CHAPTER II

LITERATURE REVIEW

2.1 Object Design

2.1.1 Definition of Redesign Surabaya Zoo

2.1.1.1 Definition of Zoo

And in the creation of yourselves and the fact that animals are scattered (through the earth), are Signs for those of assured Faith. (QS. al-Jathiyya [45]: 4)

The above verse explains that God created the animals and the spread on earth, in the open air. Human task as a caliph to learn and keep His creation. One attempt to preserve the animals is to create a zoo, for animals that are threatened with extinction.

A zoo or wildlife park where animals are kept in an artificial environment, and exhibited to the public. Aside from being a place of recreation, the zoo serves as a place of education, research, and where conservation for endangered wildlife. Animals that are kept in zoos are mostly animals that live on land, whereas animals maintained in the aquarium water.

So many of the animals in the world, al-Quran divided into several types:

And Allah has created every animal from water: of them there are some that creep on their bellies; some that walk on two legs; and some that walk on four. Allah creates what He wills for verily Allah has power over all things. (QS al-Nuur [24]: 45)

The above verse describes the types of animals. Even in the Koran there are verses that use the name of an animal such as a letter al-Baqarah [2] (cow), an-

Nahl [16] (bee), An-Naml [27] (ant), al-Ankabuut [29] (the spider), al-Fill [105] (elephant), and many more species of animals mentioned in the Koran. So many kinds of animals in the wild, one guard is making efforts to open a zoo.

Zoo that allows visitors to enter by car or bus is called a safari park. Animals released in large open areas, and not confined in narrow cages, but is restricted by fences or ditches. A zoos are often equipped with a child zoo to exhibit livestock or wildlife species is not yet mature and benign for to be held or fed including by children. There are also animal-themed playground, for example, Sea World and Disney's Animal Kingdom.

According definition of the zoo that has been described above, it can be concluded that the zoo is an artificial environment created for endangered animals in accordance with the environmental habitat of native animals, where in it can be a place of education, research, and conservation.

2.1.2 History of Zoo

2.1.2.1 Ancient Age

Zoo cages originated from a collection called the menagerie of wild animals. In the 2nd century BC, Maharani Tanki from China to build "a house for deer", and King Wen of Zhou has a zoo Ling-Yu, or Garden of Intelligence 600 hectares. In the 4th century BC, almost all major cities in Greece have a zoo. In the 19th century, historians W.E.H. Lecky writes about animal fights Roman celebration of the first held in 366 BC.

London Zoo is the oldest scientific zoo, opened 27 April 1828 for members of the Zoological Society of London, founded Stamford Raffles in 1826. When established, the zoo is named Gardens and Menagerie of the Zoological Society of London. The oldest zoo in Indonesia is Jakarta Ragunan Wildlife Park which was established in 1864 in Cikini as the Botanical Gardens and Botanical Batavia. Managers named Flora and Fauna Society Merciful Batavia.

2.1.2.2 Modern Age

As the times, from many of the zoo began to be established, the following will explain the development of the zoo:

Table 2.1 Development of the Zoo

Nama	Lokasi	Tahun	Keterangan
Kebun Binatang Wina	Wina, Australia	1765	berkembang dari koleksi hewan kerajaan di Istana Schönbrunn
Kebun binatang	Madrid, Spanyol	1775	-
Kebun binatang	Paris, Prancis	1795	Didirikan oleh Jacques-Henri Bernardin. Untuk keperluan penelitian dan pendidikan
Zoological Society of London	London, Inggris	1826	Didirikan oleh Stamford Raffles
Kebun Binatang	Melbourne,	1860	Kebun binatang yang

Melbourne			pertama di Australia
Kebun Binatang Central Park	New York City, Amerika Serikat	1860	Kebun binatang pertama yang terbuka untuk umum di Amerika Serikat
Kebun binatang	Philadelphia, Amerika Serikat	1874	Didirikan oleh Perhimpunan Zoologi Philadelphia

(Source: Wikipedia.org, 2010)

Throughout the decade of the 1970s, when conservation efforts began into the public spotlight, few zoos began putting their conservation as a priority. The effort was pioneered by figures such as Gerald Durrell of Jersey Zoo, George Rabb of Brookfield Zoo, and William Conway of the Bronx Zoo (Wildlife Conservation Society). Since then, zoo managers are increasingly aware of the importance of their involvement in conservation programs. American Association of Zoos and then claim that conservation is their top priority.

2.1.3 Classification of Animals

In the animal kingdom (kingdom Animalia), there are many types of animals are then divided into animals that have or do not have the spine (vertebrae). This division consists of vertebrate animals (animals that have a backbone) and invertebrates (animals without backbones).

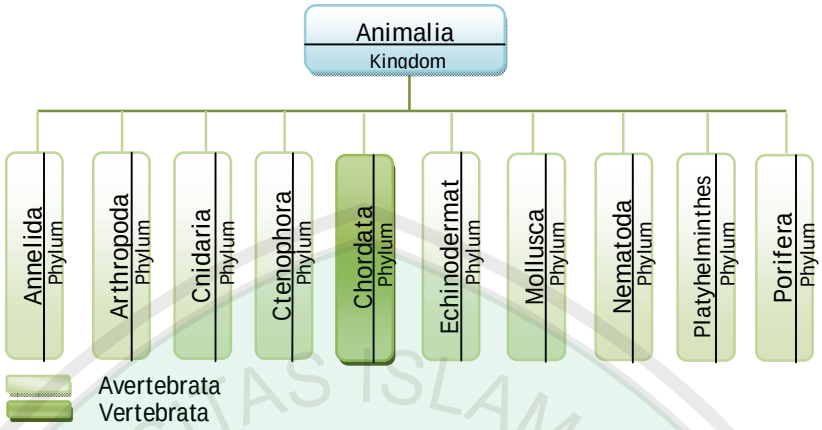


Figure 2.1: Classification of animals seen from the presence or absence of spine (Source: http://bioweb.uwlax.edu/bio203/s2009/braunsch_mela/Classification.htm,

Subfilum of vertebrates is Chordata, which includes all animals have a spine that is composed of vertebra. Vertebrata is the largest subfilum of Chordata. Has a structure which is much more perfect than the Invertebrate animals. The characteristics of vertebrate animals body that is Having a bone extending from the back of the head to the tail, has a brain that is protected by the bones of the skull, bilaterally symmetrical body shape, has a head, neck, body and tail of the tail and neck, although not absolutely example in the frog.

Vertebrates animals consists of classes which are Class Pisces (Fish), Class Amphibia (Latin amphi = two, bia = life), Class Reptilia (Latin repare = crawling/creeping), Class Aves (Bird), Class Mammalia (Latin meaning mammary glands of the breast).

Berikut diagram klasifikasi hewan vertebrata:

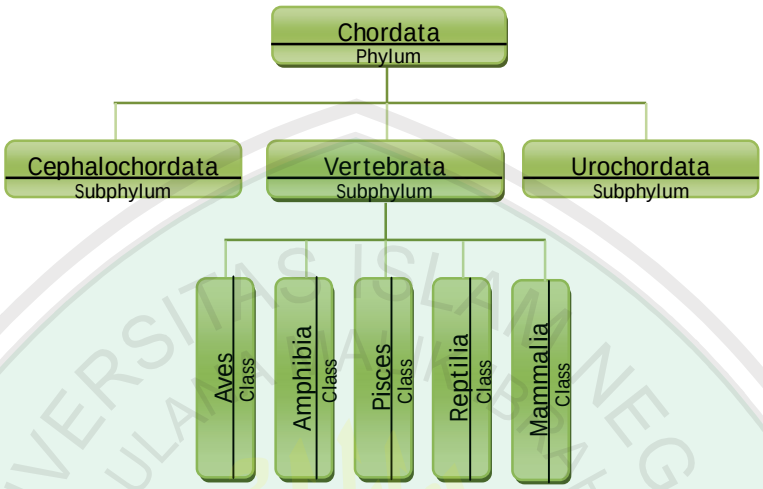


Figure 2.2: Classification of vertebrate animals
(Source: http://bioweb.uwlax.edu/bio203/s2009/braunsch_mela/Classification.htm,

2.1.3.1 *Pisces* (Fish)

Pisces (fish) is a member of the vertebrate poikilotermik (cold blooded) that live in water and breathe with gills. Fish is the most diverse vertebrate species with more than 27,000 worldwide. Taxonomically, fish are a paraphyletic group whose exact relationships are much debated. Usually the fish divided into jawless fish (class Agnatha, 75 species including lampreys and hagfish), cartilaginous fishes (class Chondrichthyes, 800 species including sharks and rays), and the rest are classified as hard bony fish (class Osteichthyes).

Figure 2.3: The animals are classified as class pisces
(Source: google.com, 2011)

The main characteristic of Pisces as follows:

• cold-blooded animals that live in water

• Breathe with gills (operculum) and helped by the skin

• The body consists of the Head

• Frame composed of true bone

• The heart consists of an atrium and a Ventricle

• The body is covered in scales and has a lateral line to determine the direction and position of swimming.

2.1.3.2 *Amphibia*

Class Amphibia, Amphibians are the group most primitive terrestrial vertebrates, occupying the place of the transition from aquatic life to terrestrial life. Changes in the life of this cause as if the group is still searching for pattern matches, so it looks the models of life, form and characteristics of diverse groups.

Figure 2.4: The animals are classified as class amphibia
(Source: Google.com, 2011)

The characteristics of Amphibia as follows:

- Can live in water and on land or moist places
- Also called animals that have a place to live (habitats) in two natural
- Animals breathe with lungs and skin.

2.1.3.3 *Reptilia*

Class reptiles are a group of cold-blooded vertebrate animals and have scales covering its body. As land animals that live in dry environments, the skin has a thick layer of horn material. This layer is modified into scales. The skin contains very few skin glands.

Figure 2.5: The animals are classified as class Reptile
(Source: Google.com, 2011)

The characteristics of reptiles are as follows:

- Dry skin is flaky from horns substance because the substance kertin.
- Breathing with the lungs.
- Bloody cold (porkoliokonal) that the body temperature is affected by ambient temperature.
- Generally are ovivar (spawn), examples of lizards, and viviparous birth, for example snakes.
- The heart consists of four chambers: two porch and the two chambers are still not perfect.

2.1.3.4 Aves (Bird)

Class Aves (birds) Each bird covered in feathers, so that is characteristic of specific bird feathers, which are not owned by a group of other Tetrapods. Essentially serves as a tool for the fur fly, because the bird is the phylogenetic development from reptiles that can not fly. Feathers probably derived from modified scales of reptiles that became ancestors of birds. Besides fur also serves to keep the bird's body temperature to remain high.

Figure 2.6: The animals are classified as class Aves
(Source: Google.com, 2011)

The main characteristic of bird as follows:

- Tools of vision, hearing instrument and sound equipment is already well developed.
- Bloody hot (homoioteral).
- The heart consists of four rooms 2 hall and 2 booths are already well developed.
- Conception egg and sperm / fertilization occurs within the parent body (internal fertilization).
- There is a pair of testes, ovaries, while only one and grow well on the left.

