

## CHAPTER V

### THE THEORITICAL BASIS

#### 5.1 Start-Ups' Needs

##### 5.1.1 Balancing Privacy and Collaboration

Start-ups are known as workers who often do networking and brainstorming. The open space layout is commonly assumed to facilitate interaction and communication between co-workers, promoting teamwork effectiveness and workplace satisfaction. However, there are times when start-ups have to meet their deadlines and need a private space to work. For this case, the open space layouts are acknowledged as being more disruptive due to uncontrollable noise and loss of privacy. Some studies that explain the problem are as follows:

- a. 2008 study by Finland's Institute of Occupational Health reported by The New York Times revealed that noise can reduce productivity by up to 10% for cognitive tasks like reading, writing, and programming that rely heavily on short-term memory.
- b. Workspace satisfaction research in 2013 by the University of Sydney found that lack of sound privacy was a leading concern for workers in open space office layouts.

Based on the research, not all start-up workers are satisfied with the open office layout concept. Therefore, distraction-free private offices are required.

##### 5.1.2 Person's Internal Clock & Rhythm

According to psychologist and sleep specialist Dr. Michael Breus, there are four different chronotypes, or a person's internal clock and rhythm. He labels them as the following animals:

###### A) Dolphin

Dolphins are light sleepers, who are often diagnosed with insomnia (difficult sleepers).

B) Bear

Bears internal clocks track the rise and fall of the sun. They need a full 8 hours of sleep a night.

C) Wolf

Wolves have a hard time waking up early and are most energetic in the evenings (the night owls).

D) Lion

Lions tend to wake up early with lots of energy. By early evening, they are exhausted (morning person).

This is why flexible working hours is becoming such a trend to make the work more productive and reduce work stress.

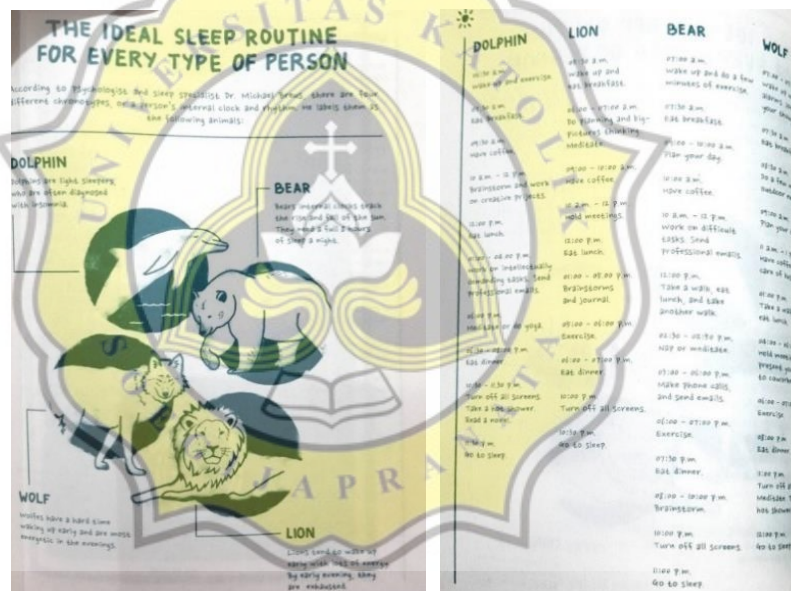


Figure 5. 1 Four Different Chronotypes of a Person's Internal Clock and Rhythm

Sources: You Do You Book page 27-28

Based on the description about productive hours and the rhythm of activities for each type of person, the spaces needed to support the needs have been added. These spaces are the game area, napping area, fitness centre, library and outdoor park.

## 5.2 Green Building

Green building is not the focus of the approach that will be applied to Start-Up Centre. However, one of the GREENSHIP categories, the Energy Efficiency & Conservation (EEC), will be applied to buildings. The reasons for the application are:

- a. BSD City is an area developed with a green concept. Besides, the buildings around the project site are certified Green Buildings. To harmonize the facade with the surrounding buildings, the Start-Up Centre's facade will apply one category from the Green Building Council.
- b. One of the Biophilic Design patterns that will be applied is the Dynamic & Diffuse Light pattern. This pattern includes a lot of sunlight and scatters it in the form of shadows. Maximizing incoming light but reducing heat, the concept of green building will be applied for this design case.

