RECOVERING GREY LANDSCAPES FOR SUSTAINABLE FUTURE- A CONTEXTUAL ANALYSIS AND CONCEIVABLE TECHNIQUE AUDIT FOR KARADIYANA DUMP YARD

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Abstract

Karadiyana dump yard was once secured with lovely wet land associated with Bolgoda Lake. Since the advancement blast in Sri Lanka the vast majority of the waste dump gathered to this land just to fill the land in order to improve the land for an improvement venture. This mission was to cause the part of the wet land into a hard land where structures can be assembled. Yet, their end-all strategy became fiasco and they have become a natural issue for the zone. Thus, the purpose of this research is to identify means by which the dumpsite landscape could be utilized into better use architecturally.

Keywords: Grey-landscape, Sustainable, Dumpsite, Waste-Architecture Combination

Introduction

Sri Lanka is one of the countries that practically experienced the adverse effects of Open Dumping on environmental sensitive areas such as wetlands, marshy lands, and river and stream reservations as a common practice that has been adopted by general public and some local authorities. Though the Meethotamulla tragedy in 2017, Created a great need for proper waste management and country moved on through new projects such as Open Dump Rehabilitation (Proposed urban park on Meethotamulla Trash Mountain), Establishment of new waste management functions (Proposed Sanitary Landfill in Aruwakkalu) and advertisement of community awareness programs, Waste problem is still alive in the country.

Figure 2: Existing Situation of Karadiyana Dump site



According to Grudziecki & Buachoom, 2016, it is important to increase the awareness and understanding of waste related issues among general public as well as professionals within the

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landscape architecture, architecture, planning and politics. Waste to Energy design lab, which launched in 2014 by Harvard University's graduate school of design for three years, conducts research on novel and effective ways to rethink the relationship of Architecture and waste. According to them, Architecture can involve in designing hybrid waste managing buildings to connect and communicate to the public and to produce energy or other by-products. Muller, 2016, mentions that, issue of waste and waste management not commonly associated with the field of architecture, but architecture helps to expresses this critical function called waste management in a way that visibly engages and welfares the public. Lack of Architecture in waste management is the major issue in slipping the relationship people have with trash.

The objective of the study

This research examines the extent to which an architecturally designed building or/and landscape with hybrid functions of waste management and community awareness system would be successful if presented as a solution to an urban open dump in Sri Lanka.

Literature Review

Hrirya Trash Mountain at Tel Aviv, Israel

This model is discussing a landscape typology which important in understanding the roll of landscape architecture in transforming dead open dumps to public livable spaces. In 20th century, "Hrirya Mountain" was a massive open landfill on the wide river plain in the southeast of Tel Aviv, Israel. Eventually it became a mountainous dump site with more than 25 million tons of wastes which was horrible to the eye sight and the olfactory sense (Rinat, 2011). Anyhow, its remarkable heap proportion was nearly one kilometer in length and 87 meters in height (Dvir, 2010). After the site became a danger for flying air crafts at Ben Gurion Airport as this open dump attracted thousands of sea birds who clashed the flight runways, was officially closed by the Israel government in 1998. And the target was to convert this man-made environmental disaster/dead space into a vibrant space.

Figure 2: Dump site before officially closed by the government

Source: The times of Israel, 2017

As the first step, combustible methane gases are eliminated through perforated pipes which lie inside the trash mountain in order to control the greenhouse gas emission. Covered the mountain by a Bio-Plastic layer which made out of gravel and one meter of clean soil for new growth provisions. It would prevent methane from escaping the ground structure and allowing flora and fauna to flourish in the soil layer once again. The water which is still leaking from the garbage dump, gets collected and treated in separate 'green sedimentation tanks'. The collected gas through perforated pipes are utilized as a source of green energy to fulfill the energy requirement of the park and to power a textile factory (Mordas, 2015).

Figure 3: Rehabilitated open dump

Source: (Times of Israel webpage, 2016)

At the design stage, slope of the trash mountain converted to observation paths. Retaining walls are stabilized by using reinforced salvaged concrete debris. Excavated materials plus several millions of cubic meters of construction demolition waste are used to build the open spaces, artificial water bodies and structures in facilitating areas. Tree trunks are recycled and then hand crafted into wooden furniture to be used in the park.

