Offshore Wind Development and Its Local Socio-Economic Impact in Akita Prefecture

A critical analysis with local stakeholder voices

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Front and back cover image

Courtesy of Akita Offshore Wind Corporation

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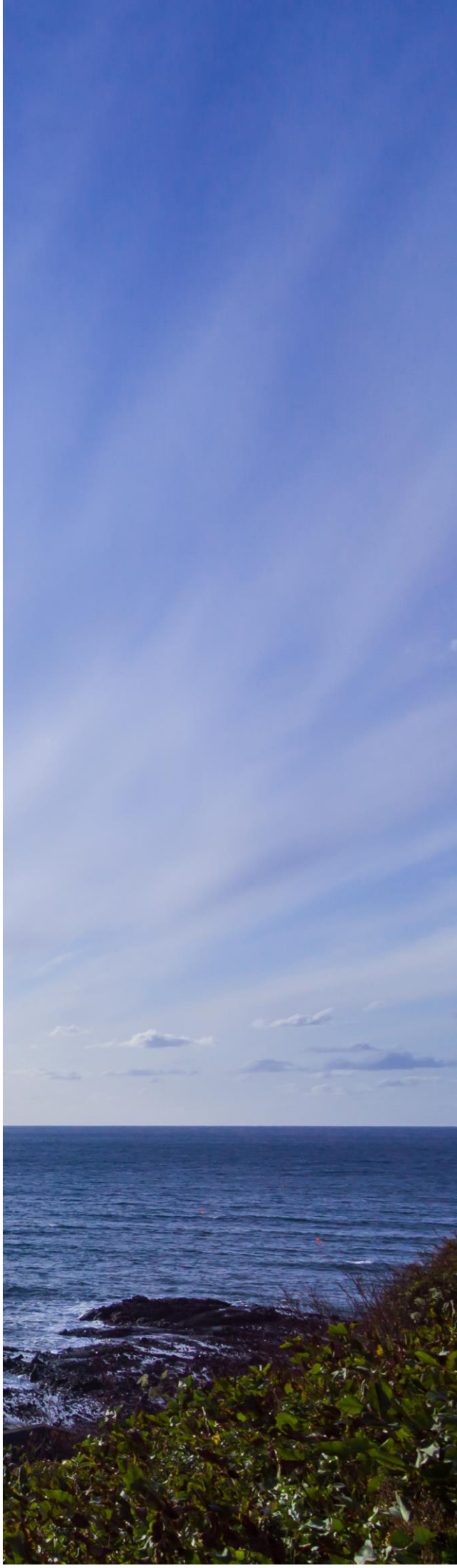

FOREWORD

Akihiko Kurashina, Japan Country Head at Ocean Energy Pathway

Akihiko joined OEP as Country Head of Japan in April 2024 and also serves as a Senior Advisor at Global Wind Energy Council (GWEC). He has extensive experience in the offshore energy industry overseas and started his involvement with the offshore wind sector at Equinor in 2000. He participated in the first and second public-private council meetings and the first to third working groups. He joined the Renewable Energy Institute in April 2023 and for one year, coordinated collaborations between government agencies and industry.

The world stands at a critical juncture in the fight against climate change. The urgency to limit global warming to 1.5°C, as agreed in the Paris Agreement, remains paramount. Decisive action, such as the COP28 agreement to triple renewable energy by 2030, is needed more than ever. Although there was limited progress on mitigation at COP29, offshore wind energy has been proven to be a key solution for countries striving to reduce emissions while meeting their growing energy demands.

As Japan aims to achieve carbon neutrality by 2050, renewable energy plays a key role in national policy. Japan recently updated its Nationally Determined Contribution (NDC), setting new interim targets to reduce carbon emissions by 60% by 2035 and 73% by 2040 compared to 2013 levels[1]. These strengthened commitments underscore the critical role of renewable energy in meeting Japan's decarbonization goals. The recently revised Seventh Strategic Energy Plan sets a target of sourcing around half of Japan's electricity from renewables by 2040, with wind energy projected to contribute approximately 4-8% of the total[2].

Offshore wind, in particular, is recognized as a cornerstone of Japan's long-term energy transition strategy, with the government keeping the target of 10 GW of offshore wind capacity by 2030 and up to 45 GW by 2040. As of March 2025, Japan's cumulative offshore wind capacity stands at 298.32 MW. However, the country's potential is vast, with an estimated 2,466 GW of resources available (including 2,396 GW for floating), according to the Mitsubishi Research Institute[3].

Among Japan's regions, Akita Prefecture stands out as a promising hub for offshore wind development. With strong, consistent wind resources along its coastline and a historical foundation in industrial, Akita is the leading prefecture in Japan's offshore wind expansion. The prefecture is already home to Japan's first operational commercial offshore wind projects, setting an important precedent for future development. This report offers a timely, independent perspective on the economic impacts of offshore wind and potential strategies to

[1] Ministry of the Environment (2025). https://www.env.go.jp/content/000291805.pdf
[2] Agency for Natural Resources and Energy (2025). https://www.meti.go.jp/press/2024/02/20250218001/20250218001-3.pdf
[3] MRI (2024). https://www.mri.co.jp/en/news/20240620.html#:~:text=Findings%20show%20a%20total%20potential,hundredths%20of%20this%20total%20potential.

maximize these benefits and support Japan's national offshore wind ambitions. In doing so, it aligns with broader national and international efforts to accelerate the deployment of renewable energy and address the increasing challenges of climate change.

A deep understanding of offshore wind's economic impact is essential to unlocking its full potential across multiple sectors. By fostering collaboration between prefectures, ensuring synergies in development efforts, and maintaining a high level of ambition for offshore wind, Japan can position itself as a global leader in offshore wind deployment. This report provides insights to drive informed, strategic decision-making, empowering Akita and other regions to capitalize on the opportunities offshore wind development presents. With sustained commitment and targeted investment, offshore wind in Akita Prefecture can play a vital role in achieving Japan's renewable energy ambitions and global climate goals.

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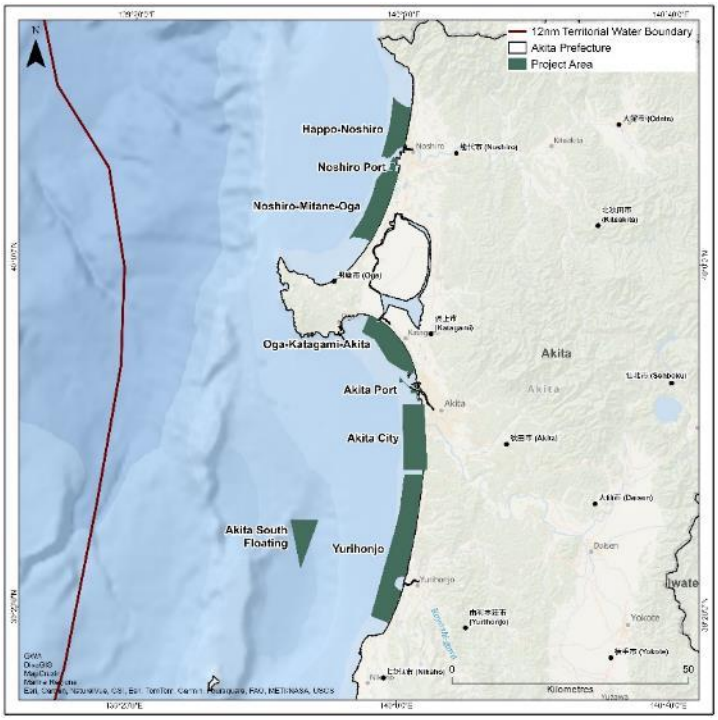
EXECUTIVE SUMMARY

Offshore wind (OSW) has been positioned as a key pillar in Japan's aim to make renewable energy a core power source and Akita Prefecture has emerged as a domestic leader in the sector. There are currently 140 MW (2 projects) operational, 2,100 MW (5 projects) under development with approximately 400 MW (1 project) under consideration for future auction rounds (see Figure 1). At the same time, Akita Prefecture is facing significant challenges relating to depopulation, ranking worst out of all 47 prefectures in terms of birth rate, death rate, ageing rate, and overall population decline rate. Therefore, there is significant hope towards the offshore wind industry in Akita to play a key role in regional revitalization.

This investigation, based on stakeholder input reflecting the current state of the local offshore wind market, revealed possible and potential scenarios for the socio-economic benefits of offshore wind in Akita Prefecture. The study considers the potential economic impact of the eight offshore wind projects in Akita Prefecture to determine the expected gross value added (GVA) and jobs created locally. Here, GVA is defined as the value of new production generated by the offshore wind projects, including both products and services. The total GVA constitutes of both direct and ripple effects.

FIGURE 1 MAP OF OFFSHORE WIND PROJECTS IN AKITA PREFECTURE



Input-output methodology was utilised, with input data gathered through desktop research, in-person interviews with key stakeholders in Akita Prefecture, and offshore wind project costs through ERM's proprietary levelised cost of energy (LCOE) model, LEnS^{TM}. Consultations with stakeholders indicated that areas such as development, onshore electrical construction, operation and maintenance (O&M) offer significant opportunities for involvement of local companies. However, the majority of high value capital expenditure (CapEx) items related to turbine and foundation manufacturing and offshore construction (turbine installation, foundation installation, and cable laying) remain out of reach based on current capabilities of local companies.

Several studies on the potential economic impact of offshore wind in Akita Prefecture have been carried out by stakeholders such as local governments, financial institutions, and project developers. The last prefectural-wide GVA study came in 2022, in the immediate aftermath of the first offshore wind auctions. Since then, the award of Round 2 and Round 3 projects, as well as the commercial operation of the Akita Port and Noshiro Port windfarms have provided further insight into the long-term direction of the offshore wind industry domestically, as well as within Akita Prefecture. Further, in February 2025 Mitsubishi Corporation announced that they will review their plans for the Noshiro-Mitane-Oga and Yurihonjo projects, attributed to changing business environments related to factors such as inflation, depreciation of the Japanese yen, tight supply chains, and rising interest rates[4]. Considering these changing dynamics, OEP and ERM's analysis offers a neutral and independent perspective to reassess the local supply chain plan to maximise the benefits of offshore wind to the prefecture and the wider region.

In this study, the "possible" and "potential" cases were considered within the analysis to calculate estimated GVA and jobs created. These are based on realistic assessments of the abilities of companies active in Akita Prefecture's offshore wind sector, producing the results shown in Table 1. The values include key contributions to Akita's business services, construction, and transportation sector.

TABLE 1 SUMMARY OF RESULTS FROM AKITA OFFSHORE WIND GVA ANALYSIS

Case	Definition	GVA[5]	Induced employment (persons during the projects' period)
Possible	Local procurement rates that are possible, considering the current plans and abilities of local supply chain companies. It does not assume major changes, investments, or improvements in the supply chain.	356 billion JPY (2.38 billion USD)	33,999
Potential	Local procurement rates that are considered hypothetically achievable*, considering feasible new investments aimed at increasing the capabilities of local suppliers. *Considers increased availability of human resources; competitiveness of local suppliers and local suppliers' entry into some new supply chain scopes.	570 billion JPY (3.81 billion USD)	51,908

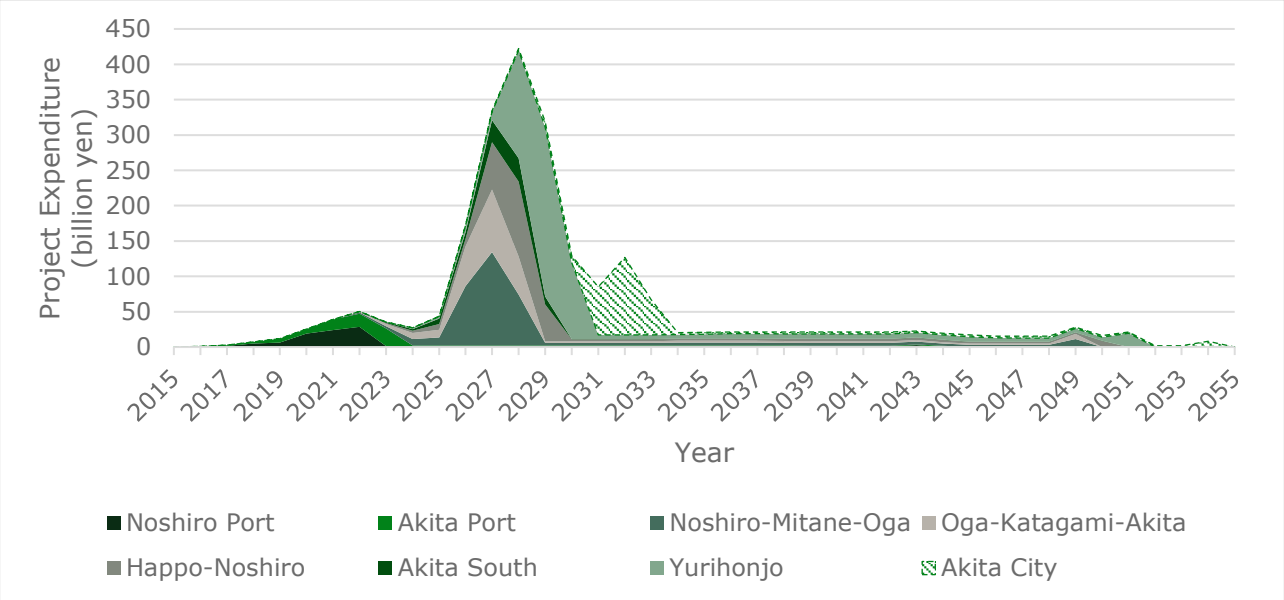
[4] Mitsubishi Corporation. (2025). https://www.mitsubishicorp.com/jp/en/news/release/2025/20250203002.html
[5] 1 USD=157 JPY (as of 1st January 2025)

Recommendations

Despite strong estimates for the local economic ripple effects under the "possible" scenario, it is critical to ensure local companies are given the maximum opportunity to contribute to offshore wind related businesses to strive for the "potential" case and beyond. Below are six key recommendations to further increase the economic benefits which offshore wind can offer to Akita Prefecture.

1. **Maximise the involvement of local companies in offshore wind O&M.**
   As seen in Figure 2, offshore windfarms provide long-term, sustainable opportunities for involvement of local businesses in operation and maintenance (O&M) related activities. The prefectural government must continue coordination with local businesses to maximise opportunities in O&M.

FIGURE 2 TOTAL EXPECTED PROJECT EXPENDITURE IN AKITA PREFECTURE BY YEAR



Source: LEnS™ (ERM)

2. **Expedite discussions to provide a more sustainable, long-term offshore wind pipeline in Akita Prefecture.**
   Based on current confirmed plans, the confirmed construction plans of offshore wind projects in Akita Prefecture are to be completed by 2030 (Figure 2). The project timelines should be managed such that the project expenditure is better distributed to reflect the local supply chain capability. Further, the prefectural government must progress stakeholder identification and discussions regarding future fixed-bottom and floating opportunities to provide greater assurance to local suppliers considering further investments.

3. **Coordinated approach to supply chain development in Akita Prefecture**.
   Currently, each offshore wind developer in Akita Prefecture has pursued supply chain development plans separately with little coordination, leading to missed synergy opportunities across projects. The developers must form a framework for collaboration and knowledge sharing to expand the capability of the prefecture's offshore wind supply chain.

4. **Multi-prefectural supply chain planning to serve the Tohoku region and beyond.**
   Mutual cooperation between businesses in neighbouring prefectures would allow for further

development of supply chain capabilities. To achieve this, the national government must lead holistic offshore wind supply chain planning, including the possibility of an internationally competitive supply chain hub to serve the entire Tohoku region and beyond.

5. **Implement human resource development planning to connect people to employment in Akita's offshore wind sector.**
   Akita Prefecture has outlined an offshore wind human resource strategy including measures aimed at students and employment matching initiatives. The establishment of Akita Prefecture as an offshore wind hub, such as in personnel training, could also help to create jobs and attract young professionals. These programs rely on coordination between stakeholders from industry, academia, government, and developers. Its success will be crucial for offshore wind to contribute to combatting depopulation in the prefecture.

6. **Maximise the auxiliary economic benefits of offshore wind.**
   Consideration of initiatives beyond the development, construction, and O&M of the individual windfarms can maximise the economic ripple effects of offshore wind. The prefectural government must successfully implement initiatives related to attracting businesses through utilisation of the clean electricity generated.

The analysis and recommendations outlined in this report indicate that significant measures have already been taken within Akita Prefecture to increase local benefits from the growing offshore wind sector. However, further opportunities have been identified for the prefectural government, project developers, and other stakeholders to take the lead on developing a holistic, long-term, and sustainable supply chain plan within Akita Prefecture. It is intended that the results and recommendations of this report will contribute to maximising the benefits to the local community in Akita, and in turn for Akita to become the model case of offshore wind implementation in Japan and globally.

Section 1

Introduction

1 INTRODUCTION

The co-existence of offshore wind (OSW) projects with local communities is critical to their success and their socioeconomic impacts are key considerations for windfarms around the world. Akita is one of the leading prefectures of offshore wind development in Japan. It has eight OSW projects, with two already under operation whilst the remainder are in the planning and development stages. This includes a demonstration project site for floating offshore wind (FOW).

In Japan, the prefectural government and local municipalities are responsible for the offshore wind project site identification, initial stakeholder management and presentation of information regarding the site to the national government. Further, the municipalities and prefectures play a significant role in coordinating and supporting local businesses to enter the offshore wind industry.

The implementation of over 2.5 GW of offshore wind capacity across the eight projects is anticipated to generate significant socioeconomic benefits within Akita Prefecture. The local supply of products and services for these projects are expected to enhance financial status and income levels for both local industries and individuals. Moreover, as these OSW projects drive increased consumption within the region, the positive economic ripple effects may extend even further. Thus through the success of offshore wind in Akita, the overall economic vitality of the prefecture is likely to experience a substantial boost.

Six studies with a wide variety of scopes have thus far been conducted on such economic effects of Akita's OSW. The analysis has been carried out by various organisations, including local governments, banks, research institutes, and project developers. The results of these studies have exhibited notable variation. The local governments have tended to report relatively lower estimates, while project developers have provided higher figures, often encompassing a broader range of projects adjacent to the offshore windfarm.

Two prefecture-wide studies have been conducted previously, firstly by the Akita prefectural government (published March 2022)[6], with the second co-authored by Development Bank of Japan (DBJ) and Hokuto Bank (November 2022)[7]. These came in the immediate aftermath of Japan's first offshore wind auction under the Renewable Energy Sea Area Utilisation Act, for which the results were released in December 2021[8].

The results of Round 1, which saw Mitsubishi Corporation awarded three projects including two in Akita Prefecture, surprised many stakeholders(particularly in terms of the winning bid prices) and led to amendments to the tender framework for following auction rounds. Subsequently, the results for Round 2 (of which again two sites were in Akita) [9] and Round 3[10] have been announced in March and December 2024 respectively, providing further insight into the long-term direction of the domestic and prefectural offshore wind industry. Further, with the commercial operation of the Akita Offshore Wind Corporation's Akita and Noshiro Port projects in January 2023[11], opportunities and challenges within the O&M phase (such as training of maintenance personnel) have come to light. Finally, in February 2025 Mitsubishi

[6] Akita prefectural government. (2022). https://www.pref.akita.lg.jp/pages/archive/10638
[7] Hokuto Bank. (2022). https://www.dbj.jp/topics/investigate/2022/html/20221115_204075.html
[8] METI. (2021). https://www.meti.go.jp/press/2021/12/20211224006/20211224006.html
[9] METI. (2023). https://www.meti.go.jp/press/2023/03/20240322002/20240322002.html
[10] METI. (2024). https://www.meti.go.jp/press/2024/12/20241224002/20241224002.html
[11] Akita Offshore Wind Corporation. https://aow.co.jp/jp/eventa/item.cgi?pro&80

Corporation announced that they will "review" their plans for the Noshiro-Mitane-Oga and Yurihonjo Round 1 projects due to factors such as inflation, depreciation of the Japanese yen, tight supply chains, and rising interest rates[12].

This report offers a timely, independent perspective on the economic impacts of offshore wind in Akita Prefecture and allows for an evaluation of the supply chain development and regional revitalization measures incorporated thus far. With the additional context of Mitsubishi Corporation's review of their Round 1 offshore wind projects, there is a unique opportunity to reassess local supply chain planning. This report aims to investigate and prepare recommendations that look to maximise the socio-economic benefits to Akita Prefecture and the wider region.

For this study, over a dozen consultations were held with key stakeholders within Akita's offshore wind sector to answer the following research questions:

1. What is the "possible" and "potential" economic impact of the OSW projects currently in operation and under development in Akita on the prefecture's industries?
2. What other socioeconomic impacts might the OSW projects have within Akita prefecture?
3. What further strategies can be employed to enhance the socioeconomic benefits of OSW projects in the future?

This study utilises the established input-output (IO) model, employing Akita Prefecture's own IO analytical tool. Input data were gathered through literature reviews, stakeholder interviews, and ERM's proprietary offshore wind cost tool, LEnS™. The costs identified by LEnS™ were allocated to specific industry sectors within Akita Prefecture. Two types of local procurement rates, "possible" and "potential", were set to estimate the impact under different scenarios: the estimated status based on current plans, and a hypothetical scenario considering feasible new investments to increase local capabilities. The application of the LEnS™ model and the precise allocation of costs into sectors are valuable to allow for a detailed and accurate analysis considering the project-specific characteristics which affect project costs, which had not been achieved in prior studies. Based on the results, key recommendations for Akita Prefecture's offshore wind sector have been identified, to maximise the socioeconomic benefits of the planned windfarms and their regional revitalization effects.

[12] Mitsubishi Corporation. (2025). https://www.mitsubishicorp.com/jp/en/news/release/2025/20250203002.html

Section 2

Research Context: Akita Prefecture

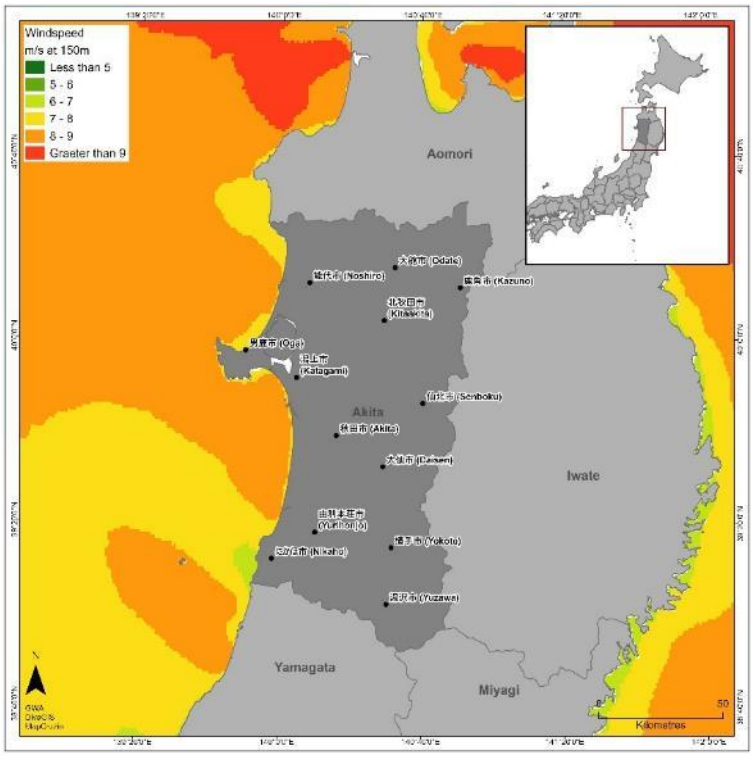
2 RESEARCH CONTEXT: AKITA PREFECTURE

2.1 GEOGRAPHY OF AKITA PREFECTURE

Akita Prefecture is located in the Tohoku region in northern Japan, and has an area of approximately 11,600 square kilometres, making it the sixth-largest prefecture in the country. It faces the Sea of Japan to the west, with a coastline spanning 264 kilometres. Akita Prefecture borders Aomori Prefecture to the north, Iwate Prefecture to the east, with Miyagi Prefecture and Yamagata Prefecture to the south. Akita City is the prefectural capital.

It has a typical Sea of Japan climate, characterised by distinct seasonal changes. In winter, the strong northwest monsoon results in frequent rain and windy conditions, with Akita City experiencing about 13 windy days and 24 cloudy days each month. As seen in Figure 3 below, a large proportion of the Akita Prefecture coast has access to strong wind resources exceeding annual mean wind speeds of 8 m/s. Slightly lower wind speeds are found to the north of Noshiro City, as well as surrounding the Oga peninsula and in the southern area off the coast of Nikaho City.

FIGURE 3 MAP OF AKITA PREFECTURE (INCLUDING MEAN OFFSHORE WIND SPEED AT 150 METRES)



The climate in Akita Prefecture varies significantly between the coastal and inland areas. The western side facing the Sea of Japan benefits from warm ocean currents that lead to milder winters. In contrast, the eastern region, bordered by the Ou Mountains, experiences colder temperatures and greater fluctuations. The mountainous areas receive more rainfall than the plains, contributing to considerable snowfall.

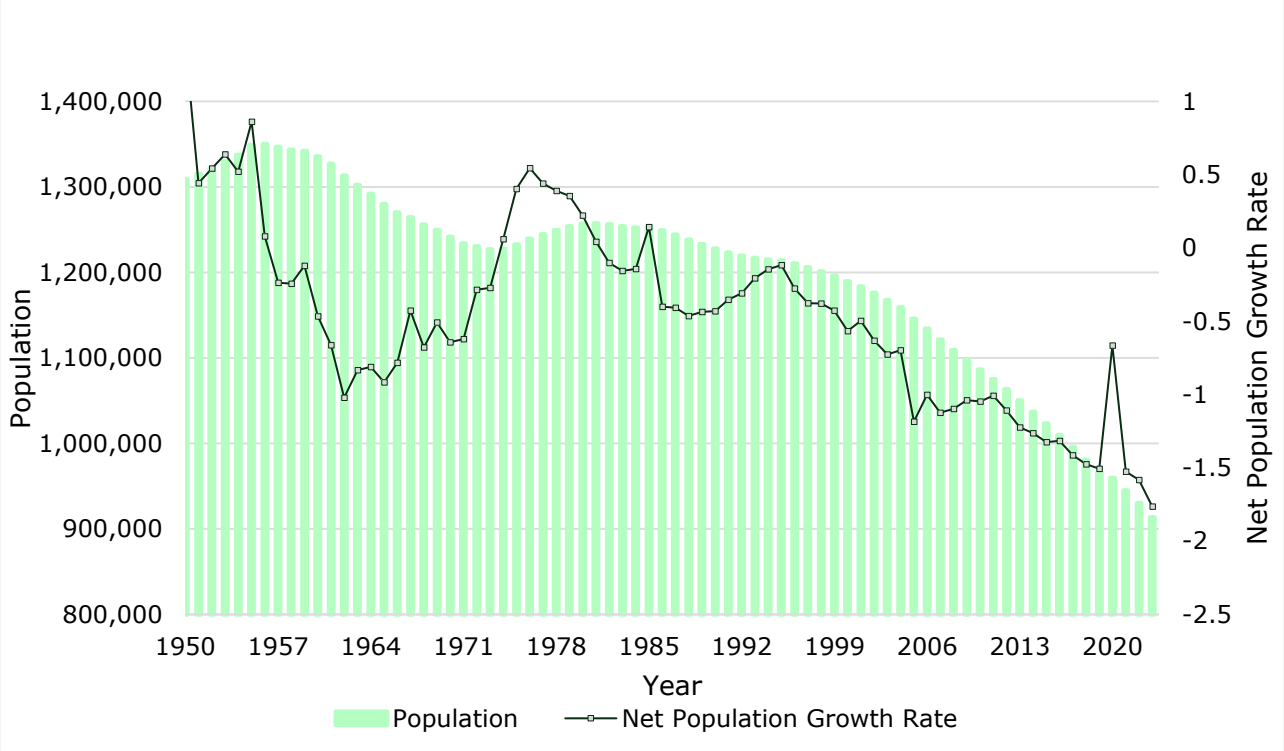
2.2 DEMOGRAPHY OF AKITA PREFECTURE

Akita Prefecture has a relatively small population compared to other prefectures in Japan (39th out of 47 prefectures)[13], with an estimated population of around 895,086 residents as of November 1st, 2024, (Figure 4).

