3D Printers for Sustainable Construction

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Situation

- An increase in building construction due to an increase in population and growing demands.
- The limited availability in energy and resources that can be utilized in building construction.

Research Question: How can 3D printing contribute to the sustainability of building construction?

Problems

Building construction has two main problems associated with it:
- Waste produced by the building process
- Labour force cost
- Amount of pollution emitted during and after construction[4].
- Time

Table 1: Quantity and Percentage of Non-Hazardous Wastes, 2014 (Tonnes) [1]

<table>
<thead>
<tr>
<th>Source of Waste</th>
<th>Quantity</th>
<th>Waste Total</th>
<th>Method of Disposing</th>
<th>Method of Incineration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Waste</td>
<td>38.0</td>
<td>1,000,000</td>
<td>Burning</td>
<td>Burning</td>
</tr>
<tr>
<td>Municipal Waste</td>
<td>20.0</td>
<td>500,000</td>
<td>Burning</td>
<td>Burning</td>
</tr>
<tr>
<td>Agricultural Waste</td>
<td>10.0</td>
<td>250,000</td>
<td>Burning</td>
<td>Burning</td>
</tr>
<tr>
<td>Slag of Watermills</td>
<td>5.0</td>
<td>125,000</td>
<td>Burning</td>
<td>Burning</td>
</tr>
<tr>
<td>Others</td>
<td>2.0</td>
<td>50,000</td>
<td>Burning</td>
<td>Burning</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>2,025,000</td>
<td>Burning</td>
<td>Burning</td>
</tr>
</tbody>
</table>

Solution

More efficient ways are needed for construction, therefore 3D printing of sustainable buildings could be used.

Software applications such as, AutoCAD can be used to model a 3D construction and interface it with the printer.

A 3D printer can be used on site, and it can be assembled on-site or transported to the site.

Additionally, 3D printers use the exact amount of material needed for a construction which reduces waste emissions [5].

3D construction printers contribute to lower costs in terms of:
- Labour force
- Transportation
- Material

Evaluation

We evaluated our solution in terms of three factors:

- Cost (long and short-run)[6]
- Weight [6]
- Effect on the community

References