



To Conserve or Not to Conserve?

A Brief Outlook of the Korean Demilitarized Zone and the German Green Belt

KEI-IOER Joint Research Collaboration on the Korean Demilitarized Zone

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Rationale and Objectives

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While many would agree that the Korean Demilitarized Zone (DMZ) is an invaluable ecological asset to humanity, research on the DMZ has been severely restricted by the ongoing political tensions between South and North Korea. Thus researchers have very limited empirical data to go on. To resolve this problem, two renowned research institutes are working in tandem in order to reveal the true nature of the DMZ and to identify any underlying threats it faces. In this way we hope that the DMZ's ecosystems and environment can be carefully preserved for the future.

The objectives in this collaborative venture are twofold: (1) The Korea Environment Institute (KEI) wishes to take advantage of Germany's experience of separation and reunification, specifically regarding the impact of these processes have had on landscape change. To analyze the change, it is necessary to develop basic land-cover data to illustrate landscape-level changes in the DMZ over time. As our collaboration largely deals with landscape change in the context of national separation and (prospective) reunification, we think it is important to include historical land-cover information of the DMZ to portray the landscape situation before the separation. (2) The Leibniz Institute of Ecological Urban and Regional Development (IOER) has experience in constructing spatially explicit historical databases based on old topographic maps. The KEI intends to utilize this expertise to set up a spatially and temporally explicit database for the DMZ region.

In this context, the KEI and the IOER have developed a method of utilizing old topographic maps by digitizing these in such a way that data can later be used to analyze landscape change. The aim of this initial comparative case study is to describe the kinds of raw data used, how the data are processed and to give an indication of the resulting digital maps. The IOER will introduce the German Green Belt case study and the KEI will present the Korean DMZ case study.



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KEI Korea Environment Institute



The Korea Environment Institute (KEI) is a top national think tank that has played a key role in advising the government of the Republic of Korea on matters of sustainable development and environmental conservation since 1993. As a member of the Korea Council of Economic and Social Research Institutes under the Prime Minister's Office, the KEI has been at the heart of developing environmental agendas through scientific research and policy recommendations. Recently, the KEI has relocated to Sejong, the new administrative capital where numerous governmental agencies and public research institutes are located, in order to more effectively bridge science and policy.

As a fully autonomous research organization, the KEI works closely with the government in two major ways. On the one hand, the institute is committed to conducting proactive environmental policy research in order to prevent and solve environmental problems. The KEI has positioned itself as a leading institution through its cutting-edge research and rigorous analyses. It meets a growing demand for knowledge on the environment and provides insight into sustainable development.

On the other hand, the KEI reviews environmental impact assessment reports on behalf of the central and local governments and provides professional feedback and alternatives so as to minimize environmental degradation caused by development activities. Thorough and fair assessment is crucial in controlling pressure and avoiding potentially adverse impacts.

Building on its 22-year experience in environment policy research, the KEI has taken its work to a new level through international joint research projects and partnerships. With a growing recognition of the need for enhanced collaboration and coordination beyond national level, the KEI has expanded its body of work to the global level. The KEI's global partnership and outreach activities, especially regarding technical cooperation and knowledge sharing with developing countries, are intended to create a sustainable development cooperation hub, serving as a global gateway for researchers as well as practitioners and providing a platform for joint research and knowledge sharing.

IOER Leibniz Institute of Ecological Urban and Regional Development



The Leibniz Institute of Ecological Urban and Regional Development (IOER) in Dresden (Germany) is an establishment of the Leibniz Association for theme-based research in the spatial sciences focusing on ecological aspects of sustainable development. It was founded in 1992 and is jointly funded by the federal and Saxon governments. The institute addresses the scientific basis for the sustainable development of cities and regions in the national and international context.

The IOER investigates cause-and-effect relationships between the natural environment and society as well as the options available to society to influence these. Particular attention is paid to the global and regional challenges of urban and regional development, for example as posed by climate change and demographic change. The institute is concerned with how cities and regions can be developed with reasonable effort to offer

the population the greatest possible quality of environment and life, to ensure that the natural environment is accorded the widest scope for development, to promote urban and regional resource efficiency, and to prevent environmental risks.

The IOER's motivation is to contribute through innovative research and advice to the compatibility of human action and the development of the natural environment in order to ensure a sustainable basis for life and to promote sustainable spatial development. The institute adopts an interdisciplinary approach in its work. Issues are tackled across all planning levels and at all scales. The IOER aspires to scientific excellence and societal relevance in its work, and that it should be of national and international importance. On the basis of its findings, the IOER advises government and society.

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German Case Study

- The Inner-German Border and Its Development
- Study Area
- Recent Data and Historical Maps

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German Case Study

The Inner-German Border and Its Development

In the aftermath of the World War II, Germany was partitioned into two states, namely the German Democratic Republic (GDR/East Germany), which was under Soviet control, and the Federal Republic of Germany (FRG/West Germany), controlled by the Allied Forces (UK, France, USA). This separation lasted from 1945 to 1990.

During this time the East German government continued to fortify the 1,378 km inner-German border. This was part of the so-called “Iron Curtain” dividing the Soviet bloc from Western Europe, running over 12,500 km from Scandinavia to the Mediterranean.

