Proceedings of the 8th Conf. Int. Forum Urban., D009, doi:10.3390/ifou-D009.

True Smart and Green City?
8th Conference of the
International Forum on Urbanism

Conference Proceedings Paper

Integrating Environmental Hazard Mitigation Into Korea-Indonesia Joint Urban Planning Studio Pedagogy

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Abstract: In 2014, as a result of a funding proposal for an academic exchange program, a joint urban planning and design studio was initiated between Seoul National University and Diponegoro University from Indonesia. The studio's objectives were to expose students to the urban planning issues of environmental hazards in a relatively remote area in Central Java. Faculty members and graduate level students from both institutions participated in the studio where intense group collaborations, site survey, and fieldtrips were conducted. Through this experience, students utilized local knowledge in introducing community-specific risk responsive measures whilst overcoming the problems of unfamiliarity inherent in intercultural collaborations. In this paper, the process of the studio development is discussed, and design proposals are described which highlights the possibility of living in harmony with disaster through various social and physical interventions. In conclusion, the results of the studio are discussed in terms recognizing environmental hazard as a vehicle for understanding local perceptions, and the subsequent advantages of designing through the use of local knowledge.

Keywords: design studio; natural hazard; intercultural collaboration

1. Introduction

A vulnerable site in a remote place associated with one or more types of hazard is frequently part of an unfamiliar, understudied region from the perspective of students and the instructors. Therefore, it is the problems per se—whether they are about economic costs or infrastructural planning for rapid recovery associated with hazard risks—that need to be defined and learned within the context of the site

and its inhabitants. Although some basic understanding of the site may be pursued in the earlier part of the course, little priori knowledge can be developed according to already established curriculums in advance of participation and field surveys (Balassiano, 2011; Abbott, 2005; Abramson, 2005).

The research is an attempt to describe the result of a joint urban planning and design studio between Korean and Indonesian students, which focused on a highly vulnerable site associated with earthquakes and volcanic eruptions in Indonesia. In view of the inherent challenges of dealing with environmental hazards and rarity of intercultural studios in the Asian context, the goal of the research is twofold. First, the process of a Korea-Indonesia joint urban planning and design studio is described in detail. Second, major academic lessons met by student groups based on the instructor's and participants' experience is demonstrated.

2. Studio description

A joint planning studio between the Graduate School of Environmental Studies (GSES) at Seoul National University and Master of Regional Urban Development Program (MRUD) at Diponegoro University was established in February 2014. This was a first-of-a-kind joint planning studio collaboration between GSES and an Asian institution which focused on a rural area exposed to various aspects of vulnerability. The following is a brief description of the planning and design studio.

2.1. Location and site characteristics

The site of the studio, Magelang, is located in Central Java, Indonesia. Magelang Regency is situated in between Semarang, the Capital of Central Java and Yogyakarta, another rapidly developing area under propitious economic conditions. Semarang, roughly 75 km north of Magelang, which was under Dutch colonial rule from the late 17th Century until 1945, constructed its first railway in 1868 running the length of 405 km connecting to Jakarta. In 1903, railroad connection was made to the Magelang area as well. Currently, the Magelang Regency is under promising influences of the rapid economic development of Semarang and Yogyakarta, with reports of high population increase. Since 2010, the average annual population increase of Magelang was reported to be 3.19%, whilst Semarang reported 4.06% population increase (Central Java Statistics, 2013). Demographically, 97% of Central Javanese are found to be Muslims, which is higher than the average figure in Indonesia, from which a strong faith-based characteristic of the site can be induced.

