

Life Cycle Analysis on Floor Materials (Wood and Granite)

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Abstract: Everyone already knows that products derived from wood are good for the environment, but they are sometimes perceived as being expensive to purchase and maintain. The reality is that the cost of purchasing wood based products is falling every day. Similarly, wooden floor tiles which initially perceived to be expensive have become increasingly affordable over the years and easy to maintain.

Granite is an igneous rock formed from volcanic activity. Granite tile remains a popular flooring choice because of its overall resilience, strength, and number of unique colour options. Its rich varieties of colours make suitable for any kind of building project, whether residential or commercial. It is expensive to acquire but the money spent on granite tiles can be said to be well spent in view of the durability and aesthetic quality it brings to the projects.

However, in comparing granite with wooden tiles, it is necessary to employ the use of Life Cycle Analysis to exhaustively scrutinize both tiles before making a decision. The reason for the Life Cycle Analysis is to find out which product has a better cost advantage, durability, aesthetics, and maintenance and eco-friendly posture.

Keywords: Analysis, Annual, Aesthetics, Durability, Granite, Maintenance, Wood.

1. Introduction:

This article will be focusing on the application of life cycle analysis method in determining what kind of floor finish will better suit an Estate developer's new housing project. The analysis will be viewed based on the product's economic and Eco-friendly posture. In this instance, the developer has been able to successfully reduce his options to granite and wooden floor tiles from among the initial several options. The initial cost of the project will be derived from the actual cost of the tiles plus installation cost.

In order to arrive at a good decision at the end of the Life Cycle Analysis process, it is necessary to consider the following key determinants. Firstly, adequate information about granite and wooden floor tiles has to be gathered. This information includes their durability, resistance under pressure, maintenance, aesthetics and cost. Secondly, the cost inventory or market data of the products has to be correctly taken and thirdly, the correct mathematical equation be adopted to achieve the correct result and ultimately ensure the right business decision for the Estate developer.

1.1. The Problem (Question):

An Estate developer is considering using wooden or PVC floor tiles as floor finishes for a 25 sq. space in his new housing project. The wooden tiles have an initial cost of \$750 and a life span of 20 years. While, the granite floor tile has an initial cost of \$1,175 but is expected to last for only 50 years. The granite tiles will attract an annual maintenance/polishing cost of \$100 while the wooden tiles will require \$200 per year for maintenance. If the interest rate is 12%, which brand of floor tile should he select, assuming both have no salvage values? Please use the present worth method.

1.2. The Aim of Analysis:

The Life Cycle Analysis seeks to achieve the following:

- To make the right choice of product between the two types of floors (Granite and Wooden floor tiles).
- To ascertain the product that is more economically favorable to use in villa designs.
- The one that is more Eco friendly

1.3. Methodology:

The life cycle inventory refers to the data collected and the calculation procedure to quantify the inputs and outputs that are associated with the product alternatives in focus. Procedures of data collection and calculation should be consistent with the goal of the study. The outcome of the inventory analysis will constitute the input for the life cycle assessment and input for the interpretation stage. In this case, the life cycle analysis on Granite and Wooden floor tiles requires the following data for a proper calculation:
(This information collected from Iranian market).

Granite Floor Tiles:

Items	Size/Life Span	Unit Price (N)	Unit Price (\$)	Total Cost (\$) 25m2
Floor Area (m2)	25m2			
Tile size	(600x600x20) mm	N10,500	\$35	\$875
Installation/m2	25m2	N3,600	\$12	\$300
Annual cleaning & Polishing/m2	25m2	N1,200	\$4	\$100
Salvage Value		N0	\$0	\$0
Product Life span	50 years			
Exchange rate		N300	\$1	

TABLE.1. showing and Life Cycle inventory table for Granite floor tiles

Initial Cost of granite tiles covering the 25 square metre space will be actual cost of tiles plus installation cost (\$875 + \$300 = \$1,175).

Wooden Floor Tiles:

Items	Size/Life Span	Unit Price (N)	Unit Price (\$)	Total Cost (\$) 25m2
Floor Area (m2)	25m2			
Tile size	(600x600x20)mm	N6000	\$20	\$500
Installation/m2	25m2	N3,000	\$10	\$250
Annual cleaning & Polishing/m2	25m2	N1,500	\$5	\$125
Salvage Value		N0	\$0	\$0
Product Life span	20 years			
Exchange rate		N300	\$1	

TABLE.2. showing and Life Cycle inventory table for wooden floor tiles

Initial Cost of granite tiles covering the 25 square metre space will be actual cost of tiles plus installation cost (\$500 + \$250 = \$750).

2. Definition of Cycle Analyse:

In the past, economic consideration of alternative designs, construction, or investments has been dependent on only initial (first) cost which ignores the other costs incurred for the investment throughout its lifetime. The idea of life cycle analysis provides an economic instrument that takes into consideration the total costs for an investment throughout its life span. Therefore, Life cycle costing can be defined as an economic assessment of alternative designs, construction, or other investments considering all significant costs of initial costs and ownership costs over economic life of each alternative.

3. Granite:

These are quartz-based natural stone tiles with very smooth finished surfaces and are often considered the queen of the stones for flooring purposes. Salt, pepper and veined patterns, very similar to marble, are very common. They are usually hard and durable. They are resistant to water and weather effects though should still be sealed in moisture-prone rooms. Therefore, they could last a long time.



3.1. Advantages and Disadvantages of Granite.

Advantages:

- **Adds resale value** to the house like hardwood, granite flooring is highly valued by home buyers and, naturally, adds value to buildings.
- **Durability:** properly sealed, high-grade granite is a long lasting choice and can last for a long time
- **Can be used in kitchens, bathrooms:** granite (properly sealed) has excellent water resistance, contrary to hardwood and engineered hardwood flooring.
- **Damage from pets and children:** good quality granite is not prone to scratches or scuffs.

Disadvantages:

- Granite is an expensive flooring choice, and installation costs can make it even more expensive
- It is a natural product. But that doesn't make granite flooring an environmentally-friendly option. Granite like other stones isn't renewable, and quarrying is an energy intensive activity, with serious environmental impacts.

4. Wooden Floor Title (Parquete):

These are made out of factory treated wood materials usually a composition of different wood types like mahogany, bamboo, cherry, oak and walnut that are then combined and cut into wooden blocks. The resulting tiles are then installed in geometric patterns such as contrasting squares or triangles that add an interesting look to the target floor. They are then given a well finished glossy surface.



4.1. Advantages and Disadvantages of Wooden Floor.

Advantages:

- **Value:** Apart from looking like a million bucks, wooden flooring can crank up the value of a space several notches if there's ever plan to sell it
- **Unique:** To ensure each tile is unique, materials are combined and then cut before they are installed. Each floor will have varying types of wood with varying colors and grains. No two is the same when it comes to parquet flooring.
- **Non-allergic:** Unlike carpets and rugs, which can harbor dust, dirt and allergens, wooden flooring provides no place for these unwelcome guests. This is an excellent choice for families with young children, who are at risk of developing allergies, and for people with allergies.

Disadvantages:

- **Damaged by moisture:** Because parquet flooring is made of wood, it is susceptible to moisture and humidity. That said, it is important to manage the humidity and keep the floors dry.
- **Installation is slightly technical** unlike other common floor coverings hence demanding an expert to do the job. This means that it costs more for a good quality floor installation.

5. Impact Assessment:

In the impact assessment stage, the developer will take into consideration the results of the inventory analysis in relation to the environment and human health. In other words, the potential Eco-friendly characteristics of the Granite and Wooden tiles will be critically examined for decision making.

6. Life Cycle Impact Analysis:

This stage involves the developer making his final decision based on his interpretation of the life cycle analysis outcome from the data provided in the earlier two steps above i.e. the inventory and impact analysis stages. The eventual interpretation has to be in line with the goal of this study, which is making the right choice between Granite and Wooden floor tiles. All of the stages discussed above are graphically demonstrated in figure 3 below.

