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| **Put the title of the paper here with font Bold Arial,**  **size 14pt, centered, length up to 2 lines**  First + Middle (initial) + Last name\*1a(Superscript―[[1]](#footnote-1)\*:Corresponding, 1:affiliation, a:footnote info),  Sullivan T. Smith\*2, Tanaka Ikarashi1a and Ahmed M. Mohamed2b 11pt  *1Affiliation (Department, Institute, Address, Country) with font Arial, size 8 pt*  *2School of Computing and Engineering, Building Performance and Climate Change Research Group, St Mary Road, Ealing, London, W5 5RF*  *(Received*  *keep as blank , Revised*  *keep as blank ,* *Accepted*  *keep as blank )9pt* |
| **Abstract.** This study aimed to develop a model to accurately predict the acceleration of structural systems during an earthquake. The acceleration and applied force of a structure were measured at current time step and the velocity and displacement were estimated through linear integration.……10 pt  **Keywords:** complex terrain; typhoon wind field; CFD simulation; surface roughness length; topography 10 pt  This is an open access article distributed under the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. |

### **1. Introduction 10pt**

The growing awareness of the need to minimise greenhouse gas (GHG) and mitigate climate change has resulted in a greater focus on the embodied carbon (EC) of construction material. Many investigations about reduction of carbon emissions within built environment have been carried out. Blay-Armah et al. (2022) have studied the reduction strategies for buildings’ end of life using circular economy (CE) principles. A general sustainable carbon reduction method has been described by B-Jahromi and B-Armah (2022) ……10pt

### **2. Section title: Level 1**

The system examined, shown schematically in Fig. 1 is a whole life cycle of a building. The building has a total gross area of 280m2. The publications (Mohebbi et al. 2021; Hasan and B-Jahromi, 2020; Gibson and Orr, 2022; Akbarnezhad and Xiao, 2017) are considered also with material selection impacts on carbon emission reduction are investigated. Carbon reduction investigations in buildings concentrating on material selection with characteristics of building components have been studied using mathematical models and the finite element method (Hassan and B-Jahromi, 2020; Blay-Armah et al., 2022). ……

#### 2.1 Numerical simulation procedure

The calculation of embodied carbon emissions of each material of the life cycle can be determined by equation (1):

|  |  |
| --- | --- |
|  | (1) |

Life-cycle assessment (LCA) is a modern tool used to assess the environmental effects of a product throughout its life span - from raw materials extraction to final disposal. It is a systematic and holistic methodological technique to assess the environmental burdens of a product or a process. the building elements and individual materials are displayed in Tables 1-2.……

### **3. Section title: Level 1**

To quantify the operational carbon emissions, the construction materials were assigned to the build elements. The thermophysical characteristics of the building materials, specifically walls, frames, floor, and doors were defined to generate the BRUK-L report.

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| Table  Description automatically generated |
| Fig. 1 An illustrative building whole life cycle 10pt |

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|  | A picture containing text, clipart  Description automatically generated |
| (a) Simulated building by Autodesk® Revit® BIM software | (b) Simulated building Thermal Analysis software (TAS) |
| Fig. 2 3D models for calculating whole life cycle carbon emissions. The two mix designs were different, but had similar objective | |

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| Table 1 Caption 10pt | | |
| **Building Element** | | **Structural element and component** |
| Substructure | Foundation including foundation wall and floor slab | |
| Superstructure | Structural frame: roof beams, columns and tie beams | |
| Roof: steel profile system on tapered insulation | |

Table 2 Caption

|  |  |  |
| --- | --- | --- |
| **Material** | **Weight (kg)** | **Embodied Carbon (kgCO2e)** |
| Aluminium | 117 | 2,670 |
| Concrete | 1,055 | 444 |
| Steel | 2,832 | 2,312 |
| Timber | 1,269 | 21 |

### **4. Section title: Level 1**

*4.1 Subtitle: Level 2*

*4.1.1 Subtitle: Level 3*

The embodied carbon of each material was calculated within the parameters (Fig 1). The results obtained from the preliminary carbon emission analysis are shown in Table 2.

The results show that……

#### Subtitle: Level 4

The results obtained from the preliminary analysis of carbon emission show that the timber contributed the least carbon emissions during the end of life with the total emission of 21 (kgCO2e). The findings of the current study support the previous studies which have suggested that the use of wood results in lower average carbon emission. For instance, Hafner and Schäfer (2018) concluded that timber-based materials can potentially reduce carbon emissions by 9–56% when compared to mineral substitutes. Similar conclusions were made in a study for the UK’s Committee on Climate Change by Spear et al. (2019) which observed that substituting masonry with timber frames can achieve

nearly 20% reduction in embodied carbon emissions.….

### **5. Conclusions**

The aim of this research was to examine carbon emission reduction in construction materials. The life cycle phases included in the analysis were production, construction, operation, and disposal. A case study of a commercial building LCA was performed to evaluate the emissions by individual building materials. A mathematical simulation procedure for predicting reduction was developed.

The reduction of carbon emission depends heavily on the construction material used and construction method……….

### **Acknowledgments**

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