



PAYING IT FORWARD

ENVIRONMENTAL SUSTAINABLE DESIGNS (ARC 1413)

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INTRODUCTION

1.1 PROJECT

Architecture, the art of building in which human requirements and construction materials are related so as to furnish practical use as well as an aesthetic solution. In this particular subject and assignment, Environmental Sustainable Design, we are about to find out that architecture is not only provides shelter to people, but it is much more than that. This project provides us an opportunity to apply our skills and creativity to utilize and to help improving the lives of the less fortunate. It also gives us a chance to bond interactions with the community by working with them. In order to do so, we have chosen a strayed dogs shelter at Kuala Selangor and surveyed the site for flaws and things they may lack or insufficient. In order for us to explore and understand more about the concept of environmental and ecological sustainability, we are only allowed to use green materials or recyclable materials as to reduce the negative environmental impacts brings to the site. And now our tasks is to improve the lives of the strayed dogs with our creativity and the knowledge of sustainability.

1.2 COMMUNITY

Location: Batang Berjuntai, Kuala Selangor.

Person in-charged: Ms. Vignes

We got to know that this non-profit animal shelter by the name of “Lost Animal Soul Shelter” (LASS) and is located in an isolated area in Batang Berjuntai. It houses for more than a hundred destitute abandoned dogs mainly from KL and Seremban area. After some conversations over the phone and emails with the founder of LASS, Ms Vignes, we decided to make a play area for the puppies that are in the animal shelter. Their main purpose is to provide them a safe, we so called it a “home” for these dogs and puppies and also take care of them with their basic needs. The person-in-charged, Ms. Vignes expresses that this shelter still needs help in funding from the community or provision wise, and also she is seeking ways to promote this shelter, so dog-lovers from outside will give more attentions, come over to adopt these strayed dogs, it also needs some help to improve its current environment. While we were visiting the place, the dogs were chasing around porch area, since they do not have a proper play area. We are asked and decided to do the play area for puppies.

Firstly, there is an empty land in the shelter itself measuring (1494 x 1123) cm² in which Ms. Vignes hopes to make use of that piece of land to do something better. Secondly, there are some puppies in the shelter which are not able to live and sleep with the matured dogs as the matured dogs are larger in size and more aggressive, therefore the

puppies have no choice but to stay with the workers themselves. Lastly, we would like to provide a protected, sustainable, and healthy place for the puppies to live in each day.

1.3 ENVIRONMENT



Fig. 1 View to the site

The shelter is situated in an outskirt area where you will have to go through the narrow roads in order for you to reach there. Due to its location, the shelter needs further attention. The shelter is extremely hot during the day. It smells bad due to the cow shelter sits next to it. The shelter is mainly built with concrete and steel, there is barely any greenery on site. The play area that we installed is beside the existing dog shelter, an empty and unused space next to the porch.



Fig.2 View to the play area site



Fig.7 Play area site

DESIGN

2.1 PROGRESS

Design Idea

We wanted to construct a more naturalistic play area to enhance the visual of the shelter. Also, it is more environmental friendly. Therefore, by planting grass, we could have a closer approach towards a cleaner and greener atmosphere.