Figure 4: public livable space designed on Trash Mountain [online image]

Source: (Research gate webpage, 2012)

This public livable space which appears as a dead space earlier, planned with functions and spaces such as tranquil waters, walking and biking trails and impressive vistas of the Tel Aviv skyline. This is aided with a promenade along an artificial lake, an open air theatre with 30,000-person capacity and a bio-diversity center. A solid concrete platform in the center, accommodates central functions in the park and a restaurant. Hidden layers of gravel, function as cool storage areas. Unique agricultural patterns are found in local context, planted on the site, mostly in the form of olive groves. The most important part of this park is the waste and recycling center which consists of three large recycling plants, where processing waste and producing biofuel facility outside the park. It takes approximately 3,000 tons of household waste

Figure 5: Biofuel facility area that connected with Arial Sharon Park

Source: ariel-sharon-park.html [home page])

or about 1000 truckloads per day and manages to reuse or recycle 80 percent of this waste (Galfund, 2016).

Recycling Plant for Urban Waste, Madrid, Spain.

This model expresses the building type to understand how architecture can involve in transforming dead open dumps to public livable spaces.
This is a Bio methane producing and Composting plant which is located at an industrial suburb of Madrid. The plant is designed by Abalos and Herreros in 2000 to manage urban waste generated in Madrid through waste treatment and recycling systems on a large dead open dump (Muller, 2016). Main intention of the project was convert this dead space into public livable space and rebuild as a part of the surrounding hillside context (Hill, 2002).
Building consists of two parts and weight station pavilion. And a combination of modern waste treatment with a sort of living museum. It unifies the typically separate functions in waste management such as collection, selection, and processing and treatment facility areas. And consisting with office rooms, workshops and waste storage spaces other than museum space. It facilitate the management function of urban wastes and educate the community about the benefits of waste to develop individual waste management in the country. The whole process functions under a single, sloping, green roof which expresses unique gravitational character of the surrounding hillside context. The building envelop is made out of recyclable polycarbonate panels which is cheap, flexible and saves money on lighting costs (Demby, 2003).

Figure 6: Recycling Plant built on a dead open dump in Madrid

Source: (‘A daily Dose of Architecture Books’ webpage, 2002)

Methane generates electricity as well as organic waste generates compost. Electricity and compost to the private sector to make a profit as well as earn from the visitors who are being attracted to the building due to the museum and building appearance. Whole building is a bolted structure which can be easily ripped to pieces as it designed for thirty years. The government hope that the community would educate about the benefits of waste management through the support of the design and would help in reducing waste generation by segregating them at the domestic level during this time period. After that, the building will function either service building or will be dismantled with parts recycled or re-used.

Figure7: Bolted structured building which inspired by the natural context

Source: Waste Architecture Platform' webpage)

Figure 9: Building interior designed by using recyclable materials

Source: (Waste Architecture Platform' webpage)

Methods

This is a qualitative research on finding out the applicability of 'waste and architecture combination' in transforming dead open dumps to public livable Spaces including waste management functions in Sri Lanka.

Literature Review

Find out the knowledge gap through literatures and develop a common design criteria.

Figure 8: Building envelop finished by polycarbonate panels

Source: (A daily Dose of Architecture Books' webpage, 9 December 2002)

Examples– 1. Hrirya Trash Mountain at Tel Aviv, Israel
2. Recycling Plant for Urban Waste, Madrid, Spain