The separation was initiated on 1 July 1945 when the GDR was founded on the territory of the Soviet sector. In the early years from 1945-52 there existed a so-called “Green Border” between the two Germanys with check-points, barriers or barricades at cross-border roads, border patrols and simple fences.

Ostensibly to stop an influx of spies, terrorists and smugglers, but in reality with the aim of checking the growing flood of emigrants from East to West, the GDR authorities implemented a so-called “Special Regime” in the years 1952-67. The border area was redesigned as follows: A 500 m wide “protective strip” adjoining the border was placed under tight control. Barbed wire fencing was erected within a short distance to the borderline (behind the so-called “no-man’s land”) along with a 10 m wide ploughed strip of land (the so-called “dead strip”). This was followed by several barbed wire fences, which in some areas were also mined. In this zone trees and brush was cut down to provide clear lines of sight; bridges and roads were closed and houses adjoining the border were torn down. Armed guards were authorized to shoot at anyone attempting to cross the border illegally. An additional 5 km wide “restricted zone” required a special permit for entry. Border guards supervised all activities in this zone. This was also the period that saw the construction of the Berlin Wall (1961).

← “Aerial image of the former inner-German border – nowadays a Green Belt (but this is by far not generally the case). The image was taken between the villages of Tettenborn (Lower Saxony) and Klettenberg (Thuringia) near by the investigation area. The former East German part is on the right hand side, the former patrol road is clearly visible. Left of it, there are remnants of the anti-vehicle ditch. After reunification, the border fortifications were pulled down and the road crossing the former border was reconnected. Image taken 04.08.2003, courtesy of Klaus Leidorf - www.Leidorf.de”

German Case Study

Between 1967 and 1989 the border was further fortified to create the so-called “Modern Frontier”. The barbed-wire fences were replaced by harder-to-climb expanded metal barriers (total length: 1,265 km) and the following features were installed (Ritter and Lapp, 2011):

- Directional anti-personnel mines (up to 293 km)
- Spring-guns (up to 60,000 over 339 km)
- Anti-vehicle ditches to block the movement of people and vehicles (829 km)
- Tripwires and electric signals to help guards detect escapees (1,186 km)
- All-weather patrol roads enabled rapid access to any point along the border (1,339 km)
- Most wooden guard towers were replaced with prefabricated concrete towers (total 733)
- Observation bunkers (total 473)

Under the process of reunification in 1990, the GDR became a part of the Federal Republic of Germany. When border installations were pulled down, biologists came across several rare species inhabiting the former border areas. This was the motivation for the establishment of a so-called “Green Belt” along the former border to function as a primary migration corridor. At the same time, the German Green Belt is part of the European Green Belt, which has replaced the old Iron Curtain.

In the first years of reunification there was a great deal of activity to re-establish transportation and communication infrastructures between east and west. Confiscated properties in the border area were returned to the original owners or their heirs. This led to new and intensive agricultural usage in the formerly isolated and undisturbed border region. Today the natural value of the Green Belt is more carefully considered when planning of new developments (i.e. by placing essential infrastructure underground or conserving important habitats). The Friends of the Earth Germany have drawn up guidelines to conserve and improve the natural state of the Green Belt (BUND 2014). Korea now has the opportunity to benefit from the experiences made during the process of German reunification by learning about potential landscape changes and transformation paths.

1984



1982



2010



2013

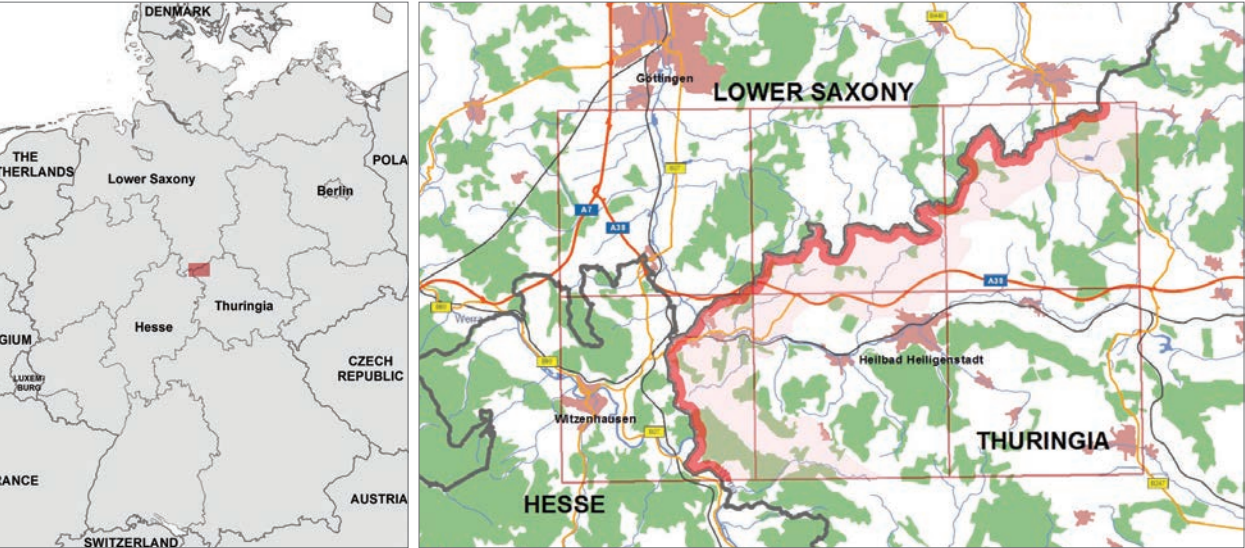


↑ (above) Landscape development and renaturing at the former inner-German border near Rottenbach (Bavaria, former FRG) and Görzdorf (Thuringia, former GDR) between 1984 and 2010. The course of the so-called Iron Curtain was an engraving wound in the landscape. After dismantling the border fortifications, nature has reclaimed parts of the landscape.