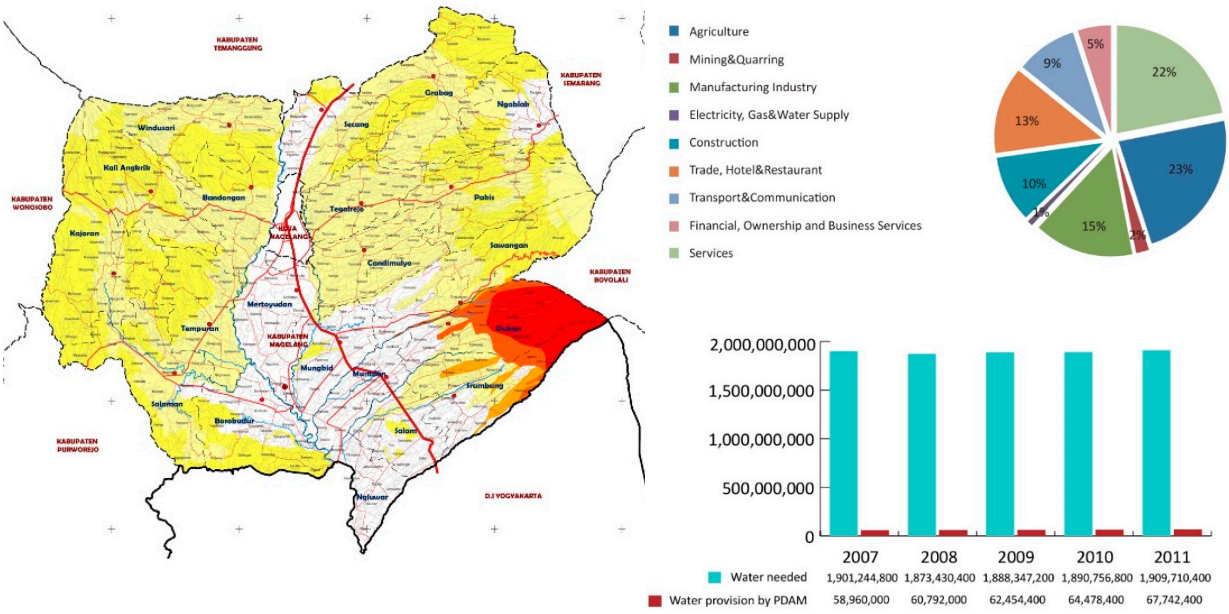
Magelang Regency is largely an agriculture-based area, and on the outskirts of the administrative borders are four active volcanic mountains – Mt. Merapi, Mt. Merbabu, Mt. Sindoro, Mt. Sumbing – imposing a constant threat of environmental hazard. The most recent eruption of Mt. Merapi in 2010 caused 304 deaths and left approximately 300,000 refugees hopeless (WHO, 2010). Due to this disaster, the areas of Dukun and Srumbung within the Magelang Regency, 15 km away from the volcanic eruption were covered by pyroclastic flows which destroyed 10.13 square kilometer of the floriculture site in Dukun, and 14.20 square kilometers of salak plantation in Srumbung.

Furthermore, the area suffers from poor infrastructure and public services which indirectly exacerbates the already vulnerable conditions of the site. There are currently no proper wastewater treatment facilities installed in Magelang, and hence serious problems of water pollution and odor are left untreated. Villagers rely on local springs or village wells for drinking water which has a high

possibility of being contaminated, and although there are local water supply companies, these only cover 3.5% of the total demand proving to be extremely inadequate. Road conditions are poor and there are no proper mechanisms for treating urban waste, which adversely affects reconstruction efforts in the aftermath of a natural disaster.

As Jabareen (2013) mentioned vulnerability may consist of several aspects such as demographic, socioeconomic and spatial distribution. In respect to the discussions above, the issues of vulnerability identified in Magelang consists of both the natural and human-induced conditions.

Figure 1. (a) Disaster prone area map from the spatial plan document of Magelang Regency 2010-2030. **(b)** Per-capita income of Magelang Regency in 2010 (source: Center of Statistical Bureau, 2011). **(c)** Water provision in Magelang Regency (source: local water provision company of Magelang Regency, 2012).



2.2. Course design

The studio was structured into two parts: first, students from GSES were prepared through a graduate-level seminar course titled Studies in Urban and Regional Planning; second, a field-based studio work was conducted. Later, participants of the studio were divided into five working groups: 1) Proposing the principles of regional planning and design, 2) Environmental vulnerability and water/food/living issues, 3) Community survey and social vulnerability, 4) Mobility and walkability, and 5) Urban design and planning proposal; both GSES and MRUD students were allocated to one of the groups.

Group collaboration is a key method of work which is especially instrumental in intercultural urban planning studios, and in this case, weekly group presentations were facilitated to maximize opportunities for face-to-face interactions. An important aspect that needs considering in forming groups is the students' skill match. Because in many cases students have diverse academic backgrounds and experiences, ensuring the best skill match amongst students is a crucial part of the running of the studio.

The collaborative relationships nurtured in the groups are key in enabling a common understanding of problems and issues raised by the studio, and is also instrumental in the proposal stages.

Table 1. Background of joint studio team members.

