data insights.

By integrating data management into these three stages, Tosa Town can improve its citizen engagement model and ensure that a comprehensive understanding of community needs and preferences guides decisions. Data will flow between citizens and the government, fostering community participation, information sharing, and empowerment.

Table 1. Three-phase data-driven citizen participation ladder.

Stage	Focus	Description
Informing	Data Collection	Utilize tools like town broadcasts, flyers, and social media for collecting data on citizen engagement. Implement targeted surveys on digital platforms.
Consultation and Involvement	Data Processing	Analyze feedback from workshops and digital platforms. Use participatory tools for data visualization and interaction in community projects.
Collaboration and Empowerment	Data Provision/Utilization	Equip councils with data analyses for decision-making. Share processed data transparently. Use data in direct policy formation and measuring progress towards SDGs

As mentioned above, citizen participation practices are considered bottom-up approaches in Japan, and mostly the local governments of smaller cities and towns take the lead on this. There is no national-level guidance. Citizen engagement is also linked to open data and open decision-making, which are the core of open governance principles. Since this is mostly a bottom-up approach, transparency in citizen engagement is ensured through the above-mentioned ladder of participation. Bias is reduced through neutral information sharing, and a sense of ownership and participation is generated through the process.

7. Conclusion

This study focuses on a small city in Japan, where challenges such as declining and aging populations, along with slow progress in digitization, hinder the achievement of the SDGs. Specifically, through interviews with residents of Tosa Town and a thorough literature review, this study analyzes local governance and data management approaches in Tosa Town to understand their impact on the citizen-government interface and SDG attainment.

The outcome of research question 1 is the development of the Citizen Participation Ladder Model in Tosa Town. The model illustrates a progressive hierarchy of citizen participation in local governance, ranging from receiving information (informing) to actively contributing and influencing decisions (consulting, participating, collaborating, and empowering). The inclusion of the unique tools Tosa Town has in this model reflects the town's commitment to fostering an inclusive and participatory governance philosophy, ensuring that the voices of all

community members are considered in driving sustainable development and shaping the future of local governance.

In research question 2, the outcome is the integration of data management into the citizen participation ladder model in Tosa Town, which increases participation at three stages: data collection, processing, and provision/utilization. Initially, data is collected through one-way communication channels, such as social media, to understand community interests. The next stage involves a two-way conversation, where feedback from different platforms is analyzed to gain insights into the community. The final stage focuses on data-driven decision-making and transparent sharing to align policies with community needs and preferences, ultimately strengthening the link between citizens and government.

In conclusion, this study highlights the significance of multi-stage strategies in tackling the unique challenges that small cities like Tosa Town encounter. An effective citizen-government interface and strategic data management have emerged as key drivers of local governance in alignment with the SDGs, offering insights for similar cities that strive to achieve the 2030 SDGs.

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