



## ENVIRONMENTAL AWARENESS AND ITS RELATED FACTORS IN HIGHLY POPULATED URBAN AREA: A SHORT REVIEW

Rita Sundari

The Research Center of Private Universities Coordination Bodies, 13360 Jakarta, Indonesia

E-mail: [ritsun2003@yahoo.com](mailto:ritsun2003@yahoo.com)

**ABSTRACT:** This article discusses the implications of environmental awareness in crowded municipal region in relation to non structural urban planning, environmental geology, watershed development and human behavior. The role of policy makers and stakeholders on comprehensive urban planning system are also involved in association with environmental awareness. Long term environmental mismanagement in urban planning and development has impacted on routine water flood problems affected the social and economic factors as well as the unsustainable lifestyle of a mega city. The complicated factors involved in this comprehensive urban development have taken great attentions from environmental activists as consequences on the responsibilities of friendly urban management ongoing with the conditions of highly populated urban development.

**Keywords:** environmental awareness; friendly urban development; water flood problem; human behavior.

### INTRODUCTION

A crowded mega city has common problems in relation to limited power resources (energy and water) and different socio economic and educational backgrounds that accelerates environmental degradation and poses a challenge to environmental sustainability. Moreover, a densely populated mega city in developing regions poses a magnet to attract people from rural areas to migrate to the city in searching for a better job and a better life. Consequently, this condition has strongly impacted on the sustainable development of a densely populated urban area that needs strategy and approach in comprehensive integral urban planning and development. In fact, the migration and settlement of rural residents pose opportunities and challenges in the complex mega city. As an overview, Batterncourt and West [5] reported an increase in infrastructure of about 85% for any city if the population is getting about doubled. On the other hand, in order to foster urban sustainability, previous activists proposed environmental models in association with growing number of population in dense urban area [6, 7, 10]. With regard to the sustainable development of densely populated urban regions, several factors have to be highlighted encountered with the role of policy makers and stakeholders related to urban planning system, environmental geology and climate, planning system of water bodies and human behavior. A mega city, which reflects its own characteristics encountered with infrastructure design and transportations, in fact, it is another opportunities and challenges for benign urban development. However, the planning and development of urban watersheds are also important and urgent as an integral component of the city morphology. Therefore, a failure in drainage system may impact on serious water flood problems. Several problems related to water inundation have been arisen due to lack of waste disposal, inappropriate design of drainage system, waste mismanagement and water run-off. This condition is strongly related to human behavior from different sub races and various education backgrounds in a complex mega city. Previous studies reported that river basins were the favorite place for settlement of people coming from rural areas because rivers played significant role in the development of a city, both socially and economically [3, 14]. In addition, other factors such as land geology and climate have to be considered in the comprehensive urban development including the integrated planning of water bodies and green program. Therefore, this article underlines on the role of human behavior toward pro-environmental behavior in association with environmental awareness as an integral part of comprehensive urban development including land geography and waterways closely related to the impact of water flood disaster.

## Non structural urban planning

With regard to the historic waterways in comprehensive urban planning of a mega city development, several conditions have taken attentions including low basin areas, large rivers flowing from rainy highland resources, overloaded settlement, disordered city development, violations on environmental regulations and different socio economic backgrounds that all are strongly related to environmental awareness. A defect comprehensive urban planning is implicated with uncompleted survey causing lack of important urban information, unintentional stimuli, less strengthening in promoting environmental awareness, general knowledge and perceptions, as well as unsustainable pro-environmental behavior [7]. Fig.1 shows the water flood in a settlement region located nearby big river caused by water flow from highland area undergone heavy rainfall. Uncompleted survey gives strong impacts on disordered urban planning associated to low environmental awareness, lack of environmental behavior and practices, as well as low environmental concerns.



**Fig.1 The water flood in a settlement region located nearby river due to water flow from highland area undergone heavy rainfall (<http://www.liputan6.com/tag/banjir-jakarta>) [15]**

Unintentional stimuli may impede the development of environmental awareness, for example, water flood disaster in a disordered mega city, nuclear plant leakage, irresponsibility on the way of waste discharge impacted on waste accumulation and clogging (Fig.2). Less fostering in environmental awareness impacted on less enforcing environmental behavior, for example, the knowledge of waste discharge and facilities of waste disposal by local community as well as regular waste recycling under the responsibility of local department of general construction, that all of this matter can generate environmental mismanagement. Unsustainable pro-environmental behavior poses a threat and challenge to friendly urban development and stringent environmental regulations. Non structural urban planning poses the responsibility of policy makers and stakeholders to maintain sustainable environmental management, benign urban development including green program and land reclamation, balanced eco system and pro-environmental behavior.



**Fig.2 Solid waste clogging in a river of municipal region (<http://www.liputan6.com/tag/banjir-jakarta>).**

In the context of benign urban development in association with environmental awareness, this article proposed a SWOT model (Fig.3) to show strength (S), weakness (W), opportunity (O), and threat (T). For example, the strength poses the responsibility of expertise/policy makers on infrastructure and waterways upgrading of a complex mega city, the weakness indicates irresponsible human behavior and low environmental awareness, and the opportunity is reflected by positive acts of communities toward pro-environmental behavior, as well as the threat is showed by uncontrollable increased population and growth number of human activities, industry and technology. SWOT analysis is a useful framework to help environmental scientists to investigate problems found in densely populated urban area.