### 5.2.1 Green Building Council Indonesia & EDGE

GREENSHIP by GBC Indonesia contains six categories:

1. Appropriate Site Development (ASD)
2. Energy Efficiency & Conservation (EEC)
3. Water Conservation (WAC)
4. Material Resources & Cycle (MRC)
5. Indoor Air Health & Comfort (IHC)
6. Building & Environment Management (BEM)

The Energy Efficiency & Conservation (EEC) category will be applied to the design because, in this category, the building facade is arranged to include a lot of natural lighting but by reducing the incoming heat. Based on the EDGE website, some of the application of energy solutions for the low extra cost of buildings are as follows:

- a. Reduced window to wall ratio
- b. External shading devices
- c. Insulation of roof and external walls
- d. Air conditioning with high COP

- e. Saving lighting for internal, common areas, and external spaces
- f. Natural ventilation
- g. Reflective paint/tiles for external walls and roofing
- h. Low-E coated glass

Through the analysis of the surrounding buildings in chapter 3, the similarities that will be applied are using the stopsol glass, shading devices, and double facade systems such as perforated shading, light shelves, and reflective shading.



Figure 5. 2 Stopsol Glass

Sources: [agc-yourglass.com](http://agc-yourglass.com)

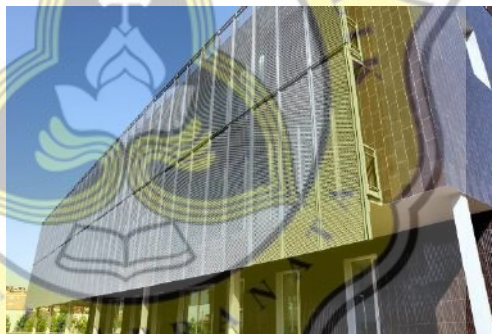


Figure 5. 3 Perforated Metal Shading

Sources: [arsitag.com](http://arsitag.com)

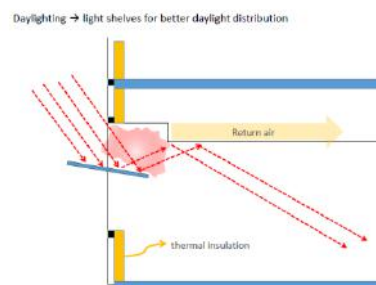


Figure 5. 4 Light Shelves on Ministry of Marine Affairs and Fisheries' Façade

Sources: The Presentation of GB Implementation & Challenges in Indonesia, Green Building Seminar

## 5.3 Biophilic Design

### 5.3.1 14 Patterns of Biophilic Design

Biophilic Design is an attempt to reconnect humans with living systems. Departing from the current situation, where humans are more dominant in carrying out activities in buildings or the environment that keep people away from nature, in this concept, nature will be brought into the room (outdoor to indoor). The application pattern of Biophilic Design is divided into three groups with 14 patterns (Terrapin Bright Green, 2014), namely:

#### a) Nature in The Space Patterns

Nature in the space patterns leads to the physical presence of the natural environment directly in the built environment so that humans can directly interact with multi-senses.

##### 1. Visual Connection with Nature

Viewing the natural elements and systems directly.

##### 2. Non-Visual Connection with Nature

Can sense the presence of nature through the auditory (hearing), haptic (touch), and olfactory (olfactory) nerves.

##### 3. Non-Rhythmic Sensory Stimuli

Provides natural sensory stimulation that attracts attention with unpredictable movements.

##### 4. Thermal & Airflow Variability

Adjust the temperature, humidity, and airflow as closely as possible to the natural environment.

##### 5. Presence of Water

Provides experiences to see the water flow, hear the sound of water splashing, and touch the water.

##### 6. Dynamic & Diffuse Light

Present the sunlight with different light and shadow intensities overtime or hours of exposure.

##### 7. Connection with Natural Systems

Creating conditions in which humans can still feel the weather and seasonal changes.

b) Natural Analogues Patterns

Imitates the natural environment into the quality of the building space through materials, textures, patterns, and colours. Design manifests as furniture and decoration.

1. Biomorphic Forms & Patterns

Copying the form found in nature such as contours, patterns, and textures that resemble nature. This natural form changes the room or facade to be more dynamic.