	Disciplinary characteristics of GSES group	Disciplinary characteristics of MRUD group
Major instructors	1 urban and regional planning faculty 1 urban design faculty	2 urban and regional planning faculty
Additional instructors	1 urban design faculty (German) 1 environmental management faculty 1 transportation planning faculty	2 urban and regional planning faculty
Students	7 urban and regional planning students 1 geography student 1 transportation planning student (PhD) 2 environmental management students (1 fluent in Indonesian) 4 urban and landscape design students (PhD, fluent in Chinese)	12 urban and regional planning students (1 Papua New Guinean) 3 transportation planning students 1 architecture student 1 urban design student

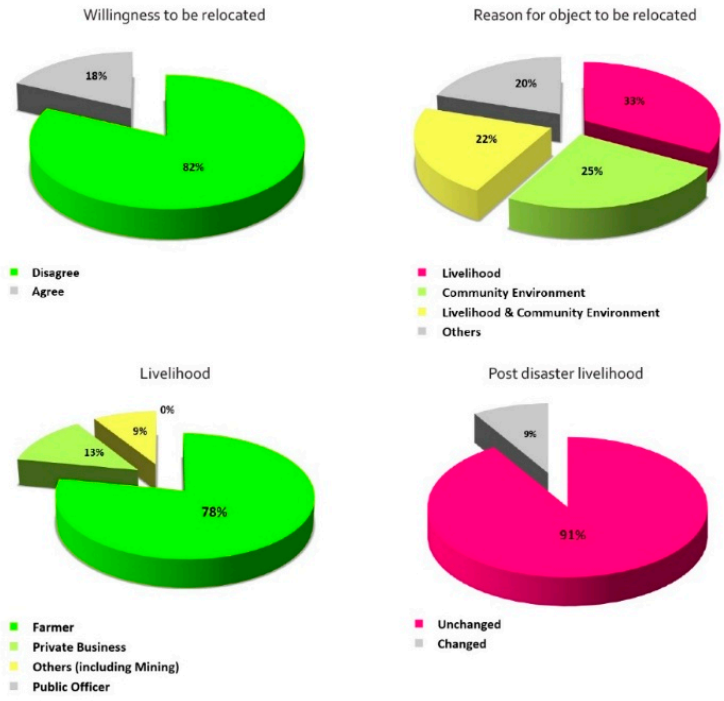
The first joint studio at GSES focused on the exchange of preliminary studies and knowledge about the study area; the five working groups conducted an intensive three-day joint workshop, which was guided by two GSES instructors and two MRUD faculty members. The second joint studio at MRUD involved field trips to the site in Magelang and another three-day students' workshops; the same working groups proposed their research outcomes and planning/design proposals under the guidance of four GSES instructors and four MRUD faculty members (Fig. 2). Key observations were made of the state of housing, public sanitary facilities, local economic activity such as stone-breaking and salak plantation, and evacuation sites among others. From this field investigation students again refined issues of interest.

Figure 2. GSES and MRUD students and staffs having discussions during field survey.

An important component of the field investigation was the student-led survey of the local community. Students quickly discovered that despite the dangerous conditions posed by Mt. Merapi, villagers were resistant towards relocating to different areas. Survey results showed that 82% of the local community disagreed to relocation for livelihood reasons (33%), and attachment to community environment (25%). An overwhelming 78% of the local community were involved in salak plantation, and Mt. Merapi

provided good soil conditions for agricultural businesses. Additionally, there were post-disaster economic gains made through selling volcanic eruption materials broken down into pieces manually, and so even after a major volcanic eruption in 2010, 91% of the local villagers did not change or consider changing their source of income. In fact, farmers waited until re-cultivation of salak was possible, whilst working in temporary job conditions and receiving government aid (Fig. 3). The survey also revealed the community's strong cultural attachment to the environment. Local villagers displayed strong connections to the land that had been inherited for generations and also shared a common cultural view that Mt. Merapi was genuinely harmless. In other words, the place posing substantial hazard risks to the community also served as a source of socioeconomic safety net and a place of communal belonging. Such findings significantly informed the general planning and design directions in later stages of the studio.

Figure 3. Student-led villagers' survey results.



3. Studio Outcome

In the final studio outcome, the concept of "Living in harmony with disaster" was put forth through four principles: community resilience; economic sustainability; shared responsibility; and design for all which was informed by in-depth field studies. Based on such planning concept, the subsequent design proposals that followed were also deeply rooted in site specific discoveries by which two notions were important.

The first local knowledge that was embraced and further developed by the studio was the concept of "sister villages." This approach proposed the pairing of a village which is highly vulnerable to hazard risks with another village that is safeguarded by some geographic feature or infrastructural artifacts. In the event of a disaster, individual households could escape to the village shelter then temporarily migrate to a neighbor's home—or a paired sister's place—located in a safer village along a designated route with

reliable mode of transportation. Accordingly, the students proposed urban design and transportation plans that facilitate the notion of the sister village by building a post-disaster refugee camp that also function as a pre-disaster meeting point (Fig. 4).