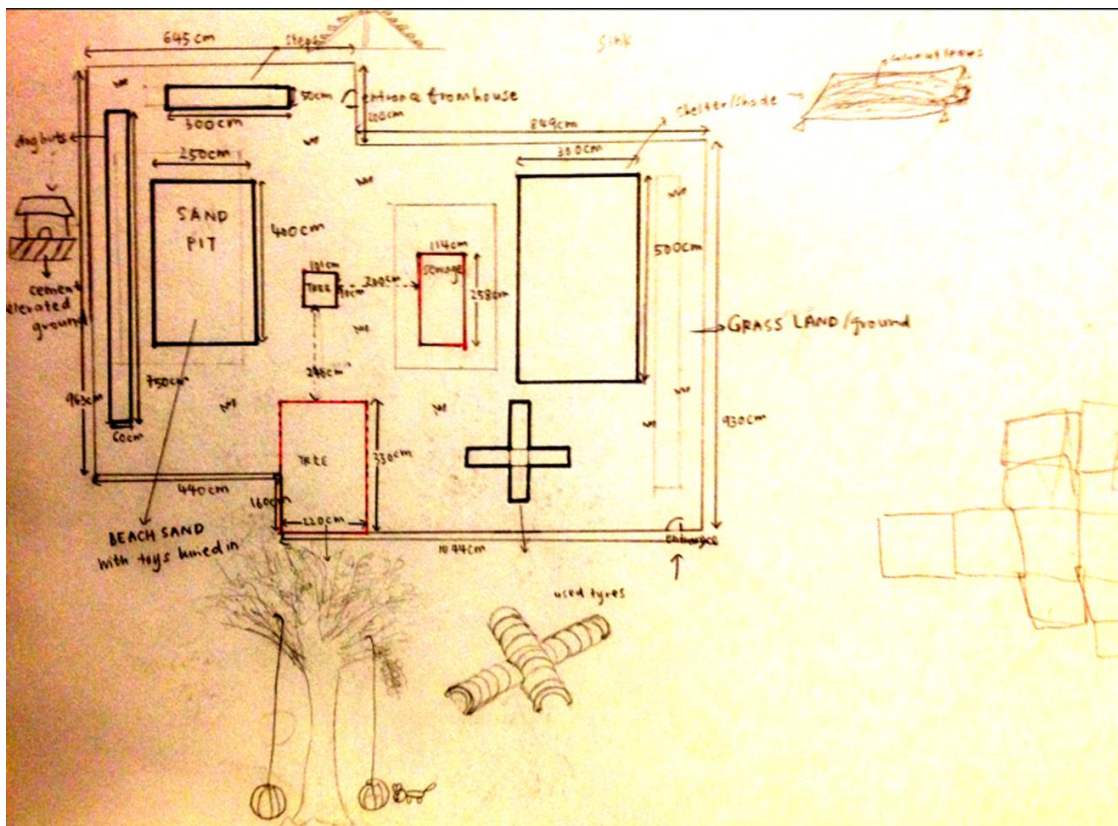


Fig. 3 Play area floor plan

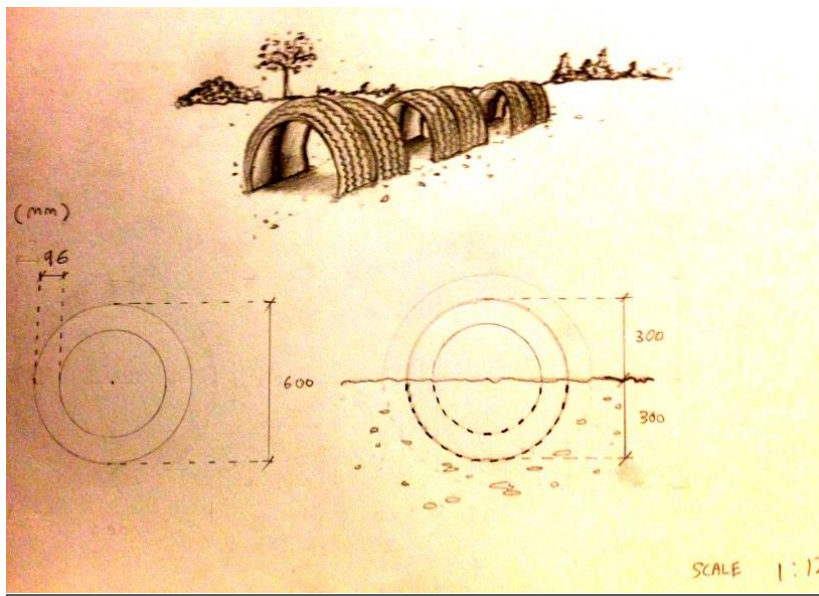


Fig.7 Tires tunnel design

Fig. 6 Sand pit designed

PUPPIES' PLAY AREA + HUT

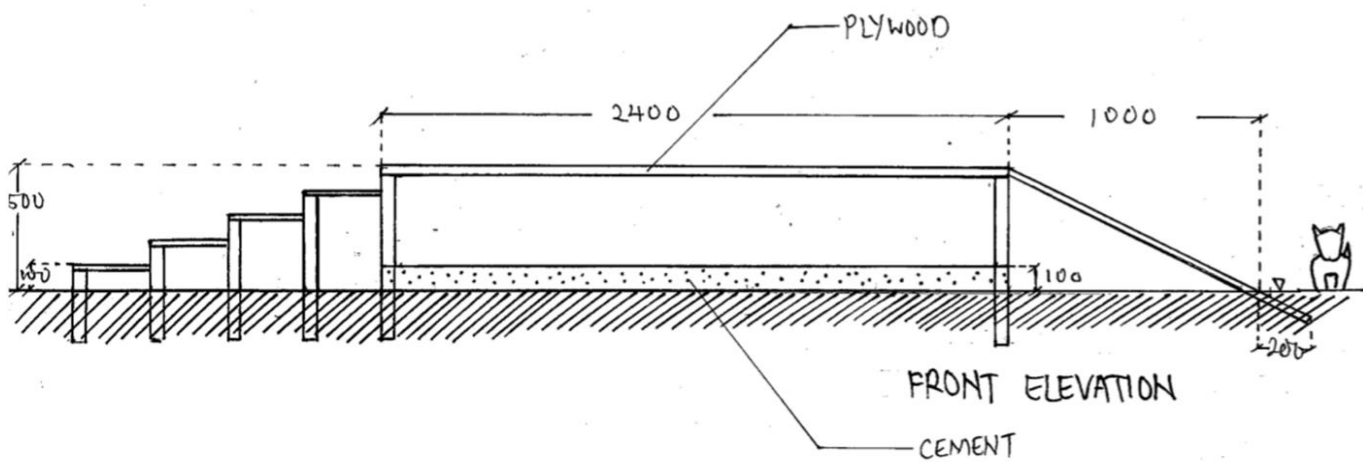
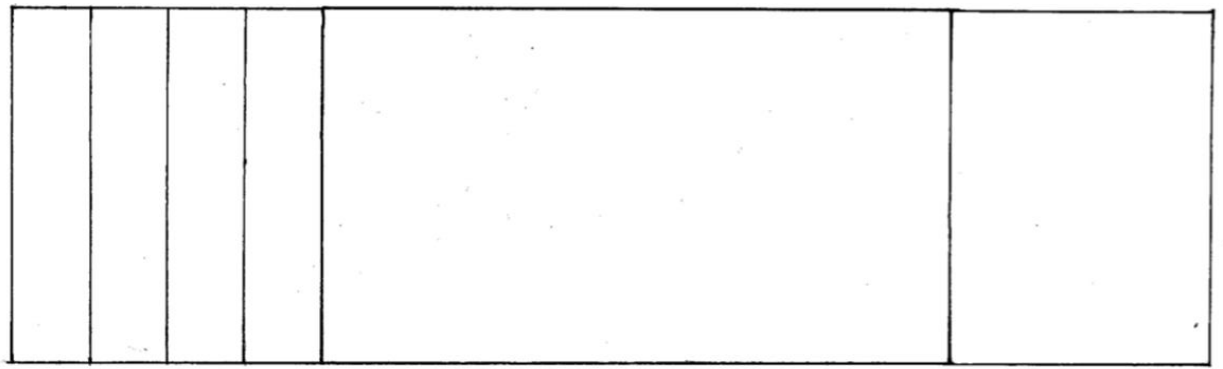
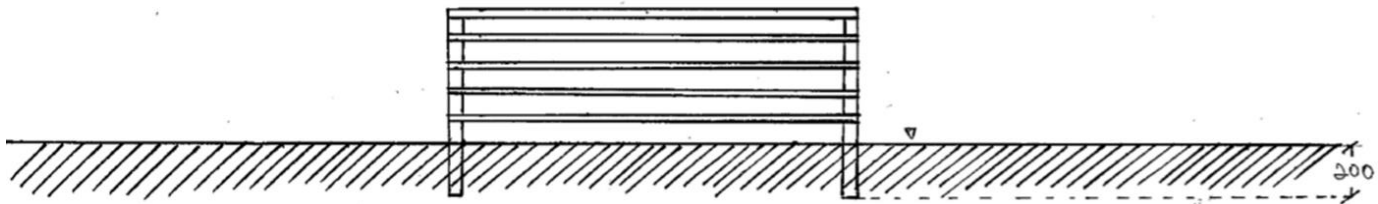