Since the first national census conducted after World War II, Akita's population peaked at a record high of 1,349,936 in 1956[14]. Following this peak, the population has experienced fluctuations and has been in continuous decline for 43 years, from 1982 to 2024[15], as seen in Figure 4. In 2023, the population decline rate reached 1.76%, marking the highest rate recorded for three consecutive years since 2021 and the highest decline rate among all prefectures in Japan for eleven consecutive years[15].

According to statistics from 2023, the birth rate—defined as the number of children born per 1,000 individuals—was 4.0, representing the lowest level in Japan for the 29th consecutive year. In contrast, the mortality rate, which indicates the number of deaths per 1,000 individuals, reached 19.3, the highest level recorded in Japan for 12 consecutive years. These figures underscore the accelerating decline of the population[16].

FIGURE 4 POPULATION CHANGE IN AKITA (1950-2023)



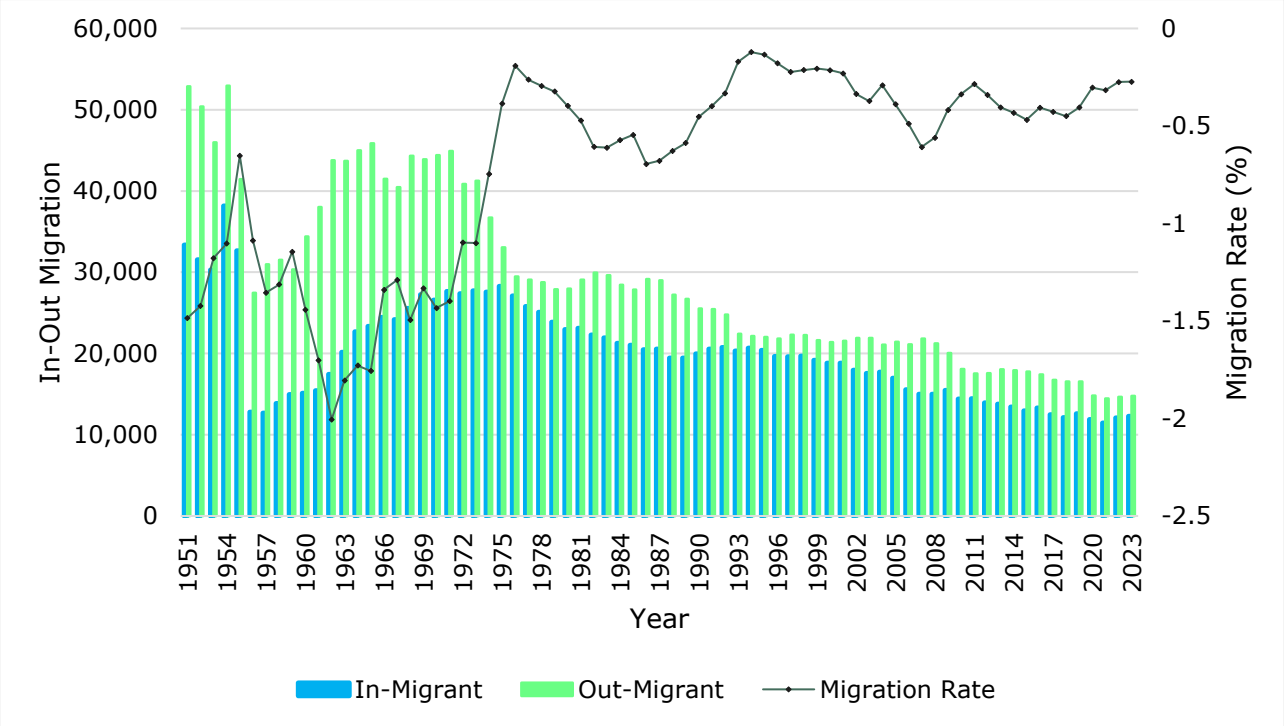
Source: Akita Prefectural Government (2024)[14]

Since before World War II, rural areas have primarily functioned as a source of labour for metropolitan areas such as Tokyo, resulting in a persistent state of "net out-migration" in Akita, where the number of individuals leaving these areas consistently exceeds those moving

[13] Statistics Bureau of Japan. (2024). https://www.stat.go.jp/data/jinsui/2023np/index.html
[14] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/uploads/public/archive_(2024.11.1).pdf
[15] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/uploads/public/archive_0000044493_00/2023(R5).pdf
[16] NHK. (2024). https://www3.nhk.or.jp/lnews/akita/20240606/6010021246.html

in (Figure 5). Since the 1980s, social factors and major natural disasters have caused fluctuations in this out-migration trend, and the population losses due to out-migration have remained in the low thousands in recent years. However, in 2023, both in-migration and out-migration numbers increased compared to the previous year, with the growth in in-migrants surpassing that of out-migrants. As a result, the net social population change rate has decreased for the second consecutive year.[17] The background behind the reduction in the rate of social population decline includes the establishment of the Akita Population Vision in 2015. This vision focuses on reforming Akita Prefecture's industrial structure by fostering and strengthening the local manufacturing industry as a key issue. Additionally, the increase in the number of in-migrants may reflect efforts to enhance support programs for families with children and young people, aimed at curbing out-migration and promoting migration to the prefecture.[18]

FIGURE 5 SOCIAL POPULATION CHANGE IN AKITA (1951-2023)



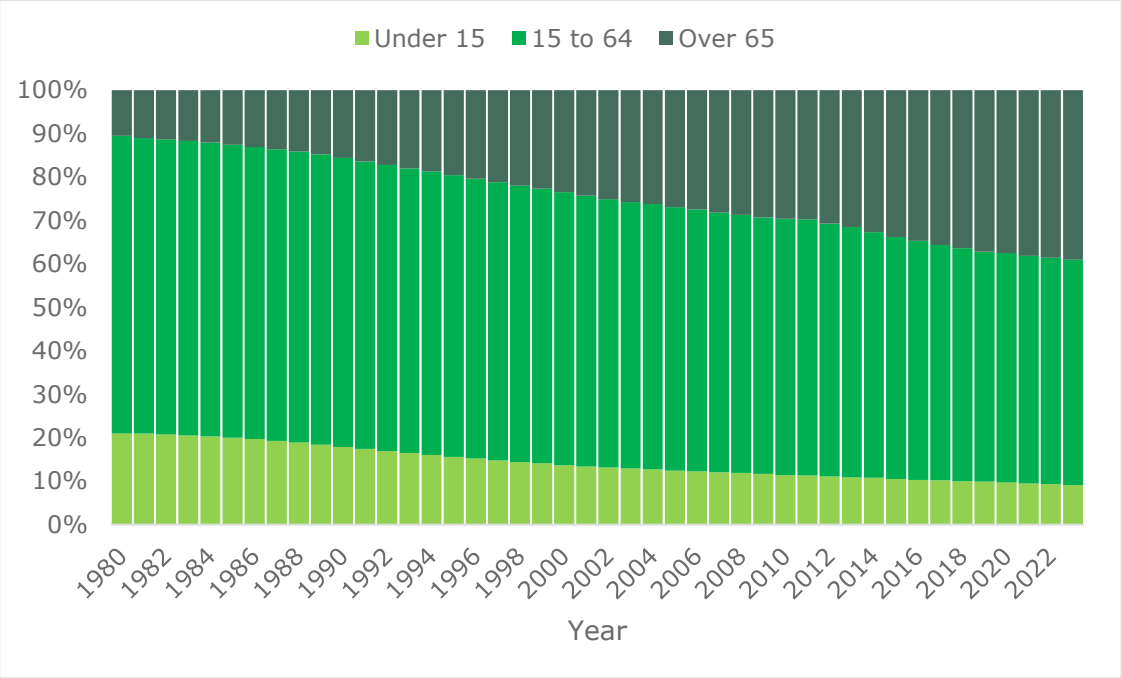
Source: Akita Prefectural Government (2024)[19]

As of 2023, the average age in Akita Prefecture stands at 53.5 years, ranking first in the nation, while the national average is 48.2 years[20]. Additionally, when examining the population by age group (Figure 6), those under 15 years old account for 9.1% of the total population, and this figure has decreased for 42 consecutive years since 1982, marking the lowest in the nation. While the national ageing rate, defined as the percentage of the population aged 65 and older in the total population, averages 28.1%, Akita Prefecture records a significantly higher rate at 39%, leading the country[17]. Roughly speaking, this means that 2 in 5 people in

[17] Akita prefectural government. (2024). https://www.pref.akita.lg.jp/uploads/public/archive_0000044493_00/2023(R5).pdf
[18] Akita Prefectural Government. (2022). https://www.pref.akita.lg.jp/pages/archive/63573
[19] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/uploads/public/archive_(2024.11.1).pdf
[20] National Institute of Population and Social Security Research. (2023). https://www.ipss.go.jp/syoushika/tohkei/Popular/P_Detail2024.asp?fname=T12-08.htm

Akita Prefecture is elderly. Japan has the highest ageing rate among 200 countries and regions worldwide[21], and Akita has the highest rate within Japan. Japan's ageing rate is anticipated to reach 38.4% by 2070[22], suggesting that Akita is experiencing a demographic shift that may foreshadow the ageing trends of Japan in the coming four decades.

FIGURE 6 POPULATION TRENDS BY AGE GROUP IN AKITA (1980-2023)



Source: Akita Prefectural Government (2024)[23]

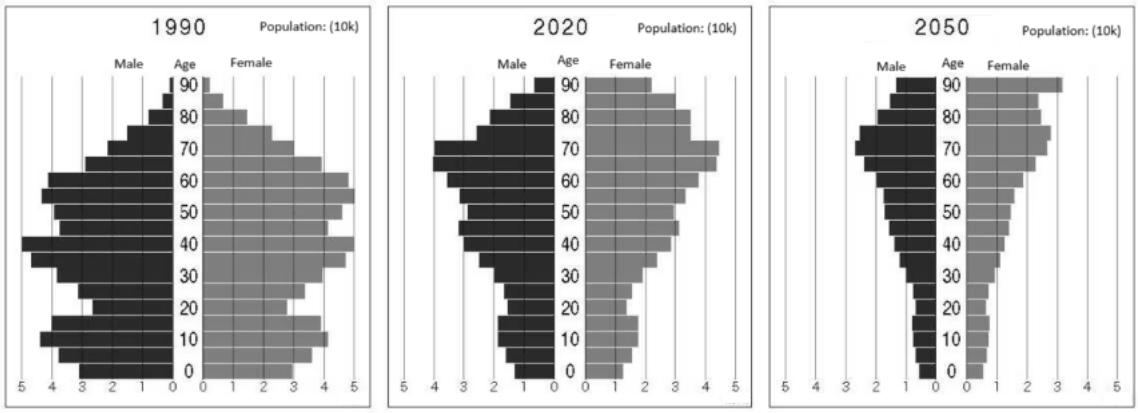
Finally, examining the changes in Akita Prefecture's population pyramid (Figure 7) clearly highlights the serious challenges of population decline, particularly in the younger age groups, as well as the reduction in the workforce from 1990 to 2020, with projections extending to 2050.

In 1990, the pyramid had a broad base, indicating a solid foundation of young people, which reflected the relatively higher birth rate at that time. However, by 2020, the shape of the pyramid changed significantly, becoming more inverted with larger numbers in the cohort of 70 years and older from the "baby boomer" generation. The younger age segments became markedly narrower, demonstrating an overall demographical instability.

The 2050 pyramid presents a truly alarming future situation. By this year, the overall shape of the pyramid narrows further, taking on a nearly linear decrease from the 70s down to the younger age groups. This shape highlights a significant decrease in the younger population, leading to an extreme reduction in the workforce. Consequently, it is evident that there will be serious implications for the regional economy.

[21] The Asahi Shimbun. (2024).https://www.asahi.com/articles/DA3S16034824.html
[22] National Institute of Population and Social Security Research. (2023). https://www.ipss.go.jp/pp-zenkoku/e/zenkoku_e2023/pp2023e_Summary.pdf
[23] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/uploads/public/archive_0000044493_00/2023(R5).pdf

FIGURE 7 POPULATION PYRAMIDS OF AKITA PREFECTURE (1990-2020-2050)



Source: Toyokeizai Online (2024)[24]

2.3 ECONOMY AND INDUSTRY OF AKITA PREFECTURE

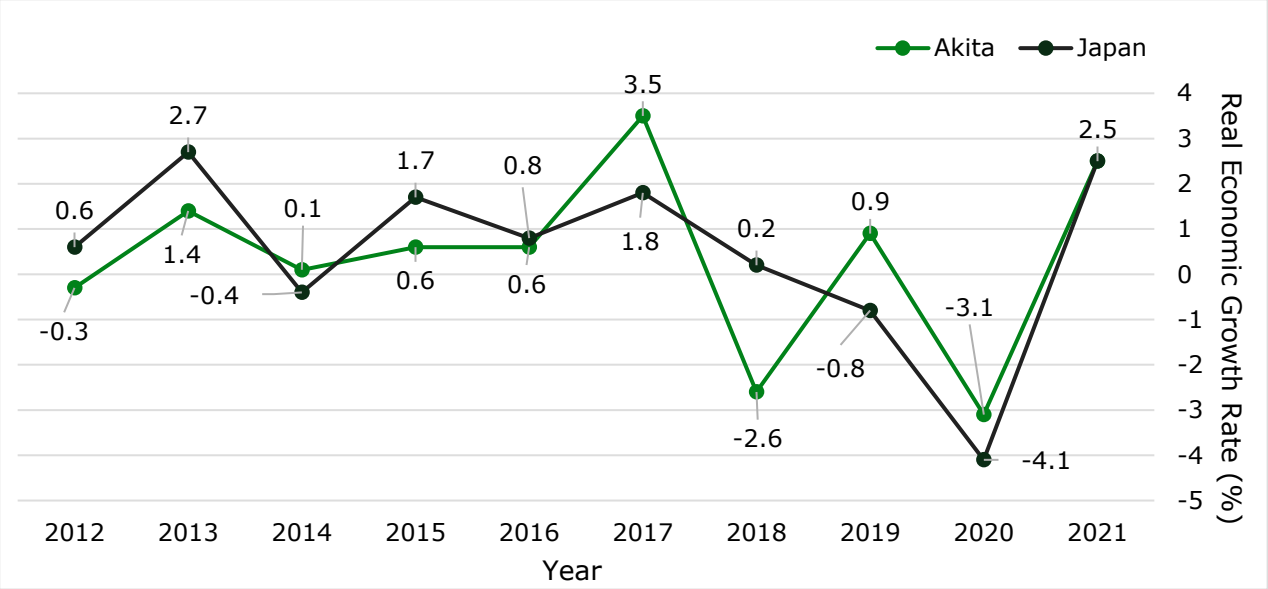
2.3.1 INDUSTRY OF AKITA

Akita is known for its nature, rich resources including water, forests, and vast farmland, vibrant culture, and local foods enjoyed for generations. However, Akita's economy faces serious challenges, including an ageing population (as outlined in Section 2.2 above), severe economic conditions, and a shortage of healthcare services. These problems are not easy to fix in a short period.

In 2021, Akita's gross prefectural product (GPP) was 3,545,316 million JPY[25]. The real economic growth rate for Akita Prefecture in 2021 was 2.5%, which was the same as the national economic growth rate. It can be inferred that the results for both the national economy and Akita Prefecture were due to a recovery from the losses caused by COVID-19 in 2020. When comparing the trends of GDP (gross domestic product) and GPP, it can be said that the trends are consistent and that, like the nation, they are strongly influenced by economic fluctuations (Figure 9).

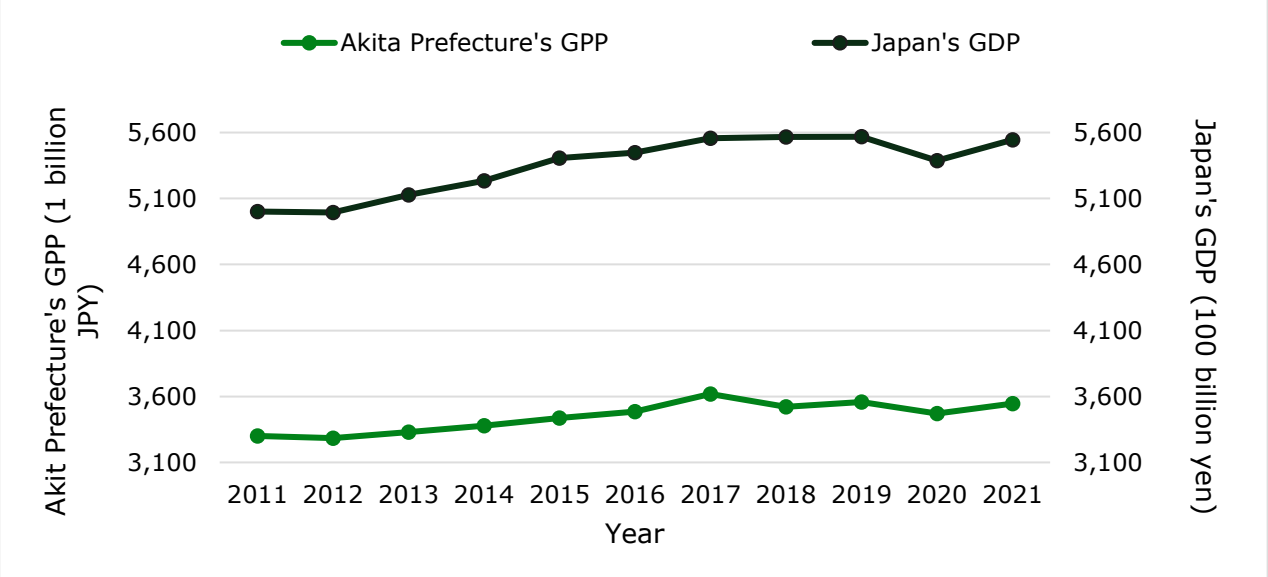
[24] Toyokeizai Online. (2024). https://toyokeizai.net/articles/photo/845581?pn=3
[25] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/43842

FIGURE 8 COMPARISON OF REAL ECONOMIC GROWTH RATES: AKITA PREFECTURE VS. NATIONWIDE



Source: Akita Prefectural Government (2024)[26]

FIGURE 9 TRENDS IN JAPAN'S GDP AND AKITA PREFECTURE'S GPP (2011-2021)



Source: Akita Prefectural Government[27]

The breakdown of Akita's industrial structure shows that the tertiary sector constitutes 71.8% of the economy, with the secondary sector accounting for 25.8% and the primary sector representing 2.5%[26]. Agriculture and forestry in this primary sector have historically been foundational industries in the region. Although the proportion of the primary sector has significantly declined in recent years, it remains relatively high compared to the national average of 1.0%[28].

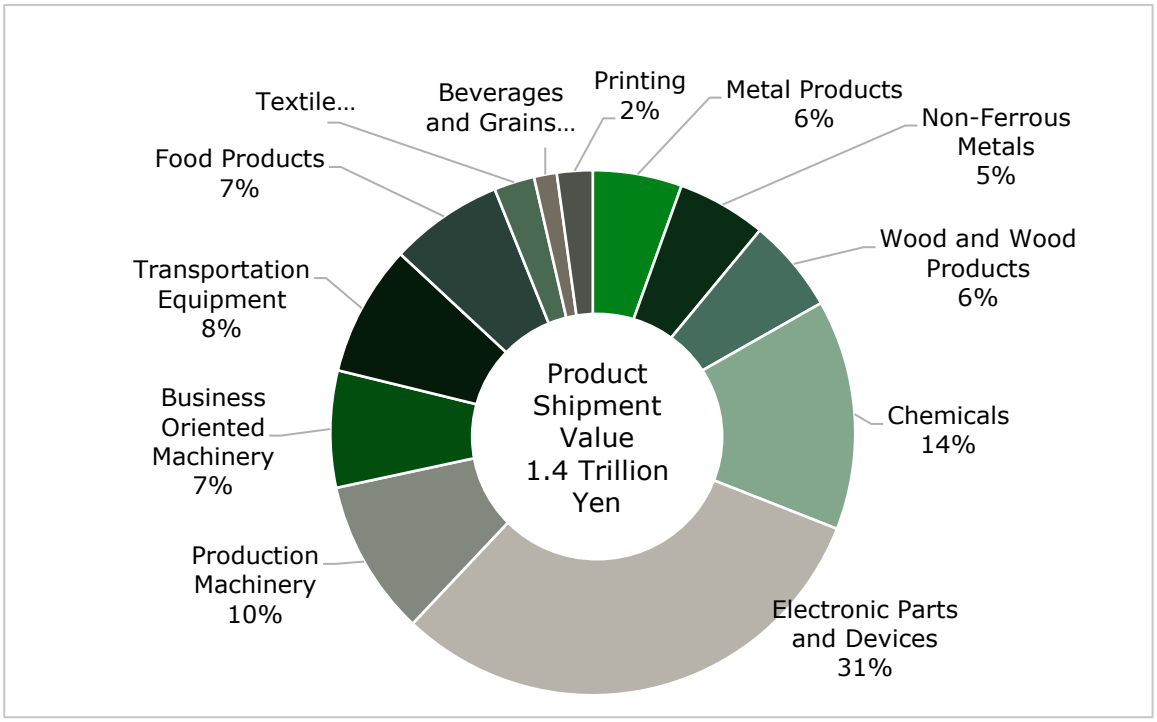
[26] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/43842
[27] Akita Prefectural Government. (2024). https://view.officeapps.live.com/op/view.aspx?src=https
[28] Ministry of Agriculture, Forestry and Fisheries. (2023). https://www.maff.go.jp/j/tokei/sihyo/data/01.html

The agricultural, forestry, and fishery sectors surpass national benchmarks in terms of added value, employment statistics, and various specialization coefficients. Furthermore, the trade balance of exports and imports is in surplus, highlighting the importance of these sectors in generating foreign currency for the prefecture. Agriculture's contributions to the prefectural gross product and employment rank 6th and 5th nationwide, respectively.

The fishery sector in Akita also encounters several challenges, including low catch volumes despite the harvesting of approximately 150 seafood species. The production does not meet market demand, leading to a limited proportion of locally sourced fish available in the prefecture. Additionally, the sector is grappling with a dwindling number of fishers and an ageing workforce. Fisheries are categorised into marine and inland (rivers and lakes) sectors, which are further divided into fishing and aquaculture. Over the past five years, trends indicate that marine fisheries account for approximately 95% of the total production volume, which is about 10,000 tons in the prefecture, while inland fisheries and aquaculture contribute only a minimal share.

In terms of manufactured goods shipped from the prefecture, the electronics components and devices industry plays a significant role. Many manufacturing companies in Akita operate on subcontracting and processing assembly models, making them vulnerable to economic fluctuations and heavily reliant on the performance of their ordering firms. This structural dependence has contributed to a trade deficit in the region. Furthermore, value-added productivity in the manufacturing sector, defined as value added per employee, ranked 44th out of 47 prefectures in 2011. This low ranking is largely attributed to the prevalence of labour-intensive subcontractors and small firms that lack proprietary technologies and products.[29]

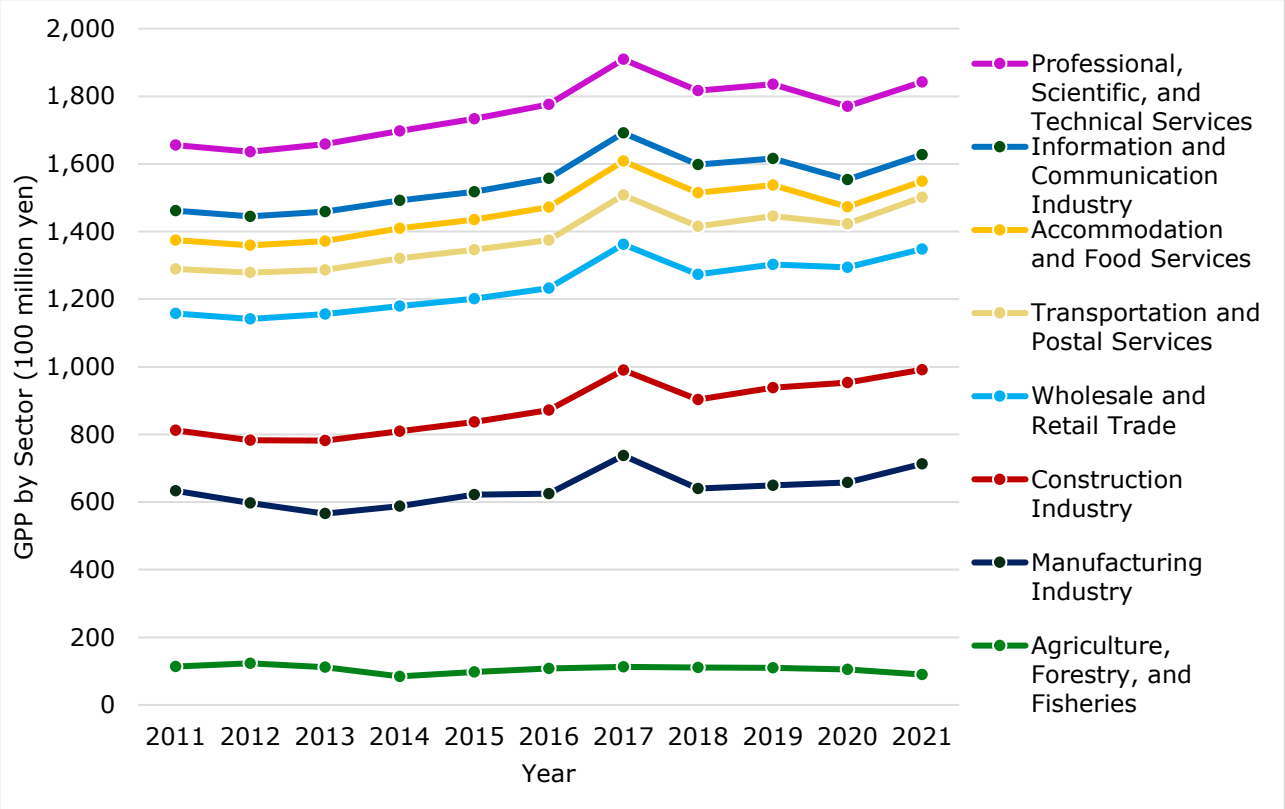
FIGURE 10 PERCENTAGE OF PRODUCT SHIPMENTS IN AKITA (2022)



Source: Akita Prefectural Government (2024)[30]

[29] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/43842
[30] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/43842

FIGURE 11 TRENDS IN AKITA PREFECTURE'S GROSS PREFECTURAL PRODUCT BY SECTOR (2011-2021)



Source: Akita Prefectural Government (2024)[31]

2.3.2 JOB MARKET IN AKITA PREFECTURE

2.3.2.1 TREND OF JOB OPENINGS IN AKITA PREFECTURE

In 2023, a total of 90,887 jobs were newly opened. Approximately half of these were full-time positions (46,583), while the other half were part-time (44,304). This number has been decreasing since 2021 and 2022, which saw 105,985 and 101,776 new jobs, respectively.

