

Issues with Building a Marine Cadastre System in South Korea

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Key words: Marine Cadastre System, Coastline land management

SUMMARY

The complexities of marine area management are highlighted in the Korean situation, with a complex legal and institutional framework, changing economic priorities, escalating conflicts related to resource use, national security and increasing pressure to address ecosystem problems. South Korea is in a difficult political and geographical situation, with jurisdictional conflict in its maritime regions. Consequently the need to establish an integrated marine management system is fundamentally important to South Korea.

Despite the absence of physically marked boundaries, and despite the complexity of reliable marine positioning, maritime boundaries and their associated rights, restrictions, and responsibilities are absolutely real and must be well managed and adhered to (Collier et al. 2003).

In this study, to build the best practice of marine cadastre system in South Korea, examination of issues with marine boundaries, environment, policy and information management, particularly for Australian and South Korean contexts, has contributed to recommendations.

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1. INTRODUCTION

South Korea is a deeply maritime nation; it has over 3000 islands with 443,000 km² of marine area, which is 4.5 times greater than the land area, and 11,542 km of political borders dominated by maritime boundaries. Coastal and marine activity has expanded over the last few decades, includes aquaculture, tourism and recreation, mineral and energy extraction, shipping and fishing. This increase in the use of the marine environment has resulted in Korea's marine territory being more highly valued than in the past. Additionally, environmental concerns over the impacts of these activities have also increased. Because of the diversity of activities operating in South Korea's maritime areas, current policy and institutional frameworks for governing this marine jurisdiction are complex and overlapping. Further, the marine environment is inherently three dimensional and increasingly needs to be viewed as four dimensional because attributes and conditions need to be related to particular times (Lee, 2009).

Part of the solution to this situation is to create an integrated system of classification and mapping for visualization. Commonly, this is known as a marine cadastral system. A marine cadastral system would integrate currently overlapping management organizations and assist in representing and managing the competing rights, restrictions and responsibilities of all possible stakeholders (Binns et al. 2003).

In spite of the increasing public need for a marine cadastral system in South Korea, the development of a marine cadastre has not been addressed in a structured manner in South Korea. This is because the concept of a cadastral system for marine environments is relatively new, and because the technologies that can model a complex environment in three-dimensions are still being developed, and because of the complex relationships that exist both between stakeholders and organizations. One significant problem relates to an absence of law to describe the marine and coastal jurisdictional boundaries for local government. As a result, conflict about maritime borders has increased dramatically (Choi et al. 2005). Currently, a local government committee addresses reconciliation, based on Local Autonomy Law; but few cases are resolved because of the complicated overlapping jurisdictions (Lee et al., 2005).

In this paper, several issues with building marine cadastre system in South Korea will be mentioned such as legal and institutional, marine environment problems and also, there is a unique situation with building a marine cadastre system in South Korea, which is the national security problem with coastline area. For instance if the marine cadastre system provides the exact coordinates from the military facilities, South Korean government would be worried about the improper use of the information. The need to balance the advantages of marine management and the national security problems must be one of core objectives of Korean marine cadastre system (Lee, 2009).

2. CURRENT ISSUES OF MARINE AREA IN SOUTH KOREA

2.1 Background

South Korea is located in Northeast Asia, and as such is considered a critical and centripetal point in world trade distribution. Over 99 per cent of South Korea's total import and export freight is transported by oceanic means (Shin 2003). In part, this is due to the fact that the only land border for South Korea is that with North Korea, across which very little passes. Very little freight, apart from people, is transported via air (Shin 2003).

As I mentioned before, South Korea is a deeply maritime nation, with over 443,000 km² of marine area which is 4.5 times greater than the land area, and 11,542 km political borders dominate by maritime boundaries. South Korea has 3153 islands and the area off the continental shelf is 3 times larger than the land area. South Korea has 2,393 km² of tidal land which occupies 2.4 per cent of the entire land, furthermore, South Korea's fishery industries produce over 3 million tons of marine products, which supply about 40 per cent of the animal protein for the people of South Korea (Ocean Korea 21, 2000).

While the maritime area has been mainly used by the fishing industry, over the last few decades the use of the area for leisure and sightseeing activities has been dramatically increasing. Traditionally South Korea's tourism policies have focused on inland development at the level of local government. In spite of the country's abundant marine resource potential, marine tourism has generally been downplayed. In recent years, however, there is a lot of evidence suggesting that marine tourism has rapidly increased, owing to an increase of leisure time and an increase in disposable incomes. In 2010 it is expected that maritime sightseeing will represent 26 per cent of the total amount of sightseeing conducted in South Korea. It is thought that this percentage will increase by 2020 to be over 40 per cent (Shin 2003).

