



# The impact and reach of the World Premier International Research Center Initiative: Results from a global reputation survey

Prepared on behalf of JSPS

## **The impact and reach of the World Premier International Research Center Initiative**

### **Report commissioned by:**

Japan Society for the Promotion of Science (JSPS)

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# Executive Summary

## Background

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### Background

The Japan Society for the Promotion of Science (JSPS) commissioned Springer Nature and Research Consulting to undertake a reputation survey focusing on the 13 World Premier International Research Center Initiative (WPI) centres, which are funded by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT).

The reputation survey seeks to:

- understand the views of academic experts, funders and policymakers about WPI centres and the programme;
- help WPI centres continue to adapt to a rapidly changing research environment and remain attractive research sites; and
- inform the preparation of a wider impact report, by complementing a bibliometric analysis.

### Methodology

The reputation survey was approached via semi-structured qualitative interviews, based on an interview questionnaire co-developed with JSPS and Springer Nature. Project contributors were identified and recruited in close collaboration with Springer Nature, and the findings arising from the interviews were analysed via thematic coding, using the NVivo software.

### Interviewees

66 stakeholders, comprising 55 academics, three editors and eight policymakers and funders, contributed to the reputation survey. Interviewees covered a wide range of countries and institutions. It should be noted that all academics involved had previous experiences with WPI centres.

## Perspectives from academics

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WPI centres deliver excellent science, but the broader WPI programme is not widely known

The reputation survey found that academics worldwide consider the science carried out at individual WPI centres to be excellent. However, the WPI brand is not broadly recognised: in the majority of cases, academics tend to remember the centre that is closest to their discipline. Awareness of a specific WPI centre tends to arise from one of three pathways: personal relationships, conferences and events, and academic literature published by WPI centres.

WPI centres are having an impact on the scientific community

Interviewees commented that WPI centres carry out science on par with other institutes at the highest level. Individual WPI centres are seen as contributing to the scientific discourse and having an impact on the scientific community, particularly by sharing leading scientific discoveries and building international connections that open up Japanese academia.

Curiosity-driven research and funding underpin uniqueness and reputation

Interviewees described the focus of WPI centres as “curiosity-driven research”, and the significant and long-term funding behind this is recognised as essential: the combination of these elements contributes to the uniqueness of the WPI programme and the fast rise of WPI centres on the global stage.

The scale of fusion efforts in the WPI programme is unique

WPI centres are seen as achieving their strategic drive to implement fusion. However, it must be recognised that this approach is now taken by most research centres worldwide and tends to be expected in most cutting-edge fields. Nevertheless, **the scale of fusion in the WPI programme is considered to be unique**: the fact that buildings for WPI centres were designed with fusion in mind is significant, as this enables and supports the **continuous exchange of ideas and cultures** alongside the periodic internal events organised to foster intellectual exchanges within a centre.

WPI centres are developing as globally connected research institutes

WPI centres have been exceptionally fast in their growth and have managed to build international profiles in a limited amount of time. They are consistently described as attractive to international collaborators and are seen as proactively seeking links beyond Japan. **Academics from all over the world value the opportunity to visit WPI centres, because they can have valuable interactions with other leading scholars.** However, WPI centres remain relatively young at this stage, and it is likely that more time will be needed for them to cement their presence in the global research enterprise.

WPI centres have a strong proposition to attract foreign academics

Interviewees described WPI centres as being very welcoming of international academics: **the use of English and the support provided to visitors are extremely valuable.** Collaborations with WPI centres are reported to be successful and productive for a range of reasons, including the **strong profiles of the Japanese PIs and scientists, the cutting-edge facilities and equipment, the quality of papers published by the centres and the very high quality of the science carried out.**

Academics are interested in different interactions with WPI centres based on their level of seniority

Attitudes towards the length of visits to WPI centres vary significantly based on an individual's career stage. Senior academics tend to prefer shorter visits, as they are responsible for managing their own research groups or centres at their home institutions, while early career researchers are open to longer stays, as they tend to have more personal flexibility.

There is potential for WPI centres to deliver long-term societal impact

Overall, WPI centres are perceived as having a positive impact on Japanese society and culture. This is clearly seen *in practice*, for example in the form of raising the scientific profile of Japan, enhancing international connectivity and engaging local communities. Furthermore, interviewees commented that there is *potential* for long-term impact, for example with regard to achieving scientific breakthroughs and creating opportunities for industry collaboration. We note that, in the case of some WPI centres, industry collaborations are already in place, which is a positive sign for the programme as a whole. Finally, in the context of long-term impact, **some contributors noted that funding for fundamental research is essential for continuous innovation and to enable scientific discoveries with transformational potential.**

## Perspectives from funders, policymakers and editors

Views on the WPI programme are positive, but awareness is very limited

In the reputation survey, it was very difficult to identify and engage funders, policymakers and editors, due to generally low levels of awareness of the WPI programme among these audiences.

Although the funders, policymakers and editors we interviewed are not actively involved in research, **they all considered the quality of the science at WPI centres to be very high.** There is also a general perception that **WPI centres have strong staff and are working in key areas of science.**

WPI centres have the potential to drive long-term change in Japanese academia

Funders, policymakers and editors noted that WPI centres employ more significant shares of international staff compared to other Japanese organisations and are seen as being more internationally open. In this context, a policymaker added that the research and administration approaches taken at WPI centres are “shaking the Japanese research system”. The opportunity to drive change is broadly recognised, but **any reform beyond individual WPI centres and their host universities will take time to materialise and is difficult to foresee.**

Opportunities for collaboration could be better leveraged

Funders and policymakers noted that current pathways to engaging with the WPI programme seem to be limited to events, exchanges and visits. **There is an opportunity for the WPI programme to have a broader range of interactions with foreign policymakers and funders, to potentially give rise to strategically important developments, such as mechanisms for substantive joint funding.**

The focus on long-term funding is key, and extensions past the 10-year timeframe may be appropriate

The focus on long-term funding is seen as very important. Policymakers and funders observed that comparable initiatives sometimes include an extent of permanent funding lines, and some noted that ambitious research programmes need secure funding to be able to take risks: **there is therefore a case for strengthening funding for WPI centres, particularly with regard to their overall duration.**

## Areas for improvement

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The WPI programme and centres could benefit from enhanced communications

Some interviewees noted that **it is difficult to find out how to engage with the WPI programme.** This is related to the WPI website but also to people’s ability to identify the processes to initiate a collaboration or an exchange programme.

