Reducing Environmental Degradation in Kampung Nambo by Cutting the Critical Contamination Points

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Abstract. Kampung Nambo is one of the densest kampung in South Tangerang, Banten Province, Indonesia. This kampung has direct boundary to the state-owned Landfill, the Cipeucang Landfill. Apart of the mountainous waste panoramas and the continuous odours that can be seen and smelled all day from the kampung, this kampung has beautiful landscape scenery and many potential to develop further towards a livable kampung. The inhabitants in Kampung Nambo are witnessing environmental degradations happened in their area, including on its spring water quality that serve as one of the clean water sources for the community. This paper describes about community engagement program activities in one area in Kampung Nambo especially in region 03/04. The program aims to facilitate the community in finding ways to decrease the environmental degradation. One of the interventions was done through sanitation aspect. The program found 7-8% of the community still apply open access from their toilets to the river. It gets the area and river even more polluted. This paper described about the action of reducing environmental degradation due to above conditions by cutting the critical contamination points. As further intervention, a new location for wastewater treatment plant was identified.

Keywords: environmental degradation, planning, sanitation

1. Introduction
Kampung Nambo is one of the densest kampung in South Tangerang City, Banten Province, Indonesia. Its density is already higher than the city’s density. Six years since the Cipeucang Landfill has been operated, in 2018, a community engagement program from Department of Architecture, Engineering Faculty, Universitas Indonesia (UI) together with Integrated Social and Economic Institute Non-Governmental Organization (BEST NGO) and the South Tangerang Local Government (STLG), was initiated. It aims to improve the kampung conditions toward a livable kampung, a smaller form of a livable city. The components of liveability are multiple and complex, including not only the built environment, but also social, economic, and natural factors [1]. The program was integrated with The City Without Slum or Kota Tanpa Kumuh (Kotaku) Program in South Tangerang and also Polycentric Urban Water Approach from Bremen Overseas Research and Development Association (BORDA) NGO Group.

Livable city is a term which described as a safe and clean environment for health and well-being and to sustain economic growth, also as the idea of development as improvement in the quality of life that requires a physical as well as a social habitat for its realization [2]. Kampung Nambo, specifically
the Neighborhood Association (*Rukun Tetangga*) 03 and the Community Association (*Rukun Warga*) 04, was chosen as the first place due to its unique potentials. It has various threats, especially for being the closest neighbor of the landfill. It also owns potentials on natural resources in terms of spring water and the greeneries with its beautiful landscape.

The total areas for the selected location is 4.1 hectares which is divided into 40% of housing settlements and 60% of open space or around 1.64 and 2.46 hectare respectively. Those numbers bring the population density in housing area became 12,682 person per km² to consider all areas, but 31,707 person per km² if taking into account the housing settlements only. Due to the urban sprawl of the unaccommodating black water, communal septic tank is planned to build in the area. The capacity must accommodate at least 5-10 households with 100 households maximum and 10 liters/person/day black water approximately [3].

![Figure 1. Existing condition in Kampung Nambo 03/04.](image)

Geographically, Kampung Nambo has hilly terrains (Figure 1). The land is divided into the higher and the lower part with 18 m height difference. The higher part is full of houses and paths while the lower part consists of more open spaces, water surfaces, and greeneries. A spring exist in the lower part, thus it gave the idea for the community to build fishing ponds. In the area there are 2 water flows; those are (1) the water spring water and (2) the small river. Both flows meet in one point in the area.

Kampung Nambo is only an example of a kampung in the middle of fast growing city, which has a lot of capacities but has to face many boundaries due to the unbalance development of its surroundings. The intervention goes to 5 sectors; those are waters, wastewaters, wastes, green open spaces, accessibilities, lighting and entrepreneurship. This paper only describes about the water and wastewater.

2. Materials and Methods

The methods applies in this engagement program was run through “charrette” process. It is a collaborative planning process that harnesses the talents and energies of all interested parties to create and support a plan that represents transformative changes [4]. This method is strengthen the community participation and it is commonly used to facilitate discussion between stakeholders on a
project or program. During charrette, a group of experts met the community groups and the stakeholders in several workshops. The stakeholders of this program are the community from Kampung Nambo, the planning team from UI, the sanitation experts from the BEST NGO, the decision makers and implementers from STLG.

2.1. Data Collection Method

The data was collected during the charrette workshop with the community. Four workshops were designed within 2 months, with different targets (Table 1). The first target was design for introduction to collect basic information about what is going on in Kampung and also the introduction of the program. In the first workshop, the definition of livable city was discussed and some examples were given. In this workshop the UI Team was informed that there will be a wastewater treatment and the location was already proposed by the Kotaku Team.

The second workshop was done a week after the workshop I and targeted to collect information on existing sanitation situation in the kampung, including about the water source. The tools for this workshop is the existing map of households, A2 size semi-transparent paper to trace the map and markers. The community were asked to use the marker and gave signs on houses with and without (a) water services, (b) septic tank, (c) water wells, (d) roads and (e) paths. During the second workshop, some simulations of spring water flows were held and information from the community were collected for further analysis. This workshop identified some critical points of environmental degradation especially on water sector. Thus the UI planning team asked for 2 weeks to work on the alternative solutions tackling the environmental issue to be discussed later with the community and other stakeholders.