There are marine related maps called 'Nautical Chart' and 'Nautical Publications' produced by South Korean government. The nautical chart is a graphic representation of a maritime area and adjacent coastal regions. They may show the depths of water and heights of land, natural features of the seabed including navigational hazards. The additional information can be tides and currents, local details of the Earth's magnetic field and manmade structures such as harbours, buildings and bridges. Nautical charts are used for marine navigation and take the form of charts on paper or computerised (Kim, 2006). The marine environmental information detection has been a difficult situation with the high expense, the shortage of marine surveyors (or experts), scattered marine survey data. However, the new technologies can be a solution for the problems, the integrated marine environment information system can provide high efficiency data management and remote sensing detection methods can reduce the amount of expense for marine survey.

2.2 Objectives of marine management in South Korea

2.2.1 Marine management organizations

In February 2008, the Ministry of Land, Transport and Maritime Affairs (MLTM), with the launching of the new government, was organized to accomplish the following objects, first, to establish a small but competitive government; second, to raise the value and utilization of the territory by combining the control of land and ocean resources and supporting infrastructures (MLTM, 2008).

The establishment of MLTM shows that the South Korean Government realized the significance of integrated management of the nation’s land and marine area. In the MLTM organization chart, marine relate departments are as shown below.

Marine Policy Bureau	<ul style="list-style-type: none"> - Marine Policy / R&D Division - Coastal Planning and Management Division - Marine Territory Division
Director General for Marine Environment Policy	<ul style="list-style-type: none"> - Marine Environment Policy Division - Marine Conservation Division - Marine Ecology Division
Office of Logistics and Maritime Affairs	<ul style="list-style-type: none"> - Logistics Facility and Information Division - Port Logistics Division - Port management Division
Director General for Shipping Policy	<ul style="list-style-type: none"> - Shipping Policy Division - International Shipping Division - Coastal Shipping Division - Seafarers and Labour Policy Division
Director General for Maritime Safety Policy	<ul style="list-style-type: none"> - Maritime Safety Policy Division - Maritime Technology Division - Navigational Safety and Information Division - Maritime Traffic Facilities Division - International Maritime Affairs Division
Director General for Port Development Policy	<ul style="list-style-type: none"> - Port Policy Division - Port Development Division - Port Private Investment Division - Port Construction and Technology Division - Port Re-development Division

<Table 1> Marine relate departments in MLTM organization (MLTM, 2008)

In addition, there are several support organizations in the marine management area, including the National Fishery Science Institute, National Maritime Research Institute, National Fisheries Research & Development Institute, National Oceanographic Research Institute, National Fisheries Products Quality Inspection Service, Fisheries HRD Institution, Korea

Cadastre Survey Corporation, National Parks Management, Korea Tourism Organization, and Korea Rural Community Corporation (Kim 2006).

Amongst these organizations, the Korea Cadastre Survey Corporation has been successfully driving to create a proper land cadastral system based on the Terrestrial Cadastre Law, and has been working to build a marine cadastral system from coastline survey to register. The roles of a survey organisation is made clear by Williamson et al. (2005), who note the clear role for land surveyors to work with the marine industries to provide better solutions to defining and managing boundaries in the marine environment. It is not about hydrographical surveying but using the skills of the cadastral surveyor in marine environment (e.g. coastline surveys) (Williamson et al. 2005).

2.2.2 Marine parks and reserves in South Korea

The 1967, the Natural Park Act made it possible to establish a number of marine national parks. The objectives of the Natural Park Act are twofold: (1) to conserve ecosystems, and conduct survey research on natural and historical scenery; and (2) to promote the sustainable use of South Korea's national parks. Since the Act of 1967, South Korea has established four marine-coastal national parks. These marine parks are listed below in Table 2.

Name of park	Established	Park Area (Km²)	Marine area (Km²)
Hal yeo Marine	31 th Dec, 1968	545.627	395.479 (72.5%)
Taeon Coast	20 th Oct, 1978	326.574	289.543 (88.5%)
Dadohae Marine	23 th Dec, 1981	2,321.512	1,986.684 (85.6%)
Byeonsan Peninsula	11 th Jun, 1988	154.715	9.196 (6%)
Total		3,348.428	2,680.902

<Table 2> Marine parks in South Korea (Kim, 2006)

South Korea publically states its willingness to take responsibility befitting its status as a country with an integrated marine administrative system and leading national strategies. However, there are several issues with management of National parks to be considered. These include management of existing damage to the natural environment of protected coastlines and ecosystems, the conflicting uses and objectives of fisheries and environment organizations, the rights associated with of indigenous aqua cultural practices in park areas, together with the perennial problems of the management by many organizations, lack of specialized management plans, and limited available budgets (Lee, 2009).

