

Mapping human security indexes in Japan

Background

The human security index was developed to quantify and visualize the magnitude of human security in each prefecture in Japan. It consists of 3 main components: Life, Daily life, and Dignity.

- 1) Life indexes (22 sub-indices for life and health)
- 2) Daily life indexes (40 sub-indices for economy, labor, education, welfare, lifestyle and environment)
- 3) Dignity indexes (26 sub-indices for children, women, public trust, community, regional solidarity, internationality, satisfaction. etc),

Index calculation

The sub-indices above were normalized and replaced with a variable (0 to 1). If one of the sub-indices is desirable when the value is lower, equation (1) was applied.

$$\gamma = \frac{X - x_{max}}{x_{min} - x_{max}} \quad (1)$$

where x is value of each of the sub-indices

Conversely, if one of the sub-indices is desirable when the value is higher, equation (2) was applied.

$$\gamma = \frac{X - x_{min}}{x_{max} - x_{min}} \quad (2)$$

where x is value of each of the sub-indices

The sub-indices of related items were tabulated for each life index, daily life index, and dignity index (Fig A2-4). Each index of the prefecture was calculated with the average value. The 3 calculated indices were then integrated to generate the synthetic index.

Result

○ There are clear geographical pattern of synthetic index in Japan. Most of prefectures with the highest synthetic index are in the central part of Japan.

Conversely, we observed that Okinawa, Osaka prefecture and Northern part of Japan have relatively low synthetic index.

○ The prefectures affected by the Great East Japan Earthquake in 2011 especially tend to have lower synthetic index. There may be an urgent need to restore living and the social environment.

Lists of prefectures

1. Hokkaido
2. Aomori
3. Iwate
4. Miyagi
5. Akita
6. Yamagata
7. Fukushima
8. Ibaraki
9. Tochigi
10. Gunma
11. Saitama
12. Chiba
13. Tokyo
14. Kanagawa
15. Niigata
16. Toyama
17. Ishikawa
18. Fukui
19. Yamanashi
20. Nagano
21. Gifu
22. Shizuoka
23. Aichi
24. Mie
25. Shiga
26. Kyoto
27. Osaka
28. Hyogo
29. Nara
30. Wakayama
31. Tottori
32. Shimane
33. Okayama
34. Hiroshima
35. Yamaguchi
36. Tokushima
37. Kagawa
38. Ehime
39. Kochi
40. Fukuoka
41. Saga
42. Nagasaki
43. Kumamoto
44. Oita
45. Miyazaki
46. Kagoshima
47. Okinawa