↑ (below) Constructing and reconnecting cross-border infrastructure (roads, highways, rails, energy, information and communications technology) as well as uniting settlements isolated for decades was an important demand after the German reunification. The image shows the redevelopment of a railway line near Oebisfelde (Saxony-Anhalt, former GDR) and Grafhorst (Lower Saxony, former FRG) 1982 und 2013. Fortifications and observation towers yielded to new tracks.

Study Area

The investigation area chosen for detailed analysis is the Eichsfeld region in central Germany with Göttingen as the nearest well-known city. The area covers the former border area between East Germany (now Thuringia [Thüringen]) and West Germany (now Lower Saxony [Niedersachsen] and Hesse [Hessen]). Six sheets of topographic maps provide an outline of the study area (35 by 22 km, 770 km²).



Location of the study area within Germany (VG 25 © GeoBasis-DE/BKG 2015) and detailed map of the study area (VG25, DLM250 © GeoBasis-DE/BKG 2016) including the location of the used map sheets, the former fortified 500 m wide protective strip along the inner-German border (red) and the 5 km wide restricted zone (light red).

Three criteria were used to select the study area:

- Nature protection – the area forms an important corridor between two large protected regions (the Harz mountains in the north and the Werra river valley in the south), ongoing nature protection projects
- Development – transport axis after reunification: newly built highway A38 (completed end of 2009), intensive agricultural re-development
- Data perspective – available data and maps

The region is largely rural with some wooded hills and a large number of smaller towns. The fertile, loess-covered lowland encourages intensive agriculture. The elevation is between approx. 200 and 543 m (Goburg). The newly built highway A38 passes through a small mountain (the Heidkopf, elevation: 353.6 m), which required the construction of a tunnel (Heidkopftunnel) – also to preserve the continuity of the Green Belt.

Recent Data and Historical Maps

The six topographic map sheets at scale 1:25,000 are available for the following timeframes:

Topographic map sheet	Year				
	1937/38	~1945	~1950	~1970	~1990
4525 Friedland (LS)	1937	1945	1956	1971	1991
4526 Gleichen (LS)	1937	1945	1956	1969	1993
4527 Berlingerode (T)	1937	1945	1956		1993
4625 Witzzenhausen (H)	1937	1945	1956	1969	1993
4626 Heilbad Heiligenstadt (T)	1937		1956		1988
4627 Leinefelde (T)	1937		1956		1988

* LS...Lower Saxony; T...Thuringia; H...Hesse

A selection of these maps is shown in this section subsequently to indicate land use development in one segment of the study site(area about 4.8 x 3.5 km). In addition to the historical maps, recent digital topographic data is available for the years 2000 and 2014 from the German-wide Authoritative Topographic-Cartographic Information System, Digital Landscape Model (ATKIS-DLM).

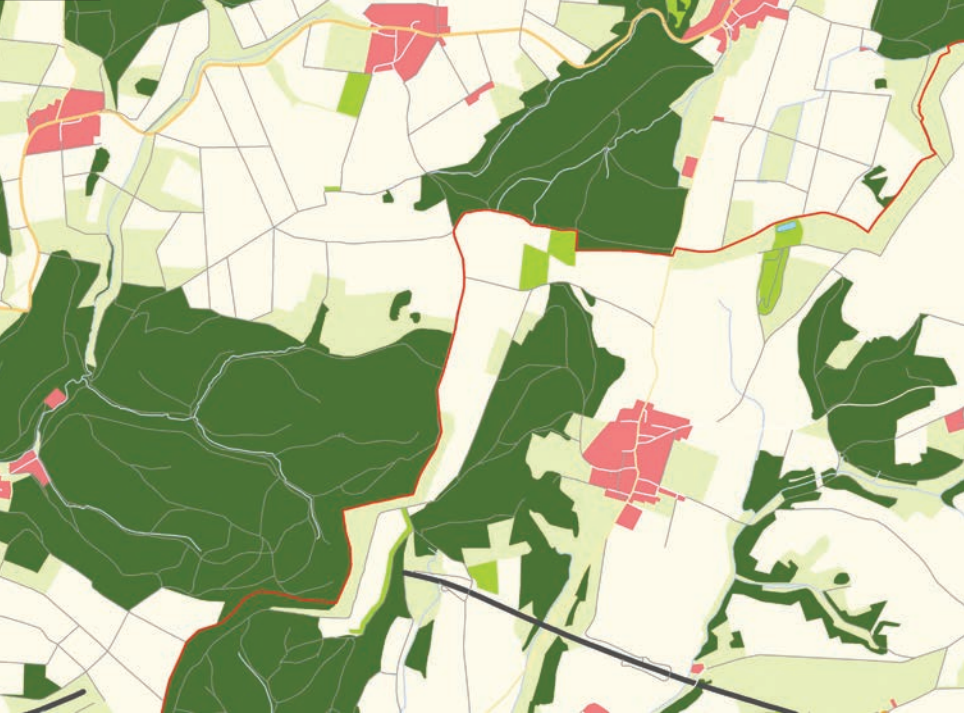
It is important to remember that maps do not always represent an objective reality, and that there can be manifold problems in the interpretation of maps, especially historic maps. In the case at hand, some topographic features may have been deliberately omitted or distorted on the GDR maps (i.e. real features at the border strip such as fortifications and military objects). Furthermore, developments in land use that take place between map editions cannot be directly illustrated. Clearly, a map is only a snapshot at a particular point in time. Data availability, accuracy, geo-referencing and digitization may provide further challenges for the analysis of historical land use development. These issues will be addressed in later project stages.