2.1.3.5 *Mammalia*

Mammalian class, the name derived from mammalian central feature of the members (of animals) which have mammary glands. Besides other features is to have the hairs, which serves to protect the body from the influence of heat or cold. Mammalian body temperature is relatively constant and this situation is called homoioterm. In the mammalian skin are the milk glands, sweat glands (sweat) and sebaceous glands. Several types of mammals have other glands such as scent glands and cheeks glands.

Figure 2.7: The animals are classified as class mammals
(Source: Google.com, 2011)

The main characteristics of mammals as follows:

- Most live on land, but some are living in the water like a whale and dolphin
- Bloody hot
- In the skin are the sweat glands and oil glands
- The brain is well developed
- Internal Fertilization
- Breathe with lungs
- There are four heart chambers are perfect

2.1.4 The Environment Wildlife Habitat

In the tropics the number and type of animals and plants are in inverse relation. Regardless of the insect world, the tropical forests in very humid areas of the world there are only small animals it compared with a very large plant world. Dry areas (savanna, steppe) occur otherwise. Savanna and steppe in Africa is a place that has the largest animal in the world, except in very dry areas (deserts, semi-desert), where there are only a few animals and plants. (Lippsmeier, 1980)

According to Jembar Team in his book Illustrated Encyclopedia of Ecology, 2007, the animal shelter can be divided into several parts, namely the soil, tropical rain forests, living in the Amazon river, mangrove forest, savanna, desert, grassland, in the basement, wood forest, life in rivers, mountains, arctic, tundra, Antarctic, oceans, coral reefs, life in the deep waters.

Figure 2.8: The division of wildlife habitat
(Source: Salim, 2010)

A description of wildlife habitat environment are:

a. Ground

Land may be boring and have no life. But the ground is an essential part of natural life. Soil consists of pieces of stone, like grains of sand are mixed with the remnants of decaying leaves, animal waste and plant debris or other of animal. Water and air fills the spaces between soil particles. There are millions of microscopic living creatures that inhabit the land, such as bacteria, small animals such as mites and fleas, the roots of growing seedlings and plants that have grown, the threads of the fungus, small living foods such as earthworms and insects and animals such as moles larger. Land has a thickness, particle size and mineral content as well as the main nutrient that is different. Climate, type of rocks that are below it and the main crops grown in soil will affect the character and ability to feed or fertility. The animals that live in this area are fleas, false scorpions, earthworms, etc.

Figure 2.9: Life on land
(Source: Salim, 2010)

b. Tropical Rain Forest

The areas that have been found in tropical rain forests near the equator, in areas that have warm climates and high rainfall throughout the year. Largest rain forest are found in Central Africa, South America, Southeast Asia and the island of Madagascar. There are also areas of small rain forest in Australia and Central America.

Figure 2.10: Spread of tropical rain forest on earth
(Source: Salim, 2010)

Tropical rainforests are the richest neighborhood of all the environmental views of plant and animal life in it. Tropical rainforests have multiple layers, like floors in high rise building. At the highest level there is a layer arises, consisting of the tallest trees, some of which reach 70 meters. This is a bright and windy

sections where birds and bats fly to find food in the form of insects, fruits and flowers.

Under the layer arises there is a layer hood, namely a "roof" that virtually concatenated, which is formed from tree branches and leaves. Here, under the warm sun, fruits and flowers grow and many animals get food from them.

Under the layer hood there is a layer which is more shade called underground storage layer, where the animals fly, jump, climb, or fly among the trees. Smaller plants can not survive on the forest floor is dark sac attaches itself in the remains of plants that have been rotting in between the branches of trees, using trees as a buffer to reach sunlight. Forest floor, only a little light that can penetrate the thick veil of forest. The atmosphere was dark and quiet here and the ground vegetation is rare. Only in a few places, such as the fall of the former place of trees that create openings in the ground or along the banks of the river, ground vegetation could find enough light to grow. As for the animals that live in this area are eagles, monkeys, Tukan Bird, morfo butterflies, anaconda, tapir, red Macao, jaguars, etc..

Figure 2.11: Life in the tropical rainforest
(Source: Salim, 2010)

c. Life in the Amazon River

Amazon River has thousands of tributaries that flow through the rain forest. Some of these channels are very wide and deep, while the other channel is narrow, shallow and full of leaves and fallen branches and tree roots that have dried up. This river filled with fish, including predators such as the famous ferocious piranhas, electric eels and arowana witch often jump out of the water to snatch insects or even birds. As for the animals that live in this area are piranhas, electric eels, birds Jacana, rabbit striped fish, arowana, hummingbird, butterfly post, angel fish, Macau hyasinta, owl, butterflies, Amazon kingfisher, tetra fish , bird-eating spiders, arapaima fish, etc.

Figure 2.12: Life in the Amazon river
(Source: Salim, 2010)

d. Mangroves

Mangroves are found in a sheltered tropical shore. These forests are formed in places like the mouth of the river, where the salty water flowing strand of mud and other sediments, as well as generate marshy land.

Trees and plants in the mangrove forest is home to various insects, while various kinds of fish swim through the shallow water between the intertwined roots tangled. Crabs, snails and other small creatures burrow into or crawl through

the mud. These animals provide food for frogs and many species of birds. Several types of monkeys climbing trees to eat fruit and leaves. They are constantly aware of the large predators, like snakes and alligators that sneak into the water or sunbathing on the mound of mud. As for the animals that live in this area are the tiger, python convoluted, proboscis monkeys, birds ribbon, alligator, wood stork and white, mud fish, etc.

Figure 2.13: Life in mangroves
(Source: Salim, 2010)

e. Savannah

Savannah grasslands found near the Equator, in the outer lanes of the tropical rain forest. Savanna's largest and most famous are in Africa. Although there are also savanna in South America, India, and northern Australia. Savanna dominated by grasses, but also contains a landscape shrubs and trees. The climate is hot with a dry season followed by rainy season.

Most plant-eating animals live in groups to protect themselves from predators. They move from one place to another that has grass and water. During the dry season begins, they move in large groups of native land in the south to the north and the west wetter. The animals that live in this area are elephant, cheetah,

wildebis, giraffe, Thomson's gazelle, zebra, marabou storks, hyenas, African wild pigs, lions, etc.

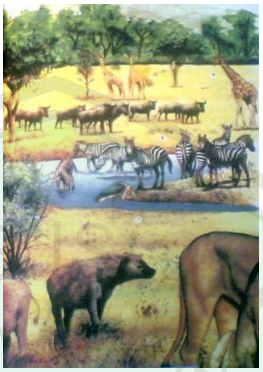


Figure 2.14: Life on the savannah
(Source: Salim, 2010)

f. Desert

Desert is one of the best places on Earth do not deserve to live. Some of the desert, especially near the Equator, hot climate all year round with temperatures sometimes reaching 50 degrees Celsius. Some heat is also a sandy desert. In the desert winds blow sand into dunes that resemble giant waves. In the landscape is barren and dry, sand is often too unstable to sustain plant life. Although it has a landscape of arid, desert turned out to accommodate a variety of animal life. The biggest problem faced by these animals is the heat and lack of water. As for the animals that live in this area is a wild horse, a young fox, bird Roadrunner, rattlesnakes, crazy woodpecker, crazy lizards, kangaroo rats, scorpions, etc.

Figure 2.15: Life in the desert
(Source: Google.com, 2010)

g. Prairie

prairie areas are found inside of the continent, far from the windy beach area cool and moist. This situation causes the warm summer and dry. But many are experiencing a very cold winter. Due to the lack of rain in summer, grasses are resistant to bad weather becomes a major plant life, although the trees can also be found in the accumulation of water during the spring. As for the animals that live in this area is the horned antelopes, gray kangaroos, armadillos, etc.

Figure 2.16: Life on the prairie
(Source: Google.com, 2010)

h. Underground

In an open meadow, where there are only a few places to hide, small animals shelter and live underground. Rabbits, ground squirrels and marmots dig a hole and tunnel networks used to sleep and escape from predators and to keep their children safe. When digging they also help to mix the nutrients in the soil

and keep the prairie healthy. The animals that live in this area are prairie dogs, owls diggers, rattlesnakes, etc.

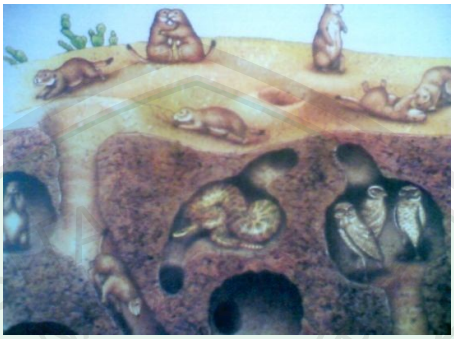


Figure 2.17: Life in the underground
(Source: Salim, 2010)

i. Wood Forest

Wood forests are found in parts of the world that have mild climate, with warm summers but mild winter. Wood forest in western Europe, in the eastern United States and Asia mostly molt. In winter, these trees lose their leaves and stop the growth. Wood forests exist in a number of broad areas in Europe, North America and Asia. Many trees are deciduous forests have been cleared of timber and mineral-rich soil used to grow food crops. As for the animals that live in this area is the red squirrel, green woodpeckers, brown owls, small squirrels, small deer, gray squirrels, cucakrawa bird, badgers, rabbits, crows, passerin bird, songbirds, fox, hedgehogs, etc.

Figure 2.18: Life in the wood forest
(Source: Salim, 2010)

j. Life on the River

The rivers contain only a small fraction of Earth's waters, but this place is an important habitat for many species of animals. In the water Source, usually in the mountains, the river water flowing quickly and plants can not stick him in the riverbed. The main food Source of invertebrates, such as water snails, leeches and maggots are the remains of plants that had rotted. As for the animals that live in this area is the kingfisher, lisang water, reed birds, mayfly, dragonfly, pengarung birds, water rats, herons, frogs, newts large, frog tadpoles, red fish, snails, beetles of divers, Thorn back fish, crawfish, alligators, flamingos, marsh snakes, raccoons, tree frogs, etc.

Figure 2.19: Life on the river
(Source: Salim, 2010)

k. Mountain

The highest mountain peaks covered with snow throughout the year. Mountains which are tropical, such as Mount Kilimanjaro in Africa, has a hot and rain forest at the foot of hill and steamy night air temperature of freezing on top. Outside of this harm could be home to the mountains a large number of lives. Both animals and plants have adapted to life in a hard place. The animals that live in this area are yak, snow leopard, Himalayan wild goat, pica, etc

Figure 2.20: Life in the mountains
(Source: Salim, 2010)

l. Arctic

Most of the arctic ocean is covered by a layer of thick ice that float throughout the year. On its sides, pieces of ice that break off and float-called floating ice floating in cold water and freeze. During the summer, a few chunks of ice cracks and melts to form an aqueous waterway as well as a broad field. There are no plants that live in the arctic and are found mostly found in the waters of life that surrounds it. The animals that live in this area is sea birds, polar bears, bearded seals, spotted whale, walrus/sea mermaid, etc.