Fig.8 Puppies hut's front elevation



ROOF PLAN.


Fig.9 Puppies hut's roof plan







SIDE ELEVATION.

Fig.10 Puppies hut's side elevation



2.2 MATERIALS


MATERIALS	DESCRIPTIONS	SUSTAINABILITY
<p>Galvanized Metal Fence</p> <p>(4.5 m)</p> 	<p>Cost saving</p> <p>Easy to install</p> <p>It acts as barriers to prevent the puppies from wandering around the area and to create a barrier between the adult dogs and the puppies as the adult dogs might harm the puppies.</p> <p>It also helps preventing the puppies from running away from the play area.</p>	<p>Recyclable and can be reclaimed for other construction purposes.</p>


<p>Steel Rods (18)</p> 	<p>Steel is an alloy of iron and carbon, which is stronger than iron as carbon act as a hardening agent. Steel is suitable used in either indoor or outdoor. For the outdoor, it would remain unchanged even in a sunny or rainy weather; hence its durability is higher than any other materials.</p> <p>To build the fencing in the playing area.</p> <p>To stabilize the fencing.</p>	<p>High recyclability.</p>
<p>Metal Wire</p> 	<p>Great in strength.</p> <p>To tighten the fencing.</p> <p>Connecting the galvanized metal fence with steel rods.</p>	<p>Recyclable or can be re-used if it is still in good-condition.</p>


<p>Recycled Tires (6)</p> 	<p>Safe for the puppies to play on. Waterproof, hence is suitable for the hot and humid climate in Malaysia.</p>	<p>Durable.</p> <p>Recyclable.</p> <p>Abundant</p> <p>Can be easily found.</p> <p>Does not easily wear down.</p>
<p>Cow Grass</p> <p>(100 pieces)(30cm x 30cm)</p> 	<p>This kind of grass is usually planted in the field and the leaves are wide and short.</p> <p>Suitable for puppies as it provides a green and natural environment, in addition, gives out fresh air for the puppies to stay at the playground for a longer period.</p> <p>Low-maintenance.</p> <p>Slow growth rate.</p> <p>To cover the ground.</p> <p>Safe for the puppies to</p>	<p>Renewable.</p>

	have fun on it.	
<p>Top Soil</p> 	<p>Easy to obtain.</p> <p>Laid on the ground to plant the cow grasses.</p> <p>The contents in the top soil such as potassium, phosphorus, calcium and magnesium are very suitable to plant cow grasses on it.</p>	<p>Abundant</p>
<p>Bricks (40 pieces)</p> 	<p>Good in strength.</p> <p>Low maintenance.</p> <p>Fire resistant.</p> <p>Design flexibility.</p> <p>Brick will not require</p>	<p>Recyclable and reclaimable.</p> <p>Durable.</p>

	<p>painting and so can provide a structure with reduced life cycle costs.</p>	
<p>Oil –based Paint</p> 	<p>Oil-based paints are made with either alkyd (synthetic) or linseed (natural) oils.</p> <p>Oil-based paint is good for trim work because trim takes more abuse over time than do walls.</p> <p>To coat the fences so it does not rust easily.</p>	<p>More durable.</p>
<p>Portland Cement</p> <p>(40kg [1 bag] x 40 = 1600kg)</p> 	<p>Cement is a mixture of limestone, clay, silica and gypsum.</p> <p>Long-lasting.</p> <p>Strong.</p> <p>Water-resistant.</p>	<p>It produces a lesser CO2 therefore it gives a lesser carbon footprint, therefore, less harmful to our environment.</p>

	<p>To elevate the ground for the dog huts.</p> <p>It is to use to avoid the dog huts flooded when raining.</p> <p>It is also used to build a higher obstacle behind the fence so the puppies will not run away from the play area.</p> <p>Cement will also be applied underground to strengthen the steel rods columns so that it won't fall off when there's strong wind as for the safety of the puppies.</p>	
<p>Canopy net</p> 	<p>Low cost.</p> <p>Low maintenance.</p> <p>As a shading device to prevent sunlight from hitting directly on the ground because it will cause discomfort for the</p>	<p>Can be re-used.</p>

	<p>puppies due to the heat from the hot sun.</p>	
<p>Plywood</p> 	<p>Has a higher grade of face veneers than core veneers, which is to increase the plywood resistance to bending.</p> <p>Suitable to be chosen for building the dog huts because is easier to be cut or shaped with basic tools.</p> <p>It is also being used as formwork.</p>	<p>Renewable resources.</p> <p>Can be reclaimed and recycled.</p> <p>Plywood is producing less energy and lower greenhouse gasses emissions if compared with other materials.</p>