2015



Ortho Photos (DOP40) of the federal states © GeoBasis-DE/BKG 2015. Additional feature: state boundary (red line) © GeoBasis-DE/BKG 2015.

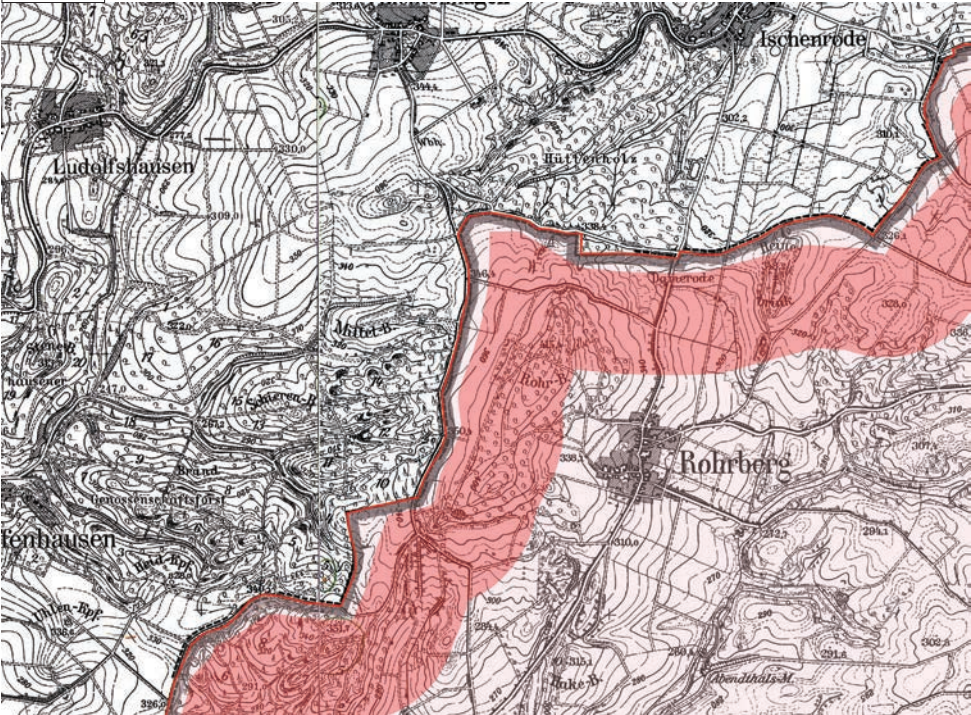
2014



Status 2014: Authoritative Topographic-Cartographic Information System, Digital Landscape Model (ATKIS-DLM), © GeoBasis-DE/BKG 2014. Additional feature: state boundary (red line) © GeoBasis-DE/BKG 2015.

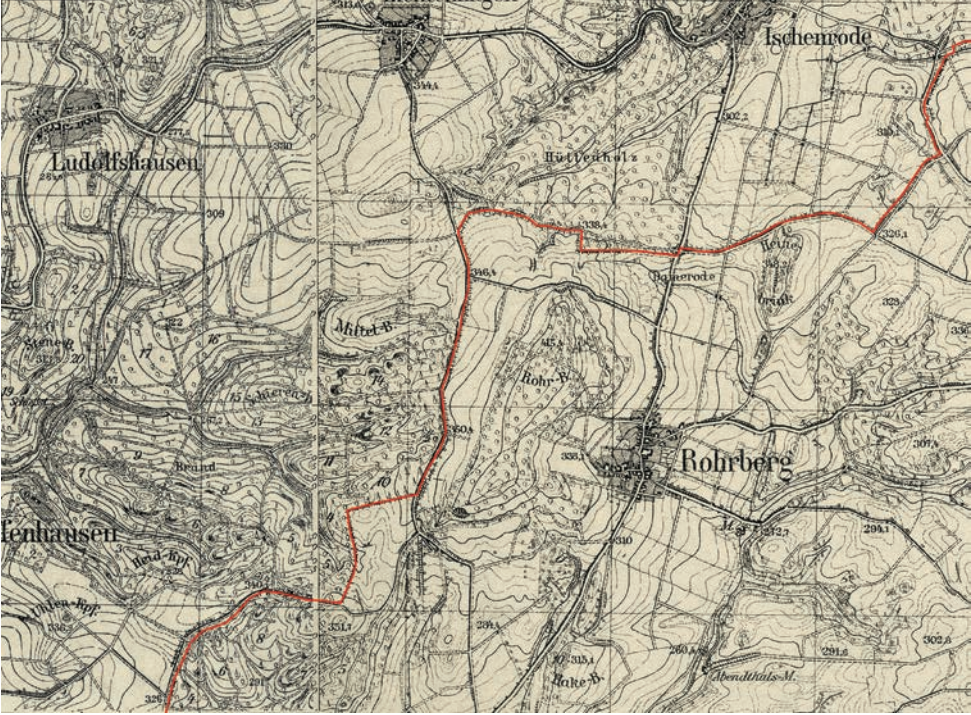
- Legend**
- | | | | |
|---------------------------------------|----------------|------------------------|----------------------|
| Urban area | Grassland | Federal state boundary | District road |
| Forest (coniferous, deciduous, mixed) | Shrub land | Motorway | Local road |
| Agriculture | Water body | Federal road | Other road, driveway |
| | Marsh or swamp | Country road | Railway |
| | | | River, stream |