Figure 4. (a) Map of two sister villages, 17 evacuation mid-points and 3 evacuation routes. **(b)** "Sister villages" transportation master-plan.

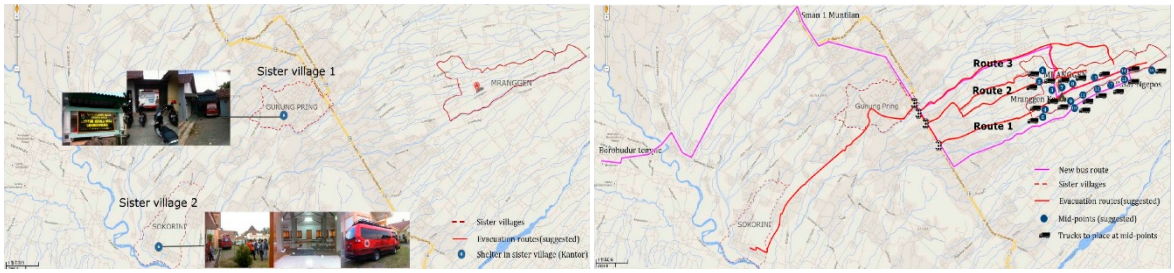


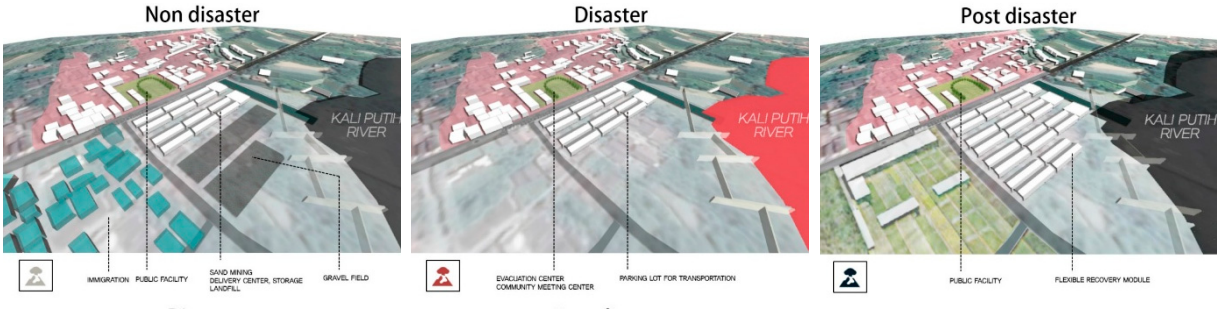
Table 2. The final planning concept of disaster management framework.

Stages of disaster	Areas of response	
Pre-disaster	Physical aspect	• Zoning regulation to control development along Kali Putih river bank • Utilizing sister-village concept • Designating exact evacuation zones • Mobilizing local residents to manage actively and provide water, waste, etc. services
	Socioeconomic aspect	• Alternative employment training during pre-disaster time periods
	Institutional aspect	• Regulation for sustainable sand-mining • Setting up of an integrated forum among villages to improve efficiencies in disaster response
During disaster	Physical aspect	• Strengthening community-based refugee handling
	Socioeconomic aspect	• Local financial aid for rapid recovery • Implementation of community-based savings as disaster insurance system
	Institutional aspect	• Operation of the community-based funds institution as additional measures to local financial aid • Community-based village rehabilitation and reconstruction • Collaboration between public and private sectors to provide services
Post-disaster	Physical aspect	• Zoning for fixed and temporary settlement areas • Improving infrastructure services
	Socioeconomic aspect	• Local financial aid for rapid recovery
	Institutional aspect	• Strengthening of integrated forum • Resolving legal aspects of land use and housing

Another aspect of local knowledge appropriation was through incorporating new approaches into the existing disaster management framework. For each stage of disaster—pre-disaster, during disaster and post-disaster—response measures were proposed by physical, socioeconomic and institutional aspects (Table 2).

