

## Interactive modelling of buildings in Google Earth and GIS: A 3D tool for Urban Planning (Tunjuk Island, Indonesia)

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### Abstract

3D modelling of buildings in Google Earth at Batam city, Indonesia is very important for knowledge about facility, infrastructure, and others. Three-dimensional (3D) visualizations are an interesting method for representing model outcomes. This research in Tunjuk island with coordinate, at Latitude: 0.984123°, and Longitude: 104.225606°, with technical data processing, there are two alternative routes for implementation the result, and they both share the same starting stage. Visible visual measurements of the master plan that has been made has a length 141.99 m and width 54.25 m with location at Latitude 0.984593° and Longitude 104.228073°. Visible visual measurements of the master plan that has been made has a length 92.96 m and width 135.46 m with location at Latitude 0.984593° and Longitude 104.228073°. This paper presented visualization tool for supporting the joint decision making in evaluation of design/renewal proposals in Batam City, Tunjuk Island, Indonesia. 3D building using Google Earth (GE) and combining Geographic Information System (GIS) system be done officially on a sampling or auditing basis by a professional body or by researchers, or it could be done by volunteers and user groups

**Keywords:** 3D modelling, Tunjuk Island, Master plan, Google Earth (GE), Geographic Information System (GIS)

### 1. Introduction

The creation of 3D modelling of buildings in Google Earth (GE) in Batam city, Indonesia is very important for knowledge about facility, infrastructure, and others. The creation of 3D modelling of heritage and archaeological objects and sites in their current state requires a powerful of methodology able to capture and digitally model the fine geometric and appearance details of such sites (Li *et al.*, 2008).

Renewal and urban planning in Indonesia is practically a complex decision-making process, which involves many actors, who perform different tasks and have diverse points of view. In such projects, the actors have often conflicting expectations, background and foci. The steps to approve a planning (or design) proposal or a renewal project are many, as the approach varies per municipality and country. For example, in Indonesia six phases can be distinguished starting from a very general vision for development and finishing with a

detailed architectural plan of each building in the area (Faiztyan *et al.*, 2015). Mapping of the information on Kepri island/ Batam city, Indonesia according in (Farizki & Anurogo, 2017; Aprilliyanti & Zainuddin, 2017; Sari & Lubis, 2017; Lubis, & Daya, 2017; Lubis *et al.*, 2017a; Lubis *et al.*, 2017b; Anurogo *et al.*, 2017).

Design traditionally, during evaluation proposals municipalities use 2D paper maps, CAD drawings, graphical images, textual/oral information and 3D physical models to present ideas and discuss alternatives to citizens. The municipalities of most have websites for dissemination of spatial plans, but they are in 2D and in most cases, offer only static visualization. Only recently large municipalities may employ systems allowing for presenting interactive digital maps for the public in Web Map Services (WMS) (Knap and Coors, 2008; Scorza *et al.*, 2010).

Despite recent developed tools and systems to support in 3D visualization for municipalities (e.g. Reitz *et al.*, 2009) and virtual exploration of cities (e.g. www.cebra.eu), the interest in virtual globes (3D Geospatial Browsers) as Google Earth (GE) is increasing. Being freely available, citizens are largely familiar with the navigation and interaction options in these tools and can participate relatively easily in the discussions. The contribution of this paper is an interactive modelling for synchronous and asynchronous communication in 3D tool for urban planning in Tunjuk Island, Indonesia.

## 2. Methodology of the implementation

This research In Tunjuk island with coordinate at Latitude: 0.984123°, and Longitude: 104.225606°, with technical terms, there are two alternative routes for implementation, and they both share the same starting stage (i.e. deciding on location for generating the geometry of the footprint) number of stories and storey height. Then the building geometries can either be;

- a. Generated and visualized on-the-fly and stored later.
- b. Generated and stored in the first stage and visualized later. These two alternative routes are illustrated in Figure 1, and research location can be seen in Figure 2.

