JAPAN 2050
LOW CARBON NAVIGATOR
Overview and Trajectory Setting
Japan 2050 Low Carbon Navigator
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What is Japan 2050 Low Carbon Navigator?

- Japanese version of the UK 2050 Pathways Calculator;
- Simulation model for energy system and emissions;
- An interactive simple to communicate tool that allows:
  - To answer the fundamental questions of how far we can reduce emissions and meet energy needs;
  - To develop your own combination of change in different technologies and sectors up to 2050;
  - To outline, in minutes, the results of energy and emissions in a transparent and evidence-based way.
Why do we develop it?

- 4th Basic Environment Plan: 80% reduction by 2050
- Uncertain direction of future energy and climate policy following the Fukushima nuclear accident
- Post-2020 national mitigation target setting for the 2015 international agreement
- International comparison among countries

As a handy and transparent scenario simulation tool, 2050 Low Carbon Navigator serves to facilitate multi-stakeholder discussions.
Simple Operation of Low Carbon Navigator

1. Social Scenario selection
2. Sector-specific project selection
3. Results presentation graph
4. Power, energy, safety, and other themes selection

Basic operational steps:

- Select the social scenario
- Choose sector-specific projects
- Present the results graphically
- Choose themes such as power, energy, safety, etc.
Society Scenarios in Low Carbon Navigator

Common Challenges

1. Aging society
2. Competition with emerging economies
3. Resource constraints

- A: Research and Development (R&D) Society
- B: Made-in-Japan (MIJ) Society
- C: Service Brand (SB) Society
- D: Resource Independent (RI) Society
- E: Share Society

Economic Growth
- Manufacture
  - Overseas
  - Domestic
- Service

Resource Independence

Well-being

Source: Adapted from MOE (2012b).
<table>
<thead>
<tr>
<th>Energy supply sectors</th>
<th>Energy demand sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nuclear and conventional power plants</strong></td>
<td>Transport</td>
</tr>
<tr>
<td>Nuclear power stations</td>
<td>Passenger transport</td>
</tr>
<tr>
<td>Conventional power plants</td>
<td>Freight transport</td>
</tr>
<tr>
<td><strong>Renewables</strong></td>
<td>Residential sectors</td>
</tr>
<tr>
<td>Solar PV</td>
<td>Space heating and cooling</td>
</tr>
<tr>
<td>Wind (Onshore, offshore and floating)</td>
<td>Hot water supply</td>
</tr>
<tr>
<td>Hydropower (Small and medium, and large)</td>
<td>Cooking, lighting and appliances</td>
</tr>
<tr>
<td>Geothermal electricity</td>
<td></td>
</tr>
<tr>
<td>Ocean power</td>
<td></td>
</tr>
<tr>
<td><strong>Biomass energy supply</strong></td>
<td>Commercial sectors</td>
</tr>
<tr>
<td>Volume of wastes and recycling</td>
<td>Heating, cooling and hot water supply</td>
</tr>
<tr>
<td>Bioenergy production and imports</td>
<td>Cooking, lighting and appliances</td>
</tr>
<tr>
<td><strong>Hydrogen production</strong></td>
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<tr>
<td>Hydrogen production for transport</td>
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<tr>
<td><strong>Refineries</strong></td>
<td>Industry</td>
</tr>
<tr>
<td>Coke production</td>
<td>Manufacturing and construction</td>
</tr>
<tr>
<td>Petroleum refinery</td>
<td>Agriculture, forestry and fisheries</td>
</tr>
<tr>
<td>Town gas production</td>
<td>Industrial process emissions</td>
</tr>
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<td></td>
<td>Non-energy GHG emissions from agriculture</td>
</tr>
<tr>
<td></td>
<td>Non-energy fossil fuel consumption in petrochemical industry</td>
</tr>
</tbody>
</table>

Source: Authors.
An Overview (2)

Levels / Trajectories Setting

Level 1: No efforts (existing capacity, or same technology, or no change in consumption)

Level 2: Great efforts (increased renewable energy, advanced technology, or reduced unit energy service demand)

Level 3: Physical limit/Technical potential (Nuclear power generation and renewables)

Source: Authors.
Example of Energy Supply Side: Solar PV

Japan’s solar PV capacity

Scenarios

| Level 1 | Capacity reaches just over 26GW in 2050, generating 27 TWh/y of electricity. There is roughly 2.2m² of solar panels per person. |
| Level 2 | Capacity reaches 47 GW in 2030 and 87 GW in 2050, and generates 92 TWh/y of electricity in 2050. There is roughly 7.5m² of solar panels per person in 2050. |
| Level 3 | Capacity reaches 76 GW in 2030 and 150 GW in 2050, and generates 158 TWh/y of electricity in 2050. There is roughly 13m² of solar panels per person in 2050. |
| Level 4 | Japan maximizes its efforts in promoting solar PV. Capacity reaches 95 GW in 2030 (producing 100 TWh/y) and 226 GW in 2050 (producing 238 TWh/y. There is roughly 22m² of solar panels per person in 2050. |
| Level 5 | This represents Japan’s physical and economic potential for developing solar PV capacity. Capacity reaches 475 GW in 2050, generating 500 TWh/y of electricity. |

Solar PV electricity generation projected by different levels

Source: Authors.
Example of Energy Demand Side: Domestic Passenger Transport Behaviour

### シナリオ設定

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>By 2050 each person in Japan travels 1,766 km per year more than today. The mode of transport is the same as of today, with passenger cars (59%), trains (29%), buses (6%), ships (0.2%) and airplanes (5%).</td>
</tr>
<tr>
<td>Level 2</td>
<td>By 2050, each person travels 883 km per year more than today. Less travel is by road (54%) and more by rail (32%) and air (8%).</td>
</tr>
<tr>
<td>Level 3</td>
<td>By 2050, each person travels the same distance as today but with a substantial shift away from cars (49%) towards rail (35%) and air (10%).</td>
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<tr>
<td>Level 4</td>
<td>By 2050, each person travel 317 km per year less than today. There is major shift away from cars to public transport: 45% passenger car, 37 rail, 8% bus, and 10% air.</td>
</tr>
</tbody>
</table>

Table 3: Total travel demand per person under different scenarios

<table>
<thead>
<tr>
<th>km travelled/person/year</th>
<th>2010</th>
<th>2050 Level 1</th>
<th>2050 Level 2</th>
<th>2050 Level 3</th>
<th>2050 Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10,641</td>
<td>12,407</td>
<td>11,524</td>
<td>10,641</td>
<td>10,324</td>
</tr>
</tbody>
</table>

Source: Authors.

Figure 30: Transport mode shares in Japan under different scenarios

Source: Authors.
What does the Navigator look like?

Excel Spreadsheet and Web Tool


Questions that can be addressed

- How much energy can we supply from different energy technologies?
- How much energy do different sectors use and how can we change this?
- Which sectors are the one we should focus on? Which are less important?
- What could happen to our energy dependency and security?
- Without nuclear, what will be the energy mix for Japan to achieve the 80% emissions target by 2050?
- How much CO2 reduction can be achieved using the most ambitious renewable energy scenarios? At what cost?
- What is the full potential of CO2 reductions in Japan? At what cost? What does the low-carbon pathway look like?
Let’s explore low carbon pathways with Japan 2050 Low Carbon Navigator!

① Go to IGES home page
② Click
③ Click & Enjoy!

For comments and enquiries: ge-info@iges.or.jp
Thank you very much!

Information
For accessing to the Web Tool version: http://www.en-2050-low-carbon-navi.jp/

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