Regarding sectoral differences, the medical welfare sector had the highest number of new job openings, with 18,614 jobs, accounting for approximately 19.4% of the total. Commerce followed with 12,764 jobs (13.3%), closely trailed by construction (12,233), services (12,056), and manufacturing (10,214).

The trend of decreasing job openings was also observed across sectors. In the medical welfare sector, job openings decreased from 20,970 in 2021, 19,192 in 2022 to 18,614 in 2023. Similarly, commerce saw a drop of 3,500 jobs between 2021 and 2023, and construction experienced a steady decline from 14,484 in 2021, 13,590 in 2022, to 12,764 in 2023.

In summary, while there are still many new job openings, the numbers vary by sector, with relatively high figures in medical welfare, commerce, construction, services, and manufacturing.

2.3.2.2 JOBS AND YOUNG GENERATION

The number of job seekers in Akita Prefecture has been decreasing due to the overall ageing population and lack of attractive opportunities. As of the end of October 2024, there are 1,222

[31] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/43842

high school students in Akita Prefecture seeking employment within the region. The job opening-to-applicant ratio is notably high at 3.97, indicating a substantial number of job openings relative to the number of job seekers. Additionally, the percentage of students wishing to work locally stands at 76.8%, which is the third-highest figure on record for Akita. However, the total number of high school students pursuing jobs in the prefecture has been steadily declining, having fallen from over 4,500 in 1989 to less than 30% of that figure in 2024.[32]

The statistics about high school graduates from Akita in 2014 showed that fewer than 50% stayed in the prefecture after graduation, while over 50% moved away. Among those who went on to higher education, about 30% attended schools in Akita, while around 70% chose to study at universities outside the prefecture. Of those who attended universities outside of Akita, only about 30% returned to Akita after graduation, suggesting that the remaining 70% likely found jobs outside the prefecture and did not return[33].

Approximately 70% of those leaving the prefecture cite employment or career changes as their reason for departing. The age group most likely to relocate is 20 to 24 years old, with many graduates moving outside the prefecture to secure jobs after completing their education. If Akita Prefecture were to offer more attractive workplaces or positions with competitive salaries, it is more likely that these individuals would choose to remain in the region.[34]

2.4 ENERGY POLICY OF AKITA PREFECTURE

2.4.1 NATIONAL ENERGY POLICY

In February 2025, the 7th Strategic Energy Plan[35] was approved by the Cabinet to achieve carbon neutrality by 2050. Like in the 6th Plan, the 7th Plan encourages maximum integration of renewable energy and a balanced energy mix. The 6th Plan set the target for the energy mix to be 36% to 38% for renewable energy by 2030, while the 7th Plan has raised the target for the energy mix to be 40% to 50% by 2040. Thermal power generation and nuclear power generation are positioned to support the stable supply of electricity, with renewable energy being designated as the primary energy source. The government is looking to raise the energy self-sufficiency rate to 30 - 40% by 2030 but as of FY 2023, Japan's energy self-sufficiency rate is only 15.2%. Approximately 68% of Japan's electricity is generated from thermal power using fossil fuels imported from abroad[36].

Looking at the composition of renewable energy, the share of wind power is projected to increase from 5% in 2030 to up to 8% in 2040. The target for solar power rose from 14% to 15% in 2030 to around 23% to 29% by 2040. Comparing the projected capacity of solar power, which is estimated at 120 GW for 2030, the 7th Plan indicates that solar power will be doubled over the next ten years, and a significant portion of the increase in renewable energy will come from solar power. However, efforts are being made to expand offshore wind power generation, which is expected to be a key pillar for establishing renewable energy as the primary energy source.

[32] PACOLA. (2024). https://www.pacola.co.jp/
[33] Akita Prefectural Government. (2022). https://www.pref.akita.lg.jp/uploads/public/archive.pdf
[34] Akita Prefectural Government. (2023). https://www.pref.akita.lg.jp/uploads/public/archive_2023(R5)idouriyuuhoukokusyo.pdf
[35] METI. (2025). https://www.meti.go.jp/press/2024/02/20250218001/20250218001-1.pdf
[36] METI. (2025). https://www.meti.go.jp/press/2024/11/20241122001/20241122001.html

Further, specific offshore wind targets have been outlined in the 2020 Offshore Wind Power Industry Vision, with 10 GW of offshore wind projects to be auctioned by 2030 (of which 5.7 GW is to be operational), and 30 to 45 GW by 2040. As of February 2025, the operational capacity of offshore wind power is approximately 250 MW[37], indicating a need for further expansion of offshore wind energy[38]. Thus far, ten offshore wind projects totaling 4.6 GW in capacity have been awarded in the first three rounds of auctions under the Renewable Energy Sea Area Utilisation Act, all of which have announced plans to come online by the end of FY 2030.

2.4.2 AKITA PREFECTURE NEXT-GENERATION ENERGY INDUSTRY STRATEGY

2.4.2.1 DEPLOYMENT OF RENEWABLE ENERGY

Akita Prefecture has a strong history in renewable energy and first developed the "Akita Prefecture Next-Generation Energy Industry Strategy" in 2011, aiming to create a large-scale renewable energy supply base and establish a hub for related industries. Subsequently, the "2nd Akita Prefecture Next-Generation Energy Industry Strategy" was published in 2016 and further revised in 2022 to reflect the national 2030 energy mix and the 2050 carbon neutrality targets. The prefecture's strong wind resources make it one of the top areas in Japan for wind power installations and give it an advantageous position in offshore wind energy. Akita Prefecture aims to address the challenges of population decline and economic stagnation by promoting offshore wind power generation and encouraging local companies to participate in related industries.

As outlined in Table 2, in the original 2016 strategy document, a FY2025 renewable energy target of 1.62 GW was set, with an interim FY2020 target of 1.41 GW. However, by the end of fiscal year 2020, the actual results exceeded the interim target, with the total installed capacity reaching 1.50 GW. Therefore, an updated target of 1.76 GW was established for FY2025 in the revised strategy, and efforts are being made to ensure that the existing power plant construction plans are steadily realised.

[37] JWPA. https://jwpa.jp/information/11062/
[38] METI. (2024). https://www.meti.go.jp/shingikai/santeii/pdf/092_01_00.pdf

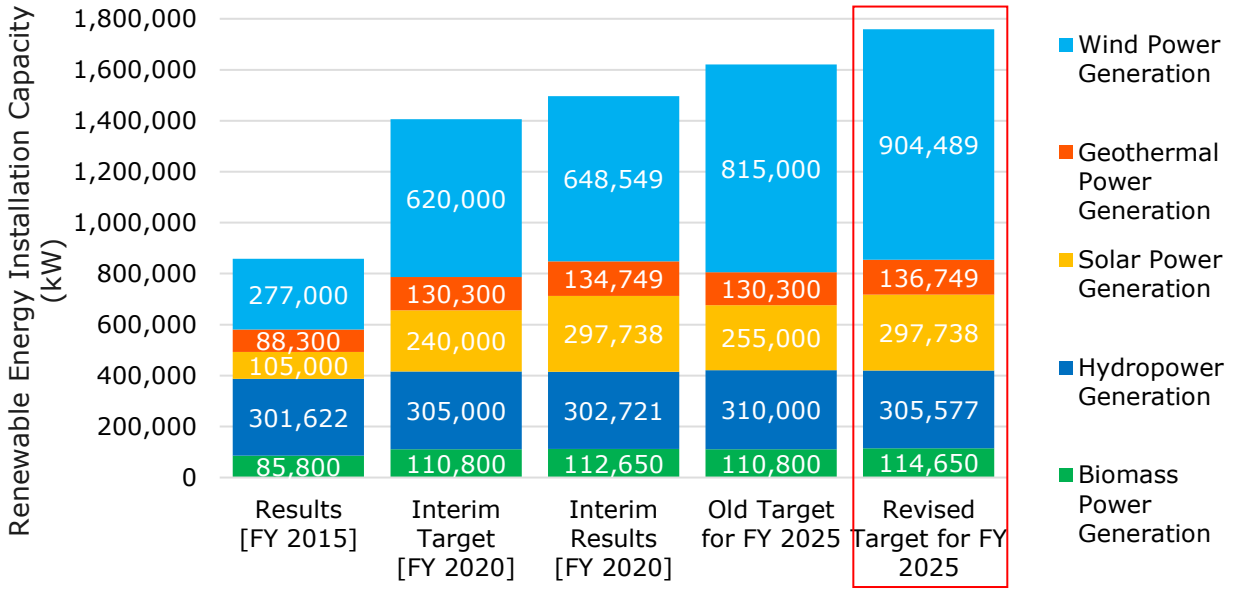
TABLE 2 AKITA PREFECTURE RENEWABLE ENERGY GENERATION INSTALLATION TARGETS AND INSTALLED CAPACITY (VALUES PROVIDED IN KW)

Power Source Type	Results [FY 2015]	Interim Target [FY 2020]	Interim Results [FY 2020]	Old Target for FY 2025	Revised Target for FY 2025
Wind Power Generation	277,000	620,000	648,549	815,000	904,489
Geothermal Power Generation	88,300	130,300	134,749	130,300	136,749
Solar Power Generation	105,000	240,000	297,738	255,000	297,738
Hydropower Generation	301,622	305,000	302,721	310,000	305,577
Biomass Power Generation	85,800	110,800	112,650	110,800	114,650
Total	857,722	1,406,100	1,496,407	1,621,100	1,759,203

Source: Akita Prefectural Government (2022)[39]

[39] Akita Prefectural Government. (2022). https://www.pref.akita.lg.jp/uploads/public/archive_0000010638_00/senryakukaiteirev2.pdf

FIGURE 12 AKITA PREFECTURE RENEWABLE ENERGY GENERATION INSTALLATION TARGETS AND INSTALLED CAPACITY (KW)



Source: Akita Prefectural Government (2022)[40]

2.4.2.2 PRIORITY PROJECTS

The revised strategy document outlines five priority projects to be pursued through to FY2025, as outlined in Table 3 below. Of these projects, Project I – "Continued introduction and expansion of offshore wind power and promotion of initiatives to form one of the largest domestic industrial hubs" and Project III – "Promoting greater participation of local businesses in the construction, component manufacturing, operation and maintenance of renewable energy power generation facilities" have been highlighted as being of particular strategic importance.

TABLE 3 PRIORITY PROJECTS OUTLINED IN THE 2022 "2ND AKITA PREFECTURE NEXT-GENERATION ENERGY INDUSTRY STRATEGY"

Key Project I (Most Important Project) **Continued introduction and expansion of offshore wind power and promotion of initiatives to form one of the largest domestic industrial hubs.**	
Action 1	Promote commercialization of offshore wind projects within water depths less than 30 metres.
Action 2	Examine the feasibility of introducing floating structures in waters deeper than 30 metres.
Action 3	Strengthen initiatives of the "Akita Offshore Wind Power Generation Related Business Forum."
Action 4	Attract investment and establish facilities for related companies outside the prefecture (first-tier suppliers, etc.).
Action 5	Promote innovation in offshore wind power-related technologies and facilitate technology development.

[40] Akita Prefectural Government. (2022). https://www.pref.akita.lg.jp/uploads/public/archive_0000010638_00/senryakukaiteirev2.pdf

Action 6	Offshore wind power human resource development project
Key Project II **Continued introduction and expansion of geothermal power generation.**	
Action 1	Establish good practices of geothermal power generation.
Action 2	Promote diverse uses of geothermal energy.
Key Project III (Most Important Project) **Encouragement of increased participation by local companies in the construction, parts manufacturing, operation, and maintenance of renewable energy generation sites.**	
Action 1	Strengthen the information provision system for local companies.
Action 2	Enhance the competitiveness of local companies (technology improvement, product enhancement, technology development).
Action 3	Initiatives to expand orders and investments from local companies.
Key Project IV **Developing a system for utilising renewable energy through local production and consumption.**	
Action 1	Promote matching between local needs and FIT power sources.
Action 2	Effective utilisation of existing non-FIT power sources.
Action 3	Development of an industrial complex that employs 100% Akita-produced renewable energy.
Key Project V **Promotion of initiatives for hydrogen production, carbon recycling, and fuel ammonia utilising renewable energy.**	
Action 1	Collaboration with the "Akita Hydrogen Consortium."
Action 2	Hydrogen production utilising surplus renewable energy.
Action 3	Actions taken in response to the trends in new hydrogen demand.

Source: Akita Prefectural Government (2022)[41]

Project I includes key measures such as ensuring the successful realisation of offshore wind projects within water depths less than 30 metres, as well as considerations for the deployment of offshore wind beyond the 30-metre line (including both fixed-bottom and floating). The prefectural government also indicated their intention to strengthen the activities of the "Akita Offshore Wind Power Generation Related Business Forum", made up of local businesses and chambers of commerce. The strategy document also outlines plans to attract offshore wind suppliers from outside the prefecture to establish bases in Akita, using the existing Akita and Noshiro base ports to form industrial clusters. Finally, the prefectural government will help to promote technological innovation and R&D for offshore wind companies and support the training of personnel for offshore wind related jobs.

Under Project III, the prefectural government aims to strengthen their initiatives for sharing information with local companies related to offshore wind and other next-generation energy

[41] Akita Prefectural Government. (2022). https://www.pref.akita.lg.jp/uploads/public/archive_0000010638_00/senryakukaiteirev2.pdf

sources. Further, the project aims to increase competitiveness of local companies both in terms of quality and cost, and to maximise the contracting opportunities for businesses in Akita through matching events with Tier 1 contractors.

As part of the remaining projects, Project II aims to expand opportunities for geothermal power generation in Akita. Finally, projects IV and V are related to maximise the utilisation of the generated renewable energy within Akita Prefecture.

Based on the objectives and action plans outlined in the revised strategy paper, the Akita prefectural government has been working to maximise the positive impact of the offshore wind projects under development in the prefecture. The prefectural government has thus far held several large-scale seminars to share information on offshore wind projects through the "Akita Offshore Wind Power Generation Related Industry Forum". Further, business matching events by category have been held, with project developers, turbine manufacturers, component manufacturers, and EPC contractors (for onshore and offshore construction) respectively. Support is also offered for individual companies negotiating with suppliers. This includes specialised "Offshore Wind Power Support Advisors" who have been appointed to assist local companies in the contracting process with international firms.

Akita Prefecture has also established a subsidy system to help cover costs for obtaining necessary qualifications, maintaining facilities, and acquiring certifications, as summarised in Table 4. This subsidy can be combined with municipal grants.

TABLE 4 OFFSHORE WIND RELATED SUBSIDIES PROVIDED BY AKITA PREFECTURAL GOVERNMENT

Category	Expense subject to subsidy	Subisidised percentage	Maximum subsidy
Human resource development	Expense for acquiring specialist knowledge or qualifications required for construction and maintenance of wind turbines	50%	500,000 JPY /person
Component manufacturing	Expense for certification of component manufacturing and research and development of related equipment such as for wind power O&M.	50%	2,500,000 JPY / person
Recruiting	Expense for recruiting and hiring activities, developing systems for entry into related industries.	50%	250,000 JPY / person

Source: Akita Prefectural Government (2024)[42]

In terms of the "local production and local utilisation" of offshore wind and other renewably generated electricity, the prefectural government is currently developing plans for a "renewable energy industrial park". Under the proposal, the industrial park will utilise 100% renewable energy generated in Akita prefecture, with electricity delivered physically from nearby assets where possible. The industrial park will aim to attract businesses in the transport equipment industry (automobiles and aircraft), the electronic components industry, the medical equipment industry, and the information industry and data centres, which are all key industries in Akita Prefecture. The candidate site has an area of 250,000 m^2 for related industries and aims for renewable energy supply to begin by 2028[43].

[42] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/72639
[43] Akita Prefectural Government. (2023). https://www.pref.akita.lg.jp/uploads/public/archive_0000072458_00.pdf

2.4.2.3 OFFSHORE WIND HUMAN RESOURCE PLAN

Additionally, Akita Prefecture has established the "Akita Prefecture Offshore Wind Power Human Resource Development Promotion Plan,"[44] which aims to cultivate talent for the offshore wind power industry and support the development of local companies. When dividing the wind power generation business into phases (Development - O&M), particularly in the O&M phase, a long-term demand for personnel is anticipated over a period of 20 years post-operation. O&M operations, which underpin the stable functioning of offshore wind power and generate the highest added value for power generation businesses, are particularly well-suited for local employment. However, since it takes time to train personnel with the necessary skills, Akita Prefecture plans to focus on the development of O&M personnel at this stage. By cultivating advanced human resources for O&M within the prefecture, it is expected that opportunities for growth will arise in related industries both within and outside the prefecture, as well as internationally. In light of this, Akita Prefecture has established two main policies for immediate initiatives regarding human resource development: one focused on students and the other on working adults.

For student development, given the current lack of recognition of the wind power industry, introductory education programs have been implemented at educational institutions to increase the number of students wishing to pursue careers in the offshore wind sector. Simultaneously, support will be provided for job-hunting activities, including internships and job fairs related to the offshore wind field, which will align with the curriculum. Additionally, as mentioned in 3.2.5 Training, universities and marine high schools in Akita Prefecture are currently conducting curricula and workshops related to wind power generation. In anticipation of a significant increase in demand for personnel in the O&M phase around 2028, these educational institutions are rapidly developing supportive systems.

For human resource development aimed at working adults, the focus is on promoting inter-company collaboration and ensuring talent acquisition through job matching. The prefecture has established the "Offshore Wind Power Maintenance Study Group" to encourage local companies to enter the offshore maintenance sector. Moving forward, these initiatives will be strengthened to promote the participation of local companies that will serve as a receiving ground for talent generated by educational institutions, while also aiming to develop a skilled training environment that leverages the prefecture's strengths as a leader in offshore wind power. Regarding the establishment of training facilities necessary for skill acquisition and maintenance, there are limitations to initiatives undertaken solely by individual companies. Therefore, collaboration between companies and educational institutions will be facilitated as needed, alongside the subsidies mentioned above. Additionally, the goal is to build a training facility that will serve as a hub for offshore wind power personnel development, attracting visitors from outside the prefecture for training purposes.

In terms of job matching, support is provided for career transitions from similar occupations that align with offshore wind power. Furthermore, active assistance is offered to those who have secured employment outside the prefecture but wish to return to work in Akita.

In addition to developing O&M personnel, efforts will also be directed towards addressing the need for human resources in project management, finance, and other areas of business

[44] Akita Prefectural Government. (2023). https://www.pref.akita.lg.jp/pages/archive/72639

development, as well as training GWO instructors and providing support for obtaining maritime operation licenses.

2.4.3 MUNICIPALITIES IN AKITA PREFECTURE

In addition to the measures outlined by the prefectural government, there are many initiatives from municipalities currently underway to support the extension of the benefits of offshore wind.

Akita City is working to establish itself as a hub for the next-generation energy industry, focusing on creating a supply chain around Akita Port. The city is focused on building the offshore wind power supply chain by sharing information with local companies and facilitating communication with electricity providers. The city arranges business matching for construction projects and plans to expand into related services like accommodation and dining.

To support workforce development, Akita City offers a subsidy that covers up to half of the costs (maximum 500,000 JPY/person) for obtaining Global Wind Organisation (GWO) certification that can be combined with support from the prefectural government, as outlined in Table 4. The city also promotes wind power awareness among students through educational programs and facility tours.

Additionally, Akita City is also promoting the development of renewable energy industrial parks to attract more businesses. This includes producing hydrogen and ammonia from clean energy, attracting data centres, revitalizing the battery industry, and developing offshore wind power in local waters.

Noshiro City, where Japan's first "large-scale offshore wind commercial operation" has commenced, aims to serve as a hub for offshore wind power projects. The city has developed its own Next-Generation Energy Vision[45] and is actively promoting offshore wind power initiatives. Significant progress is being made in establishing a base for O&M, material supply, and assembly related to wind power generation by fostering local talent and promoting the clustering of related industries.

To support this growth, Noshiro City is enhancing its infrastructure, such as ports and roads, which are necessary for the storage and transportation of increasingly larger wind turbine components anticipated in the future. The city’s progressive approach to offshore wind power has attracted visits from other municipal governments, business organisations, and companies.

To capitalise on this momentum for greater regional economic revitalization, public-private collaboration is being emphasised, including the development of guides trained in dining, lodging, and energy tourism. Additionally, the city is also actively working towards establishing a renewable energy industrial park while exploring strategies to reduce energy costs through local production and consumption using wind power and other renewable resources.

To further support these initiatives, Noshiro City collaborates with power generation companies, including Mitsubishi Corporation, to hold informational sessions and organise visits for interested businesses. To assist in workforce development, the city also offers the "Noshiro City Wind Power Workforce Development Support Subsidy" to help cover training and travel costs. This comprehensive approach aims to create an environment conducive to attracting businesses to the city.

[45] Noshiro City. (2024). https://www.city.noshiro.lg.jp/sangyo/shogyo/jisedai-energy/15838

Other coastal municipalities anticipating future projects have also formulated Carbon Neutral Declarations and Decarbonization Action Plans. These showcasing their commitment to initiatives that focus on local production and consumption of energy by utilising nearby resources and establishing a circular economy through renewable energy. In Happo Town, a partnership has been formed with Yokohama City, located in the Tokyo metropolitan area, to support regional revitalization through the local production and consumption of renewable energy and intercity distribution[46]. Efforts are underway to promote the adoption of renewable energy through intercity distribution in the metropolitan area, with the goal of creating an ecosystem that reinvests a portion of the profits generated from this distribution as regional revitalization funds for Happo Town and the wind power developer. In Oga City, the region has received national recognition as a “Next-Generation Energy Park” which provides a platform for education on renewable energy[47]. Additionally, each municipality is establishing collaborative agreements with developers aimed at regional revitalization, working together to expand markets for local products, promote fishing industries, enhance tourism, and develop human resources.

At the national level, the "National Offshore Wind Power Municipality Liaison Council" has been established to help municipalities involved in offshore wind power. This council conducts research on new generation technologies and aims to build a sustainable society by facilitating information sharing. As of November 2024, the Mayor of Noshiro City has been appointed as the chairman, and the council includes 23 municipalities, including Akita City, Noshiro City, Oga City, Yurihonjō City, Katagami City, Happo Town, and Mitane Town from Akita Prefecture.

[46] Happo Town. (2020). https://www.town.happo.lg.jp/archive/contents-1337
[47] Oga City. (2022). https://www.city.oga.akita.jp/soshik/kikakuseisakuka/machizukuri

Section 3

Offshore Wind in Akita Prefecture

3 OFFSHORE WIND IN AKITA PREFECTURE

3.1 EXISTING OFFSHORE WIND PROJECTS

As outlined in Section 2.4 above, offshore wind is an integral part of Akita Prefecture's future energy strategy and there are currently 8 offshore wind projects at various stages of development off its coast. The details of these projects and their locations are given in Table 5 and Figure 13, respectively.

TABLE 5 LIST OF EXISTING AKITA OFFSHORE WIND PROJECTS

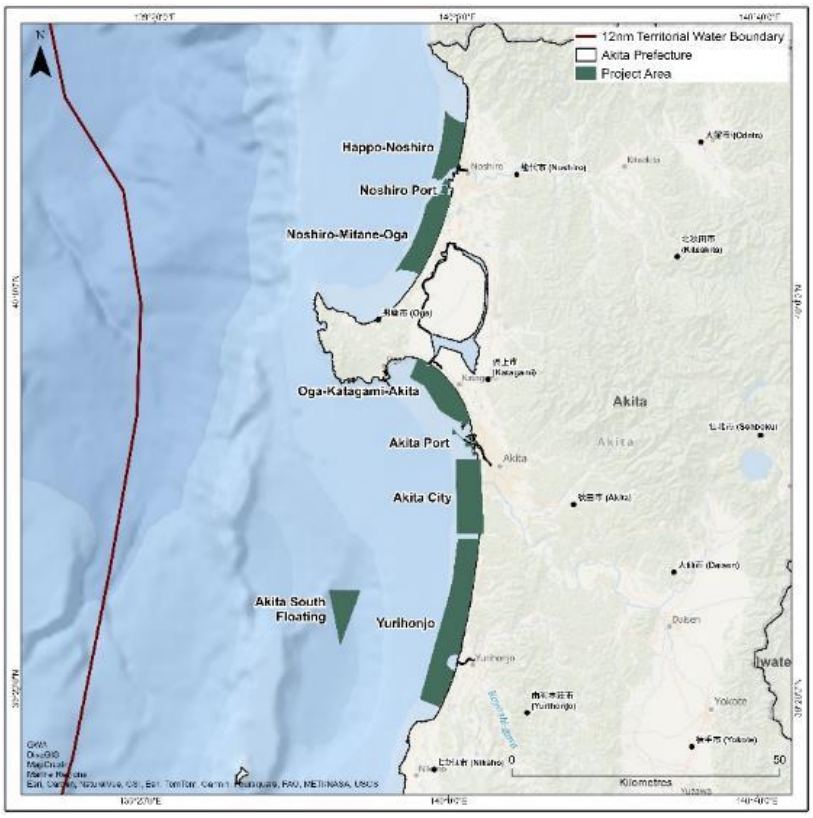
Project Name	Project Developer(s)	Project Capacity (Turbine Rating)	Foundation	Commercial Operation Date (COD) :Achieved / Expected
Akita Port	Akita Offshore Wind Corp.[48]	54.6 MW (4.2MW×13)	Fixed-bottom (Monopile)	January 2023
Noshiro Port	Akita Offshore Wind Corp.[48]	84 MW (4.2MW×20)	Fixed-bottom (Monopile)	December 2022
Noshiro City, Mitane Town, and Oga City Coast	Akita Noshiro Mitane Oga Offshore Wind LLC.[49]	494 MW (13MW×38)	Fixed-bottom (Monopile)	December 2028 (Planned)
Yurihonjo City Coast	Akita Yurihonjo Offshore Wind LLC.[50]	845 MW (13MW×65)	Fixed-bottom (Monopile)	December 2030 (Planned)
Oga City, Katagami City, and Akita City Coast	Oga Katagami Akita Offshore Green Energy LLC.[51]	315 MW (15MW×21)	Fixed-bottom (Monopile)	June 2028 (Planned)
Happo Town and Noshiro City Coast	Offshore Happo Noshiro Offshore Wind[52]	375 MW (15 MWx25)	Fixed-bottom (Monopile)	June 2029 (Planned)

[48] Marubeni Corporation, OBAYASHI CLEAN ENERGY CORPORATION, Tohoku Electric Power Co., Inc., Cosmo Eco Power Co., Ltd., Kansai Electric Power Co., Inc., Chubu Electric Power Co., Inc., The Akita Bank, Ltd., Ohmori Co., Ltd., Sawakigumi Corporation, Katokensetsu.Co.Ltd., Kanpu Co., Ltd., Kyowa Oil Co., Ltd., and Sankyo Co., Ltd.
[49] Mitsubishi Corporation Offshore Wind Ltd., C-TECH CORPORATION, and Mitsubishi Corporation
[50] Mitsubishi Corporation Offshore Wind Ltd., C-TECH CORPORATION, Venti Japan Inc., and Mitsubishi Corporation
[51] JERA Co., Inc., Electric Power Development Co., Ltd., Tohoku Electric Power Co., Inc., ITOCHU Corp.
[52] ENEOS Renewable Energy Corporation, Iberdrola Renewables Japan Co., Ltd., and Tohoku Electric Power Co., Inc.