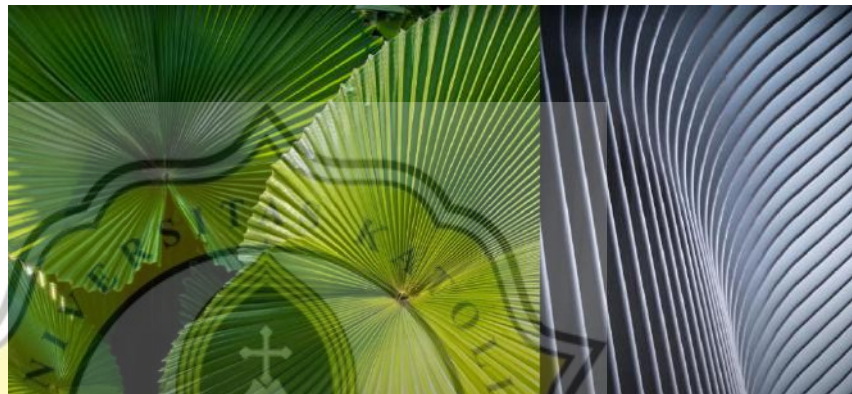


Figure 5. 5 Wall Pattern

Sources: TEDMED, *Using Biophilic Design to Heal Body, Mind, and Soul* (<https://www.youtube.com/watch?v=uAmbZCtNC9U&t=106s>)



Figure 5. 6 Wall Pattern

Sources: TEDMED, *Using Biophilic Design to Heal Body, Mind, and Soul* (<https://www.youtube.com/watch?v=uAmbZCtNC9U&t=106s>)

## 2. Material Connection with Nature

Describes the natural environment in the room by emphasizing the use of natural or similar materials so that they can reflect the natural atmosphere. Besides that, pictures and paintings could also be used to give the atmosphere.

## 3. Complexity & Order

Complexity and regularity refer to an organized hierarchy, for example, the spatial conveniences encountered in nature.

### c) Nature of The Space Patterns

The nature of the space leads to an unpredictable atmosphere and feeling that appears when humans are in a natural environment.

#### 1. Prospect

Design the spaces with an open space concept. For example, with the curtain wall, we can see events outside the room widely.

#### 2. Refuge

Give a sense of security and calmness when humans are relaxing from the tiring activities in nature.

#### 3. Mystery

Give a sense of uncertainty when in a natural environment. Different from the built environment, where the activities in the built environment already have a monotonous rhythm. For that, creating an attractive atmosphere to trigger curiosity is needed to reduce boredom.

#### 4. Risk

Feelings of fear or excitement when humans are in a place or position that has never explored.

### 5.3.2 The Application of Biophilic Design Patterns in The Start-Up Centre

In humans, perception is directed by the sensory nervous system. We perceive the world through sight, sound, smell, touch, and taste. The most powerful of all human sensory abilities, however, is vision. Given that we are more dependent on vision than on any other sense, it should come as no surprise that visual cues are the great catalyst of our behaviour. With the explanation before, the with the previous explanation, the pattern to be focused on is the visual connection with nature and dynamic & diffuse light.

#### 1. Visual Connection with Nature

##### Plants

Visual connection with nature is beneficial for psychological health. Seeing the forest scenery for 20 minutes after experiencing mental stress is provable to regain blood circulation to the brain and relax the mind. (Tsunetsugu & Miyazaki, 2005)

The positive impact on mood is proven to be the most significant when humans experience nature such as exercising in a green space for 5 minutes (Barton & Pretty, 2010)

Plants are not only used for aesthetic functions but have health benefits, especially for reducing stress & boredom and increasing concentration and mood. Stress healing itself can be seen from the decreasing number of blood pressure and heart rate. The visual connection is obtained through visuals from natural elements such as vegetation, insects, movement of water, soil, etc.

Besides, according to NASA, indoor plants could reduce the risk of getting sick building syndrome, which is mostly caused by an oversight in making air vents (World Health Organization, 1984). The carbon dioxide that has accumulated, contamination of dust, and lack of cleanliness and maintenance of buildings could cause lethargy and the onset of diseases. Indoor plants can reduce toxins in the air up to 87% in 24 hours (NASA).