Fig A1. Prefectures in Japan

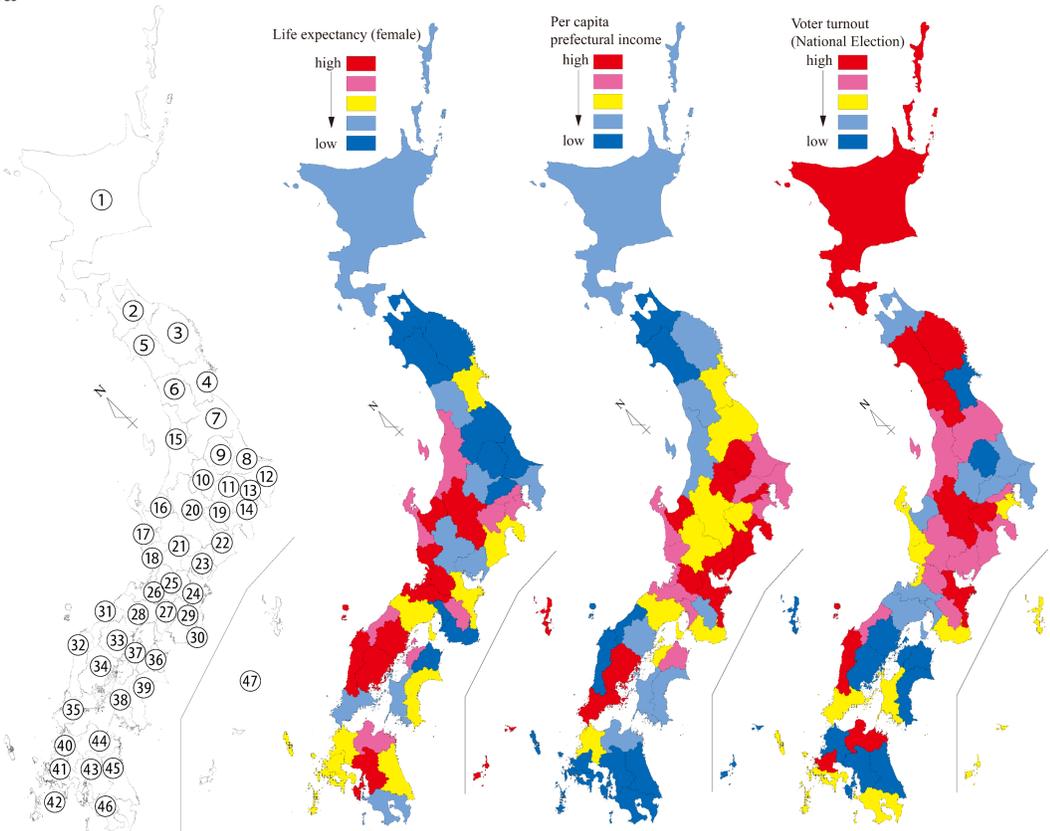


Fig A2. Case example of life index: Life expectancy (female)

Fig A3. Case example of daily life index: Prefectural income per capita

Fig A4. Case example of dignity index: Voter turnout (National Election)