Project Name	Project Developer(s)	Project Capacity (Turbine Rating)	Foundation	Commercial Operation Date (COD) :Achieved / Expected
Southern Akita Floating Offshore Wind Demonstration Project	Akita Floating Offshore Wind Corp.[53]	30+ MW (15+ MWx2)	Floating (Semi-sub)	2029 (Planned)
Akita City Coast	Pre-tender	400 MW (estimated)	Fixed-bottom (Monopile)	Unknown

[53] Akita Floating Offshore Wind Corporation (invested by Marubeni), Tohoku Electric Power Co., Inc., Japan Marine United Corporation, TOA CORPORATION, TOKYO SEIKO ROPE MFG. CO., LTD., Kanden Plant Corporation, JFE Engineering Corporation, and NAKANIHON AIR Co., Ltd.

FIGURE 13 MAP OF EXISTING OFFSHORE WIND PROJECTS IN AKITA PREFECTURE



3.1.1 PORT AREA PROJECTS

The projects at Akita Port and Noshiro Port marked the inauguration of commercial-scale offshore wind in Japan. Akita Offshore Wind Corporation (AOW), led by Marubeni Corporation, was selected by Akita prefecture in 2015 to develop the two port areas. AOW is composed of thirteen shareholders, seven of which are local companies based in Akita Prefecture.

The Noshiro Port project achieved commercial operation in December 2022, with Akita Port following closely behind in January 2023. The two facilities utilise 4.2 MW Vestas wind turbines and have a total generation capacity of approximately 140 MW. The offshore wind projects were constructed using various local and international suppliers. Monopiles were selected for this project and were supplied by Sif, while the wind turbine installation vessel (WTIV) Zaratan, owned by Seajacks (now Cadeler) was used for this project. Akita Port played a crucial role as a marshalling hub, facilitating the assembly and transport of turbine components and other equipment, and Noshiro Port is serving as the primary hub for O&M throughout the duration of the project.[54] Local companies in Akita Prefecture primarily participated in onshore construction, while others were involved in areas such as seabed surveys, the staging for the manufacturing of transition pieces and monopiles, transportation staging, and scour protection works.[55]

Due to the first-mover status of the two projects, stakeholders from across Japan have visited the windfarms to observe the windfarms.

[54] Akita Offshore Wind Corporation. https://aow.co.jp/en/project/
[55] Akita Prefectural Government. (2023). https://www.pref.akita.lg.jp/pages/archive/69234

3.1.2 ROUND 1 AND 2 AUCTION PROJECTS

Following the ratification of the Renewable Energy Sea Area Utilisation Act in 2019, four offshore wind sites in Akita Prefecture have been awarded to developers under its framework. Round 1 was the first public auction held in general sea areas outside of the port area, and consortia led by Mitsubishi Corporation secured bids for a total of three areas, including the Noshiro-Mitane-Oga area and the Yurihonjo area in Akita Prefecture in 2021. The projects plan to utilise GE's 13 MW turbines, with target CODs in 2028 for Noshiro-Mitane-Oga and 2030 for Yurihonjo respectively. Noshiro Port will serve as the marshalling port and O&M port for the Noshiro-Mitane-Oga site, while Akita Port will function as the marshalling port and Honjo Port as the O&M port for the Yurihonjō area[56].

However, Mitsubishi Corporation announced on February 3, 2025, that it would conduct a review of their projects awarded in the first round. The consortium won the projects in Round 1 at a significantly low price, which was between half and two-thirds of its competitors' bids and subsequently a review of the auction scoring and framework was carried out. The review of the three Round 1 projects, including two offshore areas in Akita Prefecture, is due to factors such as the acceleration of global inflation, the depreciation of the Japanese JPY, and rising interest rates, all of which have significantly exceeded initial expectations[57].

In Round 2, the revisions to the auction evaluation criteria included incentivizing early COD which led to the suspension and approximately 1-year delay to the Happo-Noshio tender[58]. The Oga-Katagami-Akita project was awarded to the consortium of JERA, J-Power, Itochu Corporation, and Tohoku Electric Power Company in December 2023. Akita Port will serve as the marshalling port for the project while Funagawa Port in Oga City will act as the O&M base. The project is targeting operation in June 2028 which, if achieved, will make it the first auction project to commence operation in Japan.

In the Happo-Noshiro area, the consortium of ENEOS Renewable Energy, Iberdrola, and Tohoku Electric Power Company was awarded the site in March 2024, after a short delay for the developer to resubmit their bid to resolve overlap in port usage. Although Noshiro Port is the nearest marshalling port to the site, it had been scheduled to serve as the construction base port for the Round 1 Yurihonjo project. Therefore, the marshalling ports for the offshore construction of the Happo-Noshiro project will be distributed such that Akita Port and Funagawa Port will be used for foundations, while Muroran Port in Hokkaido Prefecture will be used for wind turbine components. For O&M, Noshiro Port will be utilised.[59]

3.1.3 NEDO FLOATING DEMONSTRATION

The New Energy and Industrial Technology Development Organisation (NEDO) has chosen the offshore area south of Akita, off the coast of Yurihonjo City and Nikaho City, for one of its Phase 2 floating offshore wind power demonstration projects. The demonstration project will be carried out by a consortium led by Marubeni Corporation. Local companies, Venti Japan, a joint venture between a local company and a regional bank, and Ohmori Construction have participated as investors in the project developer. Local companies, Venti Japan, a joint venture between a local company and a regional bank[60], and Ohmori Construction have participated as

[56] Mitsubishi Corporation Offshore Wind. https://www.mcow.co.jp/en/project/
[57] Nikkei. (2025). https://www.nikkei.com/article/DGXZQOUC06BJI0W5A200C2000000/
[58] METI. (2022). https://www.meti.go.jp/press/2021/03/20220318012/20220318012.html
[59] Oga Katagami Akita Offshore Green Energy LLC. https://okaoge.co.jp/en/project/
[60] Venti Japan. (2024). 20240611_release_NEDOfutaiDemoProj.pdfl

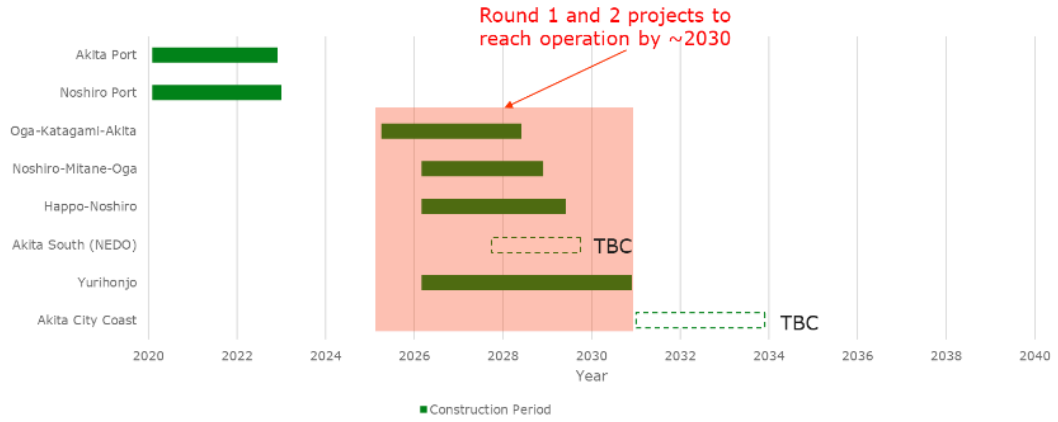
investors in the project developer. This collaboration reflects a proactive approach to encouraging the involvement of local enterprises in the wind power sector.

This demonstration initiative aims to lower costs for floating offshore wind power and facilitate its international expansion, with the objective of establishing commercially viable technology by FY 2030. Because floating offshore wind power can be deployed in various marine environments, cost reduction is essential for future growth. The project plans to install two wind turbines, each with a capacity of over 15 MW, approximately 25 km offshore in water about 400 meters deep, with operations expected to commence by the fall of 2029.[61]

3.1.4 FUTURE OFFSHORE WIND PROJECTS

As outlined in Figure 14, based on the current schedules the construction of the four Round 1 and 2 projects is expected to overlap and fall within the period between 2025 and 2030. Further, the NEDO demonstration project is also expected to fall within this period, leading to a significant concentration in construction activities within Akita Prefecture during this period.

FIGURE 14 CONSTRUCTION SCHEDULE FOR EXISTING OFFSHORE WIND PROJECTS IN AKITA PREFECTURE



Note: Construction schedule for the offshore wind projects here is based on the latest information that is available publicly.

The sea area off the coast of Akita City was designated by the Ministry of Economy, Trade and Industry (METI) as a Preparatory Area in September 2024 and is expected to be an approximately 400 MW offshore wind project. Efforts are currently underway to designate the Akita City coast as a Promotion Area to be tendered in a future auction round. This would mark the successful completion of the "first row" of offshore wind projects off the coast of Akita Prefecture.

The projects currently under development in the "first row" cover sea areas up to approximately 30 metres of water depth. Therefore, there is potential for a "second-row" of fixed-bottom offshore windfarms further offshore, as indicated in the prefecture's Next-Energy Industry Strategy. However, these projects are still in an early stage and actions such as identification and coordination of stakeholders, as well as considerations for port and grid infrastructure availability, are required before addition to METI's pipeline.

Further, as seen by the NEDO demonstration project, Akita Prefecture has significant potential for floating offshore wind. Currently, the framework for offshore wind projects under the Renewable Energy Sea Area Utilisation Act only covers the area within the territorial waters.

[61] JFE Engineering. (2024). https://www.jfe-eng.co.jp/news/2024/20240611.html

Therefore, the Japanese government is working to establish a system for installing marine renewable energy generation facilities in the EEZ, with revised legislation recently approved by the Cabinet and submitted to the Diet.[62]

3.2 OFFSHORE WIND RELATED INITIATIVES IN AKITA PREFECTURE

Akita Prefecture has long been one of the leaders in Japan's onshore wind industry and with the progression of offshore wind projects in the prefecture in recent years, many local companies have entered the market. Further supply chain developments are currently underway in Akita Prefecture to meet the demands for the four Round 1 and 2 projects which will begin construction in the coming years.

3.2.1 MANUFACTURING

In the absence of domestic wind turbine OEMs, currently, a significant portion of the wind turbine generations (WTGs) to be used in the projects off the Akita Prefecture coast are expected to be manufactured abroad. However, in a market where domestic procurement, let alone prefectural procurement, is challenging, there have been some initiatives for local companies to participate in this area.

Notably, the Mitsubishi Corporation-led consortia successful in the Round 1 auctions have selected GE turbines for their projects. GE's partner Toshiba is planning to assemble the nacelles in Kanagawa Prefecture while sourcing essential steel and electrical components from domestic businesses. Five companies in Akita are currently under consideration as potential suppliers.

Another company developing components for turbines is Aises, a manufacturer of electrical equipment, which is entering the aircraft warning light business. In collaboration with a company outside of the prefecture that specialises in special lighting, they have been developing a product focused on miniaturization and weight reduction and have obtained type approval. Looking ahead, Aises plans to produce electronic circuit boards and power supply units within Akita, enabling shorter delivery times for wind power projects in the region from their manufacturing base.[63]

Toko Tekko, a steel manufacturer, is collaborating with a machinery manufacturer from Gifu Prefecture to jointly develop davit cranes (used to transport cargo and tools from vessels to offshore wind turbine platforms), with the goal of securing approximately 100 orders by the fiscal year 2024. Sanei Kikai, a manufacturer of aerospace components, has experience producing foundation components for GE's onshore wind turbines and is also exploring the possibility of entering the offshore wind sector.

3.2.2 CONSTRUCTION

With Akita Prefecture leading wind power generation in Japan, local companies have had opportunities to enter the construction sector. The Akita and Noshiro Ports have been designated as "base ports for marine renewable energy generation facilities" by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and both the MLIT and Akita Prefecture are advancing port development initiatives. Local companies have actively participated in renovation work, engaging in tasks that range from procurement of materials to construction.

[62] Akita City. (2025). https://www.city.akita.lg.jp/jigyosha/1038525/1038892.html
[63] Nikkei. (2024). https://www.nikkei.com/article/DGXZQOCC231YX0T20C24A6000000/

A MLIT study group estimates that utilising a base port area of 18 hectares, the number of wind turbines that can be installed per year is up to 39 units, and the foundation can accommodate 60 units for 15 MW-class turbines[64]. Currently, Akita Port has a usable area of 18 hectares, while Noshiro Port has 15 hectares. The values calculated above include the use of the adjacent quay area, and discussions regarding their utilisation are necessary with the prefecture. At Noshiro Port, expansion work was completed by the end of 2024, increasing the available area from 5 hectares to 15 hectares. There are also plans to expand by an additional 9.8 hectares, but the decision will be made based on future circumstances in Akita[65]. Thus far, each base port is expected to be utilised only for one project at a time, which resulted in the Happo-Noshiro Port utilising Muroran Port.

Regarding local contractors for construction work in the offshore wind sector, Ohmori Construction has handled various tasks related to the renovation of base ports, including scour protection and the installation of ductwork for onshore transmission lines, in collaboration with its group companies. This company is one of the participating firms in AOW, the developer of the Akita and Noshiro port projects. Ohmori Construction entered this sector in 2012 and has since accumulated valuable experience in onshore wind construction projects.[66] Other local companies participating in AWO, such as Sawaki-Gumi, Kato Construction, and Kanpu, each have engaged in constructing port breakwaters and implementing scour protection measures. Hosaka Co., Ltd. focuses on the construction of wind turbines and crane rentals, actively engaging in wind turbine construction and maintenance for onshore projects both within and outside the prefecture[67]. They also possess some experience in offshore construction[68]. However, the main offshore construction scopes such as foundation and turbine installation, as well as subsea cable laying, remain largely outside the capabilities of the local construction firms.

The EPC contractor for Akita Port and Noshiro Port was a joint venture between Kajima Corporation and Sumitomo Electric Industries for the foundations and submarine cables, while Vestas Japan supplied the wind turbines[69]. For the Round 1 projects, the construction of offshore wind turbines was planned to be handled by the Japanese subsidiary of Van Oord and Kajima Corporation. Onshore construction was to be contracted to C-Tech, with the transmission equipment managed by Sumitomo Electric and Furukawa Electric, and substation equipment handled by Toshiba ESS and Mitsubishi Electric[70]. In Round 2, offshore construction in Happo-Noshiro will be undertaken by Shimizu Corporation, and the submarine cable EPC awarded to Sumitomo Electric[71]. Finally, for Oga-Katagami-Akita, Kajima Corporation was selected as the EPC contractor.

3.2.3 OPERATION & MAINTENANCE

There is significant potential for local companies to enter the O&M phase for offshore wind farms, with many actively investing in personnel and equipment to enhance their capabilities.

[64] MLIT. (2021). https://www.mlit.go.jp/kowan/content/001464702.pdf
[65] Wind Journal. (2024). https://windjournal.jp/120084/
[66] Asahi. (2021). https://www.asahi.com/articles/ASP876QZTP7TULUC001.html
[67] Sakigake. (2024). https://www.sakigake.jp/news/article/20240704AK0049/
[68] Hosaka. (2023). https://hosaka2525.com/2023-08/
[69] Kajima Construction. (2022). https://www.kajima.co.jp/news/press/202211/22c1-j.htm
[70] Wind Journal. (2022). https://windjournal.jp/114843/
[71] Oga Katagami Akita Offshore Green Energy LLC. (2024). https://www.meti.go.jp/shingikai/enecho/denryoku_gas/saisei_kano/yojo_furyoku/pdf/024_03_02.pdf

In the projects at Akita and Noshiro Ports, Vestas Japan is the primary contractor responsible for O&M of the wind turbines, supported by Marubeni Corporation's Offshore Wind Corporation in operations. Local construction firms have established joint ventures, such as Akita Offshore Wind Service (AOWS)[72] and Akita Maritime Service, which focus on O&M on offshore wind power plants. AOWS, co-founded by Japan Offshore Wind Service and Ohmori Construction in February 2020, is Japan's first dedicated O&M company for offshore wind farms and is actively involved in maintenance operations at both Akita Port and Noshiro Port[72].

In October 2019, Local companies Ohmori Construction, Sawaki Group, and Akita Kairiku Transportation have established "Akita OW Service" in collaboration with Tokyo Kisen and are currently operating two newly built CTVs[73]. During the construction phase at Akita and Noshiro Ports, these two CTVs, along with four managed by Tokyo Kisen, were utilised. Currently, the two CTVs built by Akita OW Service are in operation for O&M.

In April 2023, a consortium of local companies including four fisheries associations in Akita launched Akita Maritime Service Co., Ltd. to streamline the acquisition of maintenance contracts related to offshore wind power. Additionally, Nippon Yusen Kaisha (NYK Line), Japan's largest shipping company, opened a branch office in Akita City in 2022, collaborating with Akita Eisen to manage vessels connected to offshore wind generation. This partnership aims to facilitate efficient operations of crew transfer vessels (CTVs) and create a cohesive management system for both maintenance and operational tasks.

In Japan, Tokyo Kisen owns six CTVs[74], Akita OW Service owns two[73], NYK Line has two (one of which is under construction)[75], and Mitsui O.S.K. Lines has two[76]. MLIT anticipates that approximately 50 vessels will be needed by 2030 and around 200 by 2040[77]. Therefore, significant additional investment in crew transfer vessels will be required throughout Japan, and in Akita Prefecture, in the coming years.

Apart from CTVs, Akimoku Tekko has made strides in the O&M sector by becoming the first company in Japan to receive vendor registration from Vestas, positioning itself to repair components and tools for offshore wind turbines.[78] Hosaka Co., Ltd. has introduced two German-made cranes, each costing approximately 300 million JPY. These cranes can lift up to 250 tons and are capable of handling offshore wind turbine blades that exceed 100 meters in length. Additionally, the company has relocated its office to Akita Port with the objective of entering the maintenance management operations and services sector on a full scale.[79]

For the projects in Round 1, the Tier 1 contractors for O&M include General Electric for wind turbine maintenance, Hokutaku for offshore operational maintenance, and SeaTech for onshore system maintenance, with NYK Line overseeing vessel operations. For Round 2, which includes the Happo-Noshiro area, Vestas will lead the wind turbine O&M, while ENEOS Renewable Energy (ERE), Iberdrola Renewables Japan, and Tohoku Electric Power have formed a new O&M company focusing on operational management and Balance of Plant (BOP) maintenance.

[72] Japan Wind Development. (2020). https://www.jwd.co.jp/info/20200228-2/
[73] Nikkei. (2021). https://www.nikkei.com/article/DGXZQOCC250QW0V20C21A6000000/
[74] Tokyokisen. (2021). http://www.tokyokisen.co.jp/company/news/2021/202103.html
[75] NYK Line. (2024). https://www.nyk.com/news/2024/20240220.html
[76] Shosen Mitsui. (2025). https://ir.mol.co.jp/ja/ir/main/00/teaserItems1/00/linkList/00/link.pdf
[77] Kaiji Press Online. (2024). https://www.kaijipress.com/news/offshore_wind/2024/02/182184/
[78] Hokuu News. (2024). https://www.hokuu.co.jp/?p=15693
[79] Akita Sakigake News. (2024). https://www.sakigake.jp/news/article/20240704AK0049/

Vestas is also responsible for the wind turbines at the Oga-Katagami-Akita project, with operational management provided by J-Power Group's J-Power High-Tech. The supply and management of CTV operations in this area are co-managed by joint ventures involving NYK Line and Tokyo Eisen.

Collectively, local companies and developers are collaborating to foster the growth of the O&M sector in Akita, laying the groundwork for future opportunities in offshore wind energy.

3.2.4 FINANCE

Two local banks with headquarters in Akita are actively supporting the growth of offshore wind power by offering loans for renewable energy projects and supply chain companies making investments to expand their capabilities.

In the project at Akita Port and Noshiro Port, project financing is jointly managed by Mitsubishi UFJ Bank, Mizuho Bank, and Sumitomo Mitsui Banking Corporation. Financing agreements for both Round 1 and Round 2 have not yet been conducted.

Meanwhile, Akita Bank, a local bank in Akita, has invested in AOW, the owner consortium involved in the projects at Noshiro Port and Akita Port. Akita Bank has also established a joint venture with local companies and has gained experience operating an onshore wind power plant in Katagami City. The bank has also invested into the consortium developing the Happo-Noshiro offshore wind project[80].

Further, to promote the engagement of local companies in various related industries associated with offshore wind power projects in 2024, Akita Bank newly established a specialised division named the "Offshore Wind Industry Support Team."[81] This team aims to serve as a hub, leveraging the bank's network to connect power generation companies, construction and O&M operators, local governments, and businesses within the prefecture. The Offshore Wind Industry Support Team not only provides financing for offshore wind power projects and related capital investments but also supports customers seeking to enter related industries. Additionally, it fosters collaboration and supports the community contribution initiatives of offshore wind power companies, working towards the establishment of a sustainable offshore wind-related industry in Akita.

Hokuto Bank, also based in Akita, established Venti Japan, a wind power developer, in 2012 with the aim of entering the wind power generation industry in the northern part of Japan.[82] Notably, Venti Japan is part of the consortium for the Round 1 project off the coast of Yurihonjo City[83]. In 2013, Hokuto Bank took the lead in establishing the Akita Wind Power Consortium, known as the "Akita Wind Strategy," to promote the wind power industry in Akita Prefecture.[84] Through this initiative, Hokuto Bank has actively engaged in project finance and developed expertise and experience in onshore wind power generation projects.

In 2021, Hokuto Bank also entered into agreements regarding industry-academia-finance collaboration in the field of wind power generation with Akita University and developers.[85] This collaboration aims to facilitate the sharing of information related to the operational

[80] Akita Bank. (2024). https://www.akita-bank.co.jp/showimage/pdf?fileNo=6929
[81] Akita Bank. (2024). https://www.akita-bank.co.jp/showimage/pdf?fileNo=7298
[82] Venti Japan. https://www.venti-japan.jp/about.html
[83] Yurihonjo Offshore Wind. https://www.yuhow.co.jp/company/
[84] AWPC. https://www.awpc.jp/outline/
[85] Hokuto Bank. (2021). https://www.hokutobank.co.jp/cms_source/data/hokuto/past_info/20210513-1.pdf

performance of power generation projects and to enhance cooperation with research activities. Through this initiative, they seek to foster the development of the renewable energy industry in Akita and to invigorate research activities and human resource development.

3.2.5 TRAINING

Human resource development for the nascent offshore wind sector is a key issue throughout Japan and various companies have established training centres within Akita Prefecture.

Tohoku Electric Power Renewable Energy Service launched an offshore wind training centre "Akita Juku" at the former thermal power plant site in Akita in December 2022[86]. Akita Juku is the fourth facility[87] in Japan to be certified as a training provider by the Global Wind Organisation (GWO) and offers training of the four modules in GWO-Basic Safety Training (BST): Manual Handling, First Aid, Working at Heights, and Fire Awareness. In 2024, certification was obtained for Wind Limited Access (GWO-WLA) and Onshore Limited Access (ONL) training for the first time in Japan, which provides safety training for visitors that does not involve work inside wind turbines[88].

In March 2024, NYK Line and Nippon Marine Enterprise collaboratively established another training centre "Akita School of Wind and Sea" in Oga City[89]. This centre utilises the facilities of Oga Marine High School and part of the former elementary school campus. The plan is to aim for approximately 100 participants in the first year of 2024 and to target over 1,000 participants annually by 2030[90]. It offers GWO basic training, STCW (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) basic training, and simulator sailing training[91]. With the establishment of this facility in Akita Prefecture, it is now possible to receive all the content of BST (BST5), which includes sea survival training, in addition to the training content (BST4) that Akita Juku has offered. Furthermore, participants can gain operational experience using a high-performance simulator that replicates the navigation of CTVs (Crew Transfer Vessels)[92].

Both training centres offer courses for new trainees 1 to 2 times per month, consisting of 4 to 5 days of training, with renewal courses also available for 1 to 2 days[93]. All courses are conducted in Japanese[94]. Participants from outside the prefecture are expected, which is anticipated to have positive ripple effects on the local community too.

Educational institutions have also collaborated with government and industry to conduct joint research and technological development, focusing on cultivating young talent in offshore wind power. Akita National Institute of Technology has been designated as a key institution for advancing training in this sector, preparing to launch a five-year program that will produce students to specialise in offshore wind and develop the necessary skills to become proficient technicians.[95] Moreover, a Japan-wide consortium, "Industry-Academia Consortium for Higher

[86] Akita Bank. (2024). https://windjournal.jp/115398/
[87] Ministry of Health, Labour and Welfare. (2023). https://jsite.mhlw.go.jp/akita-roudoukyoku/newpage_01629.html
[88] Tohoku Electric Power. (2024). https://www.tohoku-epco.co.jp/information/1244789_2521.html
[89] NYK Line. (2024). https://www.nyk.com/english/news/2024/20240528_02.html
[90] Kaiji Press Online. (2024). https://www.kaijipress.com/news/shipping/2024/04/183695/
[91] Akita School of Wind and Sea. https://kazeumiakita.jp/jp/index.html#
[92] Akita School of Wind and Sea. https://kazeumiakita.jp/jp/training/
[93] Tohoku RENES. https://www.tohoku-res.co.jp/download/gwobst-schedule202501.pdf
[94] Tohoku RENES. https://www.tohoku-res.co.jp/seminar/akitajyuku.html
[95] Akita Sakigake News. (2024). https://www.sakigake.jp/news/article/20241128AK0015/

Education Program on Offshore Wind (IACOW)[96]", has been established to enhance offshore wind human resources through industry-academia collaboration, comprising seven universities and ten power generation companies situated in regions with operational offshore wind facilities. Among these, three universities are located within Akita Prefecture and will look to train personnel qualified to lead the development, construction, and operation of offshore wind power plants. These initiatives are being pursued in partnership with universities and organisations both domestically and internationally, with the goal of establishing an integrated educational system that will unite multiple universities with industry stakeholders in the future.

3.2.6 OTHER

In the development phase, local survey companies in Akita Prefecture hold significant capabilities. The Natural Science Survey Office offers a range of services, including environmental impact assessments (EIA) surveys, fishery surveys (various environmental surveys), wind measurement surveys, and geophysical and geotechnical surveys. Additionally, the Akita Prefectural Analysis Chemistry Centre conducts EIA surveys and wind measurement surveys, while Toa Survey Design specialises in geophysical and geotechnical surveys focused on seabed investigations.

On the tourism side, the local tourism association promotes offshore wind power through organised observation tours that include visits to wind turbines and power generation facilities. Noshiro City plans to provide training for wind power guide tours and may use subsidies to purchase VR equipment for industrial tourism, offering an alternative way to learn about wind power. Akita City and Noshiro City have both seen increases in visitors since the commercial operation of the respective port area offshore windfarms, and the development of new hotels are underway to meet the increased demand.

3.3 GVA STUDY FOR OFFSHORE WIND IN AKITA

3.3.1 BACKGROUND

There are six studies on Akita's offshore wind projects, as shown in Table 6. These studies have been conducted by various organisations, including municipalities, research institutes, banks, and project developers. First, a 2022 study by Akita Prefecture includes six projects in its scope. It estimates about 370 billion JPY of economic impact and 37,500 new hires caused by the projects in scope. This study is based on data gathered from AOW's Akita and Noshiro Port project and is cited as baseline in this report; however, it only provides local procurement rates for construction (12%), O&M (17%), and decommissioning (12%) with no further breakdown provided. The data was used for the studies by OYO and Akita City that estimated the economic impact within Akita City, rather than across the entire prefecture. It is worth mentioning that the study by Akita City includes the newly added project (currently designated as a Preparatory Area) off its coast, which has not been analysed in the other existing studies.

