

# Free engineering essay sample

[Education](#), [Sustainability](#)



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## Question 1

Hot-Mix Asphalt Concrete (HMAC) is an energy intensive civil engineering material. According to the Environmental Life-Cycle Assessment studies done on the production of the Hot-Mix Asphalt shows that the process of mixing asphalt and drying of aggregates consumes more energy than the energy required in the extraction of crude oil and bitumen distillation. This aspect is unsustainable since the energy is primarily obtained from fossil fuels (70 to 80% of natural gas is used to produce Asphalt) which are non-renewable energy sources. One way of mediating this shortcoming is to obtain the energy from renewable sources such as solar, wind and geothermal. Another way is to use Natural Asphalt which occurs naturally in some parts of the world and does not require a lot of energy in its preparation for use. The sustainability aspect of the traditional Hot-Mix Asphalt Concrete (HMAC) is its durability and smooth surface. The durability aspect is sustainable since the structures that are built lasts longer and need fewer repairs and therefore reduces the cost in the long run. As compared to other materials such as

bricks, PCC, gravel and stabilized earth HMAC performs relatively well in this aspect.

## **Question 2**

I will use masonry material for the construction of the house. This because the building will be located near the beach and it will be two stories high hence it will require strong materials to sustain the weight of the building and at the same time prevent the occupants from the cold breezes of the beach. The raw materials used in making masonry materials are also easily available, for instance silky sand is available on the site while sand clays is at reachable distance. Therefore the cost of transporting the materials will be minimal and the environmental impact associated with the transportation of the materials will be less. The locally availability of the materials, the high thermal efficiency of the materials, financial viability and the renewability of the sources of materials make this option sustainable.

## **Question 3**

It is sustainable to use engineering wood in making of floor tiles than using a single solid piece of wood/timber for a floor. This is because the materials that are used to make floors are supposed to be durable and water resistant. Using normal wood as the floor materials will require frequent maintenance and may affect the health of the occupants since it is susceptible to rotting when subjected to wet conditions. On the other hand engineered wood is made specifically to meet these requirements as opposed to the normal wood whose natural characteristics cannot allow it to be used as a floor

material. The indicators of sustainability in this case are the durability of the wood, maintenance costs and occupant needs and healthy considerations.

### **Question 4**

Using soil cement pavement (SCP) instead of HMA is the most sustainable option since it mostly makes use of soil which is locally available and cheap. This creates less environmental pollution since fewer materials are transported, it also increases the financial viability as soil is mainly free and the cost incurred is mainly for cement. On the other hand using high-albedo (highly reflective) pavement is the least sustainable option. This is because it requires the use of expensive materials like concrete. The transportation and preparation of these materials generate significant amount of emissions to the environment hence affecting its sustainability. The cost of the materials is also significantly high which affects the financial viability and in extension the sustainability of this method.

Question 5 CMU is the most sustainable since it has the least embedded energy and embedded carbon of the three masonry materials. This means that it used the least energy in its manufacture and released the least amount of carbon in its life cycle. It therefore implies that it affects the environment less compared to the other two and hence it is the most sustainable from the environmental perspective.

### **Question 6**

Sustainability can be defined as the ability to use a material with the minimum impact to the environment and without affecting the ability of the future generations to meet their own needs from the same resource. It

entails using locally available materials in order to reduce emissions and transportation cost. Therefore sustainable engineering materials include recycled materials and they have the following characteristics; have high thermal efficiency, creates less environmental impact, making use of renewable energy, less energy than conventional materials and are financially viable. For instance using natural stones to build a house is not sustainable since the extraction of the stones from the quarry pollutes the environment and the quarries will eventually run out of the stones hence affecting ability of the future generations to also use stones in construction. On the other hand using traditional softwood lumber for construction is sustainable since it is renewable source and it causes less harm to the environment when harvesting and in the process of using it.