1969



1969: Topographic map 1:25,000. Source: Extract from geographic base data of the surveying and cadastral authority of Lower Saxony, © 2015 LGLN.

1937



Status 1937: Plane survey sheet (Messtischblatt) 1:25,000, ed. 1909 with suppl. 1937. © Saxon State and University Library Dresden (SLUB)/ German Photographic Collection (Sächsische Landesbibliothek — Staats- und Universitätsbibliothek Dresden (SLUB)/ Deutsche Fotothek). Additional feature: state boundary (red line) © GeoBasis-DE/BKG 2015.

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Korean Case Study

The Korean DMZ is similar to the former inner-German border in that it divides a capitalist from a socialist country. In both cases there is (or was) highly restricted access to the border region. However, the DMZ differs from the old East-West German border in regard to the level of militarization. The DMZ is, in fact, a demilitarized border region; its natural features and landscapes are relatively “untouched” compared to the old East-West border. In this respect it can be argued that the region has more landscapes and habitats to conserve.

From 2009 to 2012 the KEI published a series of reports that included plans for the Ecology & Peace Park in the South Korean DMZ (KEI, 2009, 2011, 2012). Although the projects were able to make use of a range of spatial datasets and analytical methods, they were limited in demonstrating general landscape change in the DMZ. The study area was restricted to the South Korean DMZ only; hence, the reports were not geared towards providing the most comprehensive picture of the situation in the DMZ, but instead focused on issues of planning from the perspective of landscape architecture.

The present case study is the first attempt to analyze the landscape of the DMZ on both sides of the border. In here, the outline of our ongoing research is briefly introduced.

- The DMZ and Its History
- Development and Environment
- Study Area
- Recent Data and Historical Maps
- Urban Sprawl of Kaesong City between 1910 and 2010



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Korean Case Study

The DMZ and Its History

The DMZ is a no man’s land, a massive strip that delineates the partitioning of Korea into the capitalist South and the communist North. As the last remaining Cold War frontier after the fall of the Berlin Wall, it is considered the most heavily fortified border in the world, guarded by soldiers on both the southern and northern sides. Ironically, the perpetual state of tension between the soldiers on the DMZ has had one silver lining; the zone, which is 248 km in length and 4 km wide, has become a quiet resting place for flora and fauna. Running along the 38th parallel, the DMZ has been undisturbed by human intervention since its establishment in 1953, creating a natural haven for several endangered species in the Korean Peninsula.

From 1910 to 1945, Korea was illegally occupied and ruled by Imperial Japan. After Japan’s surrender in World War II, the United States of America and the Soviet Union agreed to partition the Korean Peninsula into two separate trusteeships along the 38th parallel. During the period leading up to the Korean War, the Republic of Korea (ROK) in the south and the Democratic People’s Republic of Korea (DPRK) in the north both claimed to be the sole legitimate government for the whole peninsula. After rising tension between the South and North, the Korean War finally broke out on 25 June 1950 when North Korea invaded the South. Although the Armistice Agreement was signed in 1953, the two Koreas have still not concluded any formal peace treaty, meaning that they are technically still at war. Both countries have heavily fortified their sides of the border. This makes the DMZ both a political hotspot and a refuge for endangered species in the Korean Peninsula.



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Development and Environment

If and when the two Koreas undergo reunification, this will certainly have a huge impact on the DMZ. Some areas of this strip of untouched land may have to be given up for development. Transport corridors will certainly be constructed in order to link the two Koreas and to facilitate trade. Although such developments will bring great benefits to the Korean people, at the same time they will present a severe threat to nature.

With the establishment of the DMZ between the two Koreas after the Armistice Agreement, this area has remained untouched by human hands for more than 60 years. No intensive agriculture activities or industrial developments have marred the landscape on either side of the border. This has allowed wild species of flora and fauna to thrive undisturbed in their natural habitats. However, with some commercial activities already in operation near the DMZ, it is not hard to imagine that future inter-Korean economic developments could pose a grave threat to this peaceful area.