Another study was conducted by the Development Bank of Japan (DBJ) and Hokuto Bank (a local bank in Akita Prefecture) which utilises a 'challenge target' for the local procurement rate in its analysis, set higher than the figures from Akita Prefecture's study. Consequently, the result for the economic effect is increased (approx. 820 billion JPY). The same scope as Akita Prefecture's study was used and suggests that there is latent potential of the local industry to be involved in offshore wind (OSW) development.

[96] IACOW. https://iacow-education.jp/

Lastly, project developers of Oga-Katagami-Akita and Happo-Noshiro have published their estimations of the economic benefits each project could cause, though the precise assumptions behind their figures have not been publicly disclosed. The figures are significantly higher than the other studies; for instance, the Oga-Katagami-Akita developer estimates the economic effects will be 875 billion JPY (when renewable energy projects are included in the scope) and 945 billion JPY by Happo-Noshiro's developer, both for a single project. These estimates are more than twice the value in Akita Prefecture's 2022 study, though the scopes considered by the developers are also broader.

Since the publication of the Akita prefectural government's GVA study, three rounds of offshore wind auctions have been completed, and further details regarding the Round 1 and 2 projects in Akita Prefecture have become clearer. Moreover, only the study by Akita Prefecture (2022) provides the fact-based local procurement rates of Akita's OSW projects. Therefore, a new, independent GVA study has been carried out to reflect the current offshore wind landscape in Japan and Akita Prefecture. This study updates local procurement rates to reflect the latest information regarding the capabilities of the existing supply chain in Akita Prefecture and includes the addition of the Akita South Floating Demo and Akita Coast, which were announced after the release of the Akita prefectural government's study

TABLE 6 SUMMARY OF PRIOR OFFSHORE WIND GVA STUDIES FOR AKITA PREFECTURE

Organisation categories	Organisation names	Year published	GVA (billion JPY)	Induced employment (persons)	Scope–years	Scope–projects*	Note
Municipalities	Akita prefectural government	March 2022	382.1	37,597	20	6 (a-f)	The local procurement rates and results are compared in Section 6.1
	Akita city	March 2024	133.1	5,937	20	4 (a, d, e, h)	Economic impact within Akita city. The procurement rates based on Akita prefecture's study.
Research institute and banks	OYO	May 2024	30.5	1,478	20	2 (a, e)	Economic impact within Akita city. The Procurement rates based on Akita prefecture's study.
	DBJ & Hokuto bank	November 2022	819.7	Unavailable	20	6 (a-f)	Same scope with Akita prefecture, while the local procurement rates are set higher.
Project developers	Oga-Katagami-Akita Corp.	October 2024	284.4 (875.0 if incl. BESS and local use of RE)	21,000	30	1 (e)	Details unavailable
	Happo-Noshiro Corp.	April 2024	945	Unavailable	Unavailable	1 (f)	Details unavailable

**The letters "a-h" in the column of "Scope – projects" displays the project areas that each study includes: a. Akita; b. Noshiro; c. Noshiro-Mitane-Oga; d. Yurihonjo; e. Oga-Katagami-Akita; f. Happo-Noshiro; g. Akita South (NEDO Demonstration); h. Akita city*

3.3.2 GENERAL APPROACH OF STUDY

Input-Output (IO) analysis is employed in this study, a methodology frequently used for GVA analysis. IO analysis has also been utilised in prior studies examining the economic impacts of OSW projects, including Akita's previous study and those conducted in Yamagata and Hokkaido, which are neighbouring prefectures to Akita.

In Japan, IO analytical tools are publicly available for both national and prefectural analyses. This includes Akita Prefecture who have produced an analytical tool incorporating the condition of the local industry. The tool automatically calculates the economic impacts based on final demand by industry sector, including both GVA and induced employment. The estimated effects encompass three components: 1) the direct effects within Akita (final demands), 2) indirect effects within Akita (first round ripple effects), and 3) induced effects generated within Akita (second round ripple effects). The total economic impact is derived from the sum of these three effects.

Section 4

Input Data and Methodology

4 INPUT DATA AND METHODOLOGY

4.1.1 OVERVIEW

4.1.2 DESCRIPTION OF OVERALL FLOW

As explained in Section 3.3.2, Akita's analytical tool is utilised for the IO analysis in this study. Akita provides three IO models, which account for 15, 39, and 107 industry sectors respectively. The tool covering 39 sectors was used to be in line with prior studies. It provides coefficients and calculating systems that enable users to estimate the indirect and induced economic effects.

Nevertheless, final demands by sectors must be estimated and input by the users. To calculate them, three key data categories (also indicated as numbers in Figure 15) were collected regarding the offshore wind projects in the prefecture:

1) Breakdown of DevEx (development expenditure), CapEx (capital expenditure), OpEx (operational expenditure), and DecomEx (decommissioning expenditure)
2) Sectoral classification of the cost items
3) Local procurement rates within Akita prefecture.

As a methodology for data collection, LEnS™, an internal tool to calculate levelised cost of electricity (LCOE), was used to identify the project costs, considering site and market specific characteristics of the offshore windfarms in Akita prefecture (Table 7). The costs identified include only the directly relevant items of Akita's OSW projects. Other related infrastructure investments, such as port and grid upgrades, and activities conducted by project developers, such as support for fishery industries and local communities, have been excluded from the scope of this GVA study. Literature was reviewed to categorise cost items into sectors and gather qualitative and quantitative data on local procurement rates in Akita prefecture's OSW projects. Further, interviews with key stakeholders were conducted to refine and validate the local procurement rates.

FIGURE 15 MAP OF EXISTING OFFSHORE WIND PROJECTS IN AKITA PREFECTURE

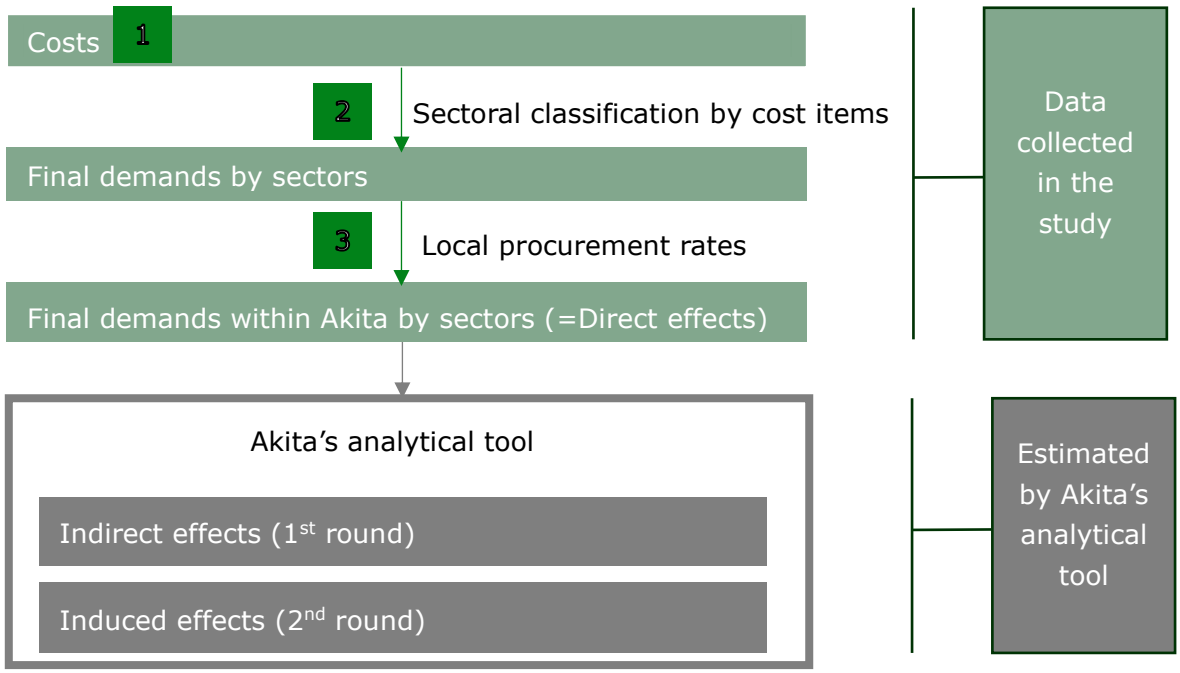


TABLE 7 TYPES OF DATA AND METHODOLOGIES FOR DATA COLLECTION

Data and Information needed	Unit	Calculation influenced	Data Collection Methods
1. Costs	JPY	Costs by items	LEnS™, literature reviews
2. Sectoral classifications by cost items	%	Final demands by sectors	Literature reviews
3. Local procurement rates	%	Final demands within akita by sectors	Literature reviews, Interviews

4.2 CAPEX AND OPEX ESTIMATION

4.2.1 LENS™ MODEL

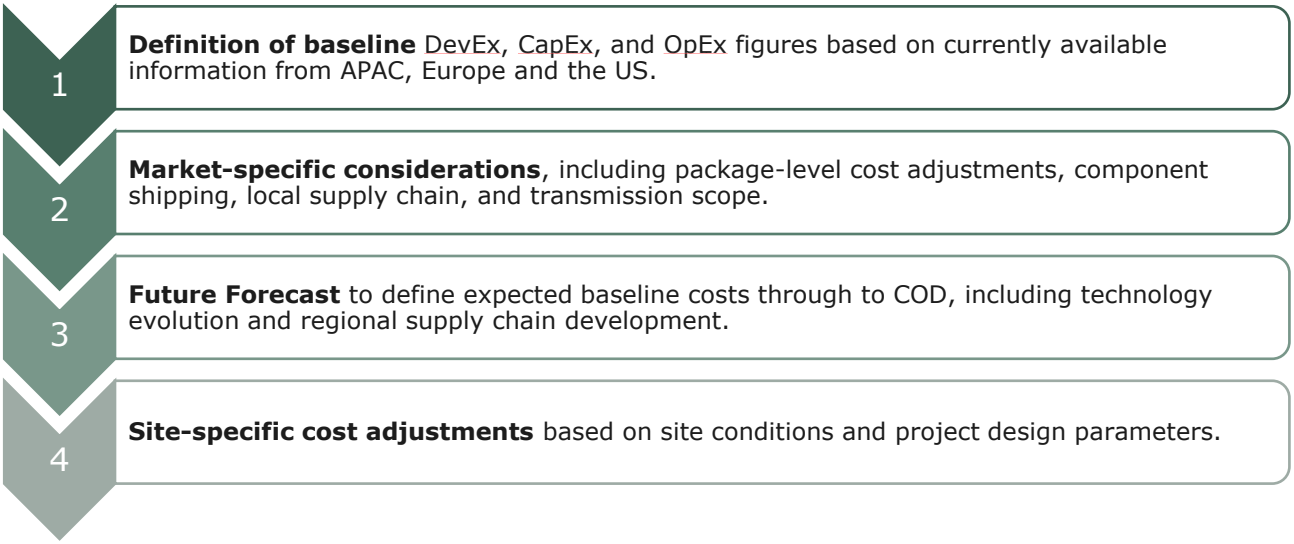
ERM's proprietary LEnS™ model is a cost forecasting tool that generates robust technical CapEx, OpEx, and LCoE estimates for offshore wind globally. The model is underpinned by a series of cost baselines constructed using high-confidence data from 50+ offshore wind farms from APAC, Europe and the Americas.

The tool synthesises a series of market forecasts and site-level costing algorithms to produce a detailed cost and yield profile for each project scenario. Forward cost projections account for the market and technology landscape at COD, and each project is individually adjusted based on site conditions with a series of package-level cost algorithms.

The assessment considers technical cost parameters for each site, including:

- Project nameplate capacity
- Turbine nameplate capacity and rotor diameter
- Forecasted COD year and project lifespan
- Water depths
- Transmission route length (high voltage alternative current (HVAC) cables)
- Port transit distances

FIGURE 16 ERM LENS™ MODEL WORKFLOW



4.2.2 MODEL INPUTS AND ASSUMPTIONS

As outlined in 4.2.1 above, the LEnS™ model considers site-specific parameters for each offshore wind project for cost estimation. Table 8 outlines how each parameter was obtained for the eight offshore windfarms off the coast of Akita Prefecture which are considered within the scope of this study.

TABLE 8 LIST OF KEY INPUTS AND ASSUMPTIONS USED FOR CAPEX AND OPEX ESTIMATION

Parameter	Description
Project Capacity	Based on information announced by project developers or municipalities (if pre-tender).
COD Years	Based on information announced by project developers where available. For the pre-tender projects, estimated as earliest COD based on project status and infrastructure availability.
Project Operational Life	Assumed as 20 years.
WTG Design	Wind turbine size based on information announced by project developers where available. Where required, estimated based on expected COD.
Foundation Design	Foundation design based on information announced by project developers where available. Where required, estimated based on foundations information for surrounding projects.
Water Depth	ERM's geographic information system (GIS) team has measured mean water depth based on bathymetry data and announced site boundaries / WTG locations.
Construction and Operations and Maintenance (O&M) Port	Ports were based on information announced by project developers where available and where required, base ports (designated by MLIT) in closest proximity were used. Likely vessel route distances were measured by the GIS team for input to the model. Port upgrades have not been factored into this cost modelling analysis.
Installation Vessel	Based on information announced by project developers where available. assumed Japanese or European owned turbine and primary foundation installation vessels will be mobilised for construction.
Offshore Substation (OSS)	No projects were assumed to use offshore substations due to their close proximity to shore.
Export Cable Length	ERM's GIS team has measured the onshore and offshore export cable distances. The distances are measurements from project centre-point to landfall and from landfall to onshore connection/offtake point.
Inter-array cable (IAC) and Export Cable Voltage	IAC and export cable voltage of 66 kV (no offshore substations).

Onshore Interconnection Point	Onshore cable connections points were based on information announced by project developers where available. When such information was not available, the interconnection point was assumed to be the closest 154 kV (or higher) substation, including those currently under construction.

In addition to the assumptions regarding the key inputs outlined above, further assumptions that are part of the LEnS™ modelling philosophy are given in Table 9 below.

TABLE 9 LENS™ MODEL ASSUMPTIONS FOR THE ESTIMATION OF DEVEX, CAPEX, AND OPEX

Cost Category	Description
DevEx	• DevEx estimates are intended to cover the costs to develop the project from project initiation to FID (final investment decision). • Costs exclude any items considered CapEx (e.g. early works), as well as high uncertainty costs such as lease acquisition and one-off project costs that are ultimately dependent on the development strategy (e.g. supply chain contributions). • This DevEx budget reflects actual DevEx spent required to build each project phase, excluding any front-loading of DevEx across multiple sites or other gaming of development strategies.
CapEx	• CapEx estimates cover assets from the offshore WTGs to the onshore substation, including engineering, procurement, construction, and installation (EPCI). It should be noted that associated costs and contingency will vary based on the selected contracting strategy. • Costs include typical developer-investments in local facilities, though are not intended to cover major one-off supply chain contributions such as fabrication facility set-up. CapEx estimates exclude interconnection fees or upgrade costs to the connecting grid network. • We assume no trade restrictions, and likewise, no additional costs have been added due to environmental, socio-economical, permitting, or other macroscopic/development restrictions. Steel tariffs or other raw material restrictions have not been considered. • Costs are based on recent historical average commodities pricing, excluding recent short-terms spikes. ERM has not applied any future price forecasts for raw materials markets up to COD.
OpEx	• ERM's O&M costs are informed by the range of expectations for fixed-bottom offshore wind OpEx globally. Costs cover all technical O&M costs and non-technical O&M costs (including project management, and plant-damage insurance), but exclude lease, tax, market fees, or business interruption insurance.

4.2.3 MODEL OUTPUTS

Table 10 shows the cost composition of offshore wind projects provided by the LEnS™ model (See Appendix B for further breakdowns). The values represent the total cost per cost item of the eight existing offshore wind projects off the coast of Akita Prefecture. The scope of this study includes items that are directly associated with OSW projects, DevEx, CapEx, OpEx, and

DecomEx. The breakdown of cost packages was obtained from LEnS™ and publicly available literature[97].

TABLE 10 TOTAL AKITA PREFECTURE OFFSHORE WIND PROJECT EXPENDITURE BY COST ITEMS

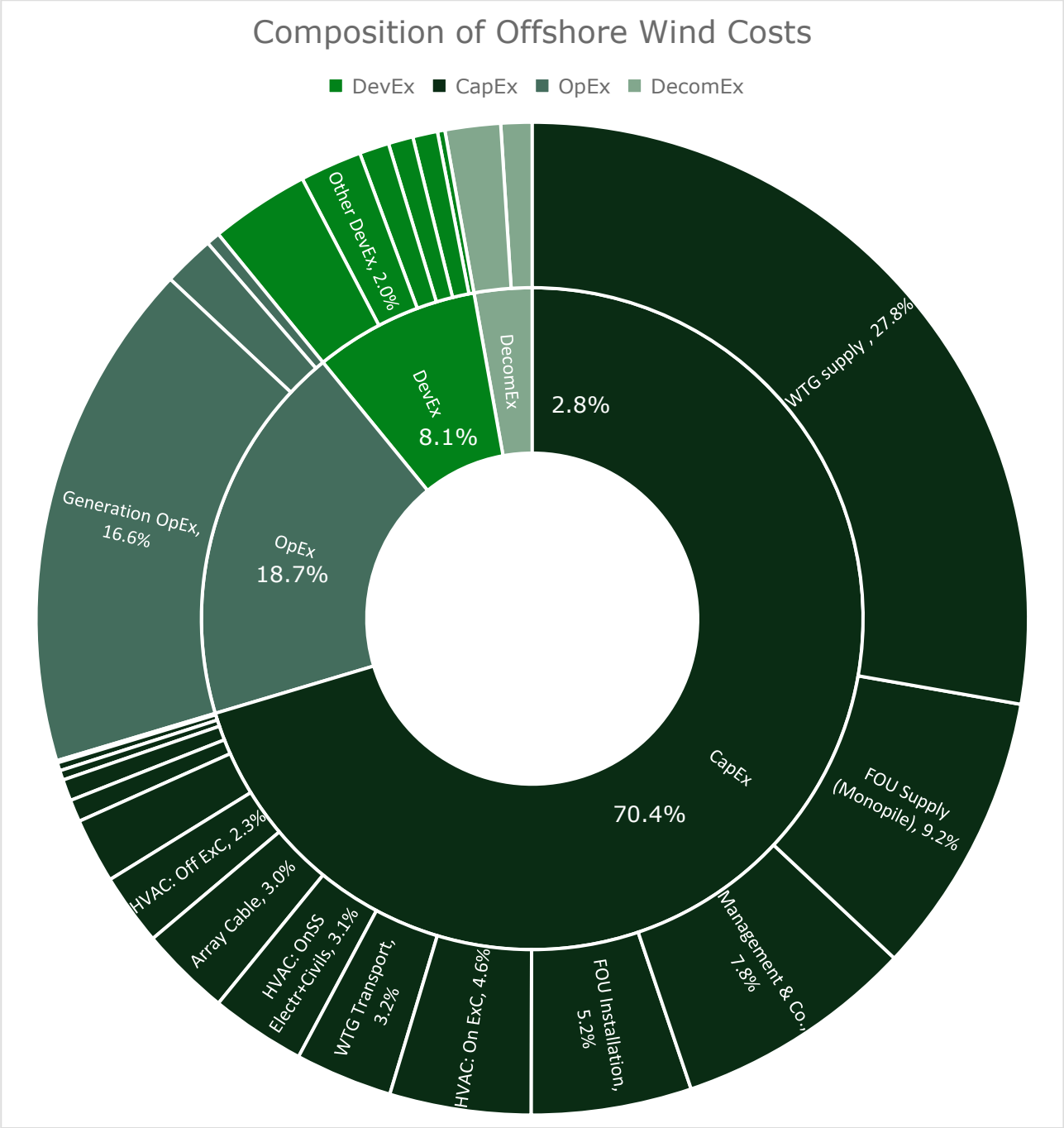
Expenditure	Cost items	Costs (million JPY)	Composition ratio
DevEx (8.1%)	Development	169,333	8.1%
CapEx (70.4%)	WTG supply	582,673	27.8%
	WTG Transport	66,463	3.2%
	WTG Installation	44,240	2.1%
	Foundation (FOU) Transport	15,093	0.7%
	FOU Installation	109,296	5.2%
	FOU Supply (Monopile)	193,585	9.2%
	FOU Supply (Floating)	6,572	0.3%
	Mooring Supply (Floating)	1,521	0.1%
	Marine Operations (Floating)	5,571	0.3%
	Array Cable	62,093	3.0%
	HVAC: Off ExC	49,077	2.3%
	HVAC: On ExC	96,615	4.6%
	HVAC: OnSS Electr+Civils	64,922	3.1%
	Project Management	163,995	7.8%
	Insurance	14,627	0.7%
OpEx – 20-year total (18.7%)	Generation OpEx	348,207	16.6%
	Transmission OpEx (OnSS, ExC)	9,285	0.4%
	Non-technical OpEx	34,999	1.7%
Decommissioning (2.8%)	Generation Decommissioning	21,302	1.0%
	Transmission Decommissioning	37,871	1.8%

Source: LEnS™ (ERM)

The pie chart (Figure 17) shows the composition of the project costs across the eight offshore windfarms. In the overall expenditure breakdown, a significant portion (70%) is attributed to CapEx, within which the supply of WTGs represents the largest share, at 28% of the total expenditure. This is followed by the costs associated with foundations (9%) and project management (8%). Additionally, generation O&M plays a key role, comprising 17% of the total costs.

[97] BVG Associates. (2019). https://bvgassociates.com/wp-content/uploads/2019/04/BVGA-Guide-to-an-offshore-wind-farm-r2.pdf

FIGURE 17 THE COMPOSITION OF TOTAL OSW PROJECT COSTS (8 PROJECTS) IN AKITA PREFECTURE



4.2.4 ALLOCATION METHODS

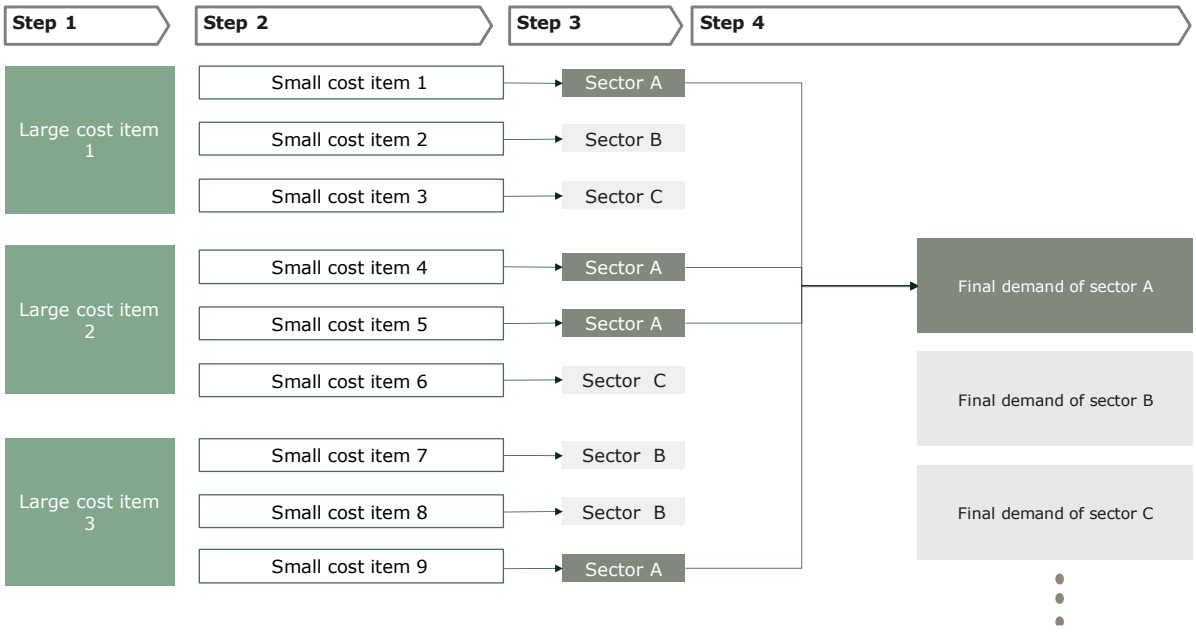
For input into the input-output model, each cost item must be allocated into one of the 39 sectors listed in the Akita's analytical tool, with reference to the following materials: the sectoral classification table for Input-Output table[98] and a sector search system of Japanese government[99]. The classification table is used as the main source as the sectors are consistent with those in Akita's IO table and tool. The sector search system was used alongside the classification table to complement.

[98] e-Stat. https://www.e-stat.go.jp
[99] e-Stat. https://www.e-stat.go.jp/classifications/terms/10

Consequently, the final demand by sectors was estimated by summing the contribution of each cost item to each sector. The process consists of four steps (Figure 18).

1. The amount (JPY) of the large cost items is identified through LEnS™.
2. The amount (JPY)of the small cost items is identified through LEnS™.
3. The amount for each small cost item (in JPY) is calculated and allocated into one of the sectors in Akita's tool with reference to the classification table and the Japanese government's sector search portal.
4. The total cost by sectors is calculated.

FIGURE 18 METHODOLOGY FOR ALLOCATING OFFSHORE WIND PROJECT COSTS TO INDUSTRY SECTORS



4.2.5 SECTOR ALLOCATION

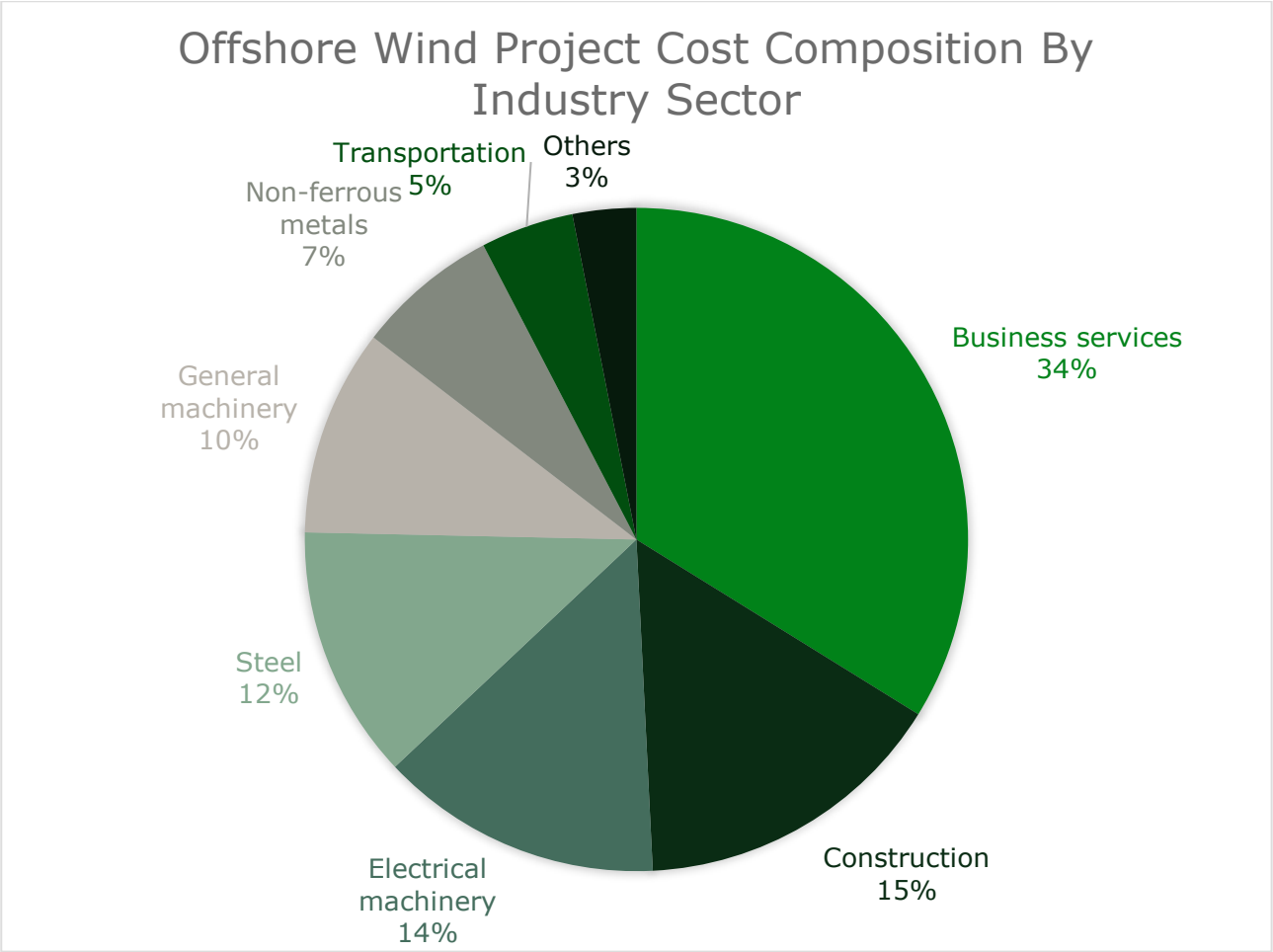
Table 11 shows the sector allocation rates for the 21 large cost items. 13 sectors were found to be relevant to the offshore wind power projects in Akita. As seen in Figure 19, Service for business (33.8%), Construction (15.4%), Electrical (13.8%), General machinery (10.1%), and Steel (12.4%) show the highest proportions across the eight offshore wind projects.