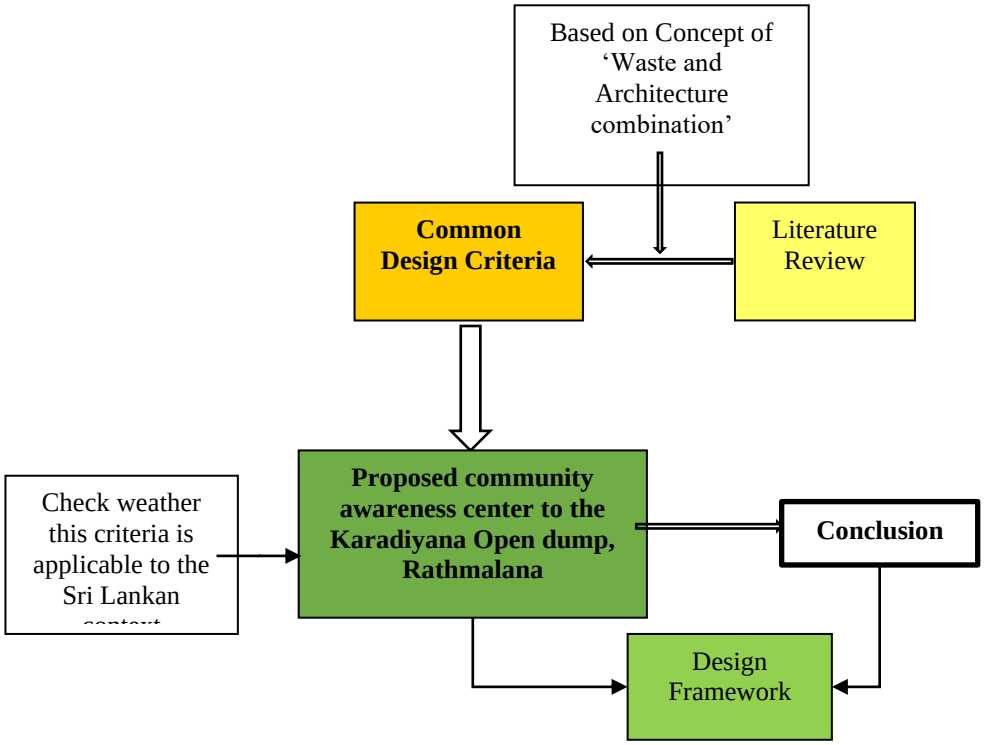
Observation

Testing capability to establish sustainable waste management center with a public livable space which is designed by considering above common design criteria on a dead space in Sri Lanka.

Sampling method

Proposing a community awareness center to the Karadiyana Open dump, Rathmalana to rehabilitate the trash mountain and its surrounding context with the engagement and education of sustainable waste management under the concept of 'Waste and Architecture Combination'. Rationale- Karadiyana Open dump is highly environmental sensitive area which surrounded by mixed residential, industrial and institutional developments. Due to the dump, immediate context is almost deserted, lack of public activities and encourage unlawful behaviors.

Methods of Analysis



Results and Discussion

The table below mentions the profits and benefits that can be tested by applying 'Waste and Architecture Combination' concept in transforming dead spaces to public livable spaces. (The criteria developed through Literature Review)

Table 01

	Sustainable benefits		
Design parameter	Environmental Friendliness	Social Acceptability	Economic Viability
Rehabilitate the context	Upgrade the Eco system of surrounding context which was disappeared with the trash.	Convert dead space to public livable space by including many functions and activities.	Add value to the surrounding built environment
Separate polluted environment with waste from the existing environment.	Protect the existing eco system (Flora and Fauna) by already polluted non-degradable waste materials.	Create a healthy environment by blocking bad smell and uncomfortable visual of the trash.	Reduce the cost of defects and easy to manage waste as foldup in a specific area.
Highly imitate the green concepts in designing the building/area.	Protect environment by using 100% recyclable/ reusable materials in construction.	Reduce the urban heat island and create healthy built environment indirectly.	Reduce the cost of construction.
	Design the spaces by applying construction wastes and other type of wastes and reduce the influence of waste on environment directly.		Reduce the maintain cost.
	Design the space in reducing energy consumption as an environmental friendly method.		

Strongly adapt to the built environment and surrounding context regarding upgrade the environment.	Arrange the spaces in the design for new growth of unique flora and fauna of the context.	Helps in upgrading the attitude in general public about the benefits of waste management at domestic level through museums, education centers, exhibition areas and observation paths (visitor's routes).	Income by the community attraction can be applied on maintance of the project.
	Educate the community of citizens, businesses, institutions about the process of waste management	Treat the community to get release mentally and physically from the pressure of day to day life by providing recreation facilities, space for community gatherings, spaces for functions, viewpoints, etc.	Directly contribute in creating new jobs and helps to reduce the unemployment of the surrounding context.
		Mostly mend the scars of built environment	
		Increase the social attraction through the appearance of the design.	
Design to facilitate one or more waste management/treatment functions	Reduce the environment pollution through waste management and treatments.	Connects the critical function called waste management with general public as a major part of the built environment.	Design the space to sell second hand items, waste upgrades as a byproduct of waste selection process.
			Generate products such as compost, bio-gas, and sell

			to the private sectors.
			Fulfill the energy requirement from the generated energy by waste and rest of that sell to the energy grid.

The below table compare the existing situation of karadiyana open dumpsite and the position after applying the proposed design of community awareness center to the rehabilitated Karadiyana Dumpsite.

Table 02

Design Considerations	Sustainable Benefits	Karadiyana Dumpsite, Rathmalana	
		Existing situation with Present Composite plant	With Proposed community awareness center + Waste Management Center
Rehabilitate surrounding area	Upgrade Ecosystem of the surrounding context which was disappeared with the trash.	Have been conserved the area rest of the trash mountain to some extent.	Proposed urban park on landscaped rehabilitated trash mountain with replanted disappeared plants such as Beli patta, Diya tana, Etthora, Guru tana, Heen dan, Hunukirilla, etc
	Convert dead space to public livable space by incorporating	No. Still a huge dead space. Only functions among people who are working at composite plant.	Proposed Community Awareness Center including