2.2.3 Marine environment management in South Korea

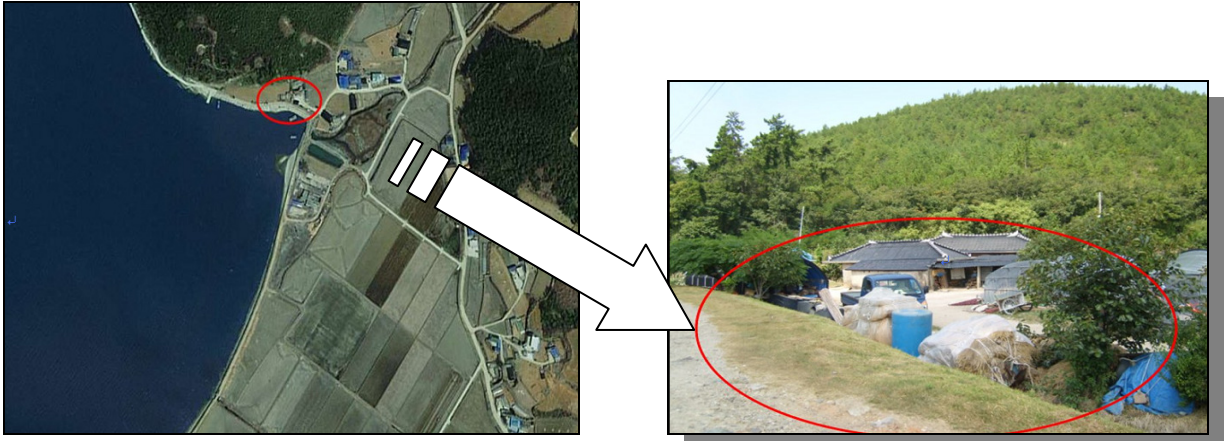
MLTM established an 'Integrated Marine Environment Information System' with several related organizations, including the National Fishery Research & Development Institute, Korea Ocean Research & Development Institute, National Oceanographic Institute, Korea Coast Guard, Ministry of Environment of Korea, Korea Meteorological Administration (MLTM, 2008).

One of the main projects of this organisation is to establish a National Marine Environment Survey Web with three development stages planned between 1996 and 2015. The first stage (1996-1998) includes permanent establishment of a coastal area contamination condition survey, with 280 locations for a water quality investigation network. The second stage (1999-2007) sees the expansion of that network to 363 locations, permanent establishment of contamination survey specification expansion (4 items), investigation of sea deposit and marine habitat, 40 locations of harbour environment condition survey, estuary survey (Sum-Jin River). Finally the last stage will include 80 locations for harbour environment condition surveys, monitoring of rivers (100 locations from 13 rivers), reinforcement of the survey of sea deposits, together with automatic and real-time survey of water quality in contaminated marine areas (MLTM, 2008). However, again there are conflicting views between government departments regarding marine boundaries. According to Lee (2005), while the Ministry of Government Legislation (MGL) and MLTM approved boundaries on the topographic map from the 'National Geographic Information Institute' (NGI) as marine boundaries, NGI declared that their marine boundaries for the location of islands cannot be used to identify jurisdictions. At the present, there is no clear law to determinate the marine boundaries (Lee 2005).

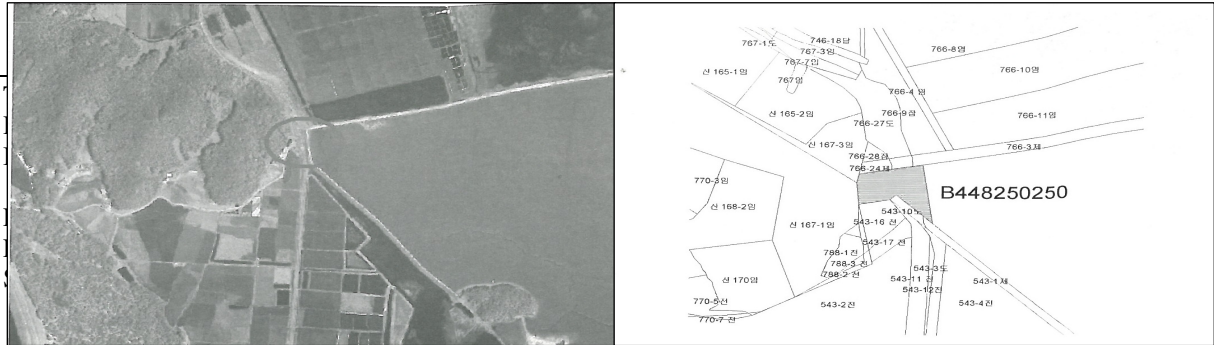
2.2.4 Coastline management in South Korea