## 2. Dynamic & Diffuse Light

Lighting plays an important role in architectural design. Different patterns of light intensity have different effects on psychological responses. Professor Alan Hedge from Cornell University examines the relationship between lighting and office worker performance. Workers who spend an average of about 7 hours per day in front of gadget screens are particularly prone to suffer eye pain, eye strain, and headaches. In his study, Professor Alan proved that natural lighting can reduce eye strain, drowsiness, and relieves headaches. Biologically, sunlight plays an important role in health, namely affecting the production of vitamin D for body resistance and regulating circadian rhythms. Circadian rhythms are sensitive to changes in light. In the normal flow of body activities, namely getting up in the morning and getting enough sleep at night, the circadian rhythm will be affected by the presence of light. The body will automatically refresh in the morning and begin to dim (want to rest) in the afternoon or evening. The flow of cooperation with the rising and setting of the sun. By utilizing sunlight, circadian rhythms can be adjusted so that workers can focus on doing their best work during working hours. (Sleep Health, 2017). Workers who do not receive sufficient lighting tend to feel sluggish and sleepy so that this will also affect their productivity. Therefore, including quality natural light in the office can encourage workers to be more energetic and productive.

## 5.4 Urban Farming

According to Dr. Dickson Despommier from Columbia University, a visionary in urban farming, urban farming procurement needs:

### 5.4.1 Light

As the only source to help plants carry out photosynthesis, light plays an important role. The provision of urban farming needs to pay attention to the intensity, quality, and duration of irradiation. For photosynthesis, the certain

minimum light intensity is required. Less light intensity means photosynthesis will be slow. Conversely, if the light intensity is high, photosynthesis will run faster.

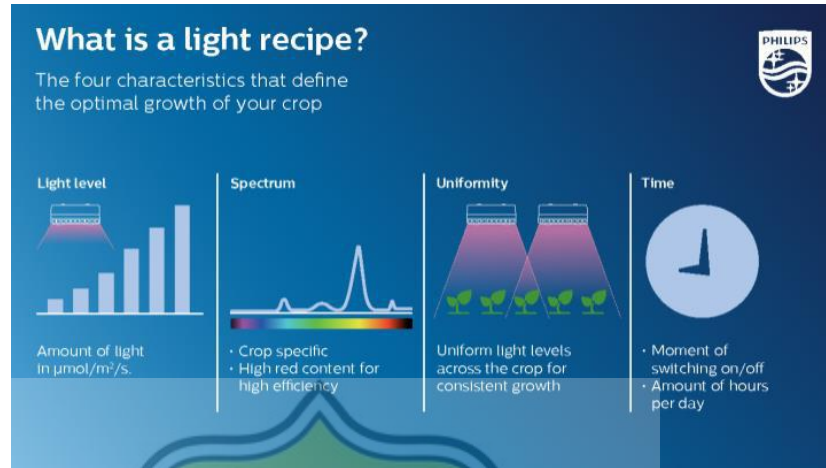


Figure 5. 7 Light Recipe

Sources: <https://www.lighting.philips.co.id>

Sunlight, as the only natural light source, has several spectra and each spectrum has a different wavelength. The differences give a different effect on photosynthesis.

The wavelength of light from long to short is; red, orange, yellow, green, blue, indigo, and purple light. Chlorophyll will absorb all colours of light, except for green light. The red light spectrum is most effectively absorbed by chlorophyll for plant photosynthetic activity.

The light emitted by the sun includes visible and invisible light (ultraviolet and infrared). Visible light has a wavelength ranging from 400 to 700 nm. Meanwhile, invisible ultraviolet light has a wavelength of less than 400 nm, and infrared is greater than 700 nm (produces heat). The most effective colour spectrum for chlorophyll to carry out photosynthesis is red (wavelength 640 - 660 nm) and blue (440 - 470 nm).

In its growth, plants need a variety of wavelengths of light, depending on the type of plant and the growth phase. To produce grapes, tomatoes, and the like, it takes mainly blue light to increase photosynthesis.

Blue light is also needed by all types of green plants and algae, especially for vegetative growth. Meanwhile, the red color spectrum is needed by plants with red leaves for photosynthesis and for the generative development of plants

For lettuce, tomatoes, and bacilli, it requires light of the same wavelengths that red and blue light has for optimal photosynthesis and growth.

Of the many types of lamps available, LED lights are considered the most appropriate for urban farming, replacing sunlight. Apart from being more efficient in electrical energy and durable, LED lamps can produce a larger red or blue light component with light intensity and spectrum that is more like natural light. Therefore, the Start-Up Centre will use LED light for the urban farming spaces.