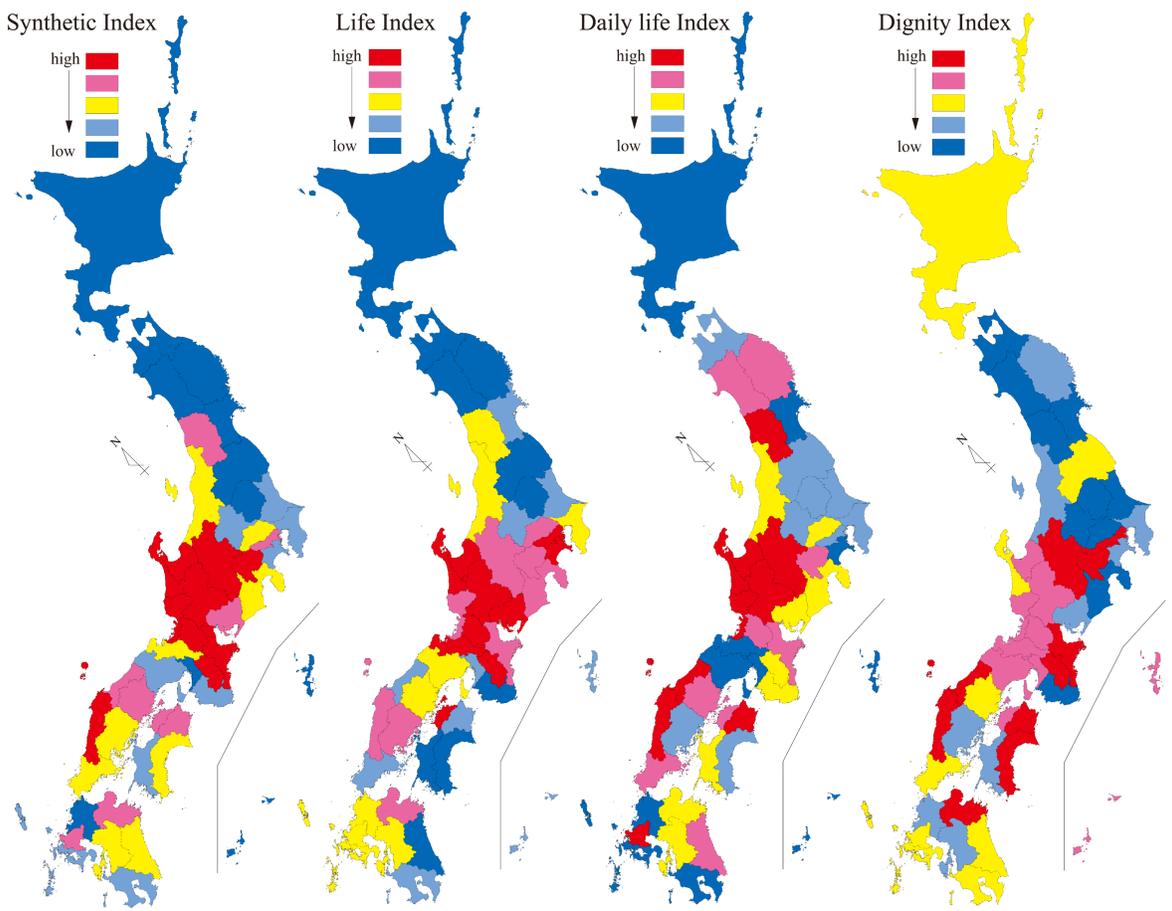


Fig A5. Distribution of synthetic index

Fig A6. Distribution of life, daily life, and dignity indexes

World maps which predict the future in the 22nd century

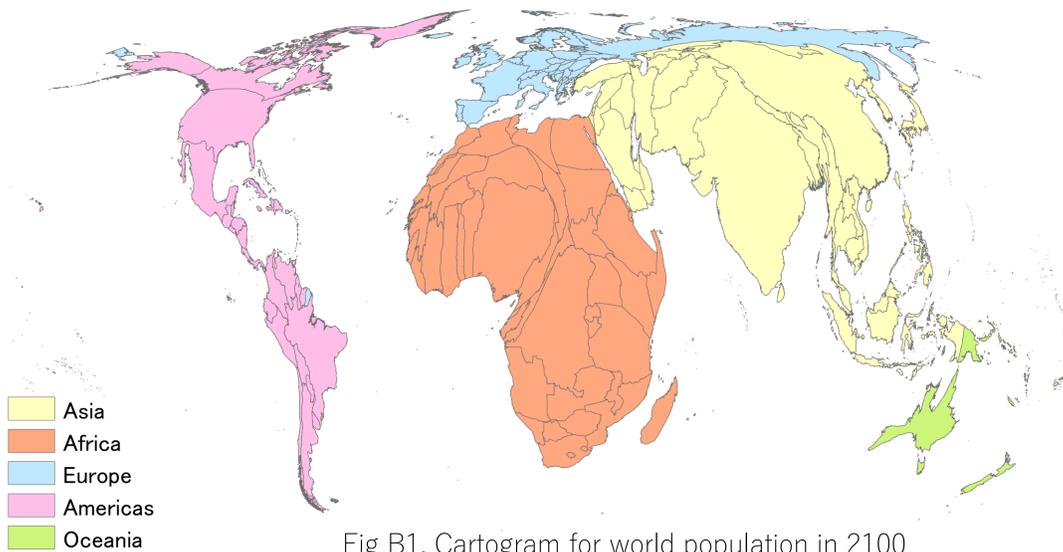


Fig B1. Cartogram for world population in 2100

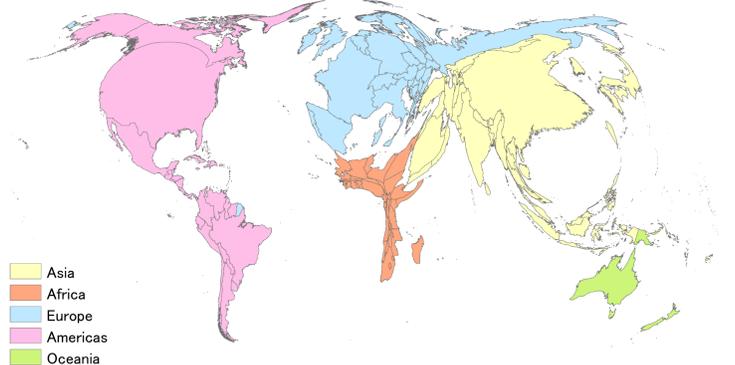


Fig B2. Cartogram for GDP in 2014

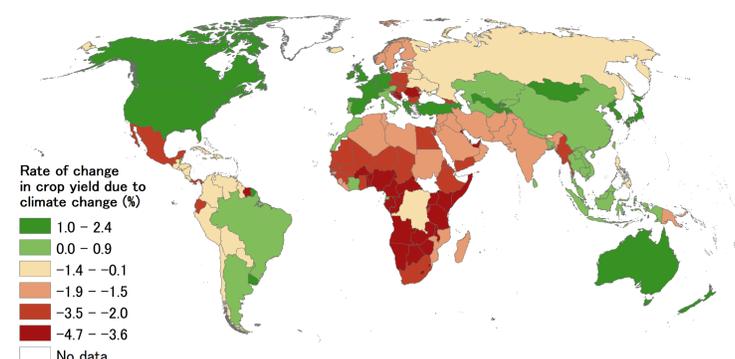


Fig B3. Effect of climate change on crop yield (B2A scenario)

In the 22nd century, Asia and Africa are predicted to have dominant proportion of the world population (Fig B1). However, these areas still suffer from several problems such as low GDP (Fig B2) and vulnerability against climate change (Fig B3).

This situation is strongly related to sustainable development goals (SDGs), our institution's major research exposure. Digital Earth approach may have role to play to tackle the problems.