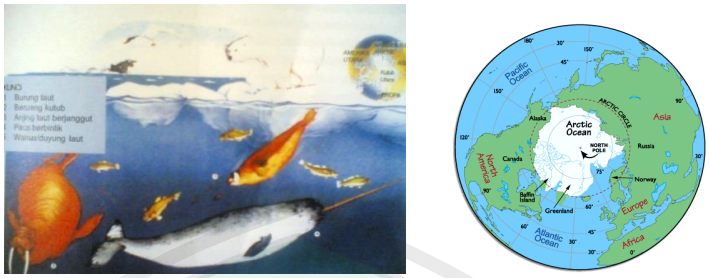


Figure 2.21: Life in the Arctic
(Source: Salim, 2010 dan google.com, 2010)

m. Tundra

Mainland which limits the arctic ocean has no trees and the soil is always frozen. Most of the year this region known as the tundra, which is a barren and wild plant and animal life are rare. However, during the short summer, the ice melts the top layer of soil and small plants can grow. As for the animals that live in this area are caribou, rats, owls arctic, etc.

Figure 2.22: Life in the Tundra
(Source: Salim, 2010)

n. Antarctic

Antarctica is a huge chunk of mountainous land that is covered by a layer of permanent ice, some of which have a thickness of up to three kilometers. This is the coldest place in the world. The only place where plants can grow along and

around the Antarctic Peninsula. Even so, the region is mostly composed of moss growing on rocks. There is not enough food in the land to feed animals larger than insects. So the animals gathered around the Antarctic coast and islands, where sea water provides much food for them. The animals that live in this area is the humpback whales, penguins, leopard seals, etc.

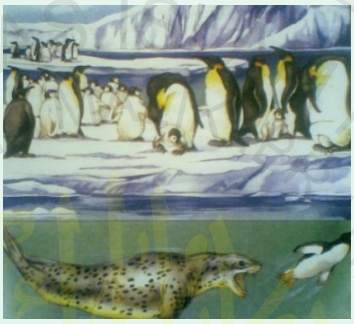


Figure 2.23: Life in the Antarctic
(Source: Salim, 2010)

o. Ocean

Oceans cover more than 360 million square kilometers of Earth's surface or approximately 71% of its total area. The water in the ocean is not calm water, but moving in the tide and currents. Only about 20% of Earth's species are living in the ocean, with about 90% of it is the species that live in shallow waters. In most oceans, especially in the zone below a depth of 1000 meters where sunlight can not penetrate. As for the animals that live in this area are anchovy, tarpon, blue marlin, squid, turtles, tuna, whales black backs, dolphins, etc.

Figure 2.24: Life in the Ocean
(Source: Salim, 2010)

p. Coral Reef

Corals are found in shallow tropical waters around the islands of volcanic or near the rocky coastline of the mainland. Corals are composed of layers of the framework of small animals called polyps. After years of colonies of coral polyps can make a huge mounds, called coral. There are different types of corals with bright colors that make the reef looks like a garden in the sea. Coral reefs are filled with animal life. Tiny plants called algae that washed up in the body or living reef. As for the animals that live in this area is the squid, fish boxes, surgeon fish, fish, shells, sea horses, moray eels, fish ax, starfish, angel fish, etc.

Figure 2.25: Life in the Coral Reef
(Source: Salim, 2010)

q. Life in deep water

Light can not go too far into the water. After a depth of approximately 200 meters there is little light and below a depth of 1000 meters it gets very dark and cold. Phytoplankton can not survive here and the amount of animal life is also much reduced. Since there is no source of plant material as food, any creatures that live in deep water to find alternative food Source. The animals that live in this area is a jellyfish chiffon, loose jaw fish, marine silver eel, fanged fish, young barracuda, lantern fish, hatchet fish, etc.

Figure 2.26: Life in deep water
(Source: Salim, 2010)

2.1.5 General Description Object Design

2.1.5.1 Surabaya Zoo (KBS)

Surabaya Zoo is one of the oldest zoos in Asia. Surabaya Zoo was first opened to the public in April 1918. Even in the 1970s, this zoo is a zoo with bears the most complete collections in Southeast Asia. Surabaya Zoo also holds the zoo's biggest and most famous in Southeast Asia. With an area of 15 hectares, this place can also be used as a place to walk and exercise.

Figure 2.27: Visible area and lay out the Surabaya Zoo
(Source: Google Map, 2010 dan Hapsari, 2010)

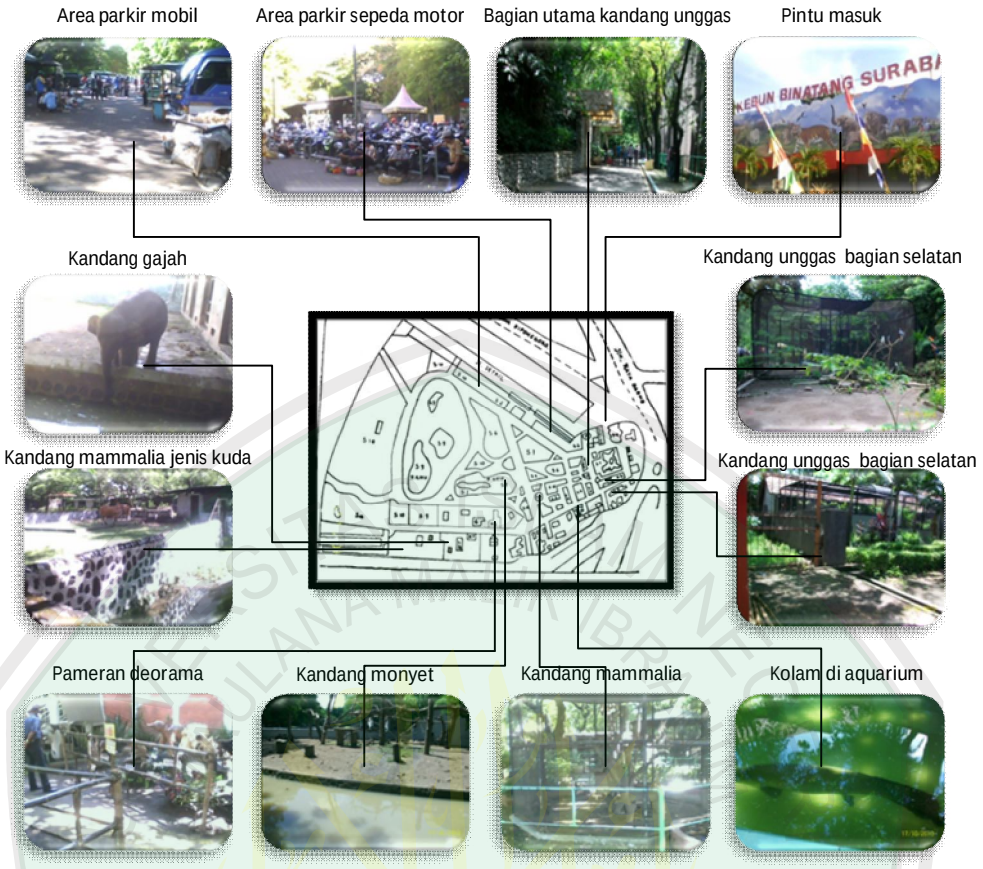


Figure 2.28: Lay out the Surabaya Zoo
(Source: Hapsari, 2010 and photo documentation, 2010)

Figure 2.29: Plan of Surabaya Zoo
(Source: Google.com, 2010)

Table 2.2: Description Surabaya Zoo map

Mamalia				Aves		Fasilitas	
8	Tapir	26	Rusa Timorensis	1	Merak Mambruk	A	Taman bermain anak
9	Chetaah	27	Anoa dan Babi Rusa	3	Burung air	B	Stand foto
10	Kera Besar	28	Kuda Nil	4	Julang	C	Aquarium
12	Onta	29	Harimau Sumatra	5	Kakaktua	D	Diorama
13	Zebra	30	Bekantan	6	Jalak Bali	E	Wisma tamu
14	Nilgey dan Rusa sambar	31	Harimau Putih	9	Pelikan	F	Karantina
15	Capybara	32	Singa	19	Burung Pemangsa	G	Nursery
16	Beruang dan kucing besar	33	Kambing Gunung	39	Ostrich	H	Perpustakaan
18	Primata	34	Owa	**Reptilia**		I	Animal show
20	Jerapah	35	Berang-berang	7	Ular	J	Panggung terbuka
21	Llama	36	Elang jawa	11	Komodo	K	Jembatan pantau
22	Bison dan banteng	37	Kuda	17	Buaya	L	Aviary
23	Rusa Bawean, Kijang, rusa Tutul, Rusa Arjuna	38	Chimpanze dan Oran Utan			M	Pintu masuk
24	Gajah			**Pisces**		N	Terminal Joyoboyo
25	Rusa Sambar, Sitatunga, Kanguru, Kulan			1	Morish		

(Source: Google.com, 2011)

Surabaya Zoo is located in the middle of the city of Surabaya, precisely at Jalan Setail no.1 that its presence is easily accessible from any direction. Location of KBS is also near from Wonokromo station and in front of the Joyoboyo terminal so easily visited from out of town visitors. Looking at these factors are

very important to maintain and develop the Surabaya Zoo as a place of recreation for the community.

Its presence in the city of Surabaya is not only a place of recreation, further impact on the surrounding environment, which is to reduce levels of pollution caused by vehicles and the pollution of domestic industry. Because the number of plants that exist in Surabaya Zoo very much and dense, The Surabaya Zoo can also be used as one of the urban forest or lungs of the Surabaya city.

In the KBS there is potential to increase the attractiveness of the community to come. In front of the main entrance there is a monument Suroboyo as an icon of Surabaya and add more value to KBS. KBS also provides facilities for visitors such as a library that can add to knowledge. Near the entrance there is a children's play area.

There is also the bridge monitor, on the back of the KBS, the visitors can see it from above as well as homes and other buildings in the city of Surabaya. Other facilities provided to visitors are photo booths that the results will be manipulated so as if in contact with the animals the zoo's collection.

Figure 2.30: Suroboyo monument in front of the KBS
(Source: Photo documentation, 2010)

Figure 2.31: Library facilities and photo booths
(Source: Photo documentation, 2010)

But in addition to the facilities on offer there are the things that make less attention diminished interest visitors to come to terms of KBS such as cleanliness, there is still much rubbish strewn in some places. And this affects the convenience of visitors. Not only that waste will carry diseases that can affect the health of animals that are in the KBS.

Figure 2.32: Cleanliness inside and outside the site of less intact and feeding the animals is less hygienic
(Source: Photo documentation, 2010)

Figure 2.33: Conditions of animals that look less groomed
(Source: Photo documentation, 2010)

Then in terms of the condition of the building, several buildings are no longer fit the conditions used, such as the Aquarium building with such conditions no longer neglected, in some of the side is damaged, even wild animals such as rats sometimes come from the corners of the floor of the building.

Figure 2.34: State of the Aquarium building
(Source: Photo documentation, 2010)

Figure 2.35: Rats roam within Aquarium building
(Source: Photo documentation, 2010)

Then the condition of the cages are less well maintained, for example on bird cages, cage structure was almost collapsed, so the landscape is not a pretty sight. On the other cages are also almost the same, less manicured look. With such conditions make wildlife-less spirit and its animal looks sick.

Figure 2.36: Condition of the buildings that are very concerning
(Source: Photo documentation, 2010)

Then in a few areas that are less savory smell of the cage like a bird cage in the front, then on the cages of animals such as horses, deer, antelope, etc. Another thing that should be of concern is the arrangement of the landscape. Arrangement of landscape on the KBS is still less than the maximum, there are areas that are not maximized, the plants are less maintained. The position of other support buildings such as libraries, mosques, photograph booths, etc. difficult to reach because of its fragmented and hidden.

Figure 2.37: Condition of some landscape fabric less than the maximum
(Source: Photo documentation, 2010)

At the main entrance should be a marker and not the public interest is served by pulling. Facade that is used less indicates that the area was a zoo, because the display will show the identity of a building, the more attractive will attract more people to visit.

Figure 2.38: Condition of the main entrance of the Surabaya Zoo
(Source: Photo documentation, 2010)

Then, in the parking area that is less accommodating vehicles coming, when visitors exceeds capacity, can not accommodate the parking of vehicles and eventually taking other land to be used as parking. Especially for parking motorcycles that often fulfill the parking area.

Figure 2.39: Parking conditions of the Surabaya Zoo
(Source: Photo documentation, 2010)

In developing a KBS course is managed by the entire board that has been selected and arranged according to the organization office.

The Surabaya Zoo Board composition:

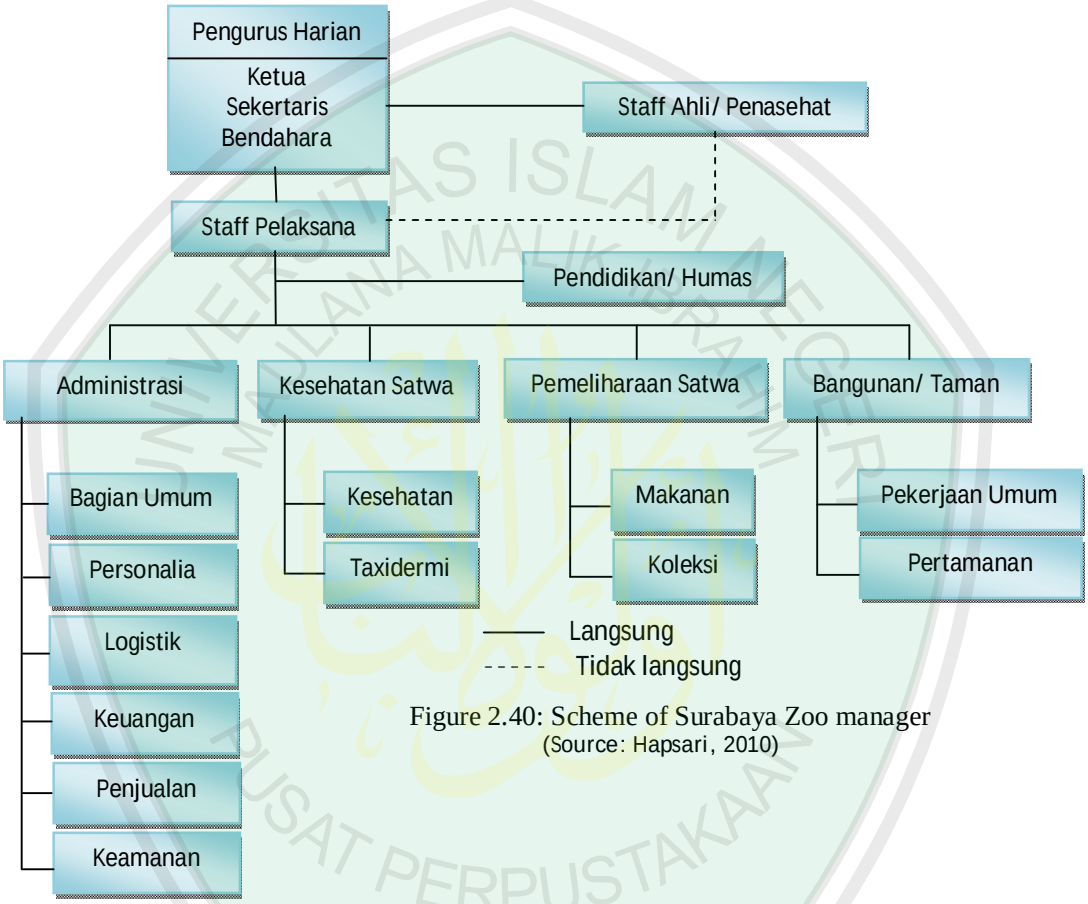


Figure 2.40: Scheme of Surabaya Zoo manager
(Source: Hapsari, 2010)

Today, Surabaya Zoo is managed by Flora and Fauna Parks Society Surabaya. The role of the manager to make the zoo more clean and comfortable has become imperative to draw the attention of many visitors. So enthusiastic visitors return to see the collection of animals in the KBS.

2.1.5.2 History of Surabaya Zoo

Surabaya zoo (KBS) was first established by decree of Governor-General of the Netherlands on August 31, 1916 No. 40, with the name " *Soerabaiasche Planten-en Dierentuin* " (Surabaya Zoo and Botanical Garden) for the services of a journalist named HFK Kommer who has a hobby of collecting animals. In terms of financial HFK Kommer received assistance from several people who have enough capital

KBS is the first location in Kaliondo, in 1916, then on 28 September 1917 moved on the Groedo street. And in 1920 moved to Darmo area a new zoo for services *OOST-JAVA STOOMTRAM MAATSCHAPPIJ* or Railway Carriage that seek locations covering an area of 30,500 m2.

For the first time in April 1918, KBS opened but by paying the entrance sign (ticket). Then due to high operating costs, then on July 21, 1922 botanical garden/KBS in crisis and will be disbanded, but some of its members disagree. In this year also, in a board meeting it was decided to disband the KBS, but prevented by the municipality of Surabaya at that time.

On May 11, 1923, meeting of members at the Simpang Restaurant decided to establish a new Zoo Society, and was appointed WA Hompes to replace J.P. Mooyman, cofounder of KBS and arranged all the activities of the garden as a leader. Big help for survival at the time of the year 1927 was from the Mayor and council members DIJKERMAN A. Van Gennep Surabaya City can persuade the House to gain attention to KBS, with SK House of Representatives dated July 3, 1927 on the purchase of land covering an area of 32 000 m3 donations from

Railway Carriage (OJS). 1939 to present KBS area increased to 15 hectares and in 1940 finished the production of the extent of 85 000 m2 garden.

In KBS development has changed its function from year to year. Surabaya zoo that beforehand only for recreation has been developed by the function becomes a means of protection and preservation, education, research and recreation. The animals that became the KBS collection from year to year the number and types continue to grow, both originating from abroad and from within the country.

2.1.5.3 Collection of Animals

Collection of animals living in Surabaya Zoo is more than 300 species. Various species of animals of this type of birds (Aves), mammals, reptiles, and various fish.

Animal enclosures are grouped in types of animals. For example poultry or birds (Aves), where there are Australian pelicans, peacocks, Bali starlings, and ostrich. The beast that is here among other Sumatran tigers, leopards, white tigers, lions, and bears.

At the rear, there is a primate animal enclosures contain orangutans, chimpanzees, baboons, proboscis monkeys. After that, there is a giraffe barn, horses, deer, camels, hippos, and the American bison that have been old age.

There is a collection of protected rare animals such as Komodo Dragons. Other animals that may rarely be seen there is also here as Tapir, pig deer and anoa. The zoo also serves as a place for the conservation of these animals.

In addition there are land animals, there are also fish fresh water and sea water which is located at the Aquarium. Aquarium is in the room is not too much. On the outside of the building there is a pond aquarium fish Arapaima Gigas is the largest freshwater fish in the world. This fish comes from the Amazon River, South America, with a length that can reach 3 meters and weighs 200 kg. In this area there are also animal species of reptiles such as some types of crocodiles, snakes, iguanas and turtles are large.

2.2 The Theories about Design

2.2.1 Standards at the Zoo Planning

The traditional role of zoological gardens (for education and scientific research) has become increasingly important because of the accelerating decimation of wildlife stocks. Zoos have expanded into breeding and preservation of different species as well as the return of animals to the wild.

The native climate/geography and social/territorial needs of animals must always be taken into account, although some acclimatization may be possible. Sometimes without the bars for the placement of individual animals and placement in a group diverse aquatic animals with and without considering geography and origin (arrival) climate: how to behave/act, territorial. Enclosure can be separated for breeding and propagation of knowledge within and outside visitors. Equipment for catching and transporting animals must be accommodated. For open air enclosures scents and wind direction are important criteria governing locations and fencing

For mammals in buildings and outside enclosures or a combination of these, with and without water, the height is often more important than the ground surface area.

Buildings to house birds must allow sunlight to enter, particularly for tropical birds, outside enclosures for waterfowl must give protection from predators.

Reptiles, invertebrates animals, without a touch of water to the metal, like quarantine, reserves fresh water and reserves sea water from 1 / 3 to ½ the overall volume.

Terrestrial invertebrates (insect) in aquariums or terrariums require extensive safety precautions to avoid eggs or larvae being introduced into local environment. Zoo for the kids and the farm / ranch with a playground for children should be provided.

The zoo should not only provide opportunities for families in town to direct contact with animals, but also to understand the natural behavior patterns of animal life, and home food production animals, especially also because of the personification of animals in the books of children's.

In the progression will lead to improvements to the natural needs of animals in buildings and open enclosure, including the chance observation of an audience without a hitch through translucent glass.

The zoo also features an area in his spare time teaching and research. The site chosen priority on natural areas and are in an area that is free. For the

maintenance treatment of animals, research and breeding assistance, the zoo developed separately from the audience, clinics, and hospitals.

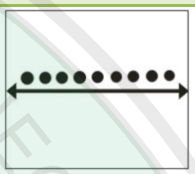
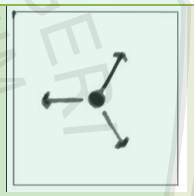
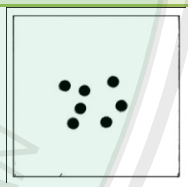
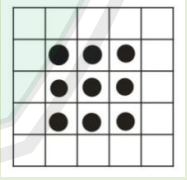
External enclosures support the healing process, acclimatization and quarantine. Elements include:

- Padded stalls for recovery, acclimatization, and observation (inside and outside)
- Separate access routes to the building
- Quarantine rooms
- Refrigerated rooms for animal carcasses, dissection room and carcass dispostal, intensive care and operating rooms
- Research laboratories and lecture theatres for teaching animal medicine
- Road transport is isolated to the transfer
- Food store and feed preparation
- Special personnel rooms with disinfecting equipment
- Air conditioning and ventilation with 12-15 air changes per hour (separate for quarantine rooms)
- Water treatment facilities and filters
- Cleaning equipment (often using steam)

2.2.2 Mass arrangement Pattern Theory

In order pattern of the mass consists of some form of centralized, linear, radial, cluster, and grid.