The funding horizon for WPI centres might benefit from further extension

Achieving high visibility is a long-term endeavour and interviewees noted that long-term funding is key to success. **Some specified that a 10-year timeframe is not sufficiently long to establish and truly embed world-leading institutes,** so there is an opportunity to extend this upon periodic review of individual WPI centres.

The start-up and spin-off culture appears to be weak

**Start-up and spin-out company opportunities appear to be limited at WPI centres and were not mentioned often in the reputation survey.** Although this is not one of the strategic aims of the WPI programme, these types of organisations are a good means of showing the potential applications that can arise from fundamental research and may help raise awareness of the WPI programme and centres.

The focus on humanities and social science disciplines is limited

A minority of contributors noted that humanities and social science disciplines tend not to be reflected in the context of WPI centres. This is seen as a **potential gap and may have a negative long-term impact on the overall programme.** Since 2017, the WPI programme call for proposals does specifically acknowledge the social sciences, so this concern may be a reflection of how the WPI programme has been developing to date.

Cultural barriers may hinder the long-term success of the WPI programme

**The perceived gender diversity at WPI centres is limited,** particularly at the PI level, even if the centres are broadly seen as being more diverse than the average Japanese institution. **Similar considerations apply to national diversity,** and the majority of staff at the PI level remain Japanese. Furthermore, **many international staff see WPI centres as a stepping stone, and only a minority consider a long-term future in Japan.** Interviewees noted that visiting academics struggle to establish a career in Japan (due to language barriers and a struggle to integrate with the Japanese culture).

Cultural barriers may also apply to Japanese individuals and to the extent to which they spend time abroad, as this implies an extent of risk for their career.

## Final remarks

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The WPI programme is broadly delivering on its strategic objectives

The reputation survey has highlighted very positive developments with regard to the objectives of Science, Fusion, Globalisation and Reform. **Views of the WPI programme are unanimously positive across the board, and most interviewees wish to interact more with WPI centres**, including both academic endeavours and joint funding mechanisms.

The WPI programme is supporting the continued success of Japanese academia

The focus on curiosity-driven research questions has the potential to lead to serendipitous breakthroughs, and the unique mix of staff, cutting-edge facilities, and opportunities for intellectual exchange continue to attract visitors from all over the world: the WPI programme is helping Japanese academia retain and strengthen its position on the global stage.

Although interviewees shared overwhelmingly positive observations about WPI centres, a number of areas for improvement have been highlighted in the reputation survey, including both strategic and cultural considerations. As a starting point, JSPS and MEXT could jointly consider the following:

- clarifying pathways for foreign organisations to engage with WPI centres and the WPI programme;
- extending the funding horizon beyond the current 10-year timeframe, upon periodic review of individual WPI centres;
- providing clarity around venture opportunities available to further develop and potentially commercialise discoveries made at WPI centres; and
- continuing to improve the levels of gender and national diversity, building on the successes achieved to date.

## Summary SWOT Analysis of the WPI programme and centres based on the reputation survey

### Strengths

- WPI centres deliver science of the highest quality and are pioneering some areas.
- The focus on fusion is conducive to curiosity-driven breakthrough research.
- People who come into contact with WPI centres have an extremely good impression of their staff and research.
- WPI centres are increasing the international reach of Japanese academia.
- Long-term funding is a significant enabler of success, including the ability of centres to build dedicated, first-class facilities.
- WPI centres attract leading academics and early career researchers from all over the world (although mainly in a visiting function).
- In the case of some WPI centres, there are positive examples of industry engagement activities, for example to commercialise equipment developed at a centre or to jointly investigate a given research question.
- WPI centres were able to maintain international links via online events during the COVID-19 pandemic.

### Weaknesses

- Awareness of the WPI programme is very limited, even if the strategic goals of the programme clearly permeate the individual centres.
- Awareness of WPI centres may be limited to those who have come into contact with their staff, research or events.
- Although there is a focus on internationalisation, there is limited national diversity at the higher levels in the academic hierarchy (e.g. number of international PIs).
- Japanese academia, including within WPI centres, is highly hierarchical. This makes it difficult for foreign academics to fully embed in the Japanese system. Furthermore, the high pressure on researchers (e.g. long working hours) is seen as an issue, particularly by the more junior visitors.
- The limited gender diversity may discourage leading international female academics to engage.
- There is limited evidence of socio-economic impact, although it is recognised that long timeframes are required to achieve this in practice.

### Opportunities

- WPI centres could clarify pathways for other international centres and organisations to engage with them, including joint posts, studentships, visits and exchange programmes.
- JSPS could more actively discuss the WPI programme as part of regular, wider communications with other funders.
- The WPI programme might consider pathways to enable long-term career prospects in Japan for foreign academics.
- The WPI programme might assess opportunities to extend funding beyond a centre's 10-year funded period (upon review).
- WPI centres might work to strengthen their efforts with regard to social science disciplines and socio-economic impact.
- WPI centres could work to ensure that cultural change and developments achieved within the centres are felt within the broader host institutions.

### Threats

- The end of funding after 10 years may jeopardise the strong profile and reputation that have been enabled during the funding period. There is a risk that WPI centres could lose their leading profile once the programme funding ends, especially the international collaboration aspects.
- Although the focus on fusion was unique when the centres were first started, this approach to research is relatively common in today's leading institutions.
- The Japanese academic culture and social customs are complex to navigate for foreigners who do not speak the language. This might affect the odds of long-term visits or jobs in the case of European or North American academics.
- The COVID-19 pandemic has put many existing collaborations on hold.

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# 1. Introduction

## 1.1 Project aims and outputs

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### Project background

In 2007, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched the World Premier International Research Center Initiative (WPI), seeking to build a range of globally visible centres of excellence across Japan. These efforts were founded on the **four strategic objectives** outlined in Figure 1 and led to the creation of 13 WPI centres between 2007 and 2021. The WPI centres are given significant autonomy, and their efforts are meant to make innovative advances in science and technology while also serving as a model for other Japanese research institutions to emulate.

The Japan Society for the Promotion of Science (JSPS) was commissioned by MEXT to manage the WPI programme, which includes grant selection, project assessment and support functions for individual WPI centres and the programme as a whole. In this context, between February and April 2021, Research Consulting has been collaborating with Springer Nature to undertake a reputation survey for JSPS, seeking to:

- understand the views of academic experts, funders and policymakers on WPI centres and the programme;
- help WPI centres continue to adapt to a rapidly changing research environment and remain attractive research sites; and
- inform the preparation of a wider impact report, by complementing a bibliometric analysis.

The authors acknowledge that the strategic objectives of the WPI programme **have been updated** by MEXT in December 2020, after consultation with members of the Programme Committee and other stakeholders. As these changes will apply starting from 2021, the present reputation survey refers only to the original strategic objectives as shown in Figure 1.

Figure 1. Strategic objectives of the WPI programme.



### Key outputs

The main output of this study is the present report and executive summary, which is complemented by a detailed analysis of interview findings undertaken via thematic coding. For confidentiality reasons, the detailed analysis is only available to JSPS and does not accompany this report.

## 1.2 Methodology and participants

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### Stakeholder engagement

The reputation survey sought to engage a total of at least 65 stakeholders, representing an average of five individuals for each of the 13 in-scope WPI centres. The interviewee list needed to include policymakers and funders, journal editors and academics from across the world.

To achieve the above, we prepared a longlist of stakeholders (informed by JSPS's views) by:

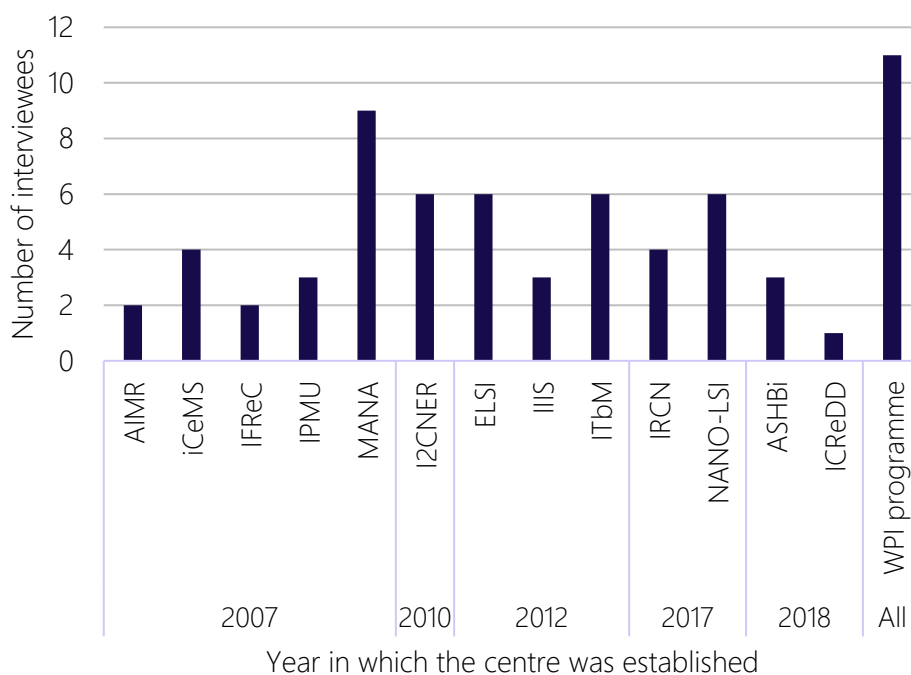
- gathering details of past attendees of events organised by individual WPI centres, both in Japan and abroad;
- analysing Scopus data, to identify (i) foreign authors who have cited work by WPI centres; (ii) co-authors of articles published alongside WPI centres; and (iii) authors cited in articles published by WPI centres; and
- building on our extensive network of contacts in the policymaking and funding landscape.

These approaches led to the identification of 683 target stakeholders, who were contacted via email and invited to attend a 45-minute semi-structured interview with a member of the Research Consulting team. The interview guide used to inform our semi-structured interviews, which was co-developed with JSPS, is available in Appendix A.

**Project participants and methodological notes**

The reputation survey reached a total of 66 stakeholders, comprising 55 academics, three editors and eight policymakers and funders (Figure 2). Interviewees covered a wide range of countries and institutions; a full overview of project contributors is available in Appendix B. We note that all the academics involved in this study had previous experiences with WPI centres, which was unavoidable given the depth of our research questions. As a result, our sample of contributors was not random, which in turn indicates that the findings of this reputation study may not be generalisable: the findings of the reputation survey should be combined with broader quantitative measures to assess the impact and reach of the WPI programme more accurately.

Figure 2. WPI Attribution of stakeholder interviews.



**Thematic coding and analysis**

Notes from stakeholder interviews were subjected to a process of thematic coding (Braun & Clarke, 2006) via NVivo, a professional qualitative analysis software tool.

The thematic coding process involved the tagging of interview notes by developing a taxonomy of recurring topics emerging from our conversations with project contributors. This allowed us to classify statements and emerging themes and to provide an indication of their frequency.

#### Quantification of views and frequencies

In section 2 (Perspectives from academics), where appropriate, we provide numbers of interviewees who have expressed a given opinion. It should be noted that these quantification efforts reflect the information that interviewees have *volunteered*. For example, the sentence “10 interviewees stated that ...” does not mean that the remaining 56 disagreed with the opinion expressed, but simply that this number of interviewees (“10”) shared this view during our discussion.

As it is not appropriate to quantify views from a small sample of contributors, no numbers are provided in section 3 (Perspectives from funders, policymakers and editors): in this case, findings are presented in a descriptive way only.

#### Acknowledgements

We would like to thank the JSPS project board (Table B1, Appendix B) for the guidance they have provided throughout the duration of the project, and the Springer Nature team (Table B2), who supported our interviewee identification and recruitment efforts and provided valuable feedback on our work. We also thank all the individuals who kindly participated in our consultation (Table B3) and provided key insights into their experience of engaging with WPI centres and the WPI programme, which informed the contents of this report.

## 2. Perspectives from academics

### 2.1 Awareness

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#### Most academics are familiar with a WPI centre that is close to their research interests

26 academics noted that they tend to remember the centre that is closest to their discipline. Interestingly, several interviewees refer to WPI centres by using their host institution or city (e.g. “Kanazawa” for NanoLSI, “Kyushu” for I<sup>2</sup>CNER), and acronyms are not used by all.

Awareness of a specific WPI centre tends to arise from one of the following pathways:

- **personal relationships**, whereby a WPI centre is the most recent affiliation of an individual who was already in one’s network;
- **conferences and events**, either:
  - organised by WPI centres in Japan or abroad; or
  - attended by WPI centre academics in other countries;
- **academic literature**, by reading the work published by academics affiliated with a WPI centre.

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*"I spent a lot of time in Japan, even before the centre started. Because of this I know many Japanese mathematicians. For example, some of the key people at IPMU I already knew before the centre started, and we have even worked a bit together."*

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The overarching WPI programme is not visible to individual academics

The reputation survey found that the WPI brand is not broadly recognised, even if academics worldwide consider the science carried out at individual WPI centres to be excellent. Consequently, 30 project contributors do not see WPI centres as being part of an overarching network (even if a minority noted that centre directors are working in a networked way). We note that the above is unsurprising, as scientists tend to focus on their disciplines rather than on the overarching administrative structures operating in the background.

Those who attended events organised by a WPI centre highlighted that the programme and other centres in the network tend to be mentioned during presentations. However, this information is typically not retained by attendees as it is not directly relevant to their research interests.

## 2.2 Science and quality

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WPI centres are on par with other leading institutes around the world

The quality of the science carried out at WPI centres is undisputed, and eight interviewees commented that WPI centres operate on par with other institutes at the highest level. In addition, the very strong reputation of Japanese scientists, who are perceived to be dedicated and meticulous, is very beneficial to the WPI programme when it comes to international collaborations.

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*"I definitely believe the science that comes out of these labs is on par with worldwide science. This is world class science and the names of their PIs are clearly recognised."*

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WPI centres are having an impact on the scientific community

All interviewees recognised that WPI centres are having an impact on and contributing to the scientific discourse (Figure 3). The reputation survey highlighted two main ways in which this impact is realised:

- **sharing leading scientific discoveries**, which includes publishing, but also the development of cutting-edge tools and their sharing with the scientific community; and
- **building international connections** via events, the circulation of scientists and the opening up of Japanese academia.

Project contributors noted that the creation of international connections is particularly important to Japan beyond a purely academic perspective, as the country is seen as having struggled to be internationally open.

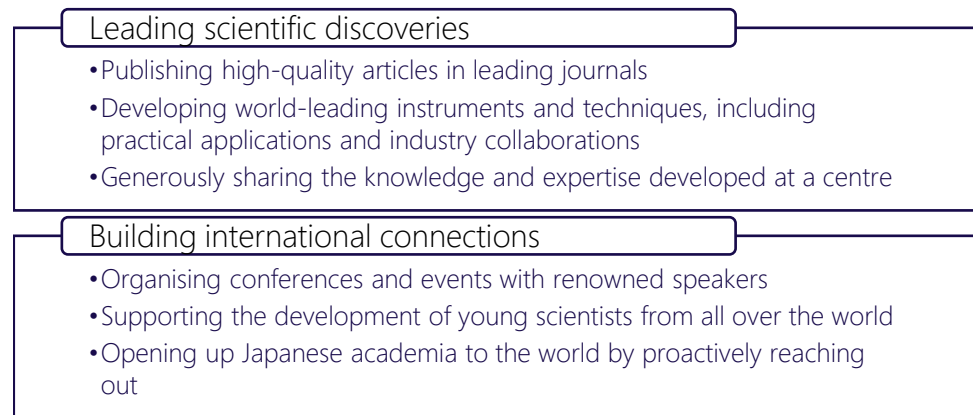


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*“They are of course having an impact. For example, the work on nanosheets is fundamental research which will have a big impact on the academic community but also on industry. This research is really pioneering and well known worldwide.”*

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Figure 3. Main contributions of the WPI programme.



## 2.3 Uniqueness

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### 2.3.1 Scientific research

Curiosity-driven research allows scientific freedom and underpins cutting-edge discoveries

Six interviewees insightfully described the focus of WPI centres as “curiosity-driven research”, and another 18 pointed out the importance of the significant and long-term funding behind this. Based on the overall reputation survey, the focus on open, fundamental research questions is one of the ingredients that allow WPI centres to remain at the forefront of science and compete with globally leading institutes.

The combination of the amount of funding available via the WPI programme and the focus on fundamental research is rare across the world: this contributes to the uniqueness of the programme and has enabled the fast rise of WPI centres on the global stage.

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*“At I<sup>2</sup>CNER, we were able to follow our instincts and do really curiosity-driven research. This was a really productive period for me, and we made some fundamental steps in understanding some of the materials we were focusing on.”*

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Some WPI centres are pioneering tools and techniques adopted worldwide

Some WPI centres are developing leading tools and techniques, which in some cases have become references in a field. For instance, interviewees mentioned the atomic force microscopy technique pioneered at NanoLSI or the nanosheet fabrication techniques developed at MANA.

It is also significant that, generally speaking, Japanese academia works closely with industry, as this increases the chances of translating some fundamental research into socioeconomic impact. 12 interviewees noted important interactions between WPI centres and Japanese industry and stated that these can help magnify the impact and reach of

the centres. An interviewee provided I<sup>2</sup>CNER as an example of this, as the Institute has some clear elements around climate change and carbon neutrality where industry applications may be more direct compared to other WPI centres.

### 2.3.2 Focus on fusion

Fusion is a key strategic priority adopted by leading research centres across the world

Overall, WPI centres are seen as achieving their strategic drive to implement fusion, even though this will apply to specific individuals or groups within the centres. One interviewee acknowledged that, when the WPI programme first began to pursue fusion, this was a significant differentiator; however, 25 interviewees commented that this approach is currently taken by most research centres worldwide and tends to be expected in most cutting-edge fields.

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*"They started to implement fusion in advance, in 2007, and now everyone is doing this; so they had the vision well in advance and they were successful."*

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The *scale* of fusion efforts in the WPI programme is unique

Although fusion alone is not seen as a distinguishing feature, 15 interviewees noted that the scale at which this is implemented in the WPI programme is, indeed, unique. The fact that buildings for WPI centres were designed with fusion in mind is significant: physical spaces enable and encourage the circulation of ideas, for example including communal areas, desk arrangements and the layout of lab benches.

23 interviewees stated that WPI centres are attractive because they support the continuous exchange of ideas and cultures, including via the above-mentioned building design but also through periodic internal events organised to foster intellectual exchanges between the different groups in a centre.

Such an approach to fusion is significantly different from the average, as fusion is most often achieved via virtual rather than physical centres: these are not equally conducive to serendipitous conversations and discoveries, including because of the difficulty of communicating across countries and time zones.