The South Korean coastline has become increasingly important in terms of land use and natural environment conservation. Due to insufficient title registration along the coast, it is currently difficult to resolve land ownership disputes (Choi et al. 2006).

An integrated marine cadastral system must support management of the marine/land interface and so incomplete data in the land cadastre along the coast will also impact on the effectiveness of the marine cadastre. In the past, the coastline lands were generally not surveyed, but boundaries defined by gaps between the registered parcels as figure 1, 2.



<Figure 1> Un-registered coastline parcels near Taean province, (MLTM, 2008)



<Figure 2> Satellite image for the unregistered parcel and cadastre mapping (MLTM, 2008)

A study by Choi *et al.*, (2006) showed that unregistered coastland represented up to 13 per cent of the entire coastland, that the accord with the coastline and the current cadastre information system was only 7 per cent, and that an average of approximately 15– 20 m width of coastland was recorded as offshore (Choi et al. 2006). These facts clearly showed the differences between the record contained in the cadastre under the terrestrial cadastre law standards and the reality. To achieve a desirable coast land management, there are several objectives:

- A tidal standard is needed in order to allow rational coast land registration for future rather than a temporary measurement by stakeholders.
- There needs to be allowance of indirect survey methods such as aerial photography, LiDAR, satellite remote sensing and marine acoustic (sonar) surveys.

This is because of the cost and other limitations of direct survey methods in the marine environment (Choi et al., 2006). South Korean law currently only allows for direct survey by GPS, total station or traditional survey.

3. CURRENT ISSUES OF MARINE CADASTRE IN SOUTH KOREA

3.1 Objectives of marine cadastre in South Korea

3.1.1 Legal issues

Firstly, there is duplication of, or contradictions between, legislation. Maritime activities can be divided into maritime, coastline and inland activity, and there is overlapping regulation in areas such as Fisheries legislation and the Fishing Ground management rules (Kim 2006).

Secondly, there is complication caused by hierarchical legislation, particularly complex international and national laws about marine areas. For example, UNCLOS and local government's laws are discordant in terms of the definition of the "outer edge of continental margin". For example, Australia has over 600 legislative elements affecting in marine areas. South Korea has much the same situation and many problems caused by confusion and misapplication of the law because of excessive laws of marine management (Lee, 2009).

Lastly there is insufficient protection of rights derived from marine activities. There are many rights related to marine areas, such as right of fishery, approach, development, operation, sea navigation, mining, use of seabed, disposal, and so on. Under the current register system in Korea, only fisheries and mining and sometimes military facilities are protected by authority.

3.1.2 Institutional issues

Due to lack of a properly organized policy structure and marine cadastre, particularly between the central and local government, the distribution of marine management is seriously

duplicated among the governments. This is compounded by a lower capacity in terms marine specialists when compared to other advanced countries; hence the recent establishment of an integrated organization (MLTM) can have more specialists with well organized and cooperation between the departments. To compare an advanced country, according to Binns(2003), the institutional problems can be competing rights, restrictions & responsibilities and lack of spatial certainty and interface jurisdiction between terrestrial and marine area. South Korea has exactly the same problems as Australia does and furthermore there are complicit marine boundaries with Japan and North Korea.

3.1.3 Technical issues

It is generally assumed that technical issues can be more easily addressed than the legal and institutional issues. However, in the context of a marine cadastre, the technical issues can be as complex as the others.

The first problem with technical aspect is the uncertainty of the baseline for marine boundaries (Kim 2006). The baseline concept has very broad spectrum and South Korea has uncertain jurisdiction guidelines with coastline, territorial sea baseline, coastal waters, territorial sea, contiguous zone, exclusive economic zone, continental shelf by the UNCLOS.

The second problem is an inadequate coastline management system. The coastline management system should provide effective and up to date information suitable to record and monitor the environmental condition and changes along the coast. This is not currently the case (Kim 2006).

The third problem is the absence of marine maps. With some exceptions that account for only a small proportion of marine activity, such as some fisheries and aquaculture boundaries and some military managed areas, reliable maps are not available or not allowed.