<p>VOC Shellac</p> 	<p>A thin layer of shellac is applied on the plywood to protect the surface being harmed from the weather.</p>	<p>Does not emit any chemical smell.</p> <p>Durable.</p>
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2.3 COSTING

Materials	Quantity (No.)	Price per (RM)	Estimated Price (RM)
1. Fencing			
(a) Steel Rod - 1.5m length - 1 inch in diameter	20	20.00	400.00
(b) Broom stick + Rope - 5m in length - 5mm in diameter	12 + 5m	21.50	21.50
(c) Galvanized Steel Fence - 0.91m in height - 50 ft in length	3 rolls	50.00	150.00
(d) Steel Wire - Price per kg - Price per 10m	2kg 10m	4.00 3.00	16.00 3.00
(e) Pliers	1	15.00	15.00
(f) Saw + Broom stick	2 + 1	10.00 + 5.00	25.00
(g) Canopy net	1	100.00	100.00
2. Elevation of Dog Huts			
(a) Cement - Product name: Floor Screed - 15kg per bag	40 bags	25.00	1000.00
(b) Transportation	-	200.00	200.00
3. Landscape			
(a) Soil - 5kg per gunny sack	2	5	10.00
(b) Cow Grass - (1 x 2)ft	100	1.20	120.00
(c) Transportation	-	70.00	70.00
4. Multipurpose Play Area			
(a) Ply Wood - (8 x 4)ft - 0.9cm thickness	14	42.00	588.00
(b) Shellac	1	50.00	50.00

(c) Nails	½ kg	3.00	3.00
(d) Hinges + Locks + Screws	10 + 3 + As much as needed	39.50	39.50
Total Price			2811.00

Sponsorships

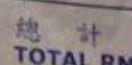
Company / Individual	Materials	Sponsor (RM)	Total Sponsor (RM)
1. Aalborg Portland Malaysia Sdh Bhd (Sponsorship by Hexadaya)	Floor Screed used for the elevation of the dog huts	1000 + 200	1200.00
2. Chia Pin	-	200.00	200.00
3. Andrew Chee	-	5.00	5.00
4. Nicholas Lai	2 tyres	-	-
	-	250.00	250.00
	Gloves	14.90	14.90
5. Meera Satheesh	-	250.00	250.00
6. Tan Chor Chen	-	200.00	200.00
7. Maple Yeow	4 tyres	-	-
8. Kai Sheng	-	700.00	700.00
9. Lee Pui Yi + Pei Yi	-	250.00	250.00
10. Lost Animals Souls Shelter	a) Canopy	-	-
	b) Wood	-	-
	c) Paint	-	-
	d) Normal Cement	-	-
Total Sponsored			3069.90

Remaining Sponsors

Budget : RM2 811

Sponsors : RM3069.90

Remaining : **RM258.90**



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M/S: CA

NO: 97601

Date : 29-4-14

Item	Particulars	Quantity	Unit Price	Amount
1	GA Paper 1 ⁴	34	4	136.00
2	WMA 216	1		3.00
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
Goods Sold Are Not Returnable 貨物出門，恕不退還		Total RM		139.00

Goods Sold Are Not Returnable 貨物出門，恕不退還

Total RM

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日期
Date

26/4/14

數量 Quantity	摘要 PARTICULARS	價銀 Price	銀 Amount 額 RM
130	1" x 1" S-G 2H	20-	260 -
3	1/2" x 1/2" BRC	50-	150 -
24	Dunn		16 -
1	Bolt cut		15 -
		總 結 TOTAL RM	441 -

貨物出門，不得退回。 Goods sold out are not returned

經手人 Issued by

收貨人 Received by

Customer Copy

交貨單
STORE DELIVERY ORDER

Nº 13468

HEXADAYA SDN. BHD.
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No. 4, 2nd Floor, Jalan Utama SR 1/9, Seksyen 9,
Serdang Raya, 43300 Seri Kembangan, Selangor.
Tel: 03-8948 7745, 8948 2241 Fax: 03-8948 8619



Messrs Sponsor by Hexadaya S/B Date 7.5.14
SMO No. 16106


Received from **HEXADAYA SDN. BHD.**
the undermentioned goods in good order and conditions.

Your Order No. _____
Our Invoice No. _____

Item	Quantity	Description of goods
	40 Bags	sci Floor screed & HVP

Delivered To: Kuala Selangor
Wage

Lorry No: WHL 584
Delivered on _____

HEXADAYA SDN. BHD.

Authorized Signature


Store-keeper


Chopped & Signed
Recipient's I/C No. _____

Usage - 15 kg / m^2

10 cm (100 mm) 150 kg / m^2

- $750 \text{ cm} \times 60 \text{ cm}$

- $7.50 \text{ m} \times 0.6 \text{ m}$

① Total usage = $150 \text{ kg} \times 7.50 \times 0.6 \text{ m}$

$$= \frac{675 \text{ kg}}{40 \text{ kg / bag}} = 16.9 \text{ bags} \approx 17 \text{ bags}$$