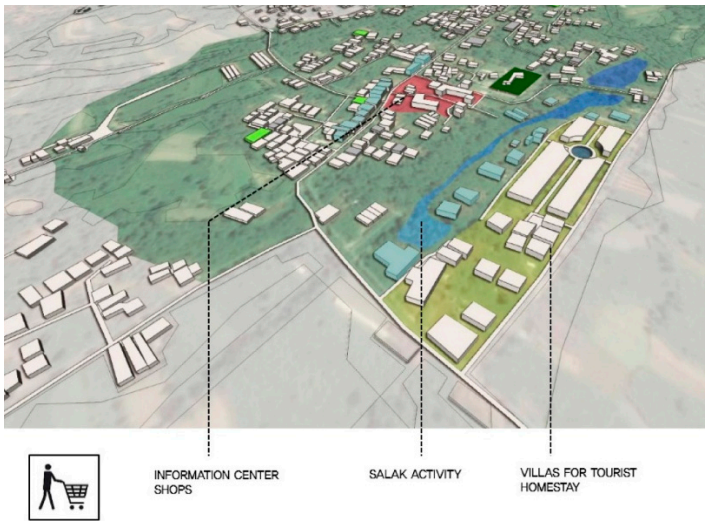
Design proposals on the neighborhood scale were devised for two villages, Mranggen and Kradenan. Mranggen was an exemplary area highly prone to disaster as it was situated near both Mt. Merapi and the Kali Putih River which flooded in the occasion of a volcanic eruption and was widening due to unregulated sand-mining of the materials deposited along the riverbank. Hence, the overall design strategies emphasized the installment of basic disaster preparation facilities whilst improving the working environment of the neighborhood. This involved removing the existing residential units and the community school close to the Kali Putih River and utilizing this buffer area flexibly. In normal conditions, this area could be used for sand-mining related offices, delivery center, storage facilities and parking area, but in the event of a disaster the same area could be used as a parking lot where aid materials can be effectively transported. In the post-disaster phase, the same area could be used as the base for reconstruction efforts (Fig. 5).

Figure 5. Mranggen neighborhood design in various stages of disaster.



Kradenan, on the other hand, was a model for countering economic vulnerability through salak plantation agro-tourism. The area was known for its sweet salaks which could potentially become an income generating resource, and so the design strategies focused on the planning of a successful tourist site incorporating the existing cultural and natural resources. Spatially, a better connection between the neighborhood's mosque and plantation site was proposed. This was to reinforce a strong axis between these two sites and allow for improved navigation for potential tourists. The main tourist area was designated on the southern part close to the salak plantation area and the newly introduced central information center and shops. The proposed villas for tourists were located along a natural stream, which could also serve as an education center so that the economic capabilities of the villagers could be strengthened (Fig. 6).

Figure 6. Kradenan agro-tourism neighborhood design.



4. Conclusions

Based on the experiences of the studio, the following planning implications were learned:

1) Environmental hazard as a vehicle for understanding local perception of neighborhood change

The villagers' reluctance to the government-led relocation plan was questioned during the workshop session, which became a starting point for the reframing of the problem. This allowed for the recognition that a strong top-down relocation plan with external assistance was highly susceptible to failure, and that in considering the applicability of the proposal other appropriate measures were needed. In this manner, the awareness of the multifaceted tie between the villagers and the post-disaster site offered great opportunities for problem-based learning. To sum up, the process of learning the specific problems of environmental hazard actually served as a vehicle in better understanding local perceptions which in turn helped to reframe the problem. This experience enables future urban planners and architects to understand the complex problems of the real world and avert making the mistake of prescribing oversimplified measures.

2) Designing with local wisdom

The joint planning studio pedagogy encouraged practical problem-solving approaches through the use of stakeholder analyses, and existing pre- and post-disaster recovery measures. Whereas permanently relocating villagers away from a disaster-prone site was not realistic, the concept of linking multiple "sister villages" was put forth as a feasible alternative. Moreover, micro-financing aid among farmers connected through sister villages was also proposed so that economic aspects can be incorporated into the overall strategy. Neighborhood design approaches were also sensitive towards the existing local activities and sought to integrate better economic means with spatial planning. As demonstrated above, utilizing a key idea induced from the problem-based learning process was further advanced when drawing up solutions that are appropriate and unique to the site. If this mutually informative relationship

of the problem-based learning and problem-solving had been undermined, the final design proposals would have lacked meaning and applicability.

3) Exposing students to the holistic nature of urban planning

The studio based learning format offers an opportunity to expose students to the holistic nature of urban planning. As seen from this case, the vulnerability of a particular area cannot be confined in terms of environmental hazard alone. It is rather a complex set of problems which involve economic and social issues, institutional capacities, and geographical characteristics among others. Hence, it is important for students to understand that these different aspects, interrelated on certain levels, all contribute towards the vulnerability of a site, and that a holistic approach is required in understanding and addressing the issues at hand.

Acknowledgments

This work was supported by the BK21 Plus Project in 2014 (Seoul National University Interdisciplinary Program in Landscape Architecture, Global leadership program towards innovative green infrastructure). Discussion about future international collaboration was supported under the framework of international cooperation program managed by National Research Foundation of Korea (NRF-2013K2A1A2055287).

Conflict of Interest

The authors declare no conflict of interest.

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