Special feature: *Kokudo-gaku* (national land infrastructure planning) as code

National land infrastructure planning and the role of infrastructure in a national emergency: Eliminating weakness and enhancing safety

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An era when destruction was part of our job

Not long ago in Japan's national defense, the scenarios called to mind by the phrase "national emergency" were bombs being dropped on cities by foreign military aircraft, nuclear missiles being launched to completely reduce cities to dust, and ultimately, foreign troops landing on the coast of Japan. At least, this was our state of mind during the Cold War era. At that time, Japan's national defense strategy considered the Soviet armed forces in the Far East as a potential threat. Hokkaido was the most important front against this threat from the north.

Just before the end of the Cold War, I was the highest-ranking officer for the defense of Hokkaido. I considered several scenarios of how the enemy might attack. In each scenario, the essential thing was to keep the enemy from occupying Sapporo, the prefectural capital.

One might suppose that other cities such as Chitose, Muroran, and Hakodate could fill the gap if Sapporo were occupied. However, if the enemy occupied Sapporo and a foreign flag flew from the roof of the prefectural government building, it would appear to the rest of the world that Japan had politically abandoned Hokkaido. In reality, Japan could not adopt a scorched-earth policy that would involve 5.7 million residents of Hokkaido.

If the enemy landed at the coast, it would be best to repulse the enemy forces right there. However, it is not possible to station all of the prefecture's troops in readiness at a single location, since the time and location of a coastal attack is unknown. The troops had to be dispersed around the prefecture, so it would have been practically impossible to wipe out the enemy at the coast because of the imbalance of military forces.

Whether the enemy attacked at Wakkanai in the north, Nemuro in the east, or Rumoi in central Hokkaido, it would be necessary to slow the enemy's advance and prevent them from reaching Sapporo. It would be a fight against time as supporting troops would keep arriving from Honshu during that time. The question would be how many days we could hold out.

If the enemy attacked from Wakkanai at the northernmost part of Hokkaido, it would be necessary to start by evacuating at least all residents north of Nayoro and moving them to the south. The Self-Defense Forces heading northward would pass private vehicles evacuating southward along national and prefectural highways, resulting in considerable confusion. The Civilian Protection Law was only passed in 2004, more than a decade after the end of the Cold War.

After the civilian population had been evacuated, the Self-Defense Forces would establish defensive positions and resist the enemy's advance. However, they would be outnumbered until the supporting troops arrived, so it would be necessary to fight tenaciously while destroying highways, tunnels, and bridges to slow the enemy's advance. Also, in order to impede the enemy's supply shipments, the

Self-Defense Forces would destroy harbors before retreating to prevent the enemy from using them.

At that time, the (then) Ministry of Transport had a plan to build additional harbors (in contrast to the present thinking, which favors consolidation to reduce the number of harbors); and the (then) Ministry of Construction had a plan to extend the expressway, which had been completed as far as Asahikawa, to Nayoro and further to Wakkanai. Of course, these towns would have been pleased to get the expressway. However, if the extension were built, it would make it much easier for the enemy to travel all the way to Sapporo after landing at Wakkanai. It was desirable in terms of national infrastructure development and economics, but undesirable in terms of national defense.

Three threats in a new era

The structures of roads, tunnels, and bridges had to be strong against natural disasters, but easily destroyed in order to keep the enemy from using them in a national emergency.

In South Korea and Switzerland, the side walls of bridge piers and tunnels are fitted out in advance with secret spaces for explosives which could be used to destroy these facilities. In addition, portions of expressways are built so that they could double as runways for aircraft to make an emergency landing, or emerge from a nearby cave and take off in a national emergency. These are straight portions about 3,000 meters in length with a foundation and surface that could withstand shock loading. High-voltage lines are buried underground; no roadside trees are planted; and the streetlights are placed low so that they could function as guidance lights.

Then the Cold War came to an end, and these preparations for a worst-case scenario became unnecessary. Meanwhile, three new threats came under closer scrutiny in terms of crisis management.

First, along with advanced development of the national infrastructure, Japan's cities and elements of basic infrastructure came to have greater weaknesses than we could have anticipated.

Second, the risk of large-scale terrorism has emerged. Terrorist groups have obtained weapons of mass destruction (biological and chemical weapons, radioactive materials, and compact nuclear weapons). Although these groups have international connections, they are not nations themselves, so they have no fixed representatives for negotiations and are not easily contained.

We would like to think that Japan is not a target of terrorism. However, considering that the sarin gas attacks on the Tokyo subway system ten years ago were the world's first case of a terrorist attack that used weapons of mass destruction, we must not neglect counter-terrorism in Japan. Public transportation facilities such as subways and Shinkansen lines, skyscrapers,vast underground shopping malls, nuclear power plants, and dams would be particularly attractive targets for terrorist attacks.

The third threat is the proliferation of medium-range ballistic nuclear missiles. These are now in the possession of India, Pakistan, and North Korea. Major countries have intercontinental ballistic missiles (ICBM) and submarine-launched ballistic missiles (SLBM). However, this threat calls for the prevention and deterrence of surprise attacks on a global scale.

It seems unlikely that any country that has recently acquired nuclear weapons would intentionally fire a missile at Japan due to hostility. However, it is possible that the missile launch button could be pushed accidentally. Medium-range ballistic missiles have a flight time of up to 10 minutes, so people will need to get into the closest shelter within a few

minutes after the alarm is sounded. Therefore, all underground structures in large cities should be built to the specifications of fallout shelters.

Considerations for essential crisis management

In order to protect the lives and assets of the people of Japan from various crises, civil engineers must also give consideration to aspects of crisis management in case of a national emergency (large-scale natural disaster, large-scale terrorist attack, or ballistic missile) when establishing priority measures in national infrastructure development and when deciding the locations and structures of various types of facilities, in addition to considerations aimed at economic effects, convenience, and environmental protection.

However, it is not feasible to establish separate measures for natural disasters and national emergencies. The most important issue is to establish the infrastructure that can help to limit the loss of life in a national emergency. The following is a list of considerations related to crisis management.

(1) Population concentrations in cities should be avoided. It is important to build a well-developed IT network and avoid a situation in which most people live close to their workplaces. Steps should be taken to attract high-quality educational institutions to the suburbs and provide incentives to businesses that establish offices nearby.

(2) Cities should be connected by multiple major roads, in order to ensure that detours are available. Routes should be selected in such a way that both would not simultaneously receive major damage in an earthquake. Several segments should be able to function as aircraft runways.

(3) Earthquake-resistant quays and earthquake-resistant cranes should be provided for access from the sea during relief efforts after a large-scale earthquake disaster. In case these cannot be used, there should be areas where landing craft could be easily beached. (The Maritime Self-Defense Force used hovercraft after the earthquake off Sumatra: Photo 1.)

Photo 1. Air cushioned landing craft (standard displacement: 85 tons, speed: 40 knots)

(4) Underground shopping malls should have simple structures and strict regulations, with specifications for fallout shelters. Subways should have additional exits, more than the number needed for ordinary traffic, in order to facilitate evacuation.

(5) In the future, in view of Japan's prevailing winds, any additional nuclear power plants should be built on the Pacific side, avoiding the Sea of Japan side. Nuclear power plants and dams should also be thought of as defensive positions against terrorist invasion, and the site topography should be modified for greater ease of protection.

(6) Schools and public buildings should be able to function as temporary antiterrorism bases, in addition to providing shelter in case of an earthquake disaster. They should be equipped with devices to detect chemicals, biological materials, and radioactivity, isolation wards for persons with illnesses, and facilities for radio

communications with administrative agencies for disaster prevention.

(7) Foundations should be built next to the main bridges over important rivers in order to allow the installation of temporary bridges if those bridges are destroyed. (When the Self-Defense Forces install a temporary bridge, the construction of temporary foundations for both ends of the bridge is more time-consuming than installation of the bridge itself: Photos 2-4.) In addition, paved spaces for use as heliports should be provided on both sides. The key is always redundancy, a critical requirement.

Photo 2. Type 81 self-propelled bridge (bridge length: 10 meters per span, height: up to 4 meters, width: 3.75 meters, capacity: 50 tons)

Photo 3. Type 92 heavy pontoon bridge (bridge length: 10 meters per span, width: 4 meters, capacity: 50 tons)

Photo 4. A heavy pontoon bridge installed by the Ground Self-Defense Forces in a few hours' time (Edo River).

The number of changes to be recommended is practically limitless. However, there is also a need for intangible enhancements in areas which provide the support to make these changes possible, including the legal system, attitudes toward crisis management, and incessant training.