Table 2.3: Shape Arrangement Mass Pattern

Form	Explanation	Figure
Centralized	Consists of a number of secondary forms that surround a dominant form of which at the center	
Linier	Consists of forms that set coupled to a line	
Radial	Is a composition of linear forms that developed outward from a centralized form in the radial direction.	
Cluster	A collection of forms belonging together as close to each other or give each other the nature of visual similarity.	
Grid	Modular forms are linked and governed by a three-dimensional grids	

(Source: D.K. Ching, 2010)

In the re-design of the Surabaya Zoo will use linear pattern forms a pattern that is intended to direct visitors to pass through all the exhibit.

2.2.3 Landscape Theory

Landscape planning specializing in large-scale project assessment study to evaluate systematically the vast land area for the provision of use for various needs in the future.

2.2.3.1 Public Space

Public space is a space that has the status of general use. Which in this case addressed to who wrote that has an interest to use it. Public spaces can be classified systematically include being: open space (landscape), circulation space (roads), public facilities (public buildings such as transport terminals, parking of motor vehicles), shopping (market, shops, etc.). Each class of public spaces that must be distinguished also between the normal and the disabled.

2.2.3.2 Pathways

Kinetics of movement is a study of the nature of the movement. The study of the movement is described by J. O. Simond, Landscape to Landscape Architecture; Eckbo, Landscape Urban Design and Rubenstein, Guide to Site and Environmental Planning. (Simond, 2006)

The description below will be presented opinion about the movement kinetics..

1. **Forms trajectory**

   Various kinds of trajectories:

   a. Form coiled

   b. form of deviant

c. Form winding

d. Form hyperbolic

e. Form of centrifugal

f. Form of centripetal

g. Forms turn to the left to right

h. Form floated to the top

i. Shape up

j. Shape descending

k. Arc shape

l. Form of direct

Figure 2.41: Trajectory in the form of graphs
*(*Source: Hakim and Utomo, 2010:118*)*

The combination of speed and nature of the movement of a subject to produce a certain emotional sense, so that in designing a trajectory of motion, must be controlled carefully.

2. Human and Movement

a. The factors that stimulate people to tend to move, as follows:

- There is something fun
- If there are objects that are desired

- Little has hitch
- There are clear signs or clues and leads
- When something is appropriate or suitable
- If something has appeal
- To reach the entrance
- If there is something different
- To achieve a goal
- If there is something wonderful and curiosity
- When you receive something
- Towards a point that has the color and texture of the strongest
- If there is a pleasant spaces
- If there is a sense of adventure
- If there is something beautiful, scenic
- Towards an object or area and suitable space with liver or needs.

b. The factors that stimulate people to reject the move, as follows:

- There are obstacles
- There is something unpleasant
- There is something outside attention
- There is something friction
- There is something of rejection
- There is something violent
- There is a steep surface
- There is something monotonous

- Boredom
- Something unwanted
- Something that prohibits
- There is a danger
- There is something unsuitable

c. The factors that guide humans in the direction of movement, as follows:

- composition of natural forms
- The divisor spaces
- Presence of signs or symbols
- The director or retaining wall
- The circulation pattern
- Availability of lane-lane
- The forms of space

d. Factors that stimulate people to rest, as follows:

- The condition of enjoyment, pleasure
- The opportunity to capture the view, object and vivid detail
- Barriers to moving
- Engage in a state without a purpose
- Opportunities for something that is personal
- Opportunities for concentration
- Inability to move forward
- There is a fun spin to shape and space.

3. Effect of Distance on the Circulation

The distance can interfere with circulation patterns are applied. The distance is too far causing the planned circulation pattern does not correspond to the desired goal. This can be overcome by the application of the circulation pattern that is direct and practical.

Figure 2.42: Suggests a circular path of adventure and fatigue to encourage people to rest

(Source: Hakim and Utomo, 2010: 124 and 125)

2.2.3.3 Vegetation

Landscape elements can basically be divided into two major categories, namely:

- Hard material; pavement, static material.
- Soft material; plants, water.

Plant is one important factor in the design landscape. In relation to landscape design, layout or planting green design is the main thing that becomes the basis for the formation of outer space. The arrangement and design of plant includes plant habitat, the character of plant, plant function, and laying the plant.

1. Plant habitat

Plant habitat are plants that are viewed in terms of botanical/morphology, according to the ecological and visual effects.

Terms of botanical / morphological, plants are divided into:

a. Tree: woody stem, branching away from the ground, rooted in, and the height above 3 meters
b. Clump: woody stems, branching near the ground, shallow rooted, and 1-3 meters high.
c. Shrubs: the stem is woody. Branching near the ground, shallow rooted, height 50 cm-1 meter
d. Ground cover: no woody stems, roots, and 20cm-50 cm high.
e. The grass

2. Plant characters

The physical characteristics of plants can be seen from the trunk and branches, canopy shape, leaf mass, the mass of flowers, colors, textures, accents, and the scale height of his loneliness.

Choice of plants depends on:

- The plant function , in accordance with the purpose of designing
- The placement of plants, according to the plant function.

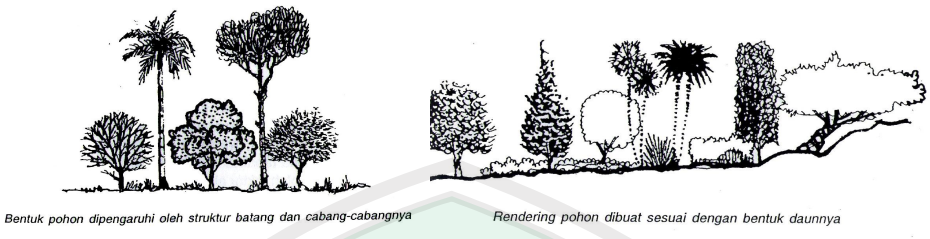


Figure 2.43: Influenced by the shape of the tree trunk and the rendering tree structure made according to the shape of its leaves
(Source: Hakim and Utomo, 2010: 128 and 129)

3. The plant function

Plants not only have aesthetic value, but also serves to boost the quality of the environment.

Some functions of plants can be categorized as follows:

a. Visual Control
b. Physical barriers
c. Climate control
d. Erosion control
e. Wildlife habitats
f. Aesthetic Values

a. Visual Control

Resist the glare caused by sunlight, street lights, and lights on the vehicle:

- Roads

With plant laying on the sidewalk or in the middle lane of the road. Should be selected trees or dense shrubs.

- Buildings

  Placement of trees, clump, shrubs, ground cover, and grass can withstand light reflection from the pavement, pounding rain, and choked back the sunlight into the area that needs shade.

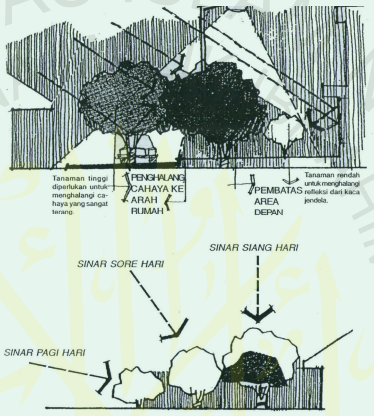


Figure 2.44: The tree view as a control on the building
(Source: Hakim and Utomo, 2010:132)

- Control the view of outer space

  Plants can be used for components of the space as a wall, roof, and floor. Wall can be formed by the plant as a shrub border. The roof is formed by a canopy of trees that form a canopy, or vines. While the floor may be used as grass or ground cover plants.

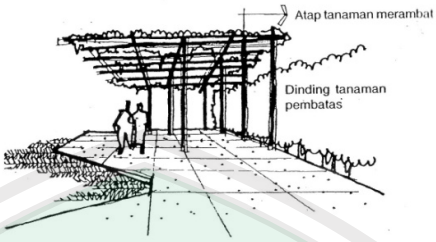


Figure 2.45: Plants as a control view of outer space

(Source: Hakim and Utomo, 2010:132)

- Control the view to get a private room

  Plants can be used to restrict the view from the outside in an attempt to create a private space. Personal space is usually the space that is protected from others' perspectives. Require the placement of barrier plants as high as 1.5 to 2 meter sight.

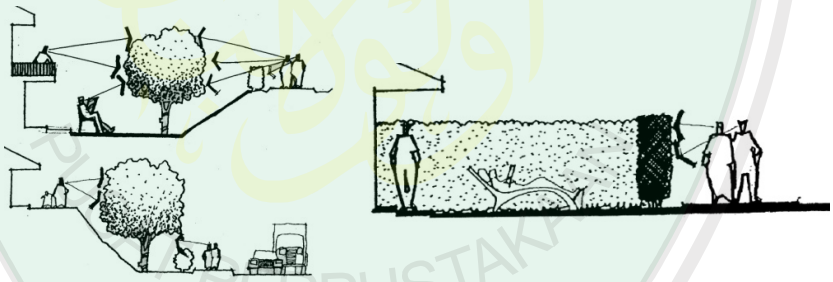


Figure 2.46: Plants as a control to get a view of personal space

(Source: Hakim and Utomo, 2010:133)

- Control the view of the unpleasant things

  Plants used as a sight barrier to things that are not fun to be displayed or viewed as landfill waste, landfills, and mining land.

b. Physical Barriers

Plants can be used as a barrier to the movement of people and animals. But they can also function guiding the movement.

c. Climate Control

Plants serve as climate control for human comfort. Climatic factors that affect human comfort are temperature, solar radiation, wind, humidity, sound, and smell.

- Control of solar radiation and temperature
- Control / wind controllers
- Controlling noise
- Air Filters

d. Erosion control

Soil conditions become fragile and easily eroded due to the influence of rain and strong wind gusts. Plant roots bind the soil so the soil can become stronger and resistant to rain and blow wind. Moreover, it can also serve to hold the rain water which falls indirectly to the ground.

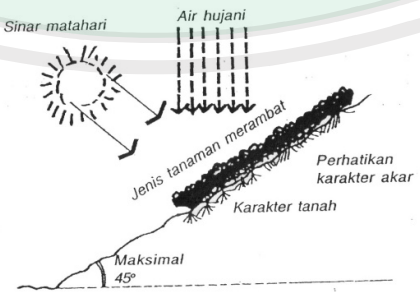


Figure 2.47: Plants as erosion prevention
(Source: Hakim dan Utomo, 2010:138)

e. Wildlife Habitats

Plants as a food source for animals and shelter life. Until the plants can indirectly help preserve wildlife.

f. Aesthetic Values

Aesthetic value of plants obtained from a combination of colors (leaves, stems, flowers), the physical form of the plant (stem, branch, and canopy), the texture of plants, plant scale, and composition of plants. The aesthetic value of plants can be obtained from one plant, a group of similar plants, plant combinations or combinations of different types of plants with other landscape elements.

Plants can cause aesthetic value of shade plants that occur on the walls, floors, and cause different shadows caused by wind and time of the shadows. Similarly, if the plant is placed at the edge or around the pool will create a shadow that is reflected by the water surface.

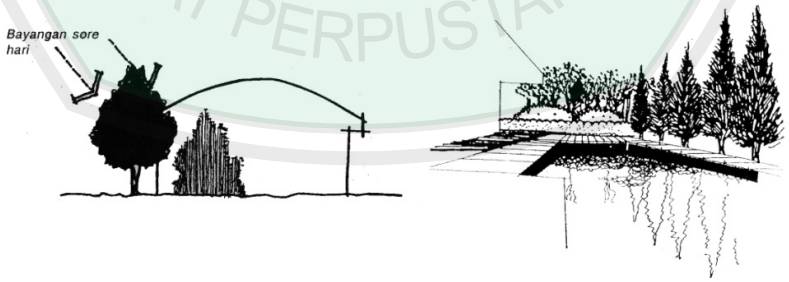


Figure 2.48: Plants as aesthetic
(Source: Hakim dan Utomo, 2010:139 and 140)

- Color

  The color of the leaves and flowers of plants to attract the attention of humans, animals, and affect the emotions who saw it. When several types of plants with different colors will be combined and composed create aesthetic value.

- Shape

  Shape of the plant can be used to show 2 or 3 dimensional shapes, suggesting a dynamic, beautiful, widen or expand the view, or as accents in a room.

- Texture

  The texture of a plant is determined by the trunk/branches, leaf mass and visibility of these plants. The texture of the plants also affect psychologically and physically for the beholders.

- Scale

  Scale is the ratio or proportion of the amount of crop plants with a plant or a comparison between the plant began with the surrounding environment.

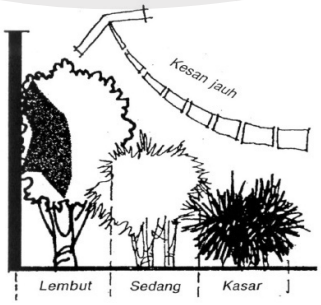


Figure 2.49: Preparation of the plant to the scale/size
(Source: Hakim and Utomo, 2010:141)

4. Plant placement

Placement of plants must be adapted to the purpose of the design without compromising the function of the selected plants. At this placement should be considered in the design entity or unity, among others:

- Variety
- Accent
- Balance
- Simplicity
- Sequence

In the design of landscape plants, the choice of plants is an important factor.

Figure 2.50: Placement of plants to give the atmosphere of the building
(Source: Hakim and Utomo, 2010:143)

2.2.3.4 Wind and Air Movement

The influence of wind and solar trajectory of the building can be utilized with buildings made openly. The orientation of the building is placed in between the trajectory of the sun and wind as a compromise between the location of the building from east to west trending, and which lies perpendicular to the wind. Preferably rectangular building a profitable application of cross ventilation.

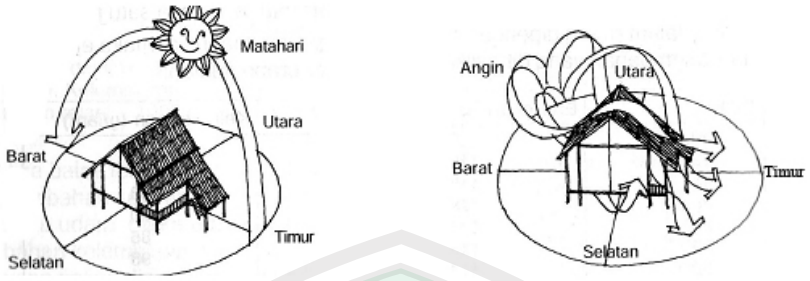


Figure 2.51: The influence of the sun and wind on the shape and direction of building
(Source: Dasar-Dasar Arsitektur Ekologis. 2011)

Moving air produces the best refreshment, so the wind can also be used to set the air in the room. Different pressure conditions on both sides of the inlet air flow will turn to find another way. Means the shifting of the air inlet on one side of the changing pressure conditions of each.

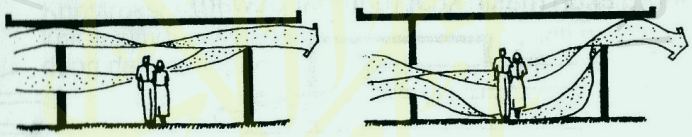


Figure 2.52: Rate of winds based on the openings of the building
(Source: Dasar-Dasar Arsitektur Ekologis. 2011)

The air flow rate affect of air refresher. if the air inlet is greater than the discharge hole, the air flow rate will be reduced, otherwise if the larger air outlet, air flow rate will be more robust.

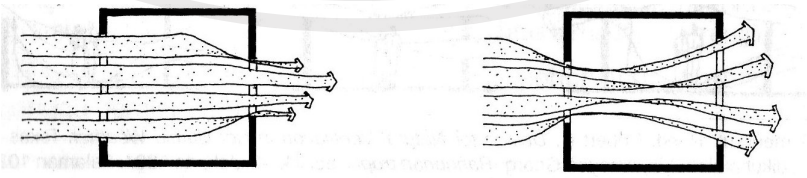


Figure 2.53: Effect of aperture size on the rate of wind
(Source: Dasar-Dasar Arsitektur Ekologis. 2011)

Utilization of vegetation on the building can help steer and control the pace of the wind into the building.

Figure 2.54 The influence of vegetation on wind speed
(Source: Dasar-Dasar Arsitektur Ekologis. 2011)

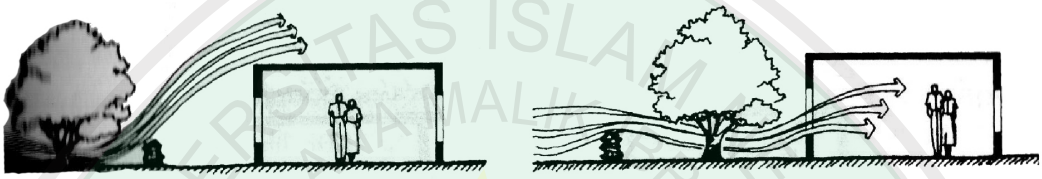


Figure 2.55: Vegetation as a filter and direct the wind speed
(Source: Dasar-Dasar Arsitektur Ekologis. 2011)

Vegetation as a barrier to sunlight and glare can be refreshing and channel air flow.

2.2.3.5 Building Protection Against the Sun

The intensity of the sun generally gives excessive light in the room. The condition can lead to too strong light resulting in glare. Barrier is necessary to avoid direct sunlight, such as the provision of walkways on the side of the building, making or providing a barrier roof fin on the window.

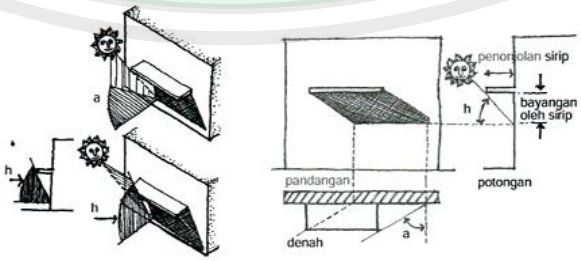


Figure 2.56: Providing shading or fins on the building to block the sun
(Source: Dasar-Dasar Arsitektur Ekologis, 2011)

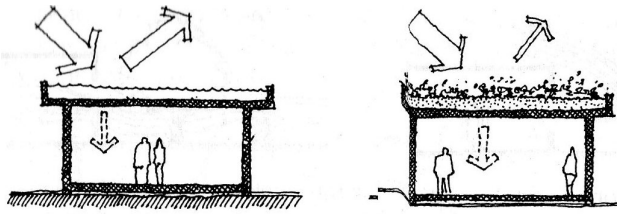


Figure 2.57: Pond water or roof garden to protect the building from beam (Source: Dasar-Dasar Arsitektur Ekologis, 2011)

Protection of buildings can be arranged with additional roof construction in addition to protecting humans against the weather, also offers protection against heat radiation with shade plants.

Figure 2.58: Vegetation as a filter against the sun's glare (Source: Dasar-Dasar Arsitektur Ekologis. 2011)

2.2.3.4 Parking Facilities

Almost all activities in open space activities require parking facilities. A parking facility is said to function properly if the parking facility is not a conflict on the road around the parking lot. Problems arising in the parking facility when parking needs do not match or exceed the parking capacity is available, so that vehicles which are not accommodated in the parking lot would disrupt the smooth flow of traffic on surrounding roads.

: In determining the layout of the park, has some of the criteria are as follows:

- Parking is located on a flat surface
- The placement of parking not too far from the center of activity.

1. Parking is located on a flat surface

Location of the flat surface is intended to maintain the security of parked vehicles in order to safely and does not roll. If the original soil surface sloped, it is necessary to consider the use of premises grading system of cut and fill.

2. Placement of parking is not too far from the center of activity

Achievement of the relationship between the parking lot with a building or place not too far endeavored activities. When the distance between the center of the parking lot far enough, it would require a clear and targeted circulation to the parking area.

From the point of planning the criteria and principles outlined parking spaces should consider the following factors.

- When the use and utilization of parking spaces
- The number needs to determine the number of vehicle parking area.
- The size of the type of vehicle to be accommodated
- Having a good security and protection from the hot sun scatter
- Self-light illumination at night
- Availability of supporting parking facilities, for example where the driver wait, the trash.

3. Pavement and Construction

Terms of pavement and construction can be divided into:

- Pavement watertight
- Pavement that absorb water.

2.3 Theme of Design

The theme will be used in the redesign Surabaya Zoo is Green Architecture.

Green comes from the English language, which means *hijau*, while the architecture is the art and science of designing buildings. In a broader sense, the architecture includes designing and building the entire built environment, ranging from the macro level urban planning, urban planning, landscape architecture, down to the micro level the building design, furniture design and product design. The architecture also refers to the results of the design process.

Green Architecture is a movement that is done in order to use the steps as hard as possible not to damage the natural and human-to-back in a comfortable and healthy life.

Some understanding of green architecture and the theories developed by some critics as follows:

a. *Green Architecture* by Brenda and Robert Vale

1. Energy Savings

   The building should minimize the need for energy use.

2. Utilizing The Climate

   Buildings should be designed to work with the climate and natural resources of energy.

3. Minimize the use of new natural resources

   Buildings should be designed to minimize the use of new natural resources and use environmentally friendly materials.

4. Appreciate the users

` Green architecture to realize the importance of all persons concerned with the building.

5. Appreciate the site

   Minimize the damage site.

6. Holistic

   All the principles of green architecture requires a holistic approach to neighborhood development.

b. *Green architecture* by *Leadership in Energy and Environmental Design* (LEED) standard:

1. The use of sustainable land development, if possible, be able to use materials from buildings that have built and maintain the environment. Use of roof garden and the planting of vegetation around buildings and in the site very supportive.
2. The use of recycling wastewater (water that has been used) and the installation of the building to collect rain water. use and water supply needs to be controlled.

3. Energy efficiency can be enhanced by a variety of ways, for example, orientation of buildings to take full advantage of seasonal changes in the position of the sun and using alternative energy such as solar energy and wind energy.
4. The use of recycled materials that do not require a lot of energy to make it again. Also, it can also use the local materials of low pollution.
5. Quality control of indoor water use features such as control of personal space, ventilation, temperature controller, and use any material that contains no toxic gas.

c. According to the book Green Architecture, published by Taschen, 2005, the standard of eco-friendly buildings are:

1. Smaller building
2. The use of recycled material
3. Use of energy-saving materials
4. The use of timber harvest area around (for the construction and furnishing) and avoid the import of timber
5. Using a system of alternative water use
6. The cost of building maintenance
7. Recycling of building
8. Reduction of ozone-depleting chemicals
9. Maintenance environment
10. energy efficiency
11. Solar orientation

12. Access to public transport.

Some of the principles of Green Architecture which has been described above, it can be concluded that the basic ideas or principles of Green Architecture is:

- Source alternative energy. Building and the environment can supply its own energy. Solar and wind energy is a commonly used alternative to be used as a substitute for electrical energy.
- The building has good air conditioning, so do not waste energy for artificial air conditioning in buildings.
- The use of material. Use of recycled building materials from buildings that have been built. In addition, the building can also use materials from the local area.
- The placement of buildings on the site. Placement of buildings should be considered in order to minimize destruction of surrounding ecosystems site.