**Environmental geology and climate**

The environmental geology and climate are significant factors in association with friendly urban development. As a mega city with more than 28 million people settled in an area of about 740 km<sup>2</sup> in 2011 was established on a land with eight large rivers, two lakes and a drain [2] has generated complex urban problems socially and economically. Land water absorption in association with human activities, industry and technology of a crowded mega city causes significant land subsidence and formation of basin region. With regard to geologic structure of the mega city the non massive quarterner land sediment was likely to form a basin area and this condition was triggered by a tectonic meta stable land in relation to vertical movements causing land fault [9]. In addition, the mega city is located in a low, basin area with average elevation of 8 meters above sea level, which is prone to water flood disaster.

It is reasonable that water flood disaster in this area poses a routine problem that cannot be handled easily. A previous report said that this area was undergone big water flood several times under the Colonial Regime since the 17<sup>th</sup> century with much fewer settlements at that time and therefore, this area is prone to water flood disaster [16]. Moreover, an investigation showed a sinking of land in the range of 5 - 10 cm each year, even up to 20 cm in a certain region. Geological investigation showed that land with low surface water caused low water absorption during wet monsoon period and this condition triggered water inundation in some regions.

Besides the factor of environmental geology, the benign urban development of the mega city is also significantly influenced by climate factor. The tropical monsoon climate make the mega city have distinct wet and dry seasons with highest rainfall in the range of 200 – 400 mm from December to March each year (Wikipedia, free encyclopedia, 2013). As a mega city, a lot of various industries (electronics, chemicals, automotive, mechanical engineering and biomedical engineering) have been established in this region. Major industries pose a significant contribution to waste problems that has to be considered in comprehensive urban planning.

<p><b>STRENGTH</b></p> <ul style="list-style-type: none"> <li>• Policy maker and stake holder</li> <li>• Environmental scientists (green program and land reclamation)</li> <li>• Expertise on mega city infrastructure and waterways planning</li> <li>• Pro-environmental behavior</li> </ul>	<p><b>OPPORTUNITY</b></p> <ul style="list-style-type: none"> <li>• Human activities (better job, better income)</li> <li>• Urban development (settlement, offices, commercial hub)</li> <li>• Development of industry and technology</li> </ul>
<p><b>THREAT</b></p> <ul style="list-style-type: none"> <li>• Water flood disaster and inundation</li> <li>• Land subsidence</li> <li>• Disordered infrastructure and waterways</li> <li>• Traffic congestion</li> </ul>	<p><b>WEAKNESS</b></p> <ul style="list-style-type: none"> <li>• Low environmental awareness</li> <li>• Increased population</li> <li>• Human attitudes (different socio economic condition, various sub-races)</li> <li>• Illegal buildings and settlements</li> </ul>

**Fig. 3 SWOT model of environmental awareness – environmental behavior in relation to densely populated urban area.**

### Watershed development

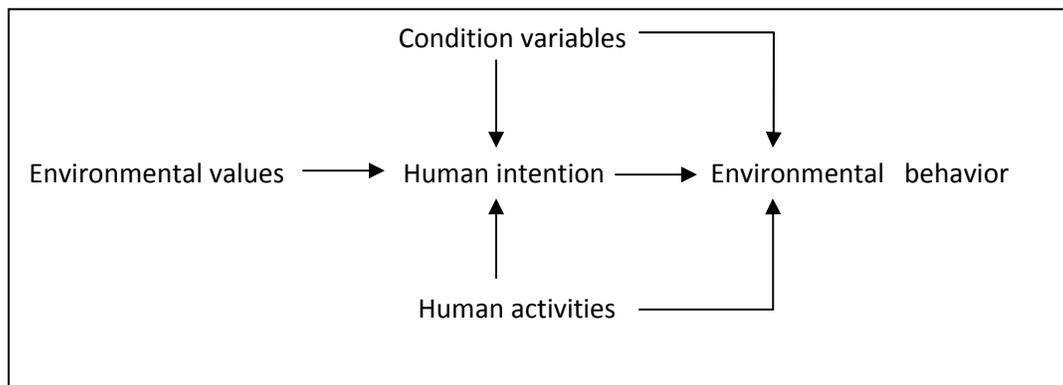
A watershed is described as a water zone in a city in association with rivers, water bodies and canals. Consequently, the waterways planning and design in the mega city nearby sea region impose significant aspect in order to resist water flood and inundation in settlement areas especially during wet monsoon period and tidal waves. Policy makers and stakeholders have to respond for the water bodies planning and design by considering the rate of water run-off, appropriate channel design with regard to water abundance in association with water rainfall in rainy peak season. The strategic approach of waterways development in a mega city poses an integrated planning of benign urban development considering settlement loading, land geology, sediment compactness and layers, and also land water.