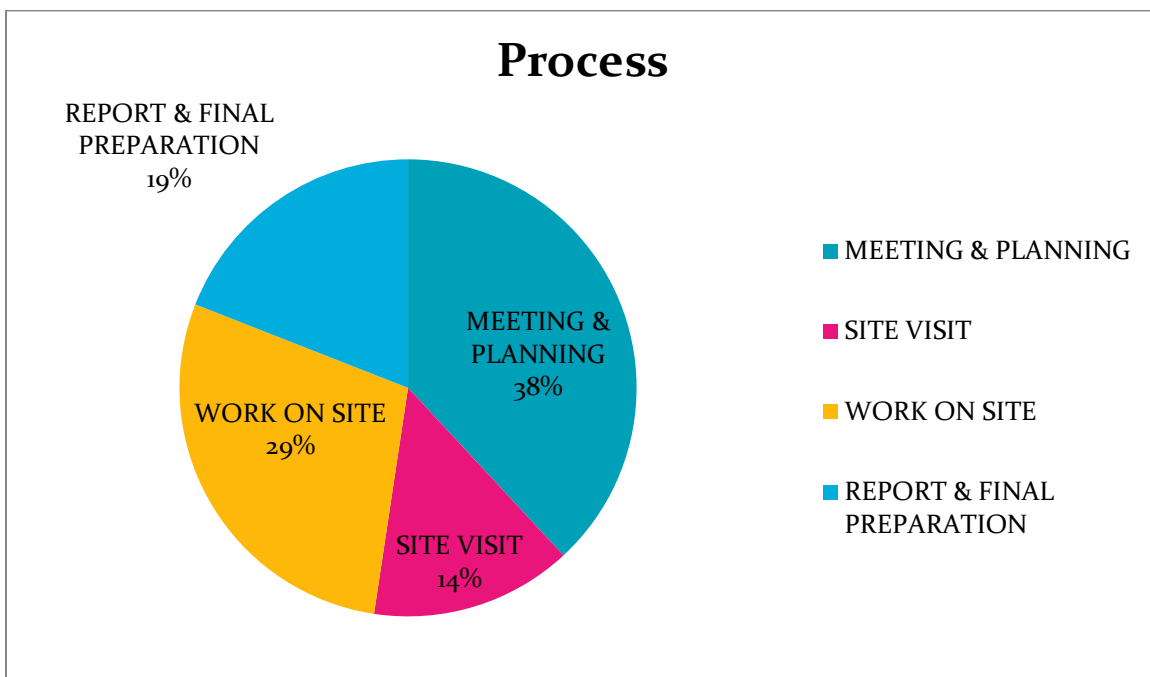
②

$$= \frac{15 \text{ kg} \times 0.30 \text{ m} \times \pi}{40 \text{ kg / bag}} = 17 \text{ bags}$$

Total = 34 bags

2.4 SCHEDULE

		week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8	week 9
	Planning & Brainstorming									
	Measurement of site									
Landscape	Loosening the soil									
	Placement of the soil									
	Grass Planting									
Fencing	Placement of the poles									
	Measuring & Cutting									
	Placement of the fence									
Multipurpose	Measurements & Cutting of the wood									
	Formwork									
	Treatment									
	Nailing the wood									
	Cement									
	Tyres									



INSTALLATIONS

3.1 INSTALLATION PART

1. Installation of fencing



Steps:

1. Before setting the fence, we measure the distance between poles and cut the fence following the measurement.
2. For safety reason, we chose to bend over the edge of the wire fence (using plier) so that it won't hurt anyone and the puppies as they are playing and running around.

As for bending over the sharp edge of wire, we need at least one people to hold the wire while the other one to the bending job.

3. After the wire fence is safe enough to be set, we need to tie it up onto the pole using metal wire. It is tied over the upper, middle and lower part of the fence to ensure that it is strong enough and wouldn't off even when the dogs play around and with the fence.

For setting the fence, we need at least 2 people to hold on each pole (each side of fence) and 1 person to tie the metal wire.

2. Installation of steel rods



Steps:

1. Digging a hole approx. 20 cm below ground level. This step is a bit exhausting for us as the ground is quite rocky around the edge of the field given.
2. Putting in the pole. With total length of 150cm, we put approx. 20 cm inside the ground, leaving around 130cm above the ground. For stronger base, we put small amount of cement mixtures to the hole then we put in the pole.
3. Next, we adjust the pole with a leveller to see whether it's straight or not. Then we pour about a bucket of cement mixture and flatten it to ground level to hold the pole so that it steady and strong enough to support the fence.

For installing the pole, we need at least 2 people. 1 to measure, to hold and to make sure that the pole is straight, and the other one is in charge of the cement.

3. Installation of metal wire



Steps (thin wire):

1. We cut it about 20cm to tie the fence and roll it few times around the pole then make a knot to make it stronger.

Steps (thick wire):

2. We consistently pull the thick wire horizontally along the fence and make a small knot around every pole then continue to other fence and so on
3. We make sure that the metal wire is straight enough and not bent over as it is used to maintain the shape of the fence.
4. The same as thin wire, we put along the thicker wire on three parts of the fence which is upper part, middle part, and the lower part.

For cutting and tying, basically we only need 1 person to do it, but for pulling the thick wire along, we need more people (about 2 or 3) to hold on to straighten the wire, the fence and to pull and tie it.

5. Installation of cow grass with top soil



Top soil steps:

1. On the first attempt, we planned to directly throw the soil to the ground then, but then we realized that the soil is too sticky that we would waste the soil if we continued to do it that way.
2. Then we tried mixing the soil with water (approx. ratio 1:5) until the soil all dissolved and thick enough then pour and splash it all over the ground.
3. We waited for the soil-water mixture to absorb into the ground.

For this part we need 3 people as it will faster and more efficient that way. 1 person to do the stirring (mixing soil and water), 1 person to control the water amount (for the mixture not to be too watery, and another 1 person to pour the mixture onto the ground).

Cow grass steps:

1. Remove the plastic cover on the bottom of each grass carpet.
2. Plant the cow grass one-by-one on to the ground and buried the bottom part with the soil.
3. Watering the grass.

7. Installation of tires



Steps:

1. We measured and marked the distances from one tires to another before we started to install them.
2. We then dug holes and insert the tires about $\frac{1}{4}$ of it into the ground.
3. We then buried them with the rocks and soil.