Notably, business services account for a third of the total costs due to significant contributions from the development and O&M phases, as well as project management costs. The next four highest sectors are predominantly related to CapEx items, which dominate over 70% of the total costs. For instance, WTG supply is mainly distributed to the electric machine, general-purpose machine, and steel sectors (42%, 36%, and 13%, respectively). Similarly, the main sector of foundation supply is steel, accounting for 100% for floating foundations and 89% for monopiles.

TABLE 11 ALLOCATION OF THE OFFSHORE WIND PROJECT COST ITEMS TO INDUSTRY SECTORS

Expenditure categories	Cost items	Allocated sector
DevEx	Development	Services for business[100](100%)
CapEx	WTG supply	Electric machine (42%), General purpose machine (36%), Steel (13%), Nonferrous metals (4%), Ceramic and stone products (2%), Chemical products (1%), Metal products (1%), Other products (1%)
	WTG Shipping	Transport (100%)
	WTG Installation	Construction (100%)
	FOU Shipping	Transport (100%)
	FOU Installation	Construction (100%)
	FOU Supply (Monopile)	Steel (89%), Ceramic and stone products (4%), Other products (7%)
	FOU Supply (Floating)	Steel (100%)
	Mooring Supply (Floating)	Steel (100%)
	Marine Operations (Floating)	Construction (100%)
	Array Cable	Nonferrous metal (50%), Construction (50%)
	Off ExC	Nonferrous metal (50%), Construction (50%)
	On ExC	Nonferrous metal (70%), Construction (30%)
	Onshore substation	Electric machine (70%), Construction (30%)
	Management & Co.	Services for business (100%)
	Insurance	Finance and insurance (100%)
OpEx	Generation OpEx	Services for business (95%), Transport (4%), Education (1%)
	Transmission OpEx (OffSS, OnSS, ExC)	Services for business (100%)
	Non-technical OpEx	Services for business (100%)
DecomEx	Generation decommissioning	Construction (100%)
	Transmission decommissioning	Construction (100%)

FIGURE 19 COST COMPOSITION BY SECTORS



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4.3 LOCAL PROCUREMENT RATE

4.3.1 METHODOLOGY

The final step in the preparation of input data for the IO analysis is to determine the total offshore wind costs that are allocated to organisations based within Akita Prefecture. This is achieved through the estimation of the local procurement rate per cost item.

In the existing GVA studies carried out in Akita Prefecture (covered in Section 3.3.1), a variety of approaches have been used to determine such local content percentages. The study conducted by Akita Prefecture in 2022, indicated a rate of 12% for construction and decommissioning activities and 17% for operations and maintenance (O&M). A 2022 study by

[100] Services for business is defined as services provided for other business establishments. It includes Goods Rental (excluding rental cars), Industrial Machinery and Equipment Rental (excluding construction machinery and equipment), Construction Machinery and Equipment Rental, Computer and Related Equipment Rental, Office Machinery and Equipment Rental (excluding computers, etc.), Sports and Recreational Equipment and Other Goods Rental, Car Rental, Advertising, TV and Radio Advertising, Newspaper, Magazine, and Other Advertising, Automobile Maintenance, Machinery Repair, Legal, Financial, and Accounting Services, Civil Engineering and Construction Services, Worker Dispatch Services, Building Services, Security Services, Other Business Services. The items in DevEx are thought to belong to Civil Engineering and Construction Services and Other Business Services.
[101] The breakdowns of business services are as follows: EIA Survey (2.9%), Fishery Impact Survey (0.7%), Wind measurement / Metocean survey (2.4%), Geophysical and geotechnical survey (9.6%), Engineering / Design (2.4%), Other DevEx (6.0%), Project Management (23.1%), Operations (0.4%), Maintenance (46.4%), OnSS, OffSS, and ExC O&M (1.3%), Other OpEx (4.9%)

the Development Bank of Japan (DBJ) and Hokuto Bank set "challenge targets" for the local procurement rates which contained aspirational expectations for the future supply chain development. The rates reported by OYO and Akita City pertain specifically to Akita City and are based on figures from the earlier Akita Prefecture study. Local procurement rates from the developers are related to confidential project plans provided in the auctions and hence have not been made publicly available.

The local procurement rates presented in this study aim to realistically reflect the current status of the offshore wind supply chain in Akita Prefecture. The procurement rates were derived from two sources:

1. Interviews with industry stakeholders (including municipalities, suppliers, developers)
2. Review of values indicated within the existing studies (Akita prefecture and DBJ & Hokuto bank) and literature

First, information was gathered regarding the current supply chain capabilities of companies in Akita Prefecture through desktop research and interviews with key local stakeholders, including municipalities, project developers, local supply chain companies, banks, and academic institutions. During these interviews, the stakeholders were asked about existing experience of local companies in offshore wind projects, as well as the status of current supply chain initiatives. Further, supply chain scopes in which future local participation was deemed feasible but remained under preliminary consideration were also discussed.

Based on this information, the value of the individual scopes which can be contracted to local companies was estimated to provide a bottom-up calculation of the local procurement rate within each DevEx, CapEx, OpEx, and DecomEx package. In the preparation of such local procurement rates, prior studies such as those by Akita Prefecture and DBJ & Hokuto Bank were used as a reference.

These draft procurement rates were then reviewed and validated through further consultations with stakeholders.

However, it is crucial to acknowledge that some level of estimation is inevitable in these numbers due to the unavailability of certain data because procurement rates for many ongoing projects are still in planning phase, remain undecided, and are largely confidential. Despite these limitations, this study aims to set detailed local procurement rates based on the latest publicly available information and the consultations with some of the key stakeholders.

4.3.2 SCENARIOS FOR LOCAL PROCUREMENT

As highlighted in Section 3.2, many companies in Akita Prefecture have entered or are beginning preparations to enter the offshore wind sector. In this study, two kinds of local procurement rates, named “possible” and “potential”, were set.

“Possible” local procurement rates refer to the estimated rates that are expected to be achieved, considering the capabilities of the supply chain and organisations in Akita Prefecture. Based on the data and information gathered from literature reviews and stakeholder interviews, the rates were established to reflect the current status of local companies in the prefecture. This includes activities that have been completed or are currently underway at the operational Akita and Noshiro Port projects, as well as announced supply chain initiatives which have made significant progress in preparation for the upcoming projects in territorial waters.

"Potential" local procurement rates are defined as the estimated rates that also include supply chain initiatives that are considered hypothetically achievable, considering feasible, additional initiatives and investments aimed at increasing the involvement of local suppliers. This includes increased availability of skilled human resources, increased competitiveness of local suppliers in development, construction, and operation, and local suppliers' entry into new supply chain scopes. The additional local procurement included here, compared to the "possible" rates, considers activities which have not yet been completed by local companies in the Akita and Noshiro Port projects, and is not yet readily available for the upcoming projects, but can potentially become feasible through further efforts by supplier in Akita Prefecture.

The "potential" local procurement rates will be realised when relevant initiatives are successfully implemented to maximise local supply chain capabilities. For example, the number of local O&M personnel can increase if training centres in Akita like Kaze-to-Umi-no-Gakko-Akita (by NYK) and Akita-juku (by Tohoku Electric Power RENES) produce skillful O&M personnel and attract the trainees to work for OSW in Akita Prefecture. Local supply of some minor turbine components may be achieved for GE turbines if Toshiba's initiative[102] is carried out successfully. Offshore logistics and O&M capabilities can grow through the further investment in new CTVs[103].

Table 12 illustrates "possible" and "potential" local procurement rates by cost items in Akita.

TABLE 12 POSSIBLE AND POTENTIAL LOCAL PROCUREMENT RATES BY COST ITEMS

Expenditure Category	Cost item	Local procurement rates		Items locally procured	Examples of potential organisations influencing the local procurement rates
		Possible	Potential		
Development Expenditure (DevEx)	Development	35%	55%	Environmental and Social Surveys, Onshore Construction Design, Permit Application	Survey companies (Akita Prefectural Analysis Chemistry Centre, Natural Science Survey Centre, etc.), Shimizu Group (Installer of platform for seabed survey), Engineering/Design companies (TOA Survey Design, etc.), and Akita marine time service
Capital Expenditure (CapEx)	Wind turbine generators (WTG) supply	0%	4.5%	Small engineering components	Aisesu (aviation obstruction lights), San-Ei Machinery
	Wind turbine transportation	10%	10%	In-port operations, steel frames for storage.	Hosaka (heavy cargo transport), Toko Tekko (steel frames)
	Wind turbine installation	0.1%	0.1%	Patrol vessels	Akita Eisen, Akita Maritime Service
	Foundation transportation	10%	10%	In-port operations, steel frames for storage.	Hosaka (heavy cargo transport), Toko Tekko (steel frames)
	Foundation installation	10%	10%	Scour protection installation	Kato Construction, Sawaki Group, Ohmori Construction

[102] Toshiba. (2023). https://www.global.toshiba/jp/news/energy/2023/09/news-20230907-01.html
[103] NYK Group. (2025). https://www.nyk.com/news/2025/20250114.html

	Foundation supply (monopile)	1.7%	4.9%	Scour protection	Kanpu
	Foundation supply (floating)	0%	0%		
	Mooring/Anchor (floating)	0%	0%		
	Array Cables	0%	0%		
	Offshore export cable	4.5%	4.5%	Landfall Construction	Ohmori Construction
	Onshore export cable	27%	27%	Onshore export cable laying	Ohmori Construction
	Onshore Substation	27%	34%	Onshore substation construction	Ohmori Construction, Nippon Electric Power Industry
	Marine Ops (floating)	0%	0%		
	Insurance	0%	0%		
	Management & Co	0%	0%		
Operation Expenditure (OpEx)	Generation O&M （20 years）	17.5%	40.8%	Maintenance and inspection, vessel management and charter, parts repair, onshore & offshore logistics, ROV	Akita Maritime Service, Akita OW Service, Japan Offshore Support, Akimoku Iron Works (parts repair), Takahashi Shuwa Constructions (ROV)
	Electrical O&M （20 years）	90%	90%	Maintenance and Inspection	Akita Maritime Service, Noshiro Electric Works
	Other O&M (20 years)	50%	75%	Maintenance and Inspection, Patrol Vessels, ROV supply	Akita Maritime Service
Decommissioning Expenditure (DecomEx)	Generation decommissioning	7%	7	Scour protection removal	Kato Construction, Sawaki Group, Ohmori Construction
	Transmission decommissioning	90%	90%	Onshore cable and substation removal	Ohmori Construction

4.3.3 PROCUREMENT RATES BY EXPENDITURE CATEGORIES

4.3.3.1 DEVEX

The majority of DevEx costs, especially survey works, can be locally procured, given that Akita Prefecture has organisations capable of conducting such assessments. However, the engineering and design aspects are expected to be outsourced to large construction or consulting firms, as offshore wind (OSW) engineering and design require specialised expertise in the field.

Regarding potential rates, the rates are projected to increase to some extent if the number of workers and the competitiveness of local organisations against external entities improve. On the other hand, some items like project management for development works, are expected to remain unchanged, led by major companies based outside of Akita.

4.3.3.2 CAPEX & DECOMEX

The supply of WTG and foundations is expected to be challenging for local organisations, as these components are typically provided by international companies such as Vestas and GE. However, there is a potential for local companies to be involved in some minor scopes, as seen from Toshiba's initiatives in the prefecture. In terms of foundations, scour protection is an area where local companies are expected to be able to participate.

Similarly, transportation is anticipated to be challenging, as large vessels required to import WTG and foundation shipping are unlikely to be supplied locally. The rates for WTG and foundation transportation are set at 10%, based on the possibility of local involvement with staging at Akita and Noshiro ports. Local procurement for installation is also expected to be challenging, as offshore construction works will be carried out by domestic or international firms owning large wind turbine installation vessels. However, patrol boats and scour prevention installation are expected to be procured locally, contributing to the 0.1% in WTG installation and 10% in foundation installation (including scour protection) respectively.

Construction works such as cable landing, onshore burial, and onshore substations offer significant potential for the involvement of local companies. Akita's construction company has experience in these areas from projects at Akita and Noshiro Port. However, since the scopes are not specialized to offshore wind, there is limited potential for further involvement in this sector. It is noted that many construction companies in Akita Prefecture are reportedly experiencing a shortage of workers, so it is key to ensure that there are sufficient human resources to support the onshore works for offshore wind.

For decommissioning works, it is assumed that the local procurement for generation facilities (turbine and O&M) will be equal to the offshore installation works. Meanwhile, the decommissioning of transmission infrastructure is expected to allow for significant involvement of local firms, as was seen for onshore construction.

4.3.3.3 OPEX

Local procurement for generation O&M was set at 17.5% for the possible rate and 40.8% for the potential rate. Thus far, companies in Akita Prefecture have been involved in a wide range of O&M activities for the Akita and Noshiro port projects including inspection of BoP components and onshore & offshore logistics, which makes the possible rate mentioned above. Further, there has been strong ambition from local businesses, as seen from the formation of Akita Maritime Service, due to the long-term opportunities within the O&M scope. Potential areas for further growth include entry into blade inspection, preparation of further CTVs for the Round 1 and 2 projects, and investment into ROVs (remotely operated vehicles) and other maintenance equipment. Further, there is expected to be a shortage of skilled O&M technicians in the prefecture which will need to be addressed. The rate is expected to increase if the above is addressed successfully. The local procurement rate for electrical O&M was set at 90% as there are existing capabilities within the prefecture which is expected to be leveraged.

4.3.3.4 SCOPES WHICH POSE CHALLENGES FOR LOCAL PROCUREMENT

It is also notable that there are some cost items for which the involvement of companies based in Akita Prefecture will be highly challenging. For example, there are currently no active, domestic wind turbine manufacturers and hence there is a strong reliance on overseas OEMs in the Japanese offshore wind sector. Whilst there are initiatives by Toshiba and GE to

manufacture nacelle parts locally in Japan, the reality is that the majority of the WTG supply chain remains based abroad.

Further, in terms of floating offshore wind, the global supply chain is still developing. Hence it is expected that there are even greater barriers for local companies to be involved in the planned NEDO demonstration project in aspects such as manufacturing of floating foundations and offshore installation.

4.4 ASSUMPTIONS / LIMITATIONS

The data collection methods, analytical model, and tools employed in this study have certain limitations and assumptions:

- The latest available data for the Input-Output table is from 2015, which means that the input coefficients may not accurately reflect the current state of Akita's industry.
- Discount rates have not been considered to allow direct comparison with existing GVA studies within Akita Prefecture.
- Income growth since 2015 is not considered in the analysis. The updated employment coefficient can affect the overall number of jobs created as income rises. However, the rate of income growth was limited to 4.9% between 2015, the year the coefficient was established in Akita's tool, and 2021, when the first offshore wind (OSW) projects were constructed. This relatively modest increase is not expected to significantly impact induced employment.
- Although local procurement rates are derived from literature reviews and interviews, it is important to note that these figures are estimations. As most projects are still in the planning and development stages, procurement decisions are not fully determined, and some information is confidential and has not been disclosed publicly.
- The future situation of the labour market is not considered in the model. The induced employment is estimated with the employment coefficient in the calculation tool. Thus, future situations, such as the decreased demand of workers through increased automation (e.g., replacement of cashier clerks with self-casher machines in commerce sector), cannot be considered.
- The Akita's tool's calculation range is limited to direct, indirect (first round), and induced (second round) effects to simplify calculation. Because ripple effects diminish with subsequent round of ripple effects, the impact of any tertiary effects (and beyond) on this analysis is expected to be minimal. This limitation is common among tools developed by Japanese government.
- The model assumes that each industry can fully adjust its production capacity to meet demand, even in cases of labour shortage.
- The model assumes that GVA will lead to new hires, without considering the potential for existing employees to work overtime, which complicates predictions.
- In the model, the local procurement is treated as constant, despite the typical fluctuations that can occur. The local procurement rate has been assumed to be consistent across the eight offshore wind projects.
- The timing of when ripple effects will materialise remains uncertain, though it is generally expected to happen within one year.

Section 5

Results

5 RESULTS

5.1 "POSSIBLE" SCENARIO

Based on the methodology outlined in Section 4, the gross value added of the eight offshore wind projects off the coast of Akita Prefecture has been calculated. The result for the "possible" scenario is outlined in Table 13 below.

TABLE 13 ESTIMATE OF GVA AND INDUCED EMPLOYMENT (POSSIBLE SCENARIO)

Effects	GVA (million JPY)	Induced employment (persons in the projects' period)
Direct effects	252,733	25,128
Indirect effects (first ripple effects)	59,983	5,060
Induced effects (second ripple effects)	43,307	3,811
Total	356,022	33,999

With the possible local procurement rates, the estimated GVA by OSW projects in Akita is about 356 billion JPY. 71% of the GVA is from direct effects, while indirect effects and induced effects account for 17% and 12% respectively, indicating that the final demand value (direct effects) holds the key to increasing the economic effects in a region.

The estimated total number of induced employments by OSW projects in Akita is 33,999 (persons) [104]. Similarly to the GVA, the estimated 74% of induced employment is from the direct effects, with 15% by indirect effects and 11% by induced effects.

5.1.1 GVA

As summarised in Table 14, the GVA results under the "possible" local procurement rates indicate that services for business and the construction sector play important roles in the calculated GVA. The GVA contribution from business services was roughly 166 billion JPY, which is about half of the total value. This sector also generated a notable ripple effect, with approximately 20 billion JPY worth of impacts in the first round and another about 2 billion JPY in the second round. The construction sector followed with GVA of approximately 93 billion JPY. Additionally, more than 99% of the effects in this sector came from direct demands, with contributions of about 0.7 billion JPY and 0.2 billion JPY from the first and second rounds, respectively.

The substantial impact on business services is primarily attributed to relatively high local procurement rates in DevEx and OpEx. DevEx, with a 35% local procurement rate, contributes to an estimated 61 billion JPY of economic effects in the Prefecture, which is more than a third of the total value in the sector. Similarly, the local procurement rate for generation O&M of 17.5% equates to over a third of the direct effects in the business services sector, generating approximately 61 billion JPY. Thus, further increases to the local content in O&M could yield further benefits towards economic benefits for Akita.

Another important finding is that commerce, real estate, and telecommunications demonstrated relatively high economic ripple effects despite having zero direct effects. The

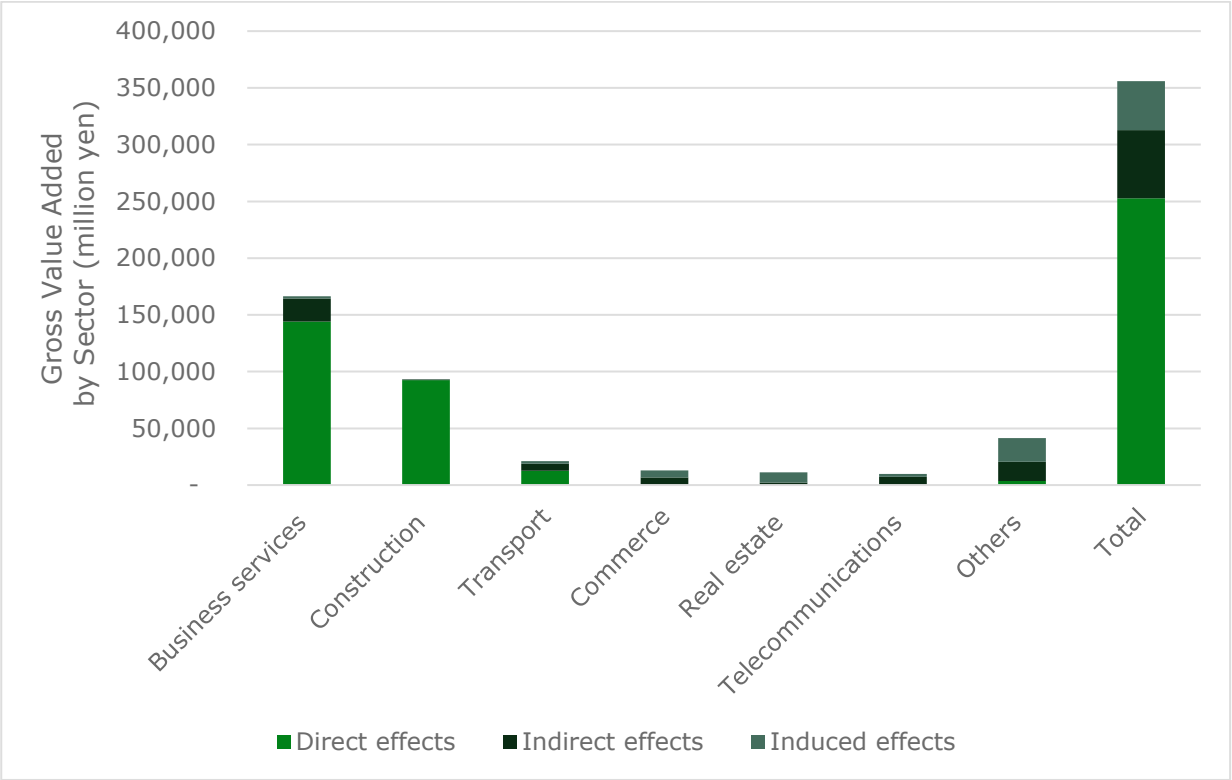
[104] The number of induced employments includes self-employed individuals and family workers.

commerce sector saw demand in both the first and second rounds of economic effects, combining to about 13 billion JPY. This corresponds to increased consumption of households with increased income. In the case of real estate, demand significantly increased in the secondary effects; although it registered about 2 billion JPY in the first round, it is estimated to be about 9.3 billion JPY, representing about 21% of the total induced effects. On the other hand, the telecommunications sector exhibited higher values in the first round, reporting about 7.2 billion JPY compared to about 2 billion JPY in the second round. These sectors highlight how indirect economic impacts can be substantial even when direct demand is absent. The commerce, real estate, and telecommunications are more influenced by the economic ripple effects than the others.

TABLE 14 ECONOMIC EFFECTS BY SECTOR (POSSIBLE SCENARIO)

Sector name	Direct effects (million JPY)	Indirect effects (million JPY)	Induced effects (million JPY)	Total effects (million JPY)
Business services	144,217	20,298	1,930	166,444
Construction	92,372	646	217	93,235
Transport	12,659	6,188	2,179	21,026
Commerce	-	6,582	6,312	12,894
Real estate	-	2,062	9,282	11,344
Telecommunications	-	7,164	2,537	9,700
Others	3,485	17,044	20,850	41,378
Total	252,733	59,983	43,307	356,022

FIGURE 20 GVA BY SECTORS (POSSIBLE SCENARIO)



5.1.2 INDUCED EMPLOYMENT

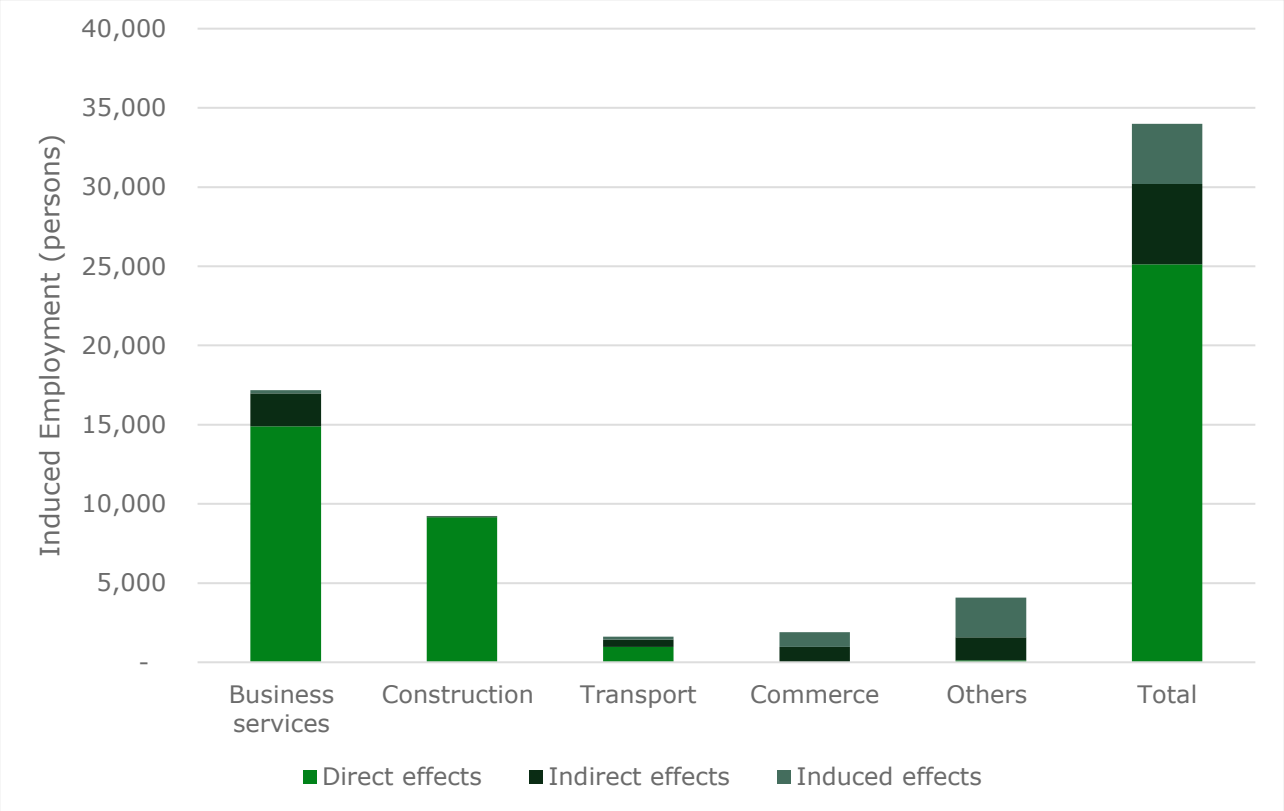
Similarly to GVA, services for business and construction contribute the greatest value towards induced employment. Business services account for about 50% of the total number of induced employments from the Akita OSW projects, translating to an estimated 17,183 new hires—comprising 14,889 in direct effects, 2,095 in the first round, and 199 in the second round of economic ripple effects. The construction sector is expected to hire 9,234 individuals, primarily within direct effects (9,148), while transport also produces many new jobs in direct and ripple effects (approx. 1,600).