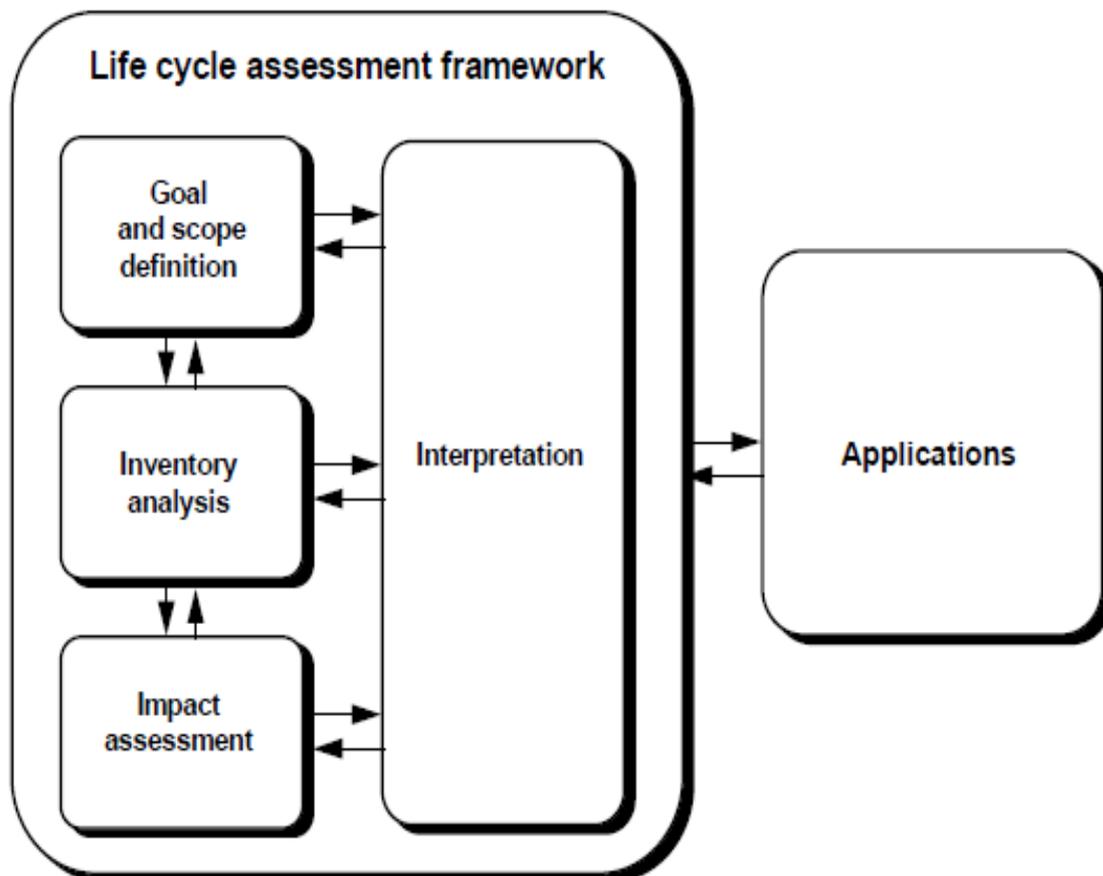


Fig.1. Showing the Life Cycle Analysis Key steps (<http://www.4980.timewarp.at/sat/Zero>)

7. Calculation: Life Cycle Table

Items	Granite Tiles (600x600x20) mm	Wooden Tiles (600x600x20) mm
Initial Cost	\$1,175	\$750
Annual Maintenance cost	\$100	\$125
Salvage value	\$0	\$0
Product Life Span	50 years	20 years

TABLE.3. showing Life Cycle Analysis data focalculation

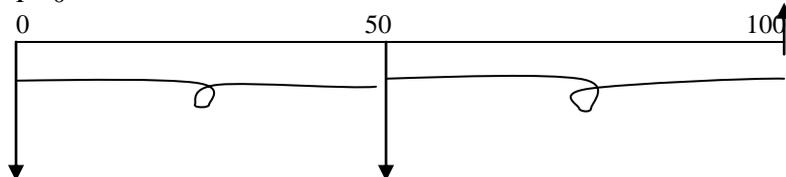
Solution:

To harmonize the years of operation, you must find the least common factor (LCM).

LCM = 12%

Granite Tiles

F= 0



\$1,175 A = 100 \$1,175 A = 100

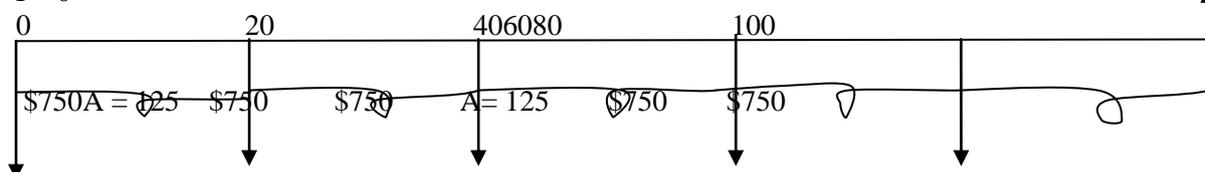
P1 = initial + Installation cost = \$1,175

P-total = P1 + 1,175(P/F, 12%, 50) + 100(P/A, 12%, 100) - 0

Ptotal = 1,175 + 1,175(0.00852) + 100(8.333) - 0 = 1,175 + 10.011 + 833.3 = \$2,018.311

Wooden Tiles

F= 0



P1 = initial + Installation cost = \$750

P-total = P1 + 750(P/F, 12%, 20) + 750(P/F, 12%, 40) + 750(P/F, 12%, 60) + 750(P/F, 12%, 80) + 125(P/A, 12%, 100) - 0

Ptotal = 750 + 750(0.1037) + 750(0.0107) + 750(0.00111) + 750(0.00012) + 125(8.333) - 0

Ptotal = 750 + 77.775 + 8.025 + 0.8325 + 0.09 + 1,041.6 = \$1,878.3225

Wooden Tiles should be chosen over Granite since wooden tiles are < Granite tiles

8. The Advantages of Using Life Cycle Analysis

The following are some of the benefits of using life cycle Analysis:

- Life Cycle Analysis (LCA) helps in reducing energy consumption and greenhouse gas emissions
- It helps in also reducing harmful impact on the air, water and soil.
- It helps in the making of strategic decisions on investments, technology, site installation, product portfolio etc.
- It gives investors an idea of product marketing, product pitch, competitive difference, and environmental labelling.
- It also provides a guide on choice of sustainable products and processes.

Conclusion:

In conclusion, I wish to say that the Wooden tiles should be chosen over granite since they cost less (<) than the granite tiles. They are also more earth friendly because they are wood based products and therefore are sustainable. They are easier to handle on site and provides a better aesthetic effect as opposed to granite tiles. On the overall, the application of Life Cycle Analysis has actually helped the estate developer in making the right choice of product (wooden tiles) for the floor finish for his building project.

Acknowledgment:

I would like to express my very great appreciation to **AIDA ROSTAMI** for her positive energy that impulsed and encouraged me to done this research work.

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