Study Area

Two map tiles at scale 1:50,000 constitute the area of investigation in the Korean case study. The same selection criteria used for the German case study are applied to the Korean case study. This western part of DMZ includes Kaesong City (North Korea) and the two major rivers Imjin and Han. Before partitioning, this was a densely populated area, with a railway connecting south and north. Due to its proximity to Seoul (the capital of South Korea), this region would be even more vulnerable than other parts of the DMZ in the case of reunification. The wetlands and rice paddies in the region provide habitats for endangered bird species such as the red-crowned crane. Currently available data and maps are listed below.

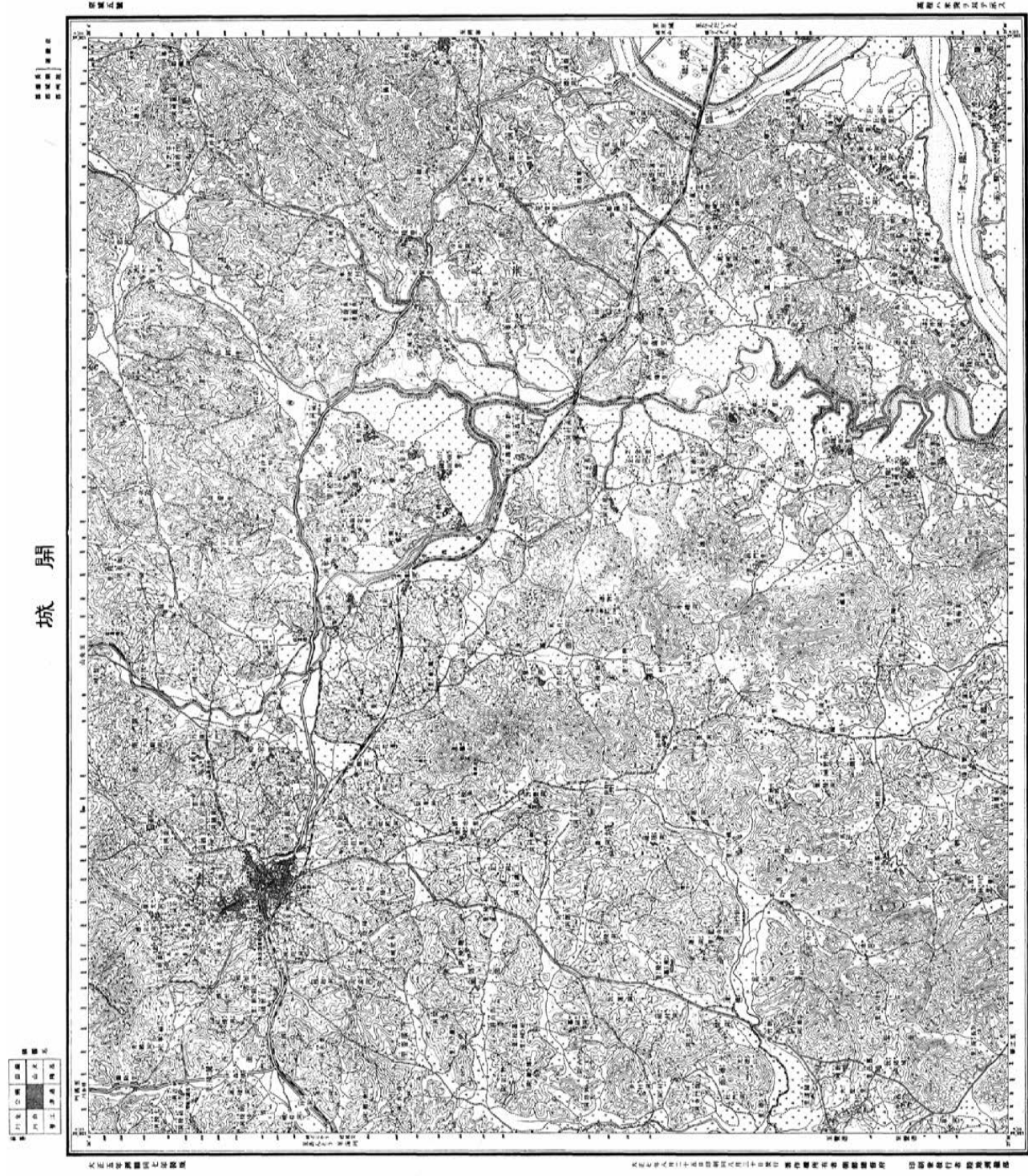


↑ Study area: The western region of the DMZ (dashed light red) along the border (red) (Map sources: ArcGIS Basemap and topographic maps before/during Japanese colonization, Border source: Naver Map).