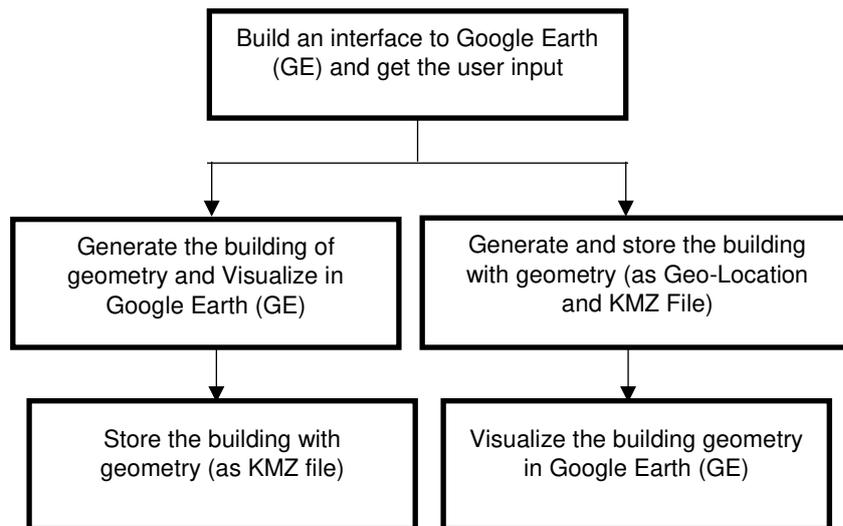


Figure 1. Routes for generation of Building Models based on user interactions

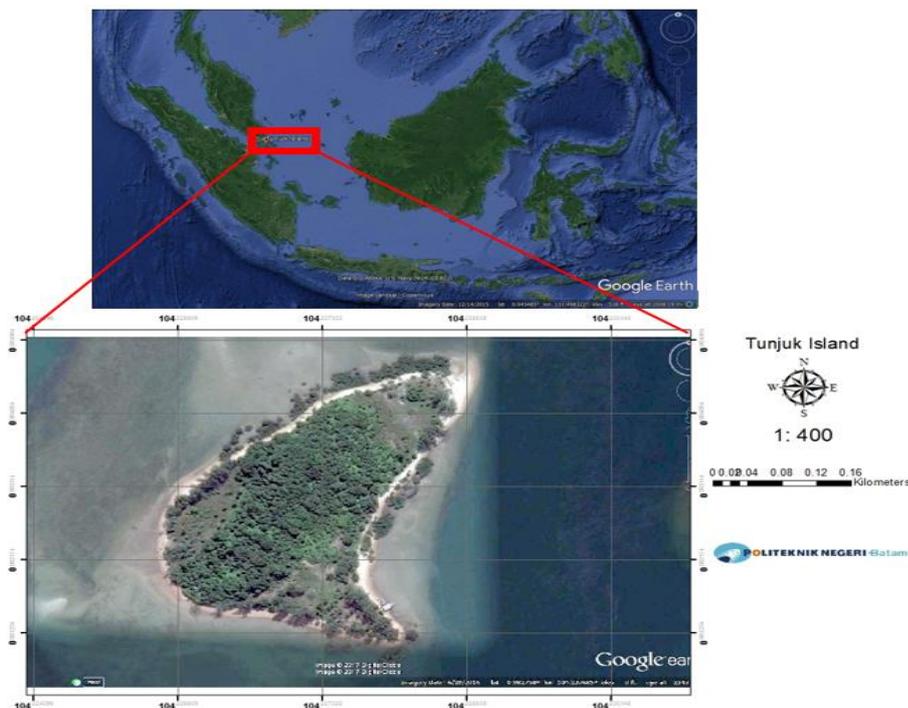


Figure 2. Research location for 3D building in Google Earth (GE)

The method chosen for implementation will not cause any technical difference, i.e. both implementations will provide the same output, in fact, generating the geometries on-the-fly and storing them in a later stage might bring performance efficiency for (the time behaviour of) the software (Figure 1).

## 5. Result and Discussion

### 5.1 Google Earth as tool for visualization and communication

3D Geospatial Browser is a new term for defining browsers that are capable of retrieving geospatial data over the web and visualizing it over a virtual globe (in form of raster and vector representations). In most 3D Geospatial Browsers it is possible to search for an address, a point of interest, as well as a coordinate pair. In addition, it is also possible to navigate (pan, zoom, rotate etc.) by

using simple and user-friendly mouse functions or appropriate toolbars. Most known 3D Geospatial Browsers are Google Earth, Microsoft Virtual Earth and NASA World Wind. The data that forms the base layer of the virtual globe is satellite images with varying resolution where the resolution of the images change depending on the user interaction with the browser.

Google Earth is the most popular 3D Geospatial Browser. In Google Earth, for most parts of the world the terrain data is available in form of the Digital Elevation Model (DEM), and the terrain can be visualized in 3D, although for many areas not that accurate. The user input is a very important resource of data, and there are many map layers created by the user input. Users can create their own points and areas of interest (i.e. placemarks). Visualization of one object 3D building models in Google Earth in Tunjuk island can be seen in (Figure 3).