8. Installation of Plywood for formwork



Steps:

1. Before we went to the workshop and cut the plywood, we measured and get the dimensions of the plywood needed for formwork.
2. After getting the plywood done, we first dug hole and insert the plywood pieces by pieces into the holes and used the rocks and sand to cover it until it is stable enough for us to pour in the cement and set.

8. Installation of Plywood for dog huts



9. Installation of Cement



Steps:

1. We make the cement mixture at ratio approx. 1:4.

This work only need a person, as the workers at the shelter also help us mixing the cement.

3.2 PROBLEMS AND SOLUTIONS

(a) Soil Condition



Fig. 11, 12 Soil Condition

The soil condition here is very dry and has a lot of big and small rocks which is difficult for us to work on it.

Solution: We spent a day to loosen the soil and throw away all the unwanted rocks.

(b) Lack of steel rods

We only order the exact amount of steel rods for the fencing. But the fencing was still bent after installing all the steel rods. The fencing is not stable enough because of the dogs and puppies keep banging on it.

Solution: We use recycle wood rods instead of steel rods that we found on site to fix and stabilize the fencing.





(c) Time constraint

We were not able finish the work according to the schedule planned earlier due to the weather because it rains quite often recently approximately at 4pm to 5pm.

Solution: We went to the site for many time until we finished the whole structure.

(d) Fencing corroded and rusted

The paint wasn't well coated because there isn't any smaller size brush when we were working on site.

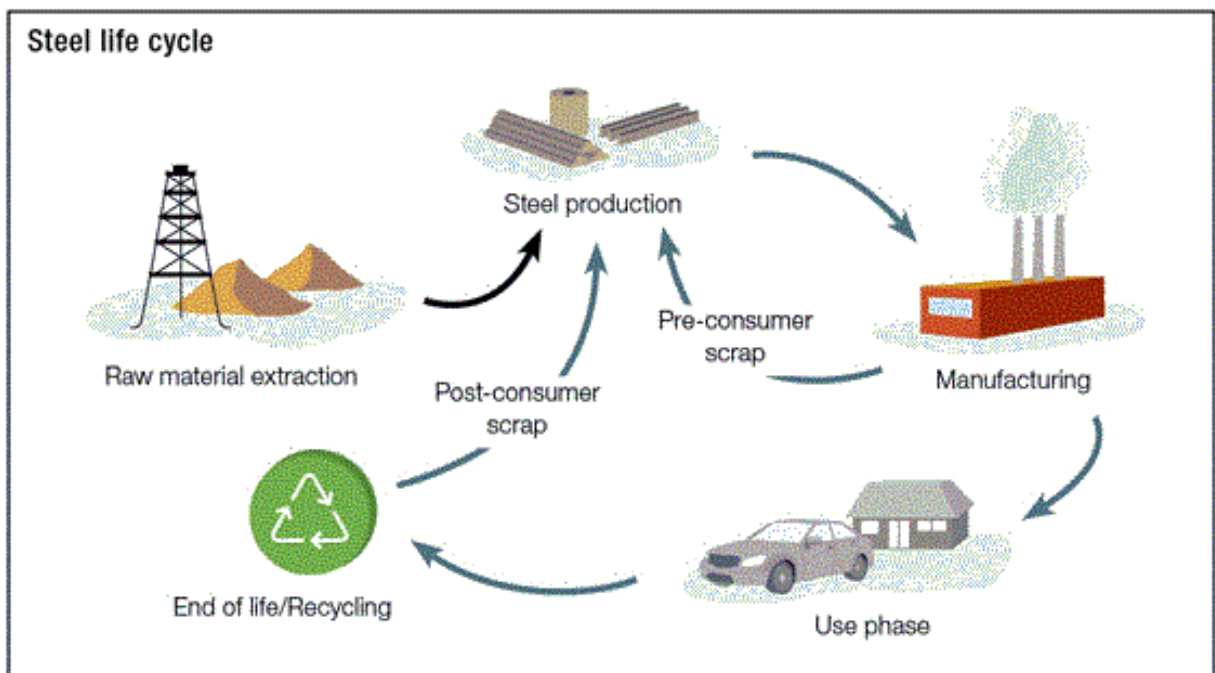
Solution: We applied the second layer, wait for it to dry. Then, we applied a layer of finishing layer to improve its aesthetic effect.

LIFE CYCLE ANALYSIS (LCA)

LCA is a technique to assess the environmental aspects and potential impacts associated with a product.

The major stages in an LCA study are raw material acquisition, materials manufacture, production, use/reuse/maintenance, and waste management.

LCA OF STEEL (STEEL RODS, GALVANISED METAL FENCING, STEEL WIRE)