By using the theme Green Architecture enables the design phase to adapt to its environment and also adjust to the habitat of animals in it.

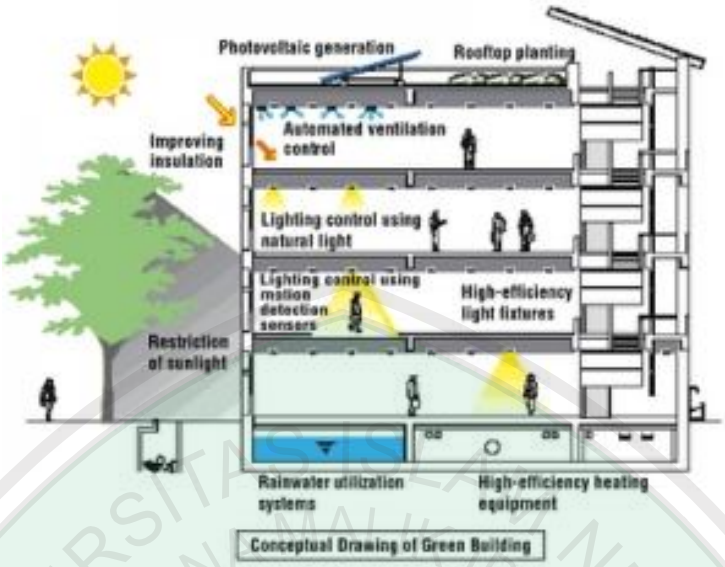


Figure 2.59: The application of green architecture in a building
(Source: Google.com, 2010)

2.4 Overview Islamic Studies

Allah created human beings in this world has two functions: as a servant of Allah and as caliph of God on earth. Caliph is the person who was entrusted to manage and care for the earth and set up life on earth with reference to the signs of Allah (the Koran) that all his work always has a value of worship to Allah SWT. And beneficial to mankind.

Human who was assigned as the caliph in the earth should be able to read and understand the content of Al-Quran and able to read nature. Caliph of Allah should be able to master the knowledge as a preparation for life in the world and in the hereafter. Therefore, people must manage, maintain, and utilize the results for the welfare of all beings. Al-Araf verse 56 states:

Do no mischief on the earth, after it hath been set in order, but call on Him with fear and longing (in your hearts): for the Mercy of Allah is (always) near to those who do good. (QS al-A'raf [7]: 56).

Humans as the caliph must keep the earth and its contents, including the animals on earth. For it to be a greater knowledge about the animals that exist on earth ranging from the type, habitat, and others.

Animals are living creatures of Allah's creation, habitat, way of life and its nature, size, color, full of diverse forms of magic. In the perspective of al-Quran, the animal is one part of the verses of Allah that must be studied and contemplated. Because the true and deep understanding can reveal the existence and power of God.

Al-Quran provides many signs about the phenomenon of animal. This is concrete evidence of how important it is to learn and understand the phenomenon of animal. The Quran states:

And in the creation of yourselves and the fact that animals are scattered (through the earth), are Signs for those of assured Faith. (QS. Al-Jaatsiyah [45]: 4)

The phenomenon of animals diversity is unique studied in order to distinguish between animals with one another. Most people distinguish animals based on traits that can be observed, appearance, food, behavior, way of breeding, habitat, and others. More than 60 verses in the Koran gives a signal about the diversity of fauna for example:

He created the heavens without any pillars that ye can see; He set on the earth mountains standing firm, lest it should shake with you; and He scattered through it beasts of all kinds. We send down rain from the sky, and produce on the earth every kind of noble creature, in pairs. (QS. Luqman [31]: 10)

Millions of animals that exist in nature has differences and similarities that can be grouped according to characteristics that are owned and formed a unique classification system. Furthermore the Koran gives an overview of how the animal is distinguished by looking at how to walk:

And Allah has created every animal from water: of them there are some that creep on their bellies; some that walk on two legs; and some that walk on four. Allah creates what He wills for verily Allah has power over all things. (QS al-Nuur [24]: 45)

Verses above describe some of the ways animals walk. There is a walk with his stomach, there is a walk with my feet. And among the animals that walk on their feet, there is an existing two-legged and four legged. Mostly there is a six-legged animal, or even many-legged

Animal diversity is not just a mere natural phenomenon. Nor was it just a scene that just gave birth to a sense of awe in the uniqueness and beauty. But above all, is a sign of the existence of the Creator, for men of understanding.

Behold! in the creation of the heavens and the earth; in the alternation of the night and the day; in the sailing of the ships through the ocean for the profit of mankind; in the rain which Allah Sends down from the skies, and the life which He gives therewith to an earth that is dead; in the beasts of all kinds that He scatters through the earth; in the change of the winds, and the clouds which they Trail like their slaves between the sky and the earth;- (Here) indeed are Signs for a people that are wise. (QS. Al-Baqarah [2]: 164)

The above verse states that the spread of all sorts and kinds of animals on earth is a sign of power and greatness of Allah SWT. This verse also confirms that the signs can only be understood for those who want to think about. Think about the animals is also thinking about diversity.

2.5 Comparative Studies

2.5.1 Perth Zoo Western Australia

Comparative study was conducted to provide a preliminary description of the design objects in terms of objects and themes. One of the objects used as comparison is the Perth Zoo, Western Australia. This zoo is one of the zoo that applying the approach to the survival of wild animals that became extinct.

Figure 2.60: Map of Perth Zoo Western Australia
(Source: Google.com, 2010)

This map shows the condition and layout of each exhibit, as well as what was inside the facility. This map is also a guide for visitors to the exploration around the Perth Zoo.

2.5.1.1 Collection of Animals

Animal Kingdom is divided into two groups: vertebrates and invertebrates. Invertebrates more than 95% of all living creatures on this planet and includes insects, arachnids (spiders and scorpions), shellfish and a wide variety of marine life such as sponges and corals. Of vertebrates, there are five main groups: amphibians, birds, fish, reptiles and mammals. At Perth Zoo has a collection of animals consisting of groups of invertebrates and vertebrates

2.5.1.2 Exhibit

Perth Zoo has exhibits for the development of zoo , among others:

- **African Savannah**

  This area of 1.25 hectares has been transformed to present the diversity and fragility of African wildlife and their environment. The African Savannah has been planted with authentic Africa grasses and trees to provide a natural habitat for the animals. Trees that will see include Cape Chestnut, Senegal Date Palm, Cabbage Tree, Sausage Tree, Thunga Tree, Flame Tree and Kei Apple. The main grasses found in the exhibit are found throughout East Africa. These grasses include Kikuyu, Fountain Grass, Elephant Grass and Rhodes Grass.

Kopje, or rocky outcrops are characteristic of the savannah and these have been incorporated into the exhibits. The rocks were constructed of wire frames and concrete and disguise night quarters for the animals or storage facilities.

- **Australian Bushwalk**

  Visitors to the Australian Bushwalk tour through re-creations of some of Australia's famous landscapes and ecosystems and encounter kangaroos, emus, koalas and Dingos face-to-face. Detours entice visitors to explore the Western Australian Black Cockatoo exhibit. Featuring some of Australia's most splendid and threatened birds, the cockatoo exhibit is planted with cockatoo food trees and plants and educates visitors about the plight of these endemic birds.

- **Australian Wetlands and Crocodile Exhibit**

  Explore the water's edge in the Australian Wetlands exhibit. Above and below the surface of the water live a myriad of species. Fish, frogs, turtles, birds, lizards and the world's largest reptile, the Estuarine Crocodile, are all part of this amazing ecosystem. In the entrance to the Wetlands, visitors can meet different frog species and Australia's most endangered reptile, the Western Swamp Tortoise. Perth Zoo runs a breeding program for this threatened Western Australian tortoise. One of the Zoo's most popular attractions also lives in the Australian Wetlands – a 500 kg Estuarine Crocodile called Simmo.

Figure 2.61: Australian wetlands and crocodile exhibit/simmo
(Source: Google.com, 2010)

- **Elephants of Asia**

  Perth Zoo houses Asian elephants have been well developed to provide more space for the animals is amazing. A new exhibition created for the larger female elephants complete with large pond.

Figure 2.62: Conditions elephants of Asia
(Source: Google.com, 2010)

- **Nocturnal House**

  Enter the dark and mysterious world of some of the world's most fascinating nocturnal creatures at Perth Zoo's Nocturnal House. Owls, possums, mice, bats, lizards, frogs and a huge array of Australian marsupials such as bettongs, bandicoots and bilbies are all on display. Nocturnal animals are generally inactive during daylight hours and come alive between sunset and sunrise. Perth Zoo's Nocturnal House reverses the clock so that Zoo visitors can see, by day, these amazing creatures in naturalistic night-time settings.

- **Penguin Plunge**

Filled with 50,000 litres of filtered salt water, the exhibit features underwater viewing, a beach, reef and rookery. The Little Penguins share their habitat with another marine bird species, the Bridled Tern. A range of coastal plants in and around the exhibit helps to create an authentic experience.

A special presentation on Little Penguins is held every day at the exhibit and gives visitors the chance to see these birds feed. Little Penguin is the smallest of all penguins and the only species to live permanently in Australian waters.

- **Rainforest Retreat**

Enjoy the tranquility waterfall running down the middle of the sound and smell of a real tropical forest. Perth Zoo Rainforest Retreat combines the beautiful winding road with a stunning array of tropical rain forest flora of Australia and several places of rest and contemplation area.

A suspension bridge across the misty waterfall gully offers a great view of mid-level and canopy stands beautifully in the Australian Rainforest.

Figure 2.63: *Rainforest Retreat*
(Source: Google.com, 2010)

- **Reptile Encounter**

The Reptile Encounter features more than 20 reptile species in 17 purpose-built reptile exhibits with landscaping to match each animal's natural habitat. Opened on World Environment Day 1997, the Reptile Encounter invites visitors into the fascinating world of snakes, lizards and tortoises, and some of the world's more interesting snakes and lizards.

Figure 2.64: Animals in reptiles
(Source: Google.com, 2010)

- **Silvery Gibbon Exhibit**

Perth Zoo Silvery Gibbon hoped that the exhibition will provide visitors with an opportunity to see the Silvery Gibbons because they will be in the wild, and that this will help people understand the importance of protecting this species from the threats that put human population pressure on wild populations.

Figure 2.65: Silvery Gibbon
(Source: Google.com, 2010)

- **Sumatran Orangutan Exhibit**

In 1979, the orangutan exhibit opened and contains simple. It was decided in 2000 that showed the total development to provide the colony of orangutans with a more natural environment and dynamic. The rebuilding of this unique exhibition provides primates with a variety of behavioral enrichment opportunities through the woods synthesis' to a tree made of steel, concrete and wood recycling. The fact that orangutans eat bark, leaves and branches blocking the use of natural materials for these structures.