4. COMPARE WITH THE MARINE CADASTRE IN AUSTRALIA

The objective of this chapter has been to benchmark other marine cadastre system in Australia, in order to inform decisions about marine policy, organizational structure and marine boundaries management. There is a long term marine policies established for marine cadastre system. However there are several issues we should consider. I indicate the three main findings from literature review.

Firstly, the legal regimes have a complexity of legislation in marine environment management, due to the excess of related law. they have exceedingly diverse and different laws, however basic integrated law is currently unavailable. Secondly, in each institutional region, there are different baselines to apply the same maritime zone under UNCLOS. In spite of the similarity of the maritime zone in USA, Canada and Australia, the standard of baseline is set differently in each country. For example, USA has Mean Lower Low Water,

and Canada set the standard with Lower Water Line from the UNCLOS' guideline, while Australia has Lower Water Mark and Indonesia has Low Tide Shoreline (Lee, 2009)

Thirdly, the marine survey methods are closely similar, but the marine cadastre applications can be varied. For example, Australia SDI have initially attempted to link terrestrial cadastre concepts to the marine area. Australia has been using the marine titling standards which can provide information about property, use, third party property, and the compliance aspects to protect right of marine area's stakeholders with effective marine management. Australia and South Korea have similar problems in relation to effective management of marine boundaries, overcoming the multiple and unclear jurisdictional limits, various co-management arrangements, dealing with the fact that no single agency manages offshore rights and boundaries, issues related to indigenous title, and the enormous maritime areas that need to be managed (Nichols et al. 2000)

The realization of maritime boundaries, especially the coastline is a significant challenge to both users and custodians of marine cadastre system, in part due to the fact that marine environmental characteristics are virtual objects rather than the land cadastre (Collier et al. 2003).

5. RECOMMENDATIONS FOR BEST PRACTICE FOR SOUTH KOREA

Integrated terrestrial and marine management system would be needed to manage the coastland

In the circumstance of the integrated organization that has been established, an integrated terrestrial and marine management system has the capacity to manage and to solve some significant problems with the currently inefficient coastline management. The National Land Information System (NLIS) is already successfully established, with strong support from organizations such as the Korea Cadastre Survey Corporation (KCSC) and South Korean Government (Lee, 2009)

Moreover, the legitimizing of digital spatial boundaries by governing agencies is critical for the advancement to legally accurate cadastral information systems. (Fowler and Treml., 2001). When discussing **capacity building**, Rajabifard et al. (2005) argued that spatial information technologies for managing coastal and marine information are now well established within most nations, however the knowledge required to use them appropriately and effectively is not, especially within Asia and the Pacific. Institutional reform, capacity building, education and training all need to be developed to address this gap.

Fowler and Treml (2001) argued that, due to a lack of understanding of mapping principles and technologies, the legal description can be inadequate to develop a mapping solution. Precise coordinates are needed in the GIS field but the fundamental cartographic concepts are not considered in the many circumstances. Not just in the USA but for all other countries, policy supported by strong understandings of important technical concepts is essential. It is

also desirable that the management of the marine environment should be integrated with land information systems, for example for dealing with problems like marine pollution from land (Binns, 2004)

In view of the results so far achieved, integrated governing agencies are critical to build an effective marine cadastre system and, for capacity building, the land surveyors and the marine scientist need to work together to build efficient land-marine cadastre system.

Metadata establishment to solve the uncertainties of tidal datum

Participation on the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) working group 2 is recommended, to establish global standards on tidal datum or international marine boundaries. In the study of conflicts between the neighbourhood countries, regional legislation limited capacity to solve these international problems.

If we can remove uncertainties related to the coastline boundaries, the building of marine cadastre system can be a lot easier than present situation. Besides the advantage of simplicity, efforts to develop advanced marine cadastre system built on common definitions and standard, from United Nations organization like PCGIAP, may generate substantial advantages in the future.

6. FUTURE RESEARCH

The work reported in this thesis has outlined some key issues for consideration as South Korea moves to develop a marine cadastre, and has made some key recommendations. The future development of this work should include :

- protocols for the development of an effective and seamless coastline management system,
- protocols for mapping the three dimensional marine environment using appropriate mapping technologies,
- research to support sustainable marine management to meet the public and users' needs for balance between the competing interests of development and exploitation, and protecting the marine environment,
- The development of metadata standard, include definition of a fundamental dataset of marine environment and definition of marine boundary standard.
- data access and management guidelines for remote (web based) access to marine cadastral information.

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