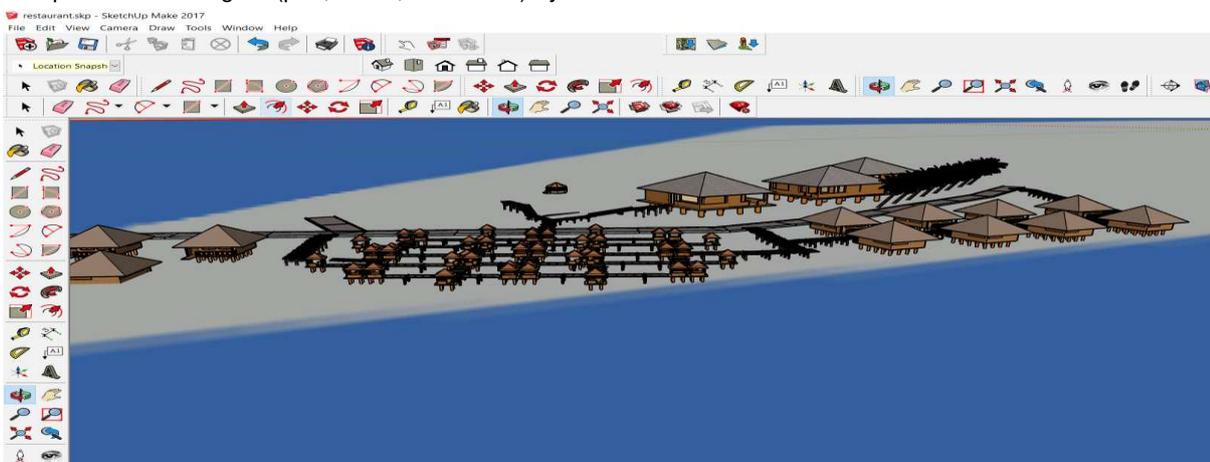


Figure 3. Visualization of one object (Restaurant) 3D building models in SketchUp to Google Earth

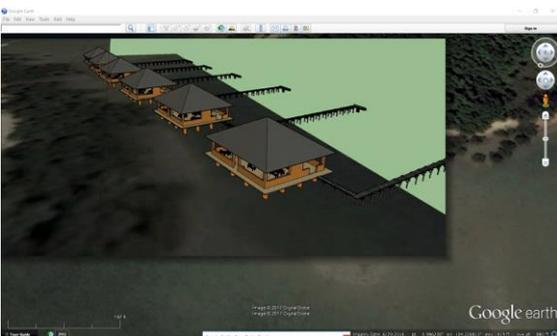


Figure 4. Visualization of one object (Restaurant) 3D building models in Google Earth

Google Earth has the ability to visualize the 3D representations (models) of the buildings which are created by the user input. These models can then be viewed by all the users of the software. The buildings visualized in Google Earth, are usually created through a 3D modelling software such as SketchUp or other 3D modelling software and imported as KML/KMZ file (Figure 3).

The representation of the building in Google Earth is a BRep (Boundary Representation) model, in addition, these models can also have textures

associated with them. Google Earth was originated from the software called Earth Viewer, created by Keyhole Inc. Thus, the mark-up language (used to represent the geometric models in Google Earth) is known as Keyhole Markup Language (KML) (Figure 4).

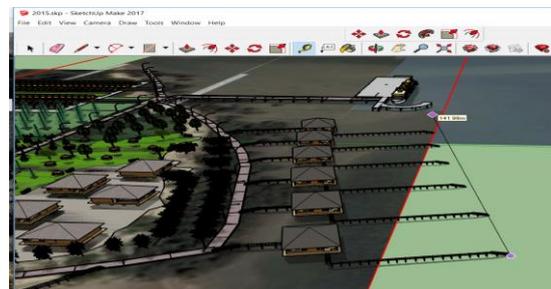


Figure 5. Measuring of one object (Restaurant) 3D building models in Google Earth

In (Figure 5) visible visual measurements of the master plan that has been made has a length 141.99 m and width 54.25 m with location at Latitude 0.984593° and Longitude 104.228073°. Figure of dock can be seen in (Figure 6).

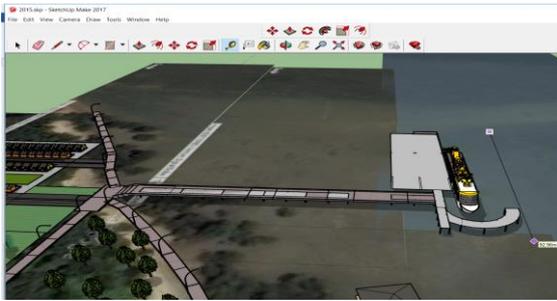


Figure 6. Measuring of one object (Restaurant) 3D building models in Google Earth

In (Figure 5) visible visual measurements of the master plan that has been made has a length 92.96 m and width 135.46 m with location at Latitude 0.984593° and Longitude 104.228073°. With the incorporation of development-based applications, GIS, and Google earth can know the location, size and design of the appropriate building we want. Result of mapping using data from Google Sketchup (GE) and Google Earth for location and base map to building same object can be seen in (Figure 7).



Figure 6. Layout of 10 object 3D building models in GIS

Figure 6 describes the existence of 10 objects underlying the development of a master plan in the Tunjuk island region of Indonesia by combining 3 aspects of the field of design, positioning and mapping. In this case, the Google Earth visualization serves more to lead viewers to compelling information about 3D building than to add value via its own imagery. In more participatory applications of virtual globes, experts can benefit from the feedback readily enabled by government (Sheppard & Cizek, 2005). The original participatory GIS movement seems to advocate a multiplicity of voices and perspectives as the solