

# An Analysis of Urbanisation Sustainability Effect from High-Speed Rail in Honshu Area

Rungskunroch, Panrawee; Kaewunruen, Sakdirat; Jack, Anson

DOI:

[10.3390/proceedings2161148](https://doi.org/10.3390/proceedings2161148)

License:

Creative Commons: Attribution (CC BY)

*Document Version*

Publisher's PDF, also known as Version of record

*Citation for published version (Harvard):*

Rungskunroch, P, Kaewunruen, S & Jack, A 2018, 'An Analysis of Urbanisation Sustainability Effect from High-Speed Rail in Honshu Area', *Proceedings*, vol. 2, no. 16, 1148. <https://doi.org/10.3390/proceedings2161148>

[Link to publication on Research at Birmingham portal](#)

## General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

## Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact [UBIRA@lists.bham.ac.uk](mailto:UBIRA@lists.bham.ac.uk) providing details and we will remove access to the work immediately and investigate.

# An Analysis of Urbanisation Sustainability Effect from High-Speed Rail in Honshu Area <sup>†</sup>

Panrawee Rungskunroch <sup>\*</sup>, Sakdirat Kaewunruen and Anson Jack

School of Civil Engineering, University of Birmingham, Birmingham B15 2TT, UK; s.kaewunruen@bham.ac.uk (S.K.); a.c.r.jack@bham.ac.uk (A.J.)

<sup>\*</sup> Correspondence: pxr615@student.bham.ac.uk; Tel.: +44-0746-852-0108

<sup>†</sup> Presented at 2018 International Symposium on Rail Infrastructure Systems Engineering (i-RISE 2018), Brno, Czech Republic, 5 June 2018.

Published: 14 September 2018

Several decades of the High-Speed Rail (HSR) in Japan have generated direct impacts on Japanese's life regarding reducing short time travel, enabling newly accessible areas, and increasing transport market. Those impacts have been continually led to indirect impacts on Japanese's society regarding population dynamics, workforces, and property price. The paper aims to understand the impact of HSR system along the urbanisation that can be a guideline to the urban developer for taking more benefit from the HSR.

The research focused on the Honshu Island, which is the mainland in Japan, represents more than 60 percent of the whole population and contains 34 prefectures. It composes of eight HSR lines from three railway operators, which is JR East, JR Central, and JR West, servicing in the Honshu Island. The trend of passenger using HSR service based on the travel distances that showed HSR gained higher market share than other modes of transportation at a distance 300–1000 km and mostly get the highest at 69.1% at a distance 500–700 km [1–3].

However, the research found that there is imbalance service in Honshu areas due to there are no HSR services in some prefectures such as Yamanashi and Chiba. Therefore, this paper expects to measure the impact of HSR network by comparing between the prefecture with and without HSR services. The results are expected to identify the indirect effects regarding population density and land pricing from the HSR network.

The study design four cases studies that compare one prefecture with the HSR services with two prefectures without the HSR service as shows in Table 1. The main criteria to match up prefectures is to select from the nearby prefectures as possible.

**Table 1.** The summarisation of the case study using in this research.

Case Studies	Prefecture with the HSR Service	Prefecture without the HSR Service
Case I	Miyagi	Chiba and Yamanashi
Case II	Tokyo	Chiba and Yamanashi
Case III	Kyoto	Shimane and Tottori
Case IV	Osaka	Shimane and Tottori

An analysis of parts can be split into two parts, which is the one-way ANOVA analysis and LSD (Least Significant Different) analysis. Concerning the ANOVA analysis, it applies to measure the relationship between each sample within the group. The null hypothesis ( $H_0$ ) is a stated for following general assumption that there is no relation in mean ( $\mu$ ) within the case study. The  $H_0$  means the Shinkansen network has no impacted on the land price caused by those means are equal. On the other hand, the alternative hypothesis ( $H_1$ ) implied that the means are not all similar. Based

on this study, the acceptance of  $H_1$  can be interpreted as the Shinkansen network has effected on land price. Then, the LSD analysis aims to justify all possible pair-wise comparisons of means comprising a factor after analysing of ANOVA, and its results showed at least one group differs from other (Williams and Abdi 2010). The outcomes can genuinely identify the similarity or dissimilarity between each pair of the sample in a case study. Also, it can justify how the impact of HSR on population dynamic and land price in the area with and without HSR station.

Regarding with the data collection, the study takes the population data in Japan during 2001–2014 where the land price data is received since 1983. In term of land pricing, the results found that HSR has effected on the land prices but, the volume of impact depends on each prefecture. In the metropolitan areas, an apparently different from the average land price illustrated the prefectures with HSR station took advantages over the areas without HSR station. Besides, the areas surrounded by HSR stations have been turned to economics zones. In the urban areas, on the other hand, HSR has shown slightly impact on majority cities such as Tokyo due to the metropolitan cities may grow up by other factors such as new business, and other facilities. Another part, the impact of HSR service on population dynamics also shows Shinkansen network had high impacts on population dynamics, especially in rural areas.

In conclusion, the analysis along two stages of this study found that HSR has impacts on urbanisation in Japan but, the volume of effect relies on characteristics of the prefecture. Among ambiguous answers of has HSR impacted on Japanese society, the research can affirm that the Shinkansen network reflects its benefit on the rural than urban areas.

**Acknowledgments:** The first author gratefully appreciates the Royal Thai Government for her Ph.D. scholarship. The second author is grateful to the Australian Academy of Science (AAS) and Japan Society for the Promotion of Sciences (JSPS) for his JSPS Invitation Fellowship for Research (Long-term), Grant No. JSPS-L15701, at Railway Technical Research Institute (RTRI) and the University of Tokyo, Japan. The authors are sincerely grateful to the European Commission for the financial sponsorship of the H2020-MSCA-RISE Project No. 691135 “RISEN: Rail Infrastructure Systems Engineering Network,” which enables a global research network that tackles the grand challenge in railway infrastructure resilience and advanced sensing [4].

## References

1. Kojima, Y.; Matsunaga, T.; Yamaguchi, S. The impact of new Shinkansen lines (Tohoku Shinkansen (Hachinohe—Shin-Aomori) and Kyusyu Shinkansen (Hakata—Shin-Yatsushiro)). *Transp. Res. Procedia* **2017**, *25*, 344–357.
2. MLIT (Ministry of Land, Infrastructure, Transport and Tourism Government of Japan). Inter-Regional Travel Survey in Japan” 2010. Available online: <http://www.mlit.go.jp/common/001005633.pdf> (accessed on 5 March 2018).
3. Williams, L.J.; Abdi, H.H. Fisher’s least significant difference (LSD) test. *Encycl. Res. Des.* **2010**, 1–6.
4. Kaewunruen, S.; Sussman, J.M.; Matsumoto, A. Grand challenges in transportation and transit systems. *Front. Built Environ.* **2016**, *2*, 4, doi:10.3389/fbuil.2016.00004.



© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).