As a matter of fact, the concept of waterways and drainage system implemented in the mega city of interest was launched by the Colonial Regime in the beginning of the 20<sup>th</sup> century after several big water floods occurred in the city during the Colonial period ( ≈ 1600 – 1900 ). The drainage design proposed by the Colonial Governance involved with large canal (built in 1922) to manage water flow to and from the city and to accommodate water flow from four large rivers streaming in the city [16]. The idea of building this canal inspired the local department of general construction to continue the concept since this design eventually can solve the water flood problem. However, ongoing with the population growth and industrial development, this design is no longer effective and needs renovation and modification of the current condition.

Ongoing with the development of drainage system in the mega city, the local government in corporation with foreign experts conducted a waterway modification by upgrading the canal in the year of 1973 to optimize the function of drainage system [16]. The department of general construction in corporation with local government has responsibility for the sustainability of drainage system including rivers, canals and water bodies, for example, the use of excavators and dump trucks for solid waste removal from the bottom of water bodies to prevent river shallowness and making embankment along water body to overcome water flood problems.

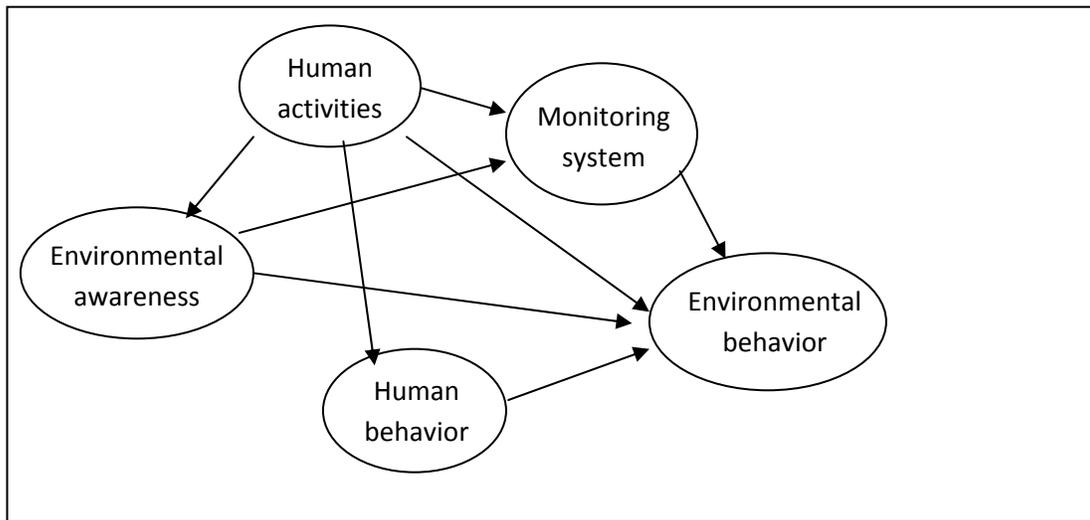
### Human behavior

In fact, human awareness poses significant contribution to water flood disaster with regard to the way of waste disposal and settlements in nearby river. With regard to environmental awareness, several concepts were proposed [4, 11] to investigate the role of human behavior in generating benign urban development considering land geology and climate, infrastructure, population, monitoring system and stimulus factors (Fig.4 and Fig.5).



**Fig.4 A modified concept of environmental behavior (Barr et al., 2001).**

In the context of human behavior in association with environmental awareness, it is important to understand the concept of environmental awareness. According to Sally and Ashby (2003), the environmental awareness is associated with the understanding of realization, perception or knowledge in the contextual of environmental condition. Another insight proposed that environmental awareness is described as a combination of motivation, knowledge and skills [12]. Nevertheless, the concept of environmental awareness is related to the understanding of growth and development toward biophysical environment and its related problems including human interactions and effects (European Environmental Agency).



**Fig.5 Adopted model implication of human behavior concept related to pro-environmental behavior (Grob, 1995).**

Having closely related to human behavior, human attitude plays important factor in the sustainability of friendly urban development. In the discussion of environmental behavior, Ajzen and Fishbein [1] described three components of attitude: (i) affect, (ii) knowledge and (iii) intention, and these components are used to study environmental behavior. With regard to highly populated urban area with different sub-races and different education background, it is reasonable that those three components of interest pose the driving force in building a benign urban area. In order to change human mindset several efforts and tasks for building pro-environmental behavior are required, for example, a short term directions and guidance toward communities may not solve the problem, however, there should be a comprehensive sustainable system, for example, a continued formal education program implemented on early age children via schooling programs and the role of parents at home by emphasizing the importance of environmental awareness. In order to overcome this challenge, an integral corporation involving department of education and local government concerned with educational program is required to generate a community with social and environmental awareness and pro-environmental behavior.

## CONCLUSION

Environmental awareness is a potential strategy in a densely populated urban region to generate pro-environmental behavior in a sustainable benign urban development. This condition is fostered by perfect structured urban planning considering land geology and climate, settlement loading, waterways design and facilities of waste disposal. Green program and land reclamation are urgent in friendly urban planning to maintain sustainable environmental development.

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