Recent Data and Historical Maps

While the Ministry of Environment has published three sets of land-cover maps since the 1980s, these are not sufficient to detect landscape change as a result of partitioning because natural succession has been underway for much longer, specifically since 1953. These recent maps cover the periods:

- 1987/1989 – land-cover maps (South-North partition, source: Ministry of Environment)
- 1997/1999 – land-cover maps (South-North partition, source: Ministry of Environment)
- 2008/2010 – land-cover maps (current situation, source: Ministry of Environment)

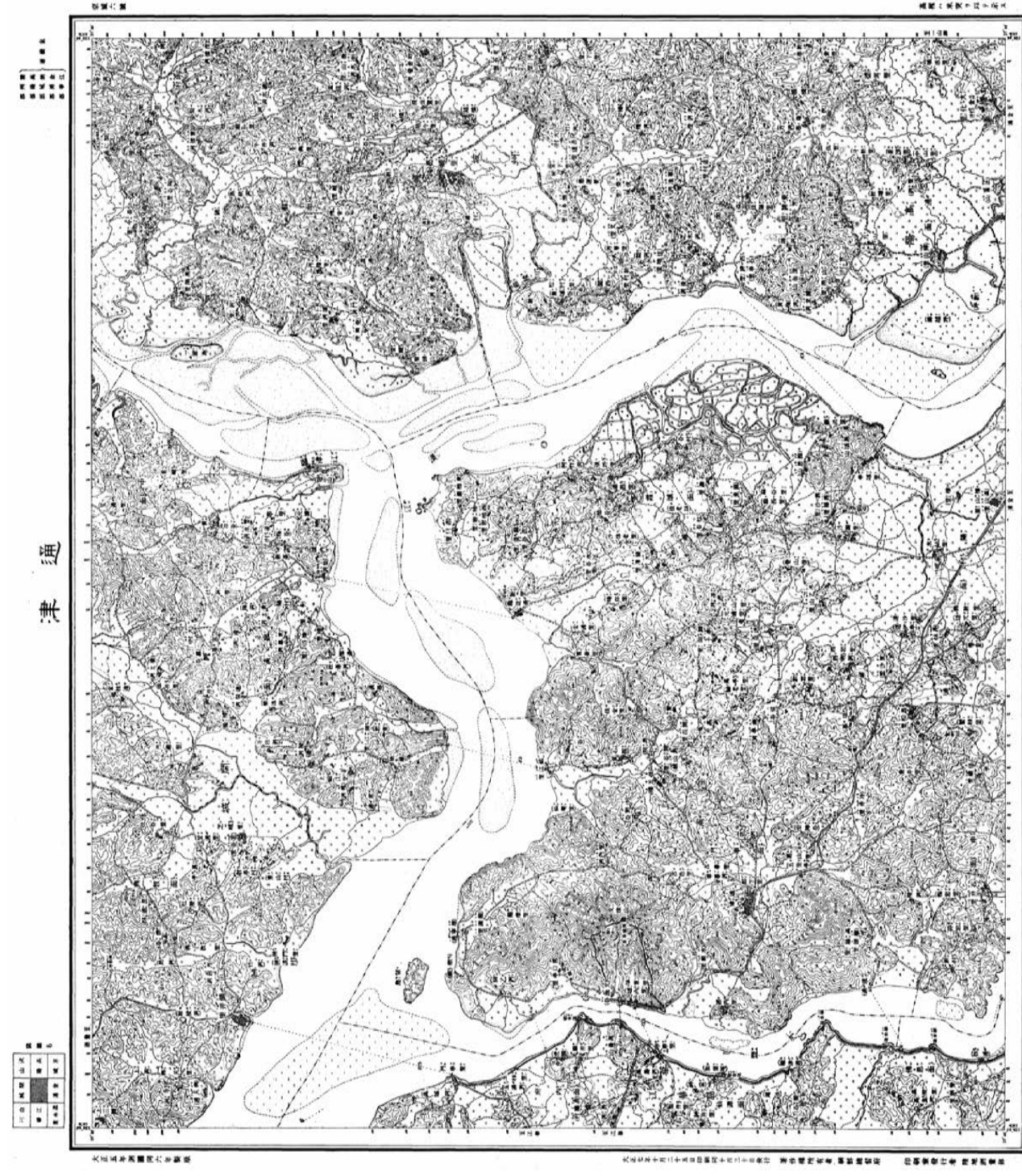


← Status 1910: The upper map tile of the study area. At the upper left corner the urban area is the Kaesong City (North Korea). The Imjin River can be seen in the lower right corner.

→ Status 1910: The lower map tile of the study area. The Imjin River flows from the North and meets the Han River in the middle.