## 2.4 Internationalisation

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### 2.4.1 Visibility

WPI centres have a growing global reputation

There is recognition that any research centre needs decades to become established and build a lasting reputation: this highlights the fact that WPI centres have been exceptionally fast in their growth and have managed to build international profiles in a limited amount of time. Regardless, WPI centres remain relatively young at this stage, and it is likely that more time will be needed for them to cement their presence in the global research enterprise.

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*"The best thing about IRCN is that they bring together some obvious things and some very new ones. Of course, it's a very new centre, so their international reputation is developing."*

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WPI centres proactively reach out and deliver collaborations

35 interviewees described WPI centres as attractive international collaborators. The centres are perceived to be proactive in seeking links beyond Japan, which is in line with the strategic objectives of the WPI programme.

Collaborations often take place between WPI staff and foreign academics with existing ties or prior connections, which was highlighted by 16 interviewees. There is therefore an opportunity for WPI centres to more proactively reach out to new partners and build new networks: it should be recognised that an element of serendipity typically underpins the most impactful and transformational breakthroughs.

## 2.4.2 Openness

WPI centres are perceived as being internationally open and welcoming

21 interviewees described WPI centres as being very welcoming of international academics. WPI centres are indeed seen as being more internationally open compared to the average Japanese institution: 15 interviewees mentioned the higher-than-average number of international staff, while 11 pointed out the importance of operating in English.

Furthermore, WPI centres have excellent staff to support visitors in finding their way in Japan, which would otherwise be a significant challenge due to the low penetration of the English language in Japanese society.

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*"They will help you get established, feel yourself at home in many different ways, it's a very welcoming culture for international people. That is a very large, positive thing for international teams and groups."*

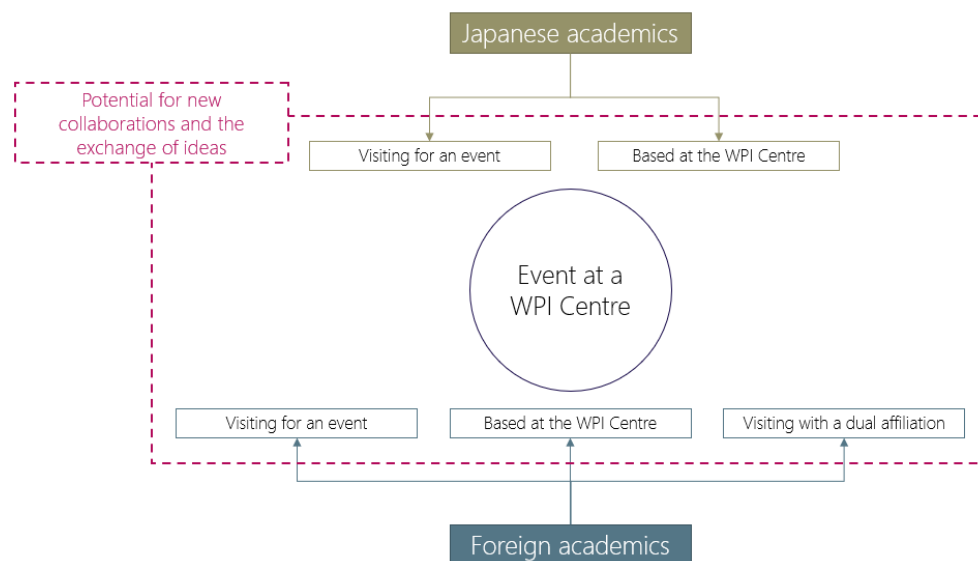
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The numerous opportunities for intellectual exchange make WPI centres attractive to visitors

As noted in section 2.3.2, WPI centres are designed and built to enable intellectual exchange. This strongly supports fusion and is also an important element contributing to the attractiveness of the centres: academics from all over the world value the opportunity to visit WPI centres, because they can have valuable interactions with other leading scholars.

For example, an academic may visit a WPI centre to present at an event, which would enable them to meet other key researchers who are (i) visiting to present at the event; (ii) working at the centre for a limited time; or (iii) based at the centre as a long-term posting (Figure 4). Notably, these individuals may be Japanese or foreign, suggesting that WPI centres and the events they organise can act as a melting pot to form new international collaborations and exchange ideas regardless of nationality.

Figure 4. WPI centres as enablers or interactions.



## 2.5 Funding as an enabling factor

Uniqueness and internationalisation are enabled by long-term funding

The activities discussed so far share a common denominator: long-term funding (see Figure 5). 13 interviewees noted that funding attracts researchers and enables international collaborations, as it is a key enabler of high-quality science and of the internationalisation efforts made by WPI centres. In this context, interviewees praised the quality of cutting-edge scientific equipment available at WPI centres and the ability of the centres to fully sponsor visits by leading academics from across the world.

Funding has allowed WPI centres to reach a significant scale of activity and global reputation in a limited timeframe

As noted in section 2.4.1, the visibility of WPI centres and their achievements has been growing fast. In the reputation survey, the availability of significant financial resources has been mentioned as an enabler of faster-than-average success.

The above is clearly in line with the strategic drivers of the WPI programme: the centres aim to become world-leading reference points in their respective domains, and they are funded at a level that is conducive to achieving this.

*“The scale of the WPI approach, however, is unique: they are rather big compared to other places doing similar things. Having a whole institute focusing on fusion is quite unique – it’s usually smaller teams.”*



Figure 5. Impact of long-term funding on the success of WPI centres.



## 2.6 Attractiveness

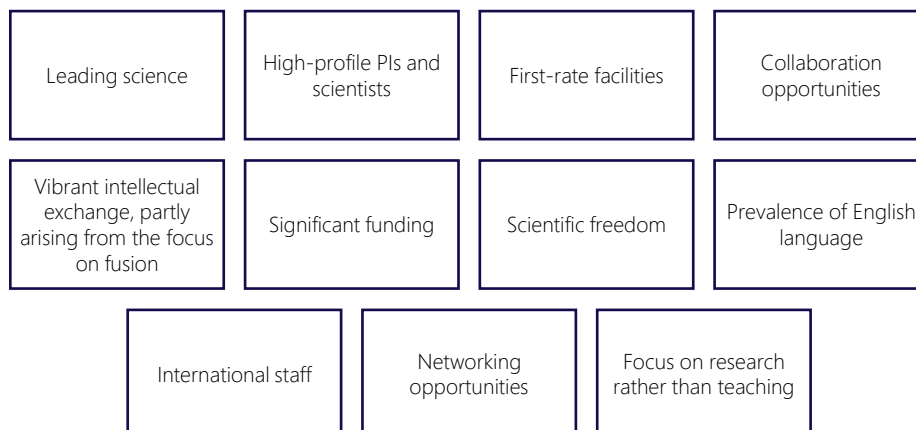
WPI centres have a strong proposition to attract other academics

The successes in terms of uniqueness, internationalisation and funding paint a very positive picture of WPI centres (Figure 6). It is therefore not surprising that foreign academics highly value the opportunity to visit and interact with them.

Collaborations with WPI centres are reported to be successful and productive for a range of reasons, including the strong profiles of the Japanese PIs and scientists (36 mentions), the cutting-edge facilities and equipment (28 mentions), the quality of papers published by the centres (27 mentions) and the very high quality of the science carried out at the centres (23 mentions).

We also highlight the importance of scientific freedom, which has been shared by a minority of respondents. Interviewees shared their perception that not all Asian countries allow the same extent of scientific freedom and, as a result, Japan would be preferable to other neighbouring countries with different customs and regulations.

Figure 6. Benefits of visiting or working with WPI centres.



Academics are interested in different interactions with WPI centres, chiefly based on their level of seniority

Although WPI centres were described as being attractive by all contributors to the reputation survey, we note that additional considerations apply: 12 interviewees observed that WPI centres are more attractive to researchers without personal commitments (e.g. family), and 5 specified that the centres are more attractive for short-term visits, events or exchanges.

In view of the above, attitudes towards the length of visits to WPI centres vary significantly based on one's career stage:

- **senior academics tend to prefer shorter visits**, as they are responsible for managing their own research groups or centres at their home institutions. They do, however, consider WPI centres as strong locations for a sabbatical;
- **early career researchers are open to longer stays**, as they tend to have more personal flexibility. These are seen as enablers of high-quality interactions and are highly valued because of the quality of science carried out at WPI centres. In this context, 23 interviewees noted that WPI centres provide good opportunities for career development.

Finally, regardless of seniority, some academics noted that visits to Japan are also very attractive from a leisure standpoint: generally speaking, Japan is perceived as an exotic and attractive country to visit. Although this is not related to scientific considerations and tends to apply to shorter interactions, it may be an asset for WPI centres when inviting people to attend an event or collaborate with them.

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*"I was actually thinking about doing a sabbatical there. I am particularly attracted to this mixture of disciplines and cultures. In other universities, I'd fear the isolation, but at ITbM I feel I could learn a lot and interact with lots of people."*

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## 2.7 Impact

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Impact may arise directly because of a WPI centre's focus or because of the wider significance of fundamental research

The reputation survey included detailed questions on the impact of WPI centres (Figure 7). Due to the type and length of interactions that interviewees had with individual centres, it was difficult for them to comment on impact in detail. Most considerations shared by interviewees were qualitative rather than arising from direct experiences and focused on the importance and impact of WPI centres and on the wider significance of fostering fundamental research in the long term.

23 interviewees highlighted that the societal impact of fundamental research can only be understood in the long term, and 16 pointed out that fundamental research has the potential to lead to major breakthroughs and impacts. Furthermore, 16 interviewees added that fundamental research can lead to important industry applications, and 15 agreed that, overall, WPI centres can have a positive impact on Japanese society and culture.

Finally, 13 interviewees noted that funding for fundamental research is essential for continuous innovation, and that programmes like the WPI are key to enabling curiosity-driven scientific endeavours.

Figure 7. Impact of WPI centres (pink colour) and fundamental research (dark grey colour).



WPI centres have an impact on various aspects of the Japanese (academic) culture

Interviewees considered a range of ways in which WPI centres are currently having an impact on the Japanese culture, both within and beyond academia:

- **WPI centres are helping to raise the profile of Japanese scientists on the global stage.** In some cases, this is closely related with industry collaborations, but interviewees were only able to offer anecdotal evidence rather than specific examples.
- **WPI centres are proactively seeking and successfully building international collaboration and relationships.** By promoting collaborations and intellectual exchanges with a global audience, WPI centres are seen as actively supporting the internationalisation of Japanese academia, including in their host institutions. There is however recognition that this is a long-lasting process of culture change, which means that the systemic impact of internationalisation efforts cannot be fully estimated at this stage, nor can it be assumed.
- **WPI centres are actively engaging their local communities,** e.g. via symposia and public lectures. By communicating and broadcasting Japan's scientific ambitions, WPI centres may help inspire new generations to take up fundamental research and support the country's long-term success. The present reputation survey did not gather detailed information in this regard, but interviewees described the public engagement efforts by WPI centres in a positive manner.

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*"People are actively talking about their work on the global stage and communicate well with the international community. And their outlook is very much a global outlook."*

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## 2.8 Barriers perceived by visitors and collaborators

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Some barriers may hinder the success of WPI centres

Although interviewees shared overwhelmingly positive observations about WPI centres, some also noted a range of potential areas for improvement that might inform the further development of the centres and overall programme. Some of the considerations in this section refer to the Japanese culture and customs: it should be noted that these observations are not meant as criticism and are only shared to help JSPS better appreciate the thinking processes of the international audiences of the WPI programme.

### 2.8.1 Strategic considerations

Pathways to engage WPI centres could be made clearer

Some interviewees noted that it is difficult to find out how to engage with the WPI programme. For example, this includes the processes to initiate a collaboration or an exchange programme (e.g. PhD-level exchanges or studentships). Some commented on the dated design of the WPI programme website, which may not be conducive to the discovery of information, where available.

There is however a perception that individual WPI centres are successful at advertising opportunities for collaboration, for example during the events and conferences they organise.

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*“The feeling I have is that the WPI website is a mixture that doesn't really know which target to go for. It's not sloppy, but it's not as engaging for a researcher, while as a bystander it's too cumbersome.”*

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The funding horizon might benefit from further extension

There is a very large number of research centres across the world, and scientists struggle to follow all new developments. Achieving high visibility is a long-term endeavour and relies on both the quality of science and the extent to which centres reach out proactively (e.g. conferences, events, press releases).

In this context, 23 interviewees noted that long-term funding is key to success, and three argued that a 10-year timeframe is not sufficiently long to establish and truly embed world-leading institutes and that there is an opportunity to extend this upon periodic review of individual WPI centres.

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*“Setting up a new institute, bringing people together who haven't worked before does take time. After this sort of 'activation time', things take off – and that's why losing the funding after ten years is such a pity.”*

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The start-up and spin-off culture appears to be weak

One academic interviewee commented on the limited visibility of start-up and spin-out opportunities in the WPI programme and noted that these are a good means of showing the potential applications to society than can arise from fundamental research. In the



reputation survey, this topic was mentioned by a few more times, but, overall, very rarely: this may indicate that, if available, these opportunities are not broadcast to current and potential visitors and collaborators.

In this context, it was also recognised that, in Japan, innovation tends to be led by larger companies rather than start-ups or spin-outs, as is common in the United States, so this point may be related to wider economic and cultural differences.

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*“I don’t know if they have lots of venture opportunities and start-ups. [...]. I just didn’t see these things at iCeMS, so I can’t really say. I don’t know if they have funding for start-ups, or if they have industrial hubs supporting the academics there.”*

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## 2.8.2 Cultural considerations

Gender and national diversity at the centres can be improved

11 interviewees stated that gender imbalance is a widespread issue in the overall Japanese higher education system. The perceived gender diversity at WPI centres is also limited, particularly at the PI level, but the centres are broadly seen as being more diverse than the average Japanese institution.

Similar considerations apply to national diversity, and the majority of staff at the PI level remain Japanese: most international staff tend to be at lower levels in the academic hierarchy, and this is partly related to cultural issues and one’s ability to secure a long-term future in Japan (see below).

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*“[The idea of] being there with the pioneers of these techniques was very attractive. But personally I am not sure I’d go, because of the gender unbalance.”*

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The Japanese academic culture is an obstacle for visitors, particularly the most junior

19 interviewees commented that social structures in Japan are highly hierarchical, and that this may be an obstacle to visiting academics and collaborators. For example, staff (particularly the most junior) are expected to work until late on a daily basis, having to remain in their office until their superiors leave. This is a challenge for some researchers and might dissuade them from spending long periods doing research in Japan. However, five interviewees specified that WPI centres are less hierarchical than many Japanese universities.

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*“My personal experience there as a young researcher was really intense: Japanese work ethics do live up to their reputation.”*

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Japan’s location, language and academic culture may hinder internationalisation efforts

Some of the above barriers with regard to diversity clearly arise from the fact that many international staff see WPI centres as a stepping stone, and only a minority consider a long-term future in Japan. Seven interviewees noted that visiting academics struggle to establish a career in Japan (often because this requires knowledge of the language), and

24 commented that, more broadly, foreigners struggle to integrate with the Japanese culture.

16 interviewees commented that Japan is geographically and culturally far from most countries, and this complicates collaborations and connections: as a result, WPI centres attract more academics from Asia compared to Europe or North America.

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*"I think if you're not Japanese it's hard to set up camp in Japan and to feel at home, and to feel you have as much connection with the scientific scene there. It doesn't prevent people from getting funding and doing research, but it may prevent them getting to the top rank."*

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## 3. Perspectives from funders, policymakers and editors

### 3.1 High-level considerations

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A limited number of non-academic stakeholders are aware of the WPI programme

In the context of this reputation survey, it was very difficult to identify and engage funders, policymakers, and editors: in many cases, the stakeholders approached had limited or no awareness of the WPI programme. Particularly, we highlight the following:

- among our interviewees, many noted that other Japanese organisations are more visible on the global stage, including other research centres such as NIMS and RIKEN and public bodies like MEXT and JSPS; and
- some interviewees acknowledged that individual centres are well-known within specific disciplinary communities, but not necessarily at the policy level.

The difficulties experienced in engaging these audiences is a message in itself: the WPI programme is not widely communicated to and discussed with funders, policymakers and editors, and this may decrease its overall reach. However, these stakeholders also recognised that building the reputation of research centres takes significant time, mirroring the views of academics. Notwithstanding limited detailed knowledge, some funders who declined to be interviewed did express strong interest in working with JSPS and the WPI programme.

The quality of science delivered by WPI centres is recognised at the policy level, too

Although funders, policymakers and editors are not actively involved in research, all interviewees considered the quality of the science at WPI centres to be very high. There is also a general perception that WPI centres have strong staff and are working in key areas of science.

An additional observation from these stakeholder groups covered the ways in which academics affiliated with WPI centres described themselves when publishing articles: particularly, the use of multiple attributions, including, for example, the centre's name and the host institution, means that the WPI programme does not stand out as the key central organisation.

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***"The international visibility and quality of the science is obvious. WPI centres are quite successful."***

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The contribution of WPI centres in the humanities and social sciences is currently limited

A minority of contributors noted that humanities and social science disciplines tend not to be reflected in the context of WPI centres. This is seen as a potential gap and may have a negative long-term impact on the overall programme.

We observe that, since 2017, the WPI programme call for proposals does specifically acknowledge the social sciences; the [latest document available](#) for our review (JSPS, 2021) notes that "projects solicited include those that aim to generate a higher order "integrated knowledge" through the fusing of knowledge in the humanities and social sciences and of knowledge in the natural sciences". Therefore, the above concern may only be a

reflection of how the WPI programme has been developing to date and may be addressed in future funding rounds.

## 3.2 Impacts on the Japanese research system

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WPI centres deliver on their own internationalisation goals

Funders, policymakers and editors noted that WPI centres employ more significant shares of international staff compared to other Japanese organisations and are seen as being more internationally open. The use of English at the centres is perceived to be highly valuable, which once again mirrors the view of our academic interviewees.

WPI centres have the potential to drive change in Japanese academia

WPI centres are “shaking the Japanese research system” and can potentially help reform it in terms of both research administration and leading research, including around the fusion objectives.

However, there is a mixed view as to whether WPI centres are driving cultural change in their host universities and beyond, as this is a long-term process and, beyond isolated examples (see quote below), is difficult to assess in practice.

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*“The AIMR has relationships with many of the departments in the University, so it is having an effect on the institution. The University has its own interdisciplinary research initiative as a consequence, inspired by the head of the AIMR.”*

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## 3.3 Policy considerations

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Opportunities for collaboration could be better leveraged

In section 2.8.1, we discussed how some academics may struggle to initiate collaborations with WPI centres. Similarly, funders and policymakers noted that current pathways to engaging the WPI programme seem limited to events, exchanges and visits.