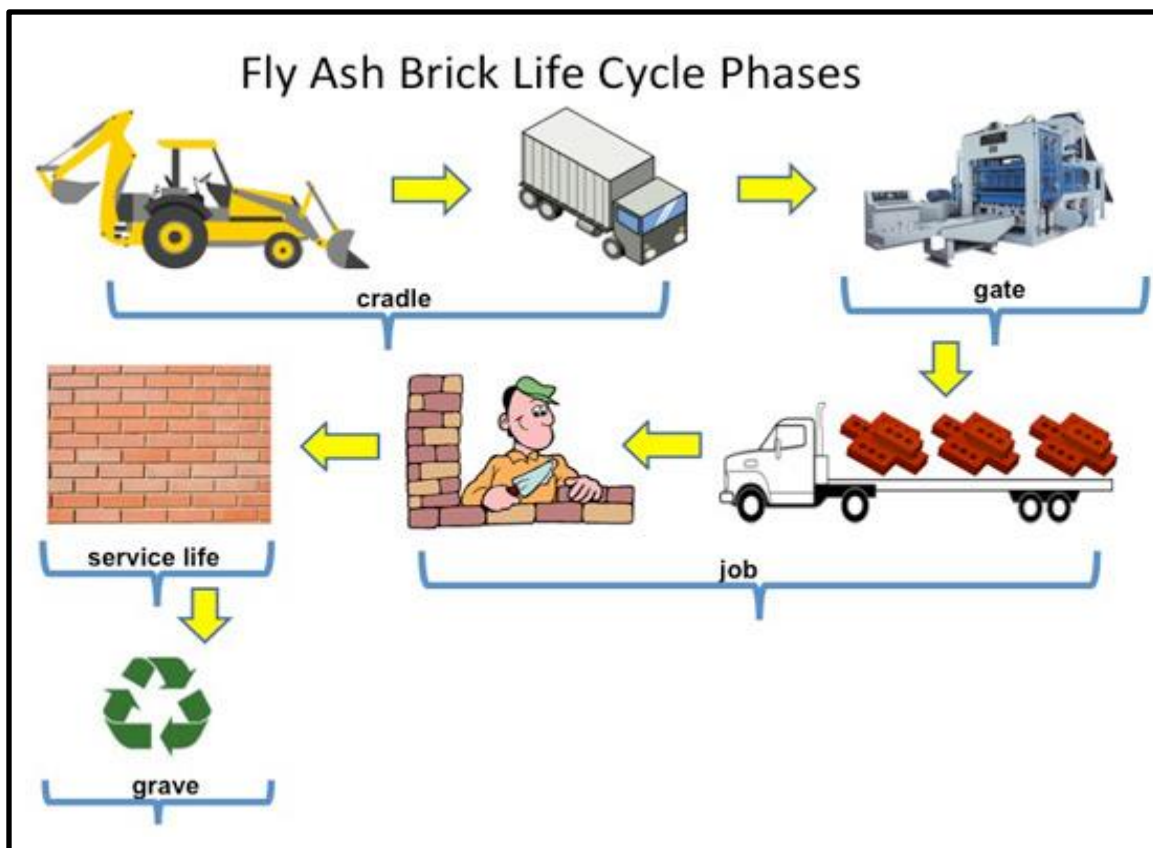
Steel (steel rods, galvanized metal fencing, and metal wire) can be recycled almost infinitely, making it one of the most sustainable packaging materials available.

DURING ITS RECYCLE PROCESS:

It travels from the consumer → to the waste stream → to the recycling facility → to the steel making process → to the new steel product → back to the consumer

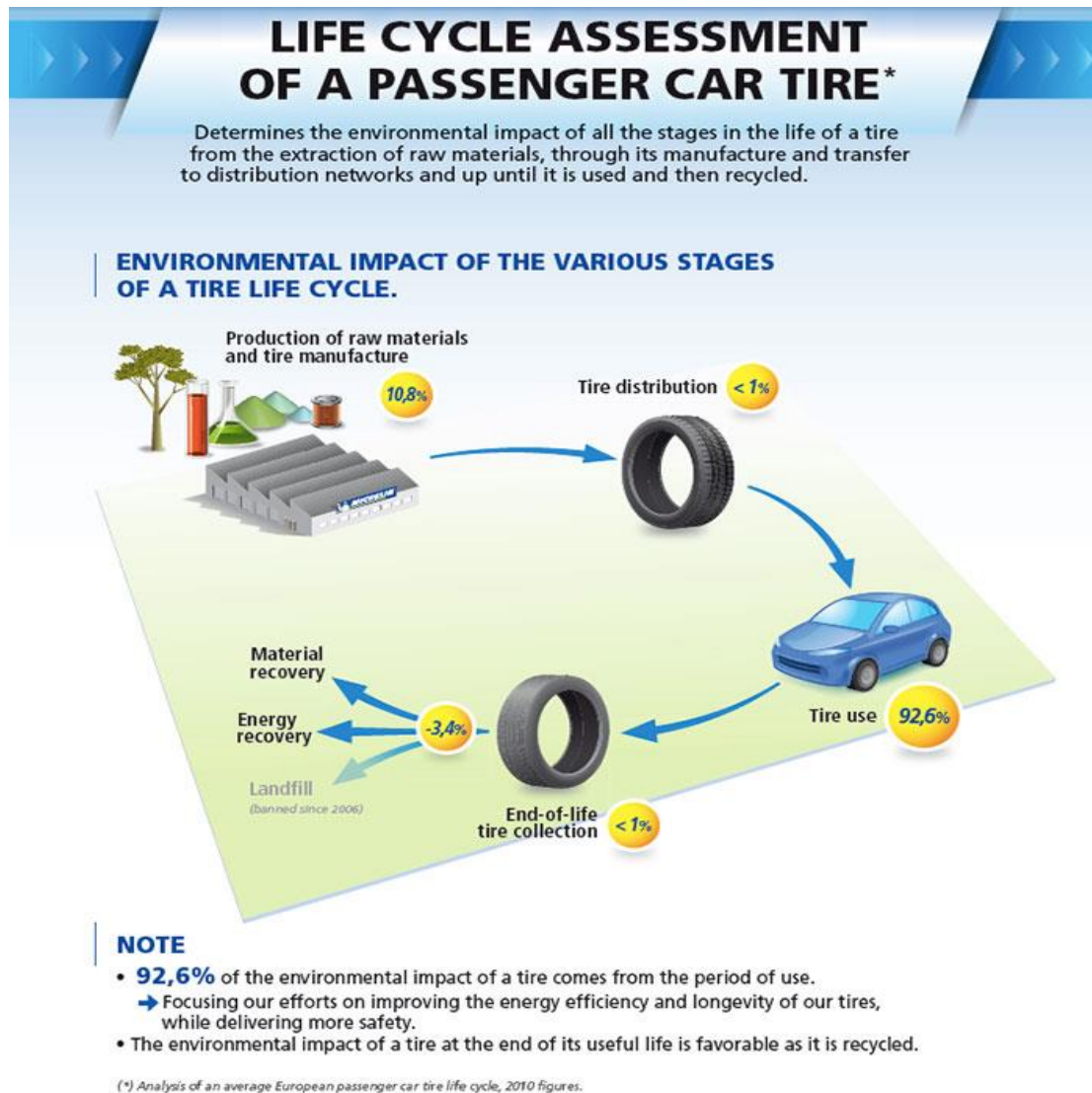
- Because of its high strength-to-weight ratio, the weight of steel required, for a given application, is generally much less than the weight of alternative materials
- Steel is a highly recycled material for multi times via an established infrastructure in a self-sustaining loop not dependent on artificial precautions or dedicated effort
- Specifying by 'recycled content' works for materials generally sent to landfill, but it does not increase recycling rates for steel. However, it may introduce unnecessary transport costs and emissions