	different functions and activities.		Information center, Waste upgrades sales center and open craft center.
	Add economic value to the surrounding built environment	There is a proposal to function the area as a part of the industrial city.	The dead space convert to a commercial space with the waste upgrades buying and selling process.
Separate polluted environment including waste from the original/existed environment.	Protect existed/original ecosystem (Flora and Fauna) from already polluted non-degradable waste materials.	No solution to the already polluted environment and do not protect flora and fauna system.	Save the rest of wetland including flora and fauna species by developing existing water network and green area as eco-park extension.
	Create healthy environment by blocking bad smell and uncomfortable visual of the trash.	No	Through sustainable waste management process and trash mountain rehabilitation process.
	Reduce the cost of defects and making easy to manage waste as foldup in a specific area	No. existing management function not enough to manage the waste amount collected per day.	Through proposed sustainable waste management process
Follow the green concepts in designing.	Protect environment by using 100% recyclable/ reusable materials in construction.	The existing waste managing building is designed by using steel and concrete and shipping containers.	yes

	Designing the spaces by applying construction wastes and other types of wastes and reducing the direct impact of waste on environment.	Some spaces are built by using second-hand shipping containers.	yes
	Designing the space to reduce energy consumption.	The building is naturally ventilated and lighted up during the day time, but required energy in operating machines.	Yes (can be explained by the design)
	Reduce urban heat island while creating a healthy built environment.	No	yes
	Reduce cost of construction.	Construction cost is comparatively low.	By mostly using recycled waste materials in construction.
	Reduce maintenance cost.	The maintenance cost is low, as it is a green building.	Yes (can be explained by the design)
Adapt to the built environment and the surrounding context to upgrade the environment.	Arrange spaces in the design for new growth of unique flora and fauna of the context.	No	Through proposed eco-park on rehabilitated trash mountain.
	Help to upgrade the attitude of the general public about the benefits of waste management at domestic level	No	Through proposed information center (museum, education center, exhibition area and observation paths).

	Treat community to get release psychologically and physically from the pressure of day to day life by providing recreation facilities, space for community gatherings, spaces for functions, viewpoints, etc.	No. Instead of that surrounding community obligates to sell their property and leave the area	The main intention of the urban park is to treat the community to get release psychologically and physically from the pressure of day to day life
	Mostly mending the scars of the built environment	No	Strongly mend the scars of the old trash mountain
	Increase of attraction of the people through the appearance of the design.	No	Highly increase the social attraction by the landscaped urban park and through the Community Awareness Center building.
	Generate income by the community attraction which can be used to cover the maintenance cost of the project.	No	Trough eco-park and waste upgrade sales center.
	Directly contribute in creating new jobs and helps to reduce unemployment in the surrounding context.	To some extent.	Yes
Design to facilitate one or more waste management/treatment functions	Reduce environmental pollution through waste management and treatments.	To some extent	By Proposed sustainable waste Management Center.

	Connection of the critical function - waste management with the general public as a major part of the built environment	Private sectors in suburbs connect with the function due to the byproduct, but not immediate context.	Sustainable Waste Management Center design as an exhibition area to the general public.
	Design a space to sell second-hand items, waste upgrades as a byproduct of waste selection process.	No	Proposed waste upgrades sales center.
	Generate products such as compost, bio-gas, and sell them to the private sectors.	Generate compost and sell them to the private sectors in the suburbs.	Proposed Sustainable Waste Management Center + Waste Upgrades Craft Center
	Fulfill energy requirement with energy generated from waste and selling rest to the energy grid.	There is a proposal to locate a waste to energy plant at the site, but not yet.	Overcome energy requirement through Proposed Bio-gas Plant.

Conclusion

By the analysis, can observe that, existing Karadiyana dump site, consisting with a huge collection of wastes and rapidly increased day by day with the unbearable amount of wastes. Those amounts of wastes cannot be managed by provided compost machines and not applicable to Colombo city character as it mainly focused on businesses, industries and institutions other than agriculture. It causes in creating unhealthy environment with horrible smell and uncomfortable visual in the surrounding context. Above design proposal could be a master proposal that taken by thinking about future of the entire country. According to the above analysis, waste-to-compost is a poor and improper solution for the Colombo city context. Anyhow, Colombo energy consumption is huge and has a huge demand. And already consisting with a market for segregated waste items. City of Colombo is a visitor's gateway and it is a great approach to educate community about the benefits of waste management aimed in reducing individual waste generation at domestic level. And can establish an exchanging system through this project and waste-to-compost plants located in suburbs. This system helps to strengthen those composite plants by exporting Colombo organic waste for them and can be imported segregated inorganic waste from them to this plant due to the huge demand. So it will be provided an ideal solution to the waste problem in entire country. That means, the application of the concept of 'Waste and Architecture Combination' to the Colombo city, the capital of Sri Lanka once, entire country can be subjected to revolution by controlling ecological collapse.

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