

# For Improving Local Disaster Preparedness in Densely Built-up Areas

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## 1. Introduction

The Basic Plan for Housing for people (decided by the Cabinet on March 19, 2021) positioned the strengthening of soft measures that contribute to improving local disaster preparedness in densely built-up areas. On the other hand, since the current measures for dense urban areas and disaster prevention performance evaluation focus on hard measures such as road and park development and noncombustible rebuilding, it is difficult to activate incentives for local residents to engage in soft measures such as fire prevention and initial firefighting. Therefore, an accurate evaluation method is required for the effect of soft measures. This paper presents a perspective on research on quantitative evaluation methods for the effect of soft measures, which NILIM is working to develop.

## 2. A perspective on quantitative evaluation of the effect of soft measures

We focused on the fact that implementation of soft measures improved the capacity of each of the following phases of regional firefighting and evacuation shown in the Table and as a result, particularly, the fire occurrence probability in each district that may lead to urban fires reduced (phases:

(1) Fire outbreak prevention (do not allow fires to start indoors) => (2) Initial firefighting at the fire origin (if a fire starts indoors, put out the fire yourself) => (3) Local firefighting (recognize a fire at an early stage and cooperate with local residents to put out the fire) => (4) Evacuation (if local firefighting is not possible, evacuate outside the district as soon as possible). The success probability of fire outbreak prevention and initial firefighting of each measure can be obtained through firefighting related statistics and spatial analysis using GIS, and then multiplied by the implementation rate of each measure, which results in the fire occurrence probability for each district. Then, by improving the current method of calculating the evaluation indicators for fire spread risk and evacuation difficulty so that the fire occurrence probability of each district can be incorporated as a variable, it is possible to quantitatively evaluate the overall disaster prevention performance, reflecting the effects of both hard and soft measures.

## 3. Conclusion

In the future, we would like to verify the effect of measures in various densely built-up areas to demonstrate and implement the aforementioned evaluation method.

**Table: Examples of soft measures by phase of local firefighting and evacuation**

Phase of local firefighting / evacuation	Examples of areas of action and measures		
	Structure (people)	Equipment and materials (goods)	Information
<b>1 Fire Outbreak Prevention</b> Initiatives for measures to control fires during an earthquake, etc.	<ul style="list-style-type: none"> <li>- Participation in seminars on fire prevention, including fire outbreak prevention measures</li> <li>- Breaker turn-off recognition rate during evacuation</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of earthquake-sensitive circuit breakers</li> <li>- Installation of furniture fall prevention</li> <li>- Percentage of combustible material scattering prevention measures implemented</li> </ul>	<ul style="list-style-type: none"> <li>- Disseminate the danger of large fires.</li> <li>- Disseminate information on fire hazard areas (e.g., disaster prevention map)</li> </ul>
<b>2 Initial firefighting at the origin of fire</b> Initiatives for initial firefighting measures by individuals at the origin of fire	<ul style="list-style-type: none"> <li>- Conduct initial firefighting training (how to use fire extinguishers, etc.)</li> <li>- Early notification training</li> </ul>	<ul style="list-style-type: none"> <li>- Install fire extinguishers for residential use</li> <li>- Install residential fire alarms</li> </ul>	-
<b>3 Local firefighting activities</b> Initiative for measures to prevent the spread of fire	<ul style="list-style-type: none"> <li>- Establishment and activities of voluntary disaster prevention organizations</li> <li>- Flying spark alert activities</li> <li>- Conduct initial firefighting training (how to use standpipes, portable pumps, etc.)</li> <li>- Secure the number of firefighters.</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of standpipes, portable pumps, etc.</li> <li>- Installation of street fire extinguishers</li> <li>- Secure and maintain fire prevention water tanks and fire hydrants</li> <li>- Seismic retrofitting of fire hydrants and water pipes</li> <li>- Interlocking fire alarm</li> <li>- High-place AI cameras, drones, etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Dissemination and clarification of information on water use locations, etc.</li> <li>- Disseminate how to use fire prevention water tanks.</li> <li>- Provide information using ICT-based tools to support disaster prevention activities.</li> </ul>
<b>4 Evacuation</b> Initiatives to implement evacuation in the event of a disaster	<ul style="list-style-type: none"> <li>- Conduct fire drills (when and how to evacuate).</li> </ul>	<ul style="list-style-type: none"> <li>- Maintenance of obstacle removal equipment (crowbar, jack, etc.)</li> <li>- Maintenance of evacuation areas, etc.</li> <li>- Interlocking fire alarm</li> <li>- High-place AI cameras, drones, etc.</li> </ul>	<ul style="list-style-type: none"> <li>- Dissemination of evacuation routes and evacuation sites.</li> <li>- Developing an evacuation plan in the event of a disaster</li> <li>- Creation of a list of persons in need of assistance in the event of a disaster, etc.</li> <li>- Provide information using ICT-based tools to support disaster prevention activities.</li> </ul>