Research & Development on future issues in accessibility for disadvantaged passengers

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3-A Enhancing client’s experiences
**About East Japan Railway Company (JR East)**

- **Hokkaido**
- **JR East**
- **Central**
- **West**
- **Shikoku**
- **Kyushu**

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Employees</td>
<td>59,240 (as of April 1, 2014)</td>
</tr>
<tr>
<td>Number of Stations</td>
<td>1,678 (as of April 1, 2014)</td>
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<tr>
<td>Number of Rolling Stock</td>
<td>13,348</td>
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<tr>
<td>Average Number of Trains Per Day</td>
<td>12,773</td>
</tr>
<tr>
<td>Passenger Line Network</td>
<td>7,474.2 kilometers (as of April 1, 2014)</td>
</tr>
<tr>
<td>Average Number of Passengers Per Day</td>
<td>17.10 million (2013)</td>
</tr>
</tbody>
</table>
65 years old and over / total population in Japan

YOSHIDA-East Japan Railway Company – R&D and future issues on accessibility for person with reduced mobility
Content

- Part 1. R&D on visual environment for the elderly
- Part 2. R&D on auditory environment for the elderly
- Part 3. R&D on mobility support for the visually impaired
- Part 4. R&D on information service for the hearing impaired and foreign visitors
- Part 5. Conclusion
1. R&D on visual environment for the elderly

Background and purpose
Existing signage guidelines are concerned with those with diminished vision or color-blindness. But there is a need for stricter standards for elderly who are prone to defective eyesight due to cataracts, etc. The purpose of this R&D is to develop guidelines based on our research.

Contents of research
1) Brightness, illuminance and color saturation within the station, and signs with which the visually impaired elderly have difficulty.
2) Evaluation of existing signage design.
3) Comparative evaluation of existing and modified signage design by elderly subjects.
1. R&D on visual environment for the elderly

Results

1) After the evaluation of existing signage design (background and text color), need for improvement was found in 4 lines among 12 main rail lines in the Tokyo area.

2) Figure 2 shows proposal for improvement.

3) Brightness contrast should be more than 0.65.

4) Letter size should be more than 70mm.
   The more complex characters are illegible.

5) Platform sign should be on a black background rather than the assigned route color background.

6) Pictograms should be shown with shadows.
2. R&D on auditory environment for the elderly

Background and purpose
Our aging society needs a proper auditory environment with consideration for the elderly. The purpose of this R&D to develop guidelines based on our research.

Contents of research
1) Tests were carried out in 3 Tokyo area stations with 10 subjects (age 66 to 80) with poor hearing.
2) Relationship between noise level and acceptability analyzed.
3) Specific S/N, the ratio of provided sound announcements to background noise, analyzed.
4) Noise level measured in various stations.
2. R&D on auditory environment for the elderly

**Results**

1) Specific S/N should be **more than 10dB.** 20dB is highly audible. (Figure 1)

2) Noise level should be **less than 65dB.** (Figure 2)

3) Stations achieving **less than 65 dB** have installed **noise absorbing material in ceiling.** (Figure 3)

4) The number of speakers should be **increased** and sound level of each **lowered.**

5) Speakers should be installed **6m apart.**
3. R&D on mobility support for the visually impaired

Background and purpose
Information which the visually impaired can attain from the map is about **1/70 compared to full-sighted users**. Tactile maps used in stations are not easily understood. We studied **mobile tactile maps** to support the visually impaired in stations.

Contents of research
1) Movement capability of the visually impaired researched.
2) Maps using non-visual information developed.
3) Appropriate information volume considered.
4) Confirmed practicality of mobile tactile maps.
3. R&D on mobility support for the visually impaired

Results

1) Information **attainable by the visually impaired**.
   - **Acoustic sense**: Chime at ticket gate, platform announcements, footsteps, sound of rollers, wind
   - **Tactile sense**: Guide blocks, floor material, handrail braille
   - **Olfactory sense**: Restaurant aromas

2) There should be no more than **4 map keys**.

3) **Straight lines, bold lines, mat surfaces** and **symbols** can be recognized **with fingertips**.

4) The map should be made in **3 different sizes**.

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Image of a station
- Straight lines represent walkways.
- Bold lines represent platforms.
- Mat surfaces represent areas.

Walkways / Stairs
- This map depicts walkways width, stairs, ticket gates, Shinkansen ticket gates.

Magnified image
- Complex section magnified.
- Information for acoustic, tactile and olfactory senses.

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tactile map in 3 different sizes
4. R&D on information service for the hearing impaired and foreign visitors

**Background and purpose**
The hearing impaired and foreign visitors often cannot attain information through **PA systems**. Methods of information dissemination for **these users** are being developed.

**Development outline**
1) Development of application for smartphone/iPhone.
2) Use of sound beacon to limit the area of information distributed.
3) Voice recognition, noise cancel/decreasing systems, etc.
4) Operable by conductor/station staff.

![Diagram showing the process of information dissemination](Image)

- **Textualization of announcement**
- **Search of standardized phrase**
- **Translation of phrase**

**Server(Cloud)**

- **Inter Net**
- **Location information**
- **Customer**

- **Beacon**
  - **Location information**
  - **Text**

- **Train**
  - **Text**

- **Station**
  - **Text**

- **Conductor, Station staff**
  - **Announcement**

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YOSHIDA-East Japan Railway Company – R&D and future issues on accessibility for person with reduced mobility
5. Conclusion

JR East has been conducting a wide range of studies and R&D to improve accessibility for people with disadvantages in mobility and have accumulated a certain level of knowledge regarding the respective factors.

However, there remain many issues and we have not yet achieved the ideal environment for all passengers.

Taking into account the Tokyo Olympic Games to be held in 2020, we need to design our stations in conformity with various users’ needs from the point of view of Universal Design.
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Thank you for listening