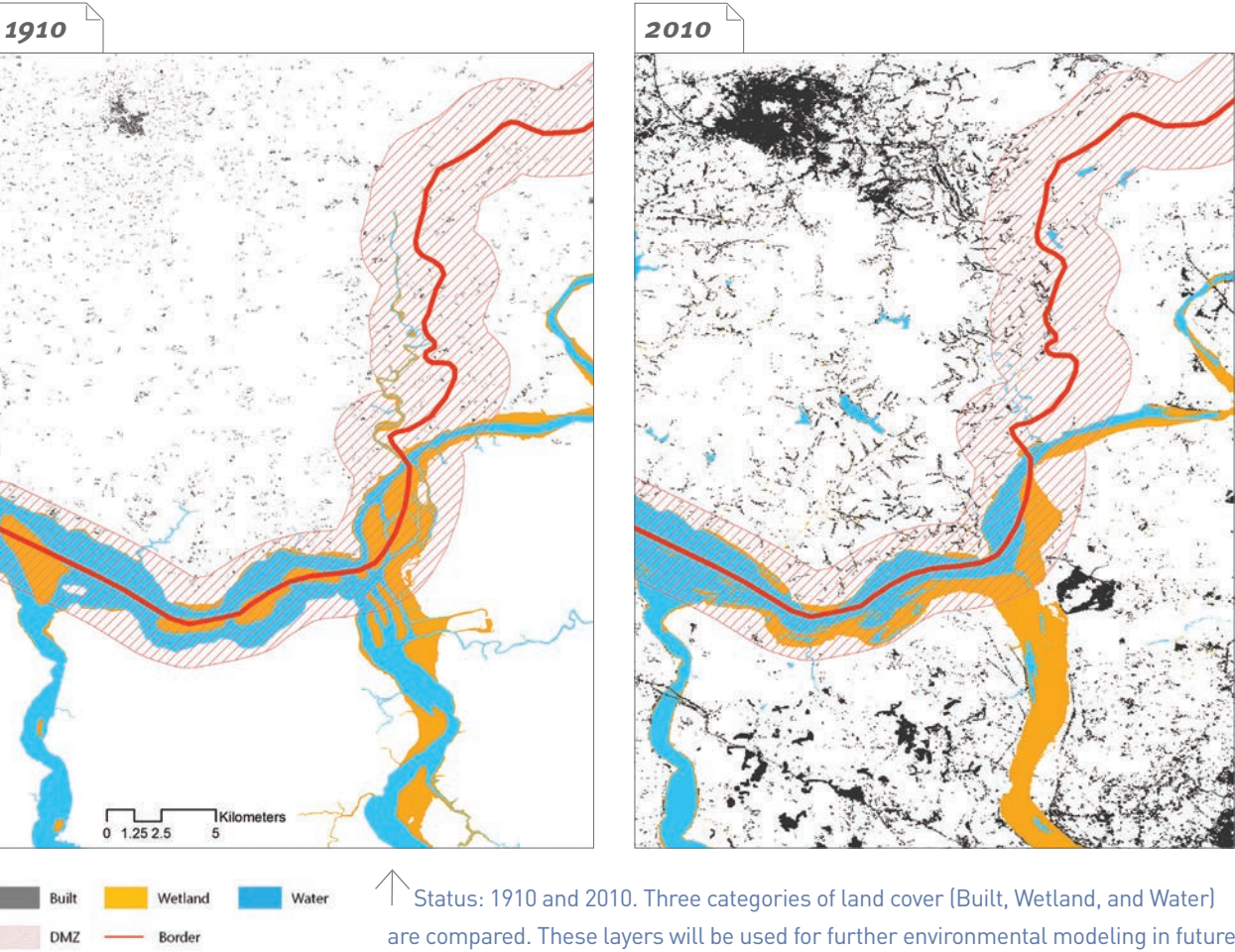
In this joint project, the KEI aims to digitize historical maps of the Korean DMZ for four time periods:

- 1910 – topographic maps (before/during Japanese colonization, source: Imperial Japan)
- 1954 – topographic maps (during/after Korean civil war, source: U.S. Army)
- 1962 – topographic maps (South-North partition, source: South Korean government)
- 1970s – land-use and topographic maps (South-North partition, source: South Korean and Russian governments)



Urban Sprawl of Kaesong City between 1910 and 2010

The raw maps of 1910 are scanned, geo-referenced, and digitized. Residential and commercial buildings, rivers and wetlands are shown in the maps. Other land-cover features such as rice paddies and areas of forestry are currently being constructed. The final maps will reveal changes in the built-up areas of Kaesong City from 1910 to 2010. In the next project stages we intend to perform further analysis to detect changes in other categories of land-use and land-cover for both the Korean and German case studies.



↑ Status: 1910 and 2010. Three categories of land cover (Built, Wetland, and Water) are compared. These layers will be used for further environmental modeling in future research.

Future Plan

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The present document provides a brief overview of our work to compare landscape changes resulting from German separation and reunification as well as the partitioning of the Korean Peninsula. Specifically, we intend to compare various sections of the inner-German border and of the Korean DMZ at the landscape level and at different time periods. Through such comparison it is hoped that South Korea can make good use of the German experience, and in this way help to minimize future environmental degradation and promote nature conservation in the Korean DMZ.

KEI-IOER Joint Research Collaboration on the Korean Demilitarized Zone

References

BUND – Bund für Umwelt und Naturschutz Deutschland/Friends of the Earth Germany (Ed., 2014): Handlungsleitfaden für das Grüne Band [Guideline for action for the Green Belt]. 78 p. (http://www.bund.net/fileadmin/bundnet/publikationen/gruenes_band/140415_bund_gruenes_band_handlungsleitfaden.pdf)

Korea Environment Institute (KEI) (2009): Research on the national park designation of the Korean demilitarized zone (DMZ), Korea National Park Service. pp. 1–257.

Korea Environment Institute (KEI) (2011): Preparing a guideline to conserve and utilize the Korean demilitarized zone (DMZ), Ministry of Environment. pp. 1–191.

Korea Environment Institute (KEI) (2012): Basic plan for establishing Ecology and Peace Park in the Korean demilitarized zone (DMZ), Ministry of Environment. pp. 1–369.

Ritter, J.; Lapp, P. J. (2011): Die Grenze - Ein deutsches Bauwerk [The border - a German construction]. Ch. Links Verlag, Berlin; 8th ed., 208 p.

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