The third workshop was done 2 weeks after the second one. The team was using the time in between to propose a new location, based on the information collected during the second workshop. In this workshop the new location was proposed. More information on the proposed location was collected and finalized until workshop IV. Workshop 4 was done a week after to communicate the new location.

| Workshop | Target | Stakeholders |
|----------|--------|--------------|
| I        | Introduction to the program, team member and overall target, Outlining the major problem in Kampung Nambo, Collecting basic information on STLG Proposal, Shaping common understanding about Livable City, Livable Kampung and Environmental degradation | Community, UI Team, STLG |
| II       | Inventory of household with access to water supply services, boreholes/groundwater wells, septic tank, Identification of critical points of environmental degradation | Community, UI Team |
| III      | Proposing action on reducing environmental degradation, Design and Planning | Community, UI Team, STLG |
| IV       | Expose the result and communicating with external | Community, UI Team, STLG |
2.2. Existing Condition
Existing data on water and sanitation were collected during the community workshop 2 (Table 2). Existing data is very important to give actual background about how the blackwater is treated and what are the clean water sources do the community has. In this way, the team can look forward into points which have been endangered by the practice of everyday life of community in Kampung Nambo. The time given between workshop 2 and 3 were also used by UI team to clarify some collected data with the actual condition on the field.

2.3. Critical Points Identification
The second workshop was held to collect und to find the critical point of the environmental damage at the area. In this paper, the critical points mean the point where the black water joined the water stream without further treatment or in other words ‘directly’. The team collected the data of housing locations, the availability of wastewater treatment and wastewater flow mapping from every houses in the area, and also clean water flow from the spring into the river. Then all of those data will be put on the same map diagram so that the critical points where wastewater without any treatment unites with the clean water flow from the spring can be identified.

| No. | Items                                               | Household | %  |
|-----|-----------------------------------------------------|-----------|----|
| 1   | Total number of household in the area               | 120       | 100|
| 2   | Number household with access to water supply service| 35        | 29 |
| 3   | Number of household with boreholes/ground water wells| 80       | 66.67 |
| 4   | Number of household with both access to water supply service and boreholes | 17 | 14.1 |
| 5   | Number of household with access to toilet           | 120       | 100|
| 6   | Number of household with access to septic tank      | 112       | 93.33|
| 7   | Number of household with open access from toilet to the water flow | 7 | 7.5 |

After finding some critical points in the area, the next step is to find the new location for the communal wastewater treatment plant (WWTP). The location of the WWTP needs to be at the most effective area both for the consideration of house location networks and desludging activities. The most important issue is the new location should manage to stop the practice of environmental degradation.

3. Finding and Discussion
Wastewater infrastructure is one of the most important socio-technical systems underpinning the development and functioning of modern cities like in developing countries [5]. Quality of river has socioeconomic relationship of water-life quality. It can be measured by several indicators like communities and population access to water sources, water influence on the health of the population, water use, water quality, public perception on the supply of water [6].

During the workshop II with the community, the team identifies that 100% household have access to clean water and toilet. The community gets the clean water through 3 options; those are (1) from local government water supply services, (2) from boreholes/ground water well, and (3) from collecting water from the spring water flows.

The spring water flows is one of the clean water sources in the area. In terms of sanitation, around 93% of the community have access to septic tank and 7-8% have open access from their toilets to the river. In some points these open access merged with the spring water flows and then joined with the existing small river. By this finding, the 11 critical points of environmental degradation was identified.
This is where the blackwater from the toilet have direct access to the spring water flows. Thus it contaminates the spring water flows. Since it joins the small river at some point, the small river gets even more polluted.

![Diagram](image)

**Figure 2.** Identification of critical contamination point zones.

There are 4 point zones were selected as the critical points (Figure 2). The team proposed the changing location of the WWTP previous location candidates from the STLG and this is because the urgency of facilitating the households with open access to the waste flows. In order to decide the suitable WWTP new location, mapping of the land ownership of the area was also conducted. This is to make sure the long term utilities, WWTP location will be built on a government-owned land instead of a private-owned land.

The next step is to collect the map data which represents the land contour elevation for the area. On the one hand, from the inventory map generated in Worshhop II the team identified area that is lower than the houses with open access from toilet to the river so that the waste water can be streamed naturally as inlet to the WWTP. On the other hand, from the same map, the team figured out which area is higher than the river flow, so that the outlet water from the future communal septic tank can be streamed naturally to the river.

WWTP must be located on a suitable planned area, green open space, or on sideways street with a strength and safety aspects [3]. The new locations for WWTP is proposed in workshop IV. The development of sanitation has an important function as it pertains to health, lifestyle, and environmental conditions that can provide comfort in daily life [7]. The new location will serve the household from the critical points. In this regard cutting the open access from the toilet has contribute to decrease environmental degradation by around 7%.

### 4. Conclusion

This program is planned to be multi-years project. The project served as a platform to integrate government program on different level stakeholders. The method used in this program is the charrette method where the improvement actions were derived from the community needs and existing condition. A good planning is the planning that involves the people around and is bottom up in accordance with the wishes and the needs of the community, where bottom–up approach is not only a
way of gathering data but also an approach centred on people, to unpack individuals’ experiences and meanings [9]. This is a community initiative approach and inputs were collected through weekly and bi-weekly workshop with staging up targets from common to more detail goals.

This year the program reduces the environmental degradation in Kampung Nambo by identifying and cutting the critical contamination points, especially from the 4 identified zones. This intervention was then followed by the proposal of new location of WWTP following the protection of spring water flows. The WWTP in the new location is proposed to serve the household in the critical points as the first priority. The WWTP in the new location has reduced the water contamination by around 7% in terms of household with access to septic tank and WWTP. This intervention also increases the amount of clean water that can be collected from the spring water flows by the community. As one of the targets of the program is there will be no more households with open access from toilet to the spring water flow; the reduction of environmental degradation in the area was also achieved.

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