LCA OF BRICKS



Because of brick's durability, the costs and benefits of a brick wall are incurred over a long period of time and over many life cycle stages, making it difficult to assess through traditional means. LCA is uniquely poised to clarify these costs and benefits.

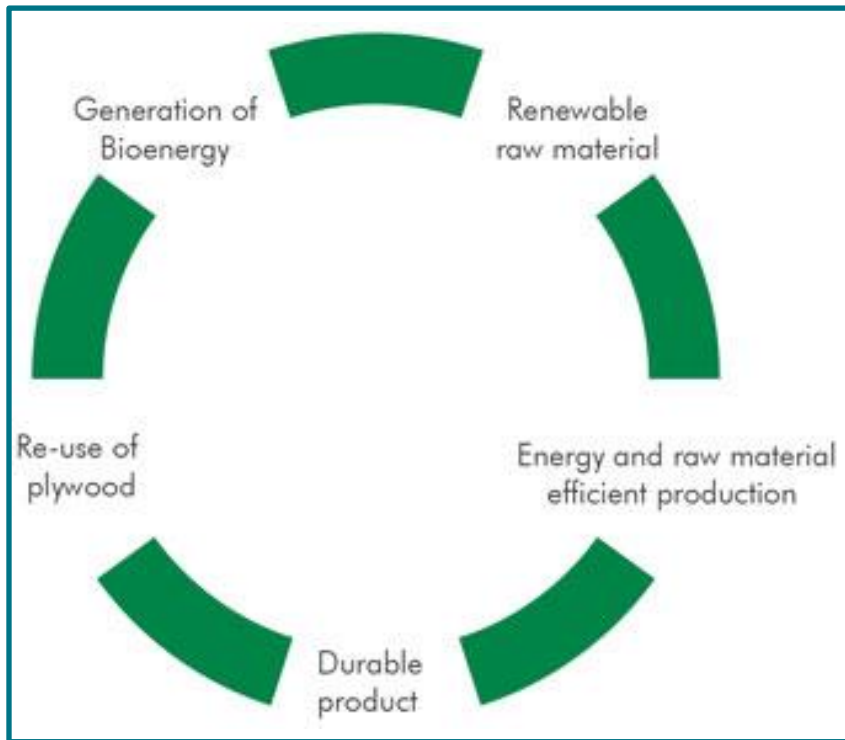
LCA OF TIRES



Raw materials of tires: Rubber, carbon black, oils, chemicals, textile steel.

Life cycle assessments show that tires impact the environment primarily during use, which accounts for more than 92% of a car tire's footprint and more than 95% of a truck tire's. This is primarily due to the energy used to keep the vehicle moving forward, or rolling resistance, which can account for one tank of fuel out of five tanks for cars and one tank out of three tanks for trucks. Compared to the in-use impact, tire production has only a limited effect on the environment, accounting for 6% to 10% of the total life cycle footprint, including raw materials extraction and distribution.

LCA OF PLYWOOD



Raw Materials: Plywood is typically harvested from Birch, Cedar, Douglas Fir, Spruce, Pine, or a blend of tropical woods.

Processing: The raw logs are then stripped of all the barks and branches and cut into segments called blocks, which are then heated by water or steam at 194°F. These heated blocks are put through the lathe, which cut them into 3mm thick and cooled with hot air. These strips are then coated with resin and laid out with each layer's grain perpendicular to the piece below it. The layer strips are then sent to the hot press, heated to 212°F and pressed together. Then they are sent for final trimming and sanding.

Problems: This manufacturing process releases many toxic chemicals into the air. These include, CO₂, CO, SO₂, NO variants and Formaldehyde. These toxins come from the gluing process or spread via plywood dust. But plywood can be recycled into particle board, and there is a growing "Green" housing movement (LEEDS, BREAAM) that reuses plywood.

REFLECTION

In a nut shell, throughout this entire project, it is found that we had not only made the site a better place but all of us had genuine fun and had few priceless moments with the dogs and puppies. In terms of education, we have learnt to address current environmental issues and searching ways to solve them.

In this project, we also appreciated the chances to interact with the dogs and puppies. Even though most of them ended up distracting us from doing work, it was all part of the fun and what made everything more heartwarming.

Unintentionally, we had instilled green awareness among the dogs and puppies. In addition, trying to improve their living condition, giving them a better place to live on is a kind of knowledge that we could never learn in school. That demonstrate the strong bonding we formed between us with the puppies, just like as they are involved with ours. It showed that as an architect, we had to be very involved to understand the needs and requirements of our clients.

All of us gained something in a way and it was an eye-opening experience. Which really enlightened us on the actual role and responsibility as an architect towards the community, it was truly rewarding to see our “clients“ satisfied with our hard work.

REFERENCES