The fact that this is a pain point at the policy level, too, is significant: interactions with foreign policymakers and funders may give rise to strategically important developments, such as mechanisms for substantive joint funding, making this currently a missed opportunity.

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*“We would like to have more interaction with WPI. [...] WPI working with our national institutes would be good.”*

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The focus on long-term funding is key, and extensions past the 10-year timeframe may be appropriate

The focus on long-term funding is seen as very important, for the reasons highlighted in section 2.5. Policymakers and funders observed that comparable initiatives sometimes include an extent of permanent funding lines (e.g. the German Excellence Initiative). In this context, some noted that ambitious research programmes need secure funding to be able to take risks: there is therefore a case for strengthening funding for WPI centres, particularly with regard to its overall duration.

Cultural barriers may hinder the internationalisation efforts of the WPI programme

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*"I think that WPI is well known in the research excellence circles; it has a crucial role in Japan. [...] It is very ambitious."*

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Funders, policymakers and editors shared the concerns around cultural barriers covered in section 2.8.2. They also added that the number of Japanese researchers who spend time abroad is limited, as this implies an extent of risk for their career, and that the hierarchy in Japanese academia may make it difficult for both foreigners and Japanese researchers alike to secure long-term positions.

From a policy perspective these cultural barriers may also limit the ability of the WPI programme to build long-lasting strategic relationships across the globe. However, we also note that any issues arising from the Japanese academic culture were not meant as criticism by project contributors, but only as a reflection of their thinking processes and own customs.

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*"JSPS could provide a mechanism through the WPI centres to enable Japanese scientists to spend time overseas with a place to return to, as well as be attractive to overseas researchers to come to Japan to work."*

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## 4. Final remarks

**The WPI programme is broadly delivering on its strategic objectives**

Returning to the strategic objectives noted in Figure 1 (Science; Fusion; Globalisation; Reform), the reputation survey has highlighted very positive developments. Views of the WPI programme are unanimously positive across the board, and most stakeholders consulted expressed a desire to interact more with WPI centres: this is true in terms of both academic interactions and joint funding mechanisms and exchange initiatives.

Interviewees see the WPI programme as broadly delivering on its strategic objectives. Opinions with regard to quality of science, the fused approach to research and globalisation are grounded in evidence and experiences, while the “Reform” dimension tends to be described as a long-term opportunity that the programme and its centres are contributing towards. In this context, there is a clear understanding that similar programmes require significant time to drive material changes and build a lasting global reputation.

**There are opportunities to continue improving individual WPI centres and the broader programme**

A number of areas for improvement have been highlighted in the reputation survey, including both strategic and cultural considerations. These can be seen as positive opportunities for the further development of individual WPI centres and the broader programme.

In terms of strategic considerations, JSPS and MEXT could jointly consider the following:

- clarifying pathways for foreign organisations to engage with WPI centres and the WPI programme;
- extending the funding horizon beyond the current 10-year timeframe, upon periodic review of individual WPI centres; and
- providing clarity around venture opportunities available to further develop and potentially commercialise discoveries made at WPI centres.

Cultural considerations are more complex in nature, as they tend to be related to long-term processes of societal change and involve both WPI centres and society at large. There is, however, an immediate opportunity for WPI centres to continue improving the levels of gender and national diversity, building on the successes achieved to date.

**The WPI programme is helping Japanese academia retain and strengthen its position on the global stage**

WPI centres employ leading academics with a strong track record, which helps in reaching and attracting leading scientists from all over the world. The cutting-edge facilities and opportunities for intellectual exchange offer significant opportunities for idea generation and contribute significantly to the value proposition of WPI centres.

The reputation survey showed that the WPI programme is helping Japanese academia retain and strengthen its position on the global stage. This is achieved via significant and long-term funding and a focus on curiosity-driven research questions with potential for serendipitous breakthroughs.



## Appendix A. Interview guide

The following interview guide was used to inform our semi-structured interviews with stakeholders. It should be noted that not all interviewees were able to answer all questions, as their ability to do so relied on individual experiences.

### Awareness

- What is your awareness and understanding of WPI centres and the WPI program as a whole?
  - What are WPI centres best known for, and what are their key contributions?
- To what extent are WPI centres recognised as a network of excellent research institutions with a shared vision?

### Science and "Fusion"

- How is science at WPI centres regarded?
  - To what extent do you perceive the science carried out at WPI centres as being world-leading?
  - To what extent are WPI centres having an impact on the international scientific community?
  - In what ways do you perceive the science carried out at WPI centres to be unique?
- Among its objectives, the WPI programme includes the principle of "Fusion". Particularly, WPI centres seek to advance research in their fields but also to pioneer new interdisciplinary domains.
  - What is your perception of "fused" research domains arising from work at WPI centres?
  - To what extent is the emphasis on "Fusion" contributing to the strength and uniqueness of WPI centres?

### Internationalisation

- How do you perceive WPI centres in terms of international openness?
  - How attractive are WPI centres as places to work?
  - How attractive are WPI centres as partners for international collaboration and intellectual exchange?
- How attractive are WPI centres to global top scientists?
  - To what extent are WPI centres working as hubs for international circulation of leading young researchers?

### Basic research and social impact

- To what extent do WPI centres impact society beyond academia and how this might come about?
  - WPI centres emphasise basic research. What is your view on the societal importance of the basic research conducted at WPI centres?

## Appendix B. Project contributors

Table B1. JSPS Project Board as of FY 2020.

Name	Role
Dr Akira UKAWA	WPI Program Director
Dr Minoru YOSHIDA	WPI Deputy Program Director
Dr Toshio KUROKI	WPI Academy Director
Ms Sawa KOYAMA	Head for Administrative Affairs, WPI Program Center, JSPS
Dr Mika IKEDA	Specialist, WPI Program Center, JSPS

Table B2. Springer Nature team.

Name	Role
Dan Penny	Director Market Intelligence
Ikuko Oba	Commercial Director, Japan Korea Southeast Asia and Oceania, Magazines and Research Services
Eri Shimoyama	Senior Strategic Partnerships Executive
Yoshiko Sugita	Senior Publishing Manager, Nature Research Custom Media
Shoko Hasegawa	Project Coordinator, Nature Research Custom Media

Table B3. Project contributors.

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