Figure 2.66*:* Sumatra orangutan exhibit and the Sumatran orangutan (Source: Google.com, 2010)

- **Sun Bear Exhibit**

This exhibition has many features that will ensure the good health of these animals and hopefully lead to a successful breeding program. There are two separate areas that allow it to bear male and female to remain apart until the mating season. There is also the delivery room at the back of the exhibition that will maximize the potential of livestock and provide privacy they need to raise the child.

Figure 2.67: Sun Bear at the Sun Bear Exhibit
(Source: Google.com, 2010)

- **The Homestead**

  Homestead Perth Zoo exhibition is designed to demonstrate practical ways in which we can change our lifestyles to reduce the negative environmental impact. The Homestead is built on three principles that is saving energy, wind energy and solar energy.

Figure 2.68: The homestead
(Source: Google.com, 2010)

- **Variety Special Playground**

  Variety Special Playground using local materials, natural materials to make the individual making the art form that stimulates all things. Caves, tunnels, a secret garden, pond and sculpture offers sights, smells and sounds for children with and without special needs.

2.5.1.3 Facilities

At the zoo is providing various facilities for visitors to support the totality of the exploration of the zoo. Ranging from educational facilities such as school

groups, education experience, souvenir shop facilities, evens programs, heritage trail. Not only is it the other facilities provided by the Perth Zoo is a park, information center, toilets, baby change, stroller/wagon fire, zebra car tours, lockers, food and drink, talking zoo, Close Encounters.

2.5.1.4 Zoning

At this zoo, grouping seen from the types of animals and animal from which it originated. So that the grouping of animals is more organized and easier for visitors to find out how the habitat, behavior, nature, kind, of animals.

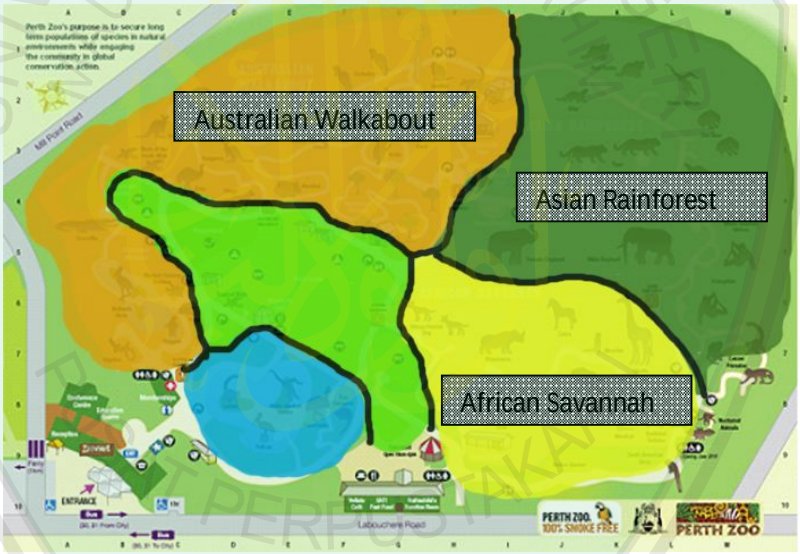


Figure 2.69: Zoning on Pert Zoo
(Source: Google.com, 2010 dan hasil analisis, 2011)

From the above picture can be an explanation in that grouping of animals based on the home animal itself. The flow is more directional and unidirectional. In the African Savannah will be found to the cages of animals from the African continent who usually live in the area of grassland savannah. Then enter the next

stage will be found the Asian Rainforest area, in this area will be found of animals that come from tropical forest regions. In this area the animals are usually found in many Asian countries Then enter the next area will be found of animals that come from the continent of Australia, this area usually with a higher temperature than tropical countries. In this zoo, the animals from Australia in the Australian Walkabout encountered.

2.5.1.5 Pathways

From the results obtained circulation grouping animals in the zoo.

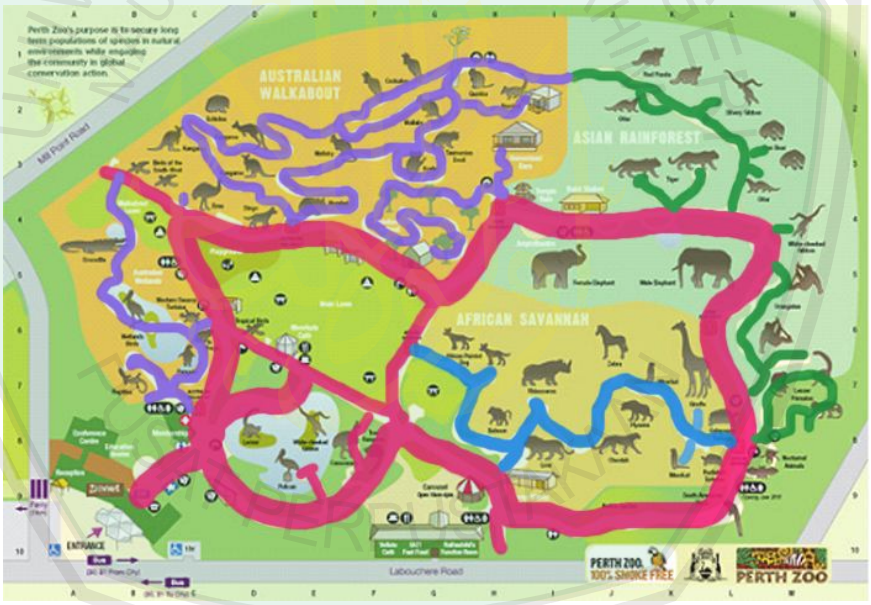


Figure 2.70: Pathway in Pert Zoo
(Source: Google.com, 2010 dan hasil analisis, 2011)

Explanation:

- Sirkulasi utama
- Sirkulasi A*fsican savannah*
- Sirkulasi *Asian rainforest*
- Sirkulasi *Australian walkabout*

In the main circulation flow around the entire exhibition and then there are ramifications that have been grouped according to previous grouping. So that visitors are directed to round the entire exhibition there.

Flow circulation was made to form a loop so that visitors can return again to the place where visitors begin his adventures in exploring the zoo.

2.5.2 Batu Secret Zoo

Batu Secret Zoo is one vehicle that is in the Jatim Park 2 of the Oro Oro Ombo Street no. 9 Batu, Malang international standards. The zoo presents a modern shape and appearance. The zoo is located in an area with other tourist Museum of Wildlife. Inside the Batu Secret Zoo, there are several areas that can be enjoyed by visitors such as the aquarium, tiger fishing, savannah, african market, hippo and croc garden, eagle, tiger land, fantasy land, farm safaris, river advanture, cafes, and several other facilities.

Figure 2.71: Building of Batu Secret Zoo
(Source: Photo documentation, 2011)

Figure 2.72: Map of Batu Secret Zoo
(Source: Google.com, 2011)

In it created an atmosphere that is similar to animal life itself. Even so the arrangement of landscape made more modern but still appear natural elements.

Figure 2.73: The atmosphere of the Batu Stone Zoo is trying to resemble the natural
(Source: Photo documentation, 2011)

Cages of animals is more modern with the planting of vegetation in it according to the animals that occupy the cage. Cleanliness and comfort are not only meant for animals but also for visitors.

Figure 2.74: Batu Secret Zoo atmosphere is clean and comfortable
(Source: Photo documentation, 2011)

Suggests the use of ceramic materials gives the modern impression , the use of ceramics used in all the Batu Secret Zoo ways.

Figure 2.75: The use of modern ceramic materials gives the modern impression
(Source: Photo documentation, 2011)

In some parts of the building using natural materials like bamboo or wood, so that the existence of these forms the main attraction for visitors.

Figure 2.76: Natural elements used in buildings
(Source: Photo documentation, 2011)

Arrangement of landscape in each cage adapted to the type of animals that will be occupied. As in the savanna region, following the arrangement of the cage

atmosphere were in Africa and even the manufacture of the cages also follow the houses style in there.

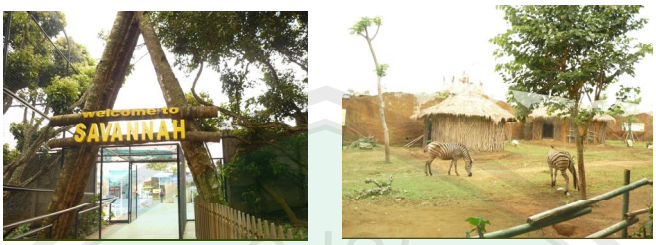


Figure 2.77: Suitability of the arrangement of the cage with its animal habitat
(Source: Photo documentation, 2011)

Cleanliness in feeding food for wildlife is maintained and built environments for animals are clean and therefore contributes to the health of animals that are on it. Animals that exist in the secret zoo look healthy and clean.

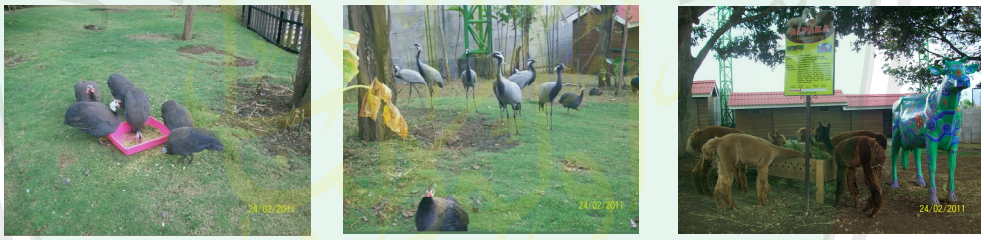


Figure 2.78: Environment and clean-feeding support animal health
(Source: Photo documentation, 2011)

The atmosphere in the building for Nocturnal animals. The setting is like a cave visible from the entrance of as if there is a stone that hit on it. The room is also made as in the woods, there are replicas of the trees.

Figure 2.79: The atmosphere in the building nocturnal animals
(Source: Photo documentation, 2011)

2.5.2.1 Pathways of Batu Secret Zoo

In the Batu Secret Zoo, the flow circulation in the zoo created to direct visitors to all the exhibits. The Secret Stone Zoo circulation as follows:

Figure 2.80: Pathways in Batu Secret Zoo
(Source: Google.com, 2011, hasil analisis, 2011)

In the Batu Secret Zoo, the circulation system used is linear, one-way direction to be taken up at the end of the exhibition. Exhibit is also made to flow so that the linear pattern can be visited all exhibition visitors. Circulation patterns at the zoo does not form a loop so that the initial entrance zoo visitors will feel different things when out of the zoo. It is precisely directed to the exit wildlife museum, which is one of the other tourist attractions. And visitors will feel different things.

The conclusion to be drawn from this comparative study is how the zoo's animals have been grouped according to species and habitats, using a circulation that directs visitors to where all exhibits. So that the stages of the journey around the exhibit can be felt.

According this comparative study can be concluded that the zoo be comparative study trying to made for artificial creatures in it and to resemble the corresponding native habitat of these animals. This means that an attempt to not destroy the environment that affect the survival of wildlife is also reflected on the theme of green architecture.