Another important observation is that the commerce sector, demonstrates a relatively large number of job creations despite having zero direct effects. Specifically, 1,900 jobs are projected to be created in this sector, with estimates indicating that 967 jobs will be filled due to the first economic ripple effect and 928 from the second round. The second round of effects does not diminish like the other sectors due to increased consumer spending power, leading to higher demand for workers in the commerce sector, especially supermarkets. While immediate direct demand in commerce may not be evident, ongoing economic activities from OSW projects can stimulate long-term employment growth in this field.

TABLE 15 INDUCED EMPLOYMENT BY SECTORS (WITH POSSIBLE RATES)

Sector name	Direct effects	Indirect effects	Induced effects	Total effects
Business services	14,889	2,095	199	17,183
Construction	9,148	64	22	9,234
Transport	968	473	167	1,608
Commerce	-	967	928	1,895
Others	123	1,461	2,495	4,079
Total	25,128	5,060	3,211	29,278

FIGURE 21 INDUCED EMPLOYMENT BY SECTORS (POSSIBLE SCENARIO)



5.2 GVA IN CONTEXT OF AKITA PREFECTURE

Under the Renewable Energy Sea Area Utilisation Act, developers are granted a 30-year occupancy for designated offshore wind sites. According to the developers' project plans, the timeline is divided into three phases: 3-4 years for development, 3-5 years for construction, and 20-24 years for operation and decommissioning. Thus, the OSW projects in Akita

Prefecture are currently permitted for a total duration of 30 years, with completion planned within this timeframe.

Considering the entire duration for the projects, the total GVA of 356 billion JPY equates to 11.9 billion JPY/year over the 30 year period (as a rough estimate, see Section 6.2 for further details of cost distribution in the project period). This is approximately 0.3% of the Akita's annual GPP in 2021 (3.54 trillion JPY)[105].

Nevertheless, in terms of GVA by sector, the values represent a noteworthy proportion of the annual GPP. The estimated effects of 5.6 billion JPY/year in the business services sector are nearly equal to 3% of Akita's annual GPP in this sector for 2021 (215.1 billion JPY) [105]. In the construction sector, Akita's GPP was 278.7 billion JPY in the same year, and the GVA from this field is estimated at 3.1 billion JPY/year, which constitutes about 1% of that amount.

Therefore, compared with the total annual GPP of Akita Prefecture, the estimated GVA of Akita's OSW projects is small, though not insignificant. However, at a sectoral level, some specific sectors are expected to experience slightly greater benefits.

5.3 POTENTIAL SCENARIO

5.3.1 RESULTS WITH "POTENTIAL" RATES

Table 16 shows the economic ripple effects estimated under the "potential" scenario. With the rates, the estimated amount of the GVA was about 570 billion JPY, and the induced amount of employment was about 52,000.

Similarly to the "possible" scenario, business services were found to play an essential role in the economic impacts of OSW. The estimated GVA was approximately 290 billion JPY in this sector, which accounts for over 50% of the total. In terms of the employment effects, this sector is estimated to have about 30,000 more workers, which accounts for about 58% of the total number of the estimated job creation.

Likewise, construction also contributes to the economic impacts. The estimated GVA of this sector was about 94 billion JPY. This figure is the second largest, accounting for about 16% of the total. The employment effect of this sector is 9,303, approximately 18% of the estimated job creation.

5.3.2 POSSIBLE-POTENTIAL COMPARISON

The estimated GVA with potential rates, of about 570 billion JPY, is almost 1.6 times as large as the result with possible local procurement rates (357 billion JPY). Similarly, the employment effects (51,908) increased by 52% from the results with possible rates (33,999).

The most significant factor affecting outcomes is the rise in final demand within the business services sector, from 166 billion JPY to 290 billion JPY. Over half of the increased GVA (about 210,000 million JPY) is due to business services, driven by a 23.3% rise in local procurement rates for generation O&M, which make up 17% of total costs. Development expenditure procurement rates, especially for assessment jobs, also contribute, including geophysical and geotechnical surveys (3.2% of the total costs). The final demand for nonferrous metals rises from zero to 20,000 JPY, driven by local sourcing of small engineering components in Akita Prefecture, increasing the WTG supply rate to 4.5%. This represents the second-largest

[105] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/uploads/public/archive_0000043842_00/R03/R03kenmin_kohyo.pdf

difference in final demand across sectors. Finally, increased local procurement rates in the onshore substation package and other O&M activities contribute to the larger GVA. The rates are expected to grow by 13% and 25%, respectively, resulting in increased production of 13 billion JPY in total.

Therefore, the comparison of the results between possible and potential local procurement rates suggests that additional efforts to increase local supply in the CapEx and OpEx phases can greatly contribute to economic benefits in the region.

TABLE 16 ESTIMATE OF GVA AND INDUCED EMPLOYMENT (WITH POTENTIAL LOCAL PROCUREMENT RATES)

Effects	GVA (million JPY)	Induced employment (persons in the projects' period)
Direct effects	408,970	38,402
Indirect effects (first ripple effects)	95,202	7,677
Induced effects (second ripple effects)	66,276	5,829
Total	570,449	51,908

5.4 OTHER ECONOMIC BENEFITS TO AKITA PREFECTURE

As mentioned previously, the values obtained in this study focus solely on the Gross Value Added directly from the development, construction, operation, maintenance, and decommissioning of the offshore windfarms in Akita Prefecture. In reality, further economic benefits are expected to the local communities within the prefecture, though detailed quantitative analysis have not been provided here.

For instance, project developers from Round 1 and 2 projects have included plans for regional revitalization. These range from measures such as establishing electricity retail agencies within the prefecture to sell the generated electricity to local companies, using the network of general trading houses to sell local produce across Japan, and support for local entrepreneurs.

Under the auction framework the developer consortium is required to make contributions to a fund for symbiotic prosperity with local communities and fisheries. For the Round 1 projects, the total contributions were set at 0.5% of the expected income from electricity sales over the 20-year operational period. However, with view of providing greater certainty to the local stakeholders in the face of fierce price competition in the auctions, this was amended from Round 2 onwards to use the formula of: total project capacity (kW)×length of occupancy (30 years)×250 JPY. Therefore, for the five auction areas (including Akita City coast), assuming a 30% capacity factor for the Round 1 projects and no change to the Round 1 tariffs, the total contributions to such funds across Akita Prefecture is expected to reach over 12 billion JPY. The use of such funds will also be expected to generate further ripple effects for the local economy.

Tax revenue is also expected to increase from offshore wind related activities. Additional corporate business tax and corporate municipal tax payments to prefectures and municipalities are expected from the establishment of new offshore wind related businesses. Further, fixed asset tax revenue from offshore windfarms is expected to be significant due to the scale of the projects. Over the 20-year operational lifetime of the windfarms, the fixed asset tax for each windfarm is expected to on the scale of tens of billions of Japanese yen. For example, the total fixed asset revenue for the 845 MW Yurihonjo coast project has been estimated to be approximately 20 billion JPY[106]. However, it should also be noted that there will be some associated reduction in the central government tax allocated to the local governments which will somewhat counteract the increase in tax revenue outlined above.

[106] Yurihonjo City. (2023). https://www.city.yurihonjo.lg.jp/1001504/1002001/1003993.html

Section 6

Discussion

6 DISCUSSION

6.1 COMPARISON WITH EXISTING GVA STUDIES

6.1.1 PROCUREMENT RATE

As explained in the earlier section, this study analyses the economic effects of OSW in Akita with more refined local procurement rates, updating data collected from the latest literature and interviews with stakeholders. The estimates from this study were compared with those from Akita Prefecture's prior study, which provides the only publicly available local procurement rates based on empirical data (see Section 3.3.1).

Figure 22 illustrates the comparison of the local procurement rate with the Akita Prefecture's study published in March 2022 (See Table 6)[107]. CapEx (incl. DevEx) shows a negative trend, decreasing by 4.1 points from a study by Akita Prefecture (Mar 2022). One potential reason for this decline is the increased challenges associated with future offshore wind projects, particularly in terms of offshore construction. The project areas in Akita and Noshiro Port, which formed the basis of the local content assumptions for the prior 2022 Akita Prefecture study, are small scale projects located in sheltered port areas. As the project size and complexity increase, the offshore components (predominantly turbine and foundation EPCI) with limited scope for involvement of local companies increase in cost disproportionately to scopes with higher local content such as onshore construction. Therefore, when considering the full pipeline of Akita Prefecture through to 2030 and beyond, there is a possibility for the local procurement in CapEx to fall below expectations in the Akita Prefecture report. Further, the rate for CapEx is further reduced once DevEx is excluded. As Figure 23 shows, the local procurement rate of CapEx itself is 4.6%, which is 7.4 points lower than Akita Prefecture's prior study (12%). Given that the rate is 7.1 even for the potential value, the rate set by Akita Prefecture's prior study may not fully reflect the nature of the upcoming auction round project.

Meanwhile, the rate for OpEx is 5.1% higher than Akita Prefecture's prior study (22.1%). This is reflective of the recent progress within Akita Prefecture in developing O&M capabilities, through the establishment of new companies such as Akita Maritime Service and Japan Offshore Support. The rate is predicted to have a relatively high potential to grow further, reaching 45% (See Section 4.3.3 for further details). This indicates that it is feasible for Akita Prefecture to enhance economic effects by developing its local industry to serve in the O&M phase.

The estimated DecomEx procurement rate is also higher than in the Akita Prefecture study. While the rate was set as 12% in the Akita Prefecture's study, both the "possible" and "potential" identified the rate would be 48.1 points higher (60.1%). The Akita Prefecture's study assumed the same local content as for CapEx. However, the significant contribution for procurement of turbines and foundations from outside Akita (and likely Japan) within the CapEx is not included within the decommissioning scope and hence higher local procurement can be expected. The rates are same between possible and potential scenario as Akita Prefecture is expected to be able to maximise the local procurement for this item.

[107] Akita Prefectural Government. (2022). pref.akita.lg.jp/uploads/public/archive_0000010638_00/senryakukaiteirev2.pdf

FIGURE 22 COMPARISON OF LOCAL PROCUREMENT RATES

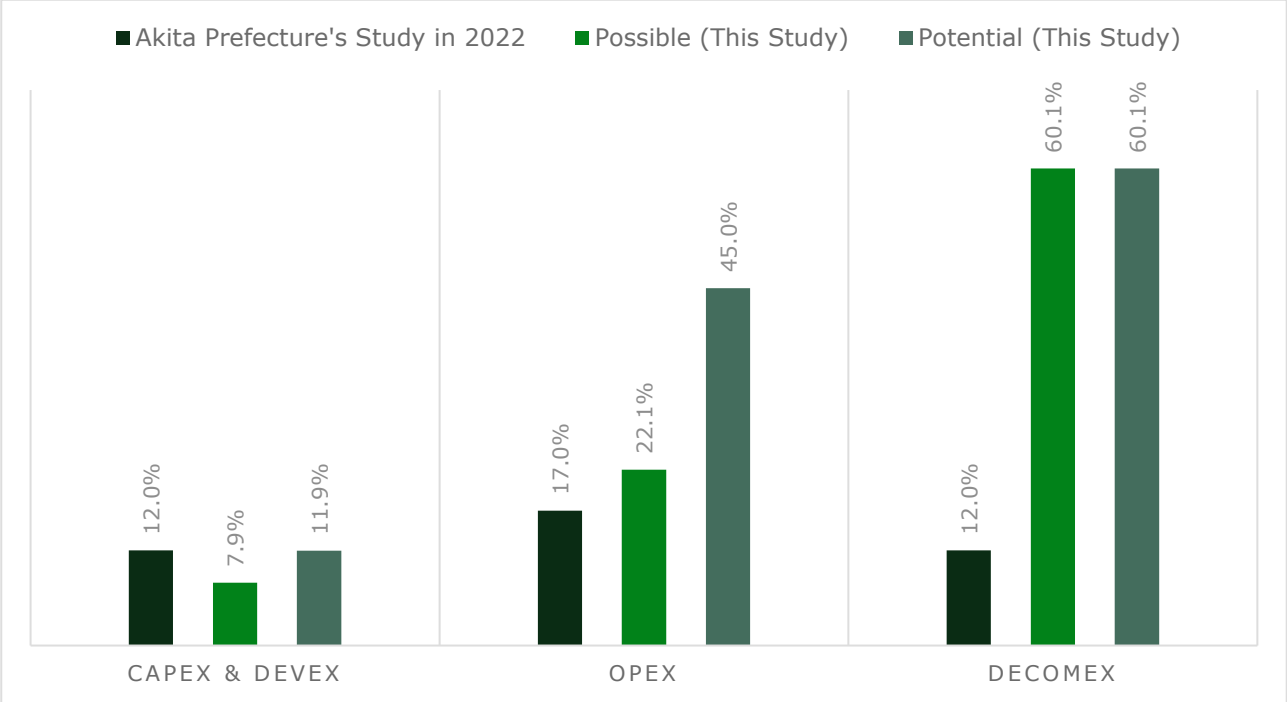
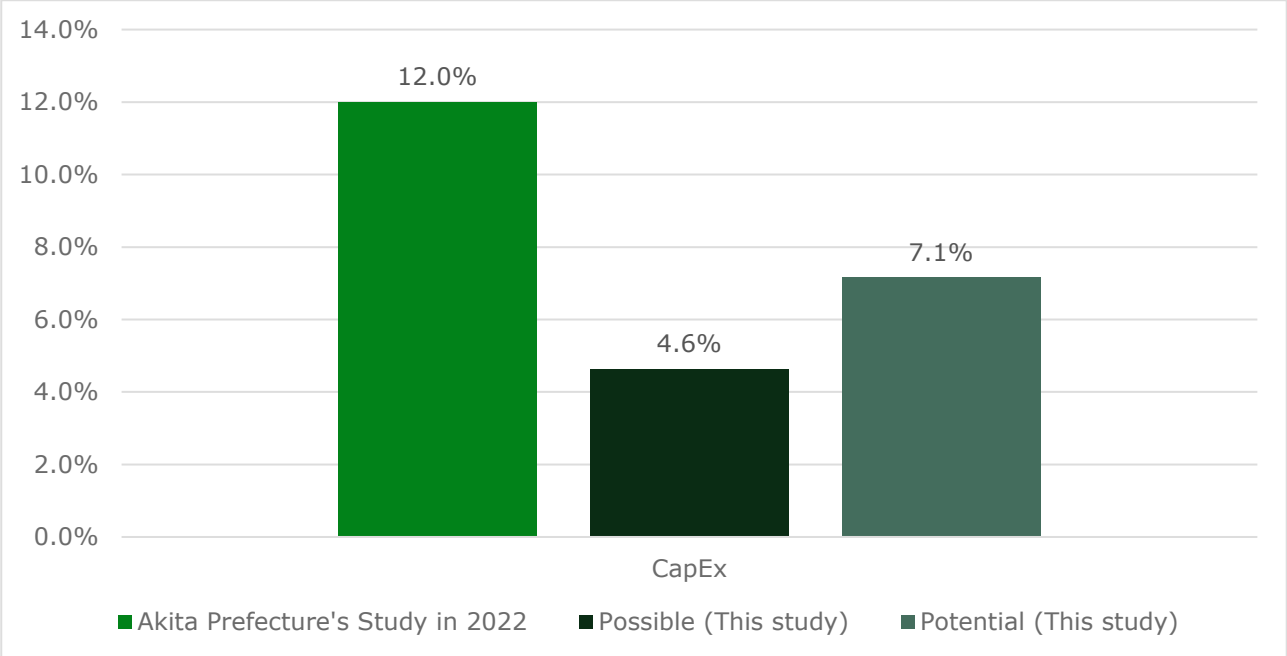


FIGURE 23 COMPARISON OF LOCAL PROCUREMENT RATE OF CAPEX (EXCLUDING DEVEX) WITH AKITA PRECTURE'S STUDY



6.1.2 GVA

The GVA figure of 382 billion JPY calculated in Akita Prefecture's study is greater than the value of 356 billion JPY obtained under the "possible" scenario (summarised in Table 17). This is despite this study including two additional projects in the scope.

As explained in Section 6.1.1, the procurement rates of this study were higher in DecomEx and OpEx, while CapEx (incl. DevEx) was 4.1 points lower. The small difference in the CapEx procurement rates however significantly impacts the final demand value. Since CapEx accounts for about 70% of the total costs, a small increase in the local procurement rate in CapEx can

produce large increases in the demand value. As the estimation with potential local procurement shows, for example, a few percentages of improvement in this category can result in additional production of over 20 billion JPY.

6.1.3 INDUCED EMPLOYMENT

Induced employment effects showed the same pattern as GVA. The total number of induced employments from the six Akita OSW projects was 37,597 in Akita Prefecture's study, while 33,999 including eight projects in this study. The reason for this difference is the same as above due to the relationship between the GVA and employment values within the IO model.

TABLE 17 COMPARISON OF GVA RESULTS BETWEEN AKITA PREFECTURE'S STUDY AND THIS STUDY (POSSIBLE SCENARIO)

Studies	Project number included the scope (projects)	Final demands (million JPY)	GVA (million JPY)	Induced employment (persons)
Akita prefecture – Base	6	268,640	382,100	37,597
This study ("possible" scenario)	8	252,733	356,022	33,999

In conclusion, it is essential to locally procure CapEx and OpEx to improve the regional economic effects. CapEx and OpEx dominate the largest parts of the cost composition in OSW projects in Akita, having the biggest impacts on the five specific sectors: business services, construction, steel, and electrical and general-purpose machinery. However, the current CapEx local procurement rate in this study is low. The figure for WTG supply is 0% and monopile supply is 1.7%. In spite of the higher rate for Opex and DecomEx and with a greater number of offshore wind projects considered in this study, the estimated final demands and GVA were lower than Akita's. Therefore, a strategy which maximises the existing capabilities of the local supply chain within Akita Prefecture is required to increase the economic impact of offshore wind.

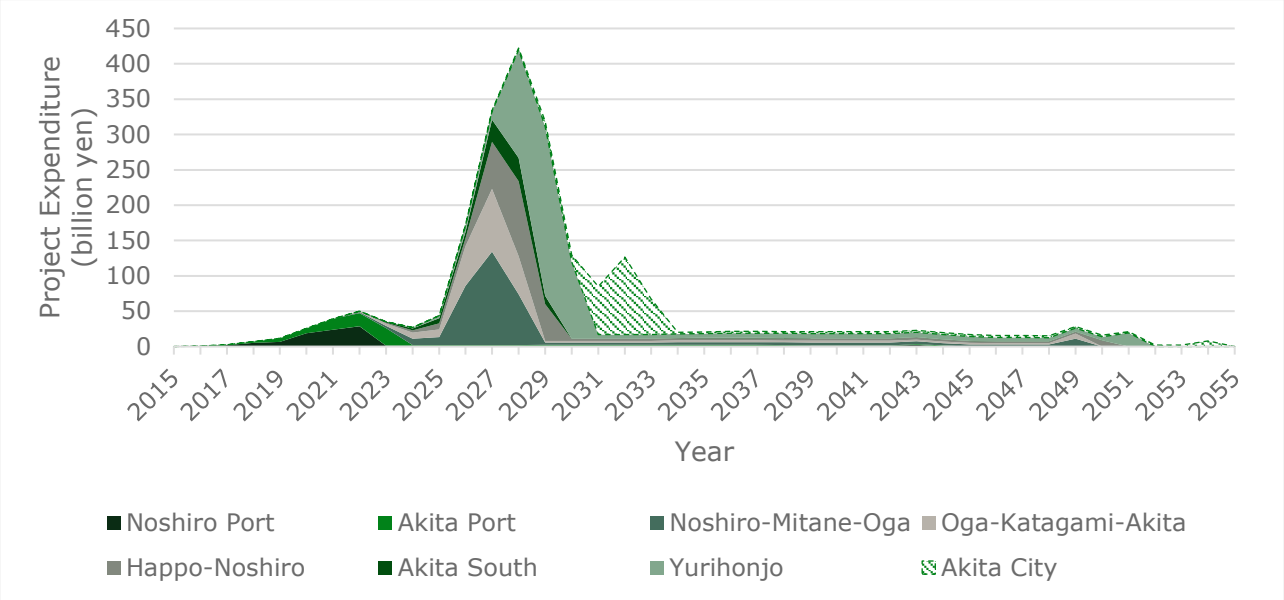
6.2 ENSURING LONG-TERM OPPORTUNITIES FOR AKITA PREFECTURE'S SUPPLY CHAIN

Under the Renewable Energy Sea Area Utilisation Act, developers are permitted to occupy their designated offshore wind sites for a period of 30 years. Offshore windfarms therefore that allow long-term partnerships to be formed with the local communities and industries. However, the expenditure of offshore wind projects is heavily concentrated in the pre-operation phase, with the DevEx and CapEx of the eight offshore wind projects combining to be over 78% of the total cost of the projects, as outlined in Figure 17. When considering the estimated expenditure of the eight projects by year, as shown in Figure 24, based on estimation from LEnS™, the total annual spending on offshore wind projects in Akita Prefecture is expected to peak in 2028 (assuming the original schedule of the Round 1 projects) at 420 billion JPY. From 2031 onwards (excluding the Akita City project coast for which the development timeline is as yet unknown), the remaining expenditure of offshore wind projects is limited to the operation

phase, averaging approximately 20 billion JPY annually, and eventually, any costs related to decommissioning.

Theoretically, if the target COD of the Round 1 (Noshiro-Mitane-Oga, Yurihonjo), Round 2 (Oga-Katagami-Akita, Happo-Noshiro), and Preparatory Stage (Akita City) projects were each staggered by 3 years, the peak annual expenditure can be reduced to 250 billion JPY. This could also provide over 50 billion JPY in annual expenditure for 15 consecutive years. Such management of the overall offshore wind construction schedules could help to avoid local supply chain bottlenecks, such as what has been seen in port availability for Happo-Noshiro, and thus increase local procurement and gross value added to Akita prefecture. However, this must also be balanced with ensuring that the short-to-medium term demand is sufficient for the expansion of supply chain capabilities to be considered as an attractive option for the local companies

FIGURE 24 TOTAL EXPECTED PROJECT EXPENDITURE IN AKITA PREFECTURE BY YEAR



Based on the current deployment plans, from the perspective of long-term, sustainable involvement of local businesses in offshore wind projects, companies must seek to maximise the local procurement of O&M related services. Thus far, many companies in Akita Prefectures have commenced initiatives related to O&M, including the establishment of "Akita Maritime Service" led by Ohmori Construction and the management of CTVs by Akita OW Service. Such companies must ensure that they are suitably positioned to participate in the operation phases of the offshore wind projects once they have completed construction to realise the "possible" economic ripple effects calculated in this study. Local companies have experience in providing O&M services for onshore and offshore BoP for the Akita and Noshiro Port projects but there is potential for further expansion into maintenance of turbine components such as blade inspection. Extensive dialogue with turbine manufacturers and prefectural support with contracting and vendor registration is expected to be key.

As discussed above, the procurement and construction phases included within the CapEx account for a large majority of the costs involved in offshore wind projects. Thus, increasing local procurement of CapEx components (beyond the values of 4.6% indicated under the "possible" case in the study) could potentially unlock significant economic ripple effects for the prefecture. The current procurement rates remain low though due to the lack of capabilities

within Akita Prefecture to cover manufacturing of major components or key construction packages, with involvement limited predominantly to supply of minor parts and onshore construction works. Therefore, any further participation of local businesses in the CapEx phase is expected to require significant investments and efforts which may be difficult to justify, considering the lack of long-term certainty beyond 2030.

To increase the potential for return on investment, there are two main methods to increase the pipeline of projects accessible to the Akita offshore wind supply chain. First is to accelerate considerations regarding the "second-row" fixed-bottom offshore wind projects, progressing the identification of and discussions with relevant stakeholders to prepare the sites for tender under METI's auction framework. These projects, in combination with the Akita City coast site, could offer a healthy pipeline of projects for the next 10+ years, minimising any risk to potential investments local companies may make to increase their internal capabilities.

The second method is to minimise the existing barriers for companies within Akita Prefecture to participate in offshore wind projects in other, neighbouring prefectures. Under the current auction guidelines, scoring is attributed to "economic ripple effect to the region" which encourages each auction participant to maximise the utilisation of local companies within each prefecture. Therefore, this system encourages the development of separate supply chain ecosystems within each prefecture. In the Round 3 auction results, announced in December 2024, sites were awarded in Aomori Prefecture and Yamagata Prefecture (both neighbouring Akita Prefecture) with developers indicating their plans for growing the respective local wind power industries. Through more holistic supply chain planning across both the region and nationwide, local companies will be able to access a wider market, with a longer-term pipeline of offshore wind projects to increase potential for returns on any investments. For the wider offshore wind market in Japan, this could also increase competition and drive technological innovation and cost reductions in the longer term.

Further, through consultations it was identified that within Akita Prefecture, there is currently little coordination between the Round 1 and Round 2 consortia regarding development of a supply chain hub in Akita Prefecture. To maximise local procurement and thus economic ripple effects, a unified approach is required to create a supply chain hub to service not just projects in Akita Prefecture but also in the wider Tohoku region, perhaps extending even to Hokkaido Prefecture and the Hokuriku region. Such initiatives must be led either by the national government or through partnerships between the prefectural governments to coordinate between the various developers and supply chain companies.

Finally, the formation of a regional supply chain hub is more likely to attract major suppliers to establish bases within the Tohoku region, allowing relationships with local companies to form. A model case for such partnerships is the formation of the joint venture "Japan Offshore Support" between NYK Line and Akita Eisen to operate CTVs in Akita Prefecture. Such initiatives help to expand capabilities of local companies and can drive further increases in economic ripple effects to Akita Prefecture. However, it must also be ensured that the introduction of major suppliers from outside the prefecture does not harm local companies through actions such as talent poaching. Collaborative approaches such as worker dispatch and recruiting talent from outside the prefecture can be mutually beneficial.

Any potential capabilities in offshore wind related component manufacturing developed through the establishment of a supply chain hub will in turn be expected to contribute to increased local procurement in the O&M phase through parts repair and replacement. However,

due to the limited market size for offshore wind within Akita Prefecture and Japan currently, any major manufacturing facilities will need to have ambitions to be internationally competitive, across the APAC region or even globally.

There are several cases of such offshore wind supply chain hubs that have been established in Europe. For example, the Teesside and Humber regions in the UK have developed into two of the most prominent offshore wind clusters globally, through the government's 95 million pound (8 billion JPY)[108] investment in construction of two new port facilities[109]. The two sites were designed to house up to seven manufacturers, creating 6,000 new jobs. Key drivers for the formation of these supply chain clusters include the UK Government's ambition for offshore wind, as seen by its 43-50 GW target by 2030, comprehensive financial incentives such as subsidies and grants from government, and the proximity of the regions to multiple offshore windfarms in the North Sea. However, a similar level of commitment to the offshore wind sector has not yet been seen by the Japanese government to allow for the establishment of such offshore wind clusters domestically.

Thus, in view of ensuring the sustainable success of businesses in Akita Prefecture, supply chain planning must be carried out with a long-term perspective. Involvement in O&M scope should be maximised to benefit from the 20-year operational periods of the offshore windfarms and investments for further entry into manufacturing and construction phases should be encouraged through providing a robust pipeline of offshore wind projects. Cross-prefectural partnerships should be pursued to inspire knowledge sharing and innovation and this requires a wider re-examination of the Japanese offshore wind supply chain strategy.

6.3 OFFSHORE WIND AS A COUNTERMEASURE TO POPULATION DECLINE

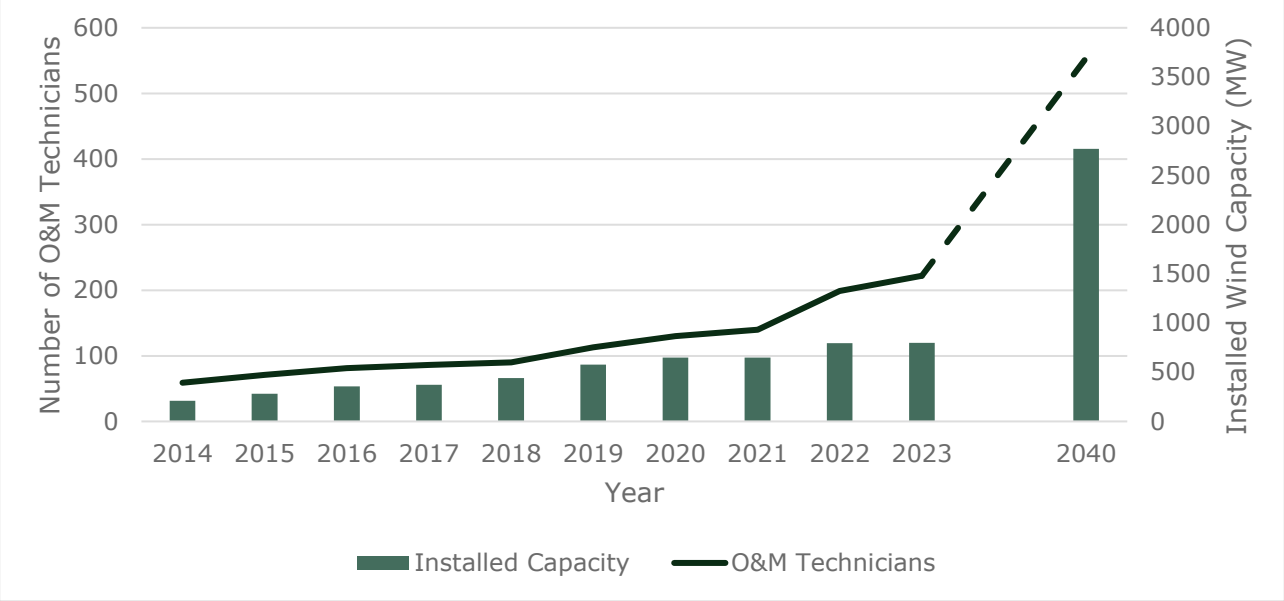
As discussed in Chapter 2, population decline is a major issue in Akita Prefecture. The prefecture has the highest values for decline rate, mortality rate, and proportion of elderlies, as well as the lowest birth rate throughout Japan. There are also high rates of net-out migration in Akita Prefecture and thus new industries such as offshore wind play a critical role in alleviating the depopulation rate. In particular, there is hope for offshore wind to generate a wide range of attractive, long-term employment opportunities to prevent the outflow of younger generations to metropolitan areas.

The input-output analysis report detailed in this report estimates that, across eight offshore wind projects spanning the 38-year period (as indicated in Figure 25), 33,999 jobs will be generated under the "possible" case and 51,908 jobs under the "potential" scenario. Averaging out over this lifecycle of offshore wind projects in Akita Prefecture (based on current plans), this equates to approximately 900-1400 jobs per year. This is a certain impact to Akita Prefecture created only from OSW industry, in which the number of new job opening was 90,877 in 2023 (See also Section 2.3.2)[110]. However, in line with the discussion surrounding the economic impact above, in reality most of these employment opportunities will be concentrated in the procurement and construction phase of the offshore wind project. For long-term employment, the O&M phase plays a critical role. Considering the commercial operation of the Round 1 and 2 projects by the end of the decade, there is therefore a strong opportunity for job growth in the coming years.

[108] 1 GBP = 197.40 JPY (January 2025).
[109] GOV.UK. (2021). https://www.gov.uk/government/news/second-wind-for-the-humber-teeside-and-uk-energy-industry
[110] Ministry of Health, Labour and Welfare. (2024). *002084056.pdf pp.15

As shown in Figure 25 below, in 2023 the total number of onshore and offshore wind turbine O&M technicians in Akita Prefecture was 222. Akita Prefecture's latest energy strategy document estimates that this number will rise to 550[111] by 2040 with the commercial operation of the awarded Round 1 and 2 projects (NEDO demonstration and Akita Coast projects excluded). However, it can be seen that to reach the employment figures estimated by the input-output analysis, other opportunities for local hiring in the O&M phase, in areas such as CTV operation or minor component repairs, must also be pursued and maximised.

FIGURE 25 WIND POWER O&M TECHNICIANS IN AKITA PREFECTURE



Source: Akita Prefectural Government (2024)

Further in relation to O&M opportunities, a 2023 study by the Japan Wind Power Association (JWPA) identified that annually approximately 2,900 personnel will require offshore safety training and 300 personnel will require maintenance work training throughout Japan by 2030[112]. Considering that just under half of the forecasted offshore wind capacity in Japan to be operational by 2030 is located within Akita (according to Mitsubishi's original Round 1 plans), this translates to significant demand within the prefecture. These figures are then expected to rise respectively to 7,900 personnel for offshore safety and 1,400 personnel for maintenance training by 2040. Considering the existence of Tohoku Electric Power Renewable Energy Service and NYK Line's training centres, and Akita's status as a leader in offshore wind, there is also significant potential for the prefecture to establish itself as a training hub for the domestic offshore wind market. Such measures to serve offshore wind projects outside of Akita Prefecture will further increase job creation opportunities. This can also act as a mechanism to attract young people from throughout the Tohoku region to gain OSW training in Akita prefecture, then potentially finding employment opportunities and relocating to live in the prefecture too.

[111] The scope included in this number is different from the estimated induced employment in business services sector presented in the Section 5.1.2. The estimated induced employment effects by IO analysis includes not only O&M workers, but also the employment in the sector demanded for both OSW projects (e.g., environment impact assessment works) and other economic activities produced by the ripple effects (e.g., goods and equipment rental services).
[112] JWPA. (2023). https://jwpa.jp/information/7798/

Additionally, in 2022 the number of job openings (90,877) actually exceeded the number of job seekers (45,645) by 99%[113] and hence more than just the availability of employment must be offered to persuade people in Akita to pursue careers within the prefecture, as well as potentially attracting talent from outside the prefecture. One key aspect is to ensure that there is a sufficient support infrastructure available for young people to obtain the relevant qualifications, as well as awareness of such schemes. Akita Prefecture and some municipalities currently offer financial support which can be used for training courses in line with Global Wind Organisation standards which should be continued and potentially grown. Further, measures such as the expansion of university programs related to offshore wind, as well as the creation of internship opportunities and visits to the operational offshore windfarms will be expected to be key to encouraging graduates to consider a career in Akita's offshore wind industry.

Therefore, a united vision between governments, academia, developers, and supply chain companies within Akita Prefecture is critical to maximising the facilitation of local employment in offshore wind. If this leads to increased awareness of the attractive jobs that are created, offshore wind will be expected to be able to play a role in mitigating against the depopulation currently seen in Akita. This effect may be increased considerably if the prefectural government is also able to attract other industries to the prefecture and create new jobs which utilise the clean electricity generated by offshore wind.

6.4 ATTRACTING BUSINESSES TO AKITA PREFECTURE THROUGH ACCESS TO CLEAN ENERGY

The economic ripple effect calculated in this study deviates from the values presented by the developers of the Round 2 offshore wind projects off the coast of Akita Prefecture (See Table 6). This is primarily due to the difference in scope included within the input-output analysis, with developers considering additional measures for regional revitalisation within their estimations. This discrepancy reveals the significant additional impact that offshore wind project related initiatives can contribute to Akita Prefecture's economy.

By 2030, nearly 50% of operational offshore wind capacity is expected to be located within Akita prefecture's waters and combined with their strengths in onshore wind and geothermal power, the prefecture is well positioned to be domestic leaders in clean energy. As the drive for RE100 continues to gain momentum globally, Akita's prefectural government is therefore looking for ways to achieve "local production and local utilisation" of this green electricity. This includes plans for a "Renewable Energy Industrial Park", outlined in Figure 26. There is a vast area of prefectural land on the inland side of the onshore wind turbines along Akita Port, and to the south of a campus of Akita Prefectural University[114]. The prefecture is advancing plans to develop a "Renewable Energy Industrial Park" (Shimoshinjo District Industrial Park) in this area. The development area covers approximately 500,000 m², of which about 250,000 m² will be designated as industrial land to attract businesses, while the remaining areas will be allocated for roads, parks, and retention basins.

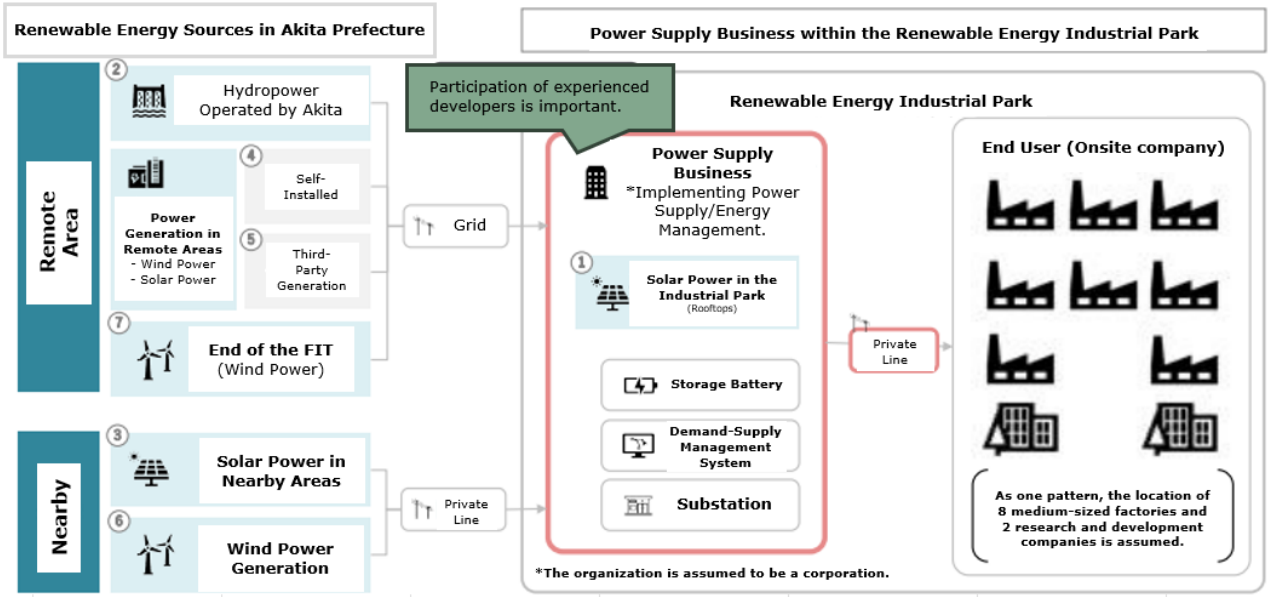
The prefecture anticipates the establishment of various sectors, including electronic components, medical devices, information technology, new energy industries, data centres, and research and development enterprises. It plans to begin supplying renewable energy electricity starting in fiscal year 2028.

[113] Ministry of Health, Labour and Welfare. (2023). 001469247.pdf pp.6
[114] Nikkei BP. (2023). https://project.nikkeibp.co.jp/atclppp/PPP/434167/080800255/

The amount of renewable energy required will vary based on the anticipated demand from tenants. The prefecture is conducting calculations based on three scenarios: "approximately 10 medium-sized factories and research and development companies," "approximately 20 small factories," and "data centres and medium-sized factories." In the case with the smallest power demand—focused on small factories—the peak power requirement is expected to be below 8,000 kW, with an annual demand of 50 million kWh. Conversely, the scenario with the highest demand—encompassing data centres and medium-sized factories—forecasts a peak power requirement of about 80,000 kW and an annual demand exceeding 600 million kWh.

While the prefecture aims to attract companies to the Renewable Energy Industrial Park, it plans to begin electricity supply from solar and prefectural hydropower facilities on-site and in nearby areas starting in 2028, gradually increasing the supply as off-site renewable energy resources become operational after 2030[115]. Keeping in mind the challenges of stable electricity supply and ensuring business viability, considerations will include the structure of the implementing entities and the presence of storage batteries.

FIGURE 26 CURRENT PLANS FOR THE RENEWABLE ENERGY INDUSTRIAL PARK



Source: Akita Prefectural Government[116]

The national government is also pursuing the development of industrial clusters utilising decarbonised power sources under their GX (Green Transformation) Industrial Location framework. Therefore, the offshore wind projects off Akita's coast offer an opportunity for Akita to also become a leading case within Japan's broader GX strategy. Therefore, ensuring such plans for the local consumption of the energy generated offshore, rather than simply exporting to metropolitan areas, will play a pivotal role in the revitalization of Akita Prefecture.

6.5 RELIABLE DELIVERY OF OFFSHORE WIND PROJECTS

The potential socioeconomic impacts of offshore wind in Akita Prefecture discussed throughout this report rely on the successful execution and commencement of operations of the offshore wind projects. Further, a reliable delivery plan of the projects is critical for local offshore wind supply chain to be able to make the necessary investments and preparations to achieve the

[115] Nikkei bp. (2023). https://project.nikkeibp.co.jp/atclppp/PPP/434167/080800255/
[116] Akita Prefectural Government. (2024). https://www.pref.akita.lg.jp/pages/archive/81211

"potential" economic ripple effects. The successful completion of all the projects is critical for the economic impact of offshore wind projects in the prefecture. The Japanese government has recently announced a one-time amendment to FIT and FIP prices to reflect up to 40% increases in commodity prices which could help to alleviate the impacts of factors such as "inflation, the depreciation of the JPY, tight supply chains and rising interest rates". Generally, projects suffering from increased project costs can also impact involvement of local supply chain which is often the higher cost option.

The review of Akita's round 1 project plans may also offer a valuable opportunity to reassess the supply chain plan in Akita Prefecture. As seen in Figure 24, the construction period of the Round 1 and 2 projects had been expected to overlap, leading to potential constraints within Akita Prefecture's supply chain in terms of both supply capability and manpower availability. As an example, the Round 2 Happo-Noshiro project was required to utilise Muroran Port in Hokkaido Prefecture as a marshalling port for turbine installation due to both the Akita and Noshiro base ports being occupied at the required time. Hypothetically, if project schedules for the offshore wind projects in Akita Prefecture were to be adjusted, more sustained supply chain demand, rather than an instantaneous peak, could be beneficial for further increasing the economic benefits of offshore wind to Akita Prefecture. Further, with the Round 3 projects awarded in Yamagata Prefecture and Aomori Prefecture also aiming for COD by 2030, holistic planning of the offshore wind project schedules is required to ensure the capabilities of the regional supply chain are being reflected.

Section 7

Conclusion and Recommendations

7 CONCLUSION AND RECOMMENDATIONS

Over the last decade, Akita Prefecture has emerged as a leading region in Japan's offshore wind sector. In this report, the economic ripple effect of offshore wind plans in Akita Prefecture has been evaluated through detailed research and over a dozen interviews with key stakeholders within the prefecture's offshore wind sector. This study was able to consider the effects of recent developments in Akita Prefecture's offshore wind industry, including the award of Round 1 and 2, the commercial operation of Akita and Noshiro Port projects, and the review of Mitsubishi Corporation's two projects. Through the calculation of the expenditure of eight offshore wind projects in Akita Prefecture, estimation of "possible" and "potential" prefectural procurement rates, and allocation of costs to relevant industry sectors, input-output analysis was carried out.

The results show that an economic ripple effect of 356 billion JPY is expected under the "possible" case and 570 billion JPY under the "potential" case, corresponding respectively to estimates of 33,999 and 51,908 jobs created. These are consequential contributions to the economy of Akita Prefecture, however, the "possible" GVA falls below the figure of 382.1 billion JPY calculated by the prefectural government in 2022.

The development of a new industry offers significant opportunities for regions such as Akita where the effects of the ageing society and depopulation are expected to have increasing impacts in the near future. Hence it is critical to ensure local companies are given the maximum opportunity to contribute to offshore wind related businesses. Below are six key recommendations to further increase the economic benefits which offshore wind can offer to Akita Prefecture.

1. **Maximise the involvement of local companies in offshore wind O&M.**
   Offshore windfarms with 20+ year operational lifetimes provide long-term, sustainable opportunities for involvement of local businesses in O&M related activities. Companies in Akita Prefecture have thus far been involved in O&M of the operational Akita and Noshiro Port projects, and further initiatives are making progress, such as the establishment of Akita Maritime Service and Japan Offshore Support in recent years. The prefectural government's continued support of dialogue between local businesses and developers/suppliers is of the upmost importance, to ensure every O&M opportunity for companies in Akita Prefecture is capitalised upon.

2. **Expedite discussions to provide a more sustainable, long-term offshore wind pipeline in Akita Prefecture.**
   Based on current plans (subject to updates regarding the Round 1 projects), construction of offshore wind projects in Akita Prefecture is set to be completed by 2030. From the view of local supply chain companies considering investments to expand their capabilities, this presents significant uncertainty in the long-term opportunities in offshore wind. The Akita City coast site was newly added to METI's offshore wind pipeline in 2024, but the confirmation of further project plans will help to minimise perceived risks for suppliers in the prefecture. The national and prefectural government, in coordination with the respective municipalities, should progress stakeholder identification and discussions regarding the "second-row" fixed-bottom projects as well as floating opportunities. The creation of a prefectural 2040 offshore wind installation target could also be considered. Further, a more flexible approach which allows for the staggering of construction timelines could create a greater period of sustained demand to match the capability of the local

supply chain. Such measures will provide greater assurance to local companies who are considering further investments to meet the demand of offshore wind projects.

3. **Coordinated approach to supply chain development in Akita Prefecture.**
   Currently, there are five offshore wind projects totaling over 2 GW under development by four different consortia off the coast of Akita Prefecture. All projects have developed plans which aim to expand involvement of local supply chain companies. However, thus far each developer has been pursuing these plans separately with minimal coordination, leading to missed synergy opportunities across projects. The developers, with support from the prefectural government, must form a framework for collaboration and knowledge sharing to expand the capability of the prefecture's offshore wind supply chain, in working towards the shared goal of successful project execution and positive impact to Akita Prefecture.

4. **Multi-prefectural supply chain planning to serve the Tohoku region and beyond.**
   In December 2024's Round 3 announcement, offshore wind sites were awarded in the neighbouring prefectures of Yamagata and Aomori along the Sea of Japan coast. Mutual cooperation between supply chain companies in each prefecture could allow for development of capabilities to maximise regional involvement in the offshore wind projects. However, this would require a transition away from the current system which considers supply chain development at a project-by-project level. The national government, in collaboration with the respective prefectural governments, must lead holistic offshore wind supply chain planning, including the possibility of an internationally competitive supply chain hub to serve the entire Tohoku region and beyond. Improved accessibility to projects in neighbouring prefectures will also benefit suppliers in each prefecture in terms of greater clarity on longer term opportunities.

5. **Implement a human resource development plan to connect people to employment in Akita's offshore wind sector.**
   Akita Prefecture's offshore wind human resource strategy outlines medium-term measures to train the necessary personnel for offshore wind projects. The strategy includes measures such as lectures and internships aimed at students and employment matching initiatives. The successful implementation of the program, and its long-term application relies on coordination between the relevant stakeholders from industry, academia, government, and the private sector. The establishment of Akita Prefecture as a training hub for offshore wind personnel could also generate additional employment opportunities, as well as attracting young professionals to the region. Ensuring the uptake of local offshore wind related jobs is crucial to maximising the economic impact of the new industry, particularly in Akita Prefecture's context of combatting depopulation.

6. **Maximising the auxiliary economic benefits of offshore wind.**
   In order to capture the full economic impacts of offshore wind, initiatives beyond the development, construction, and O&M of the individual windfarms must be considered. Akita Prefecture has emphasised the importance of "local production and local consumption" of the electricity generated from offshore wind to attract businesses. The prefectural government, in alignment with the national government's GX strategy, must ensure the successful implementation of the planned "renewable energy industrial parks" and other related initiatives in order to maximise the reach of the economic ripple effects of offshore wind.

The growth of offshore wind in Akita Prefecture offers significant opportunities for regional revitalization, particularly with the challenges of ageing societies and depopulation which are shared by many other prefectures throughout Japan. Akita Prefecture has emerged as a domestic leader in offshore wind and has the opportunity to be a model case for the rest of the country. The prefectural government, municipalities, and local companies have gone to great lengths thus far to ensure the offshore wind projects will provide significant benefits to the people and communities of Akita. As offshore wind projects in Akita Prefecture prepare to commence construction in the coming years, certain challenges have also come to light, as seen with Mitsubishi Corporation's "review" of the Round 1 projects. The momentum for offshore wind in Akita Prefecture must be sustained to maximise the economic ripple effects over the coming decades.

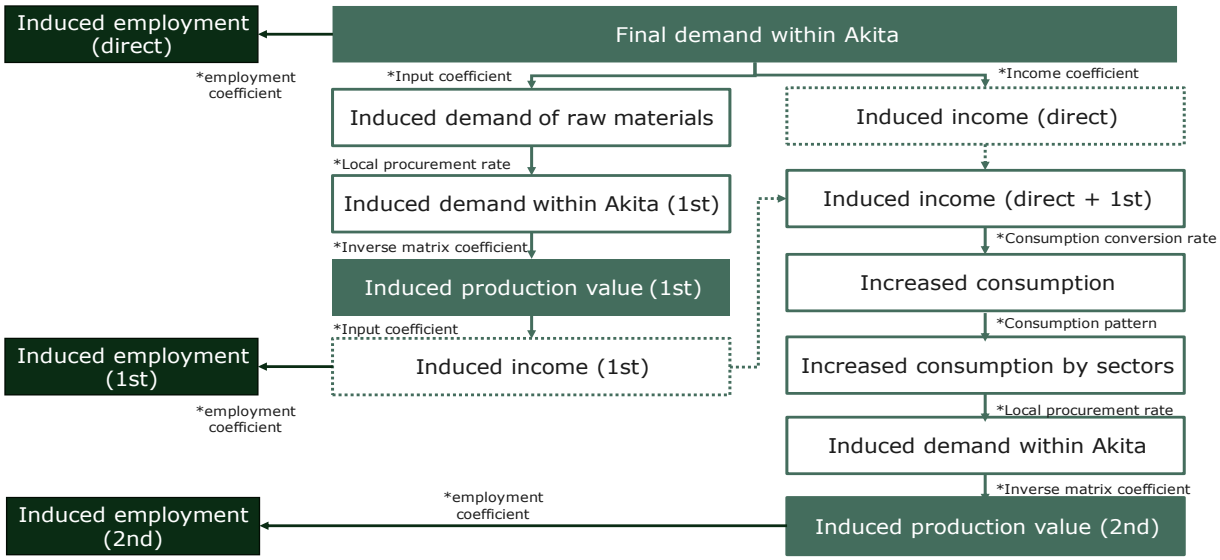
To this end, further opportunities have been identified in this report for the national and local government, project developers, and other stakeholders to take the lead on developing a holistic, long-term, and sustainable supply chain plan within Akita Prefecture. It is hoped that the results and recommendations of this report will contribute to promoting further discussion in Akita Prefecture to achieve the "possible," and working towards the "potential" of the local offshore wind sector.

Appendix A

Description of Akita's Input-Output Analytical Tool

APPENDIX A DESCRIPTION OF AKITA'S INPUT-OUTPUT ANALYTICAL TOOL

FIGURE 27 CALCULATION FLOW OF GVA AND INDUCED EMPLOYMENT



GVA

The GVA can be calculated by summing the final demands (direct effect), the GVA from the indirect effect (first ripple effect), and the induced effects (secondary ripple effect). Figure 27 CALCULATION FLOW OF GVA AND INDUCED EMPLOYMENTdescribes this calculation approach. Final demands within the prefecture reflect the locally procured costs associated with Akita's offshore wind projects. This includes development expenditure (DevEx), capital expenditure (CapEx), operation expenditure (OpEx), and decommission expenditure (DecomEx). By multiplying the final demand value by the input coefficient and the local procurement rate, the GVA (first ripple effect) can be determined. Next, the increased income generated from direct and indirect effects is calculated by multiplying each effect by the income coefficient. The increase in demand within Akita is then determined by multiplying this value by the consumption conversion rate and the consumption pattern, which is further multiplied by the inverse matrix coefficient to identify the GVA (second ripple effect).

Induced employment

Induced employment can be calculated by simple multiplication of GVA by the employment coefficient. The total number of induced employment opportunities is determined by summing the GVA of direct, indirect, and induced employment.

All the necessary coefficients and rates are already incorporated into the calculation system. These include the input coefficient, employment coefficient, inverse matrix coefficient, income rate, local procurement rate, consumption conversion rate, and consumption pattern. The

consumption conversion rate was updated in March 2024, while all other data is based on 2015 figures, as the latest Input-Output table for Akita is from that year.

Appendix B

Breakdown of Cost Items

APPENDIX B BREAKDOWNS OF COST ITEMS

DevEx	Development	EIA Survey
		Fishery Impact Survey
		Wind Measurement And Metocean Survey
		Geophysical And Geotechnical Survey
		Engineering / Design
		Other DevEx
CapEx	WTG Supply	Nacelle
		Bearing
		Main Shaft
		Gearbox
		Generator
		Power Takeoff Mechanism
		Control System
		Yaw System
		Yaw Bearing
		Nacelle Auxiliary System
		Nacelle Cover
		Other Engineering Components
		Bolt
		Blade
		Hub
		Blade Bearing
		Pitch System
		Spinner
		Rotor Auxiliary System
		Processed Steel Materials
		Steel
		Tower Internal Equipment
	WTG Transport	
	WTG Installation	
	FOU Transport	
	FOU Installation	
	FOU Supply (Monopile)	Monopile
		Transition Piece
		Corrosion Prevention Treatment
		Scouring Protection Material
	FOU Supply (Floating)	
	Mooring Supply (Floating)	
	Marine Operations (Floating)	
	Array Cable	Array Cable Supply
		Array Cable Laying Works
		Cable Laying Vessel

	HVAC: Off ExC	Offshore Export Cable Supply
		Offshore Export Cable Laying Works
		Onshore Landing Point
		Cable Laying Vessel
	HVAC: On ExC	Onshore Export Cable Supply
		Onshore Construction
	HVAC: OnSS Electr+Civils	Onshore Substation Supply
		Onshore Substation Electrical/Civil Works
	Project Management	
	Insurance	
OpEx	Generation OpEx	Human Resource Development
		Safety And Inspection
		Turbine Maintenance
		Balance of Plant Maintenance
		Operations Management - Offshore Logistics
		Operations Management - Onshore Logistics
	Transmission OpEx (OffSS OnSS, ExC)	
	Non-Technical OpEx	
Decommissioning	Generation Decommissioning	
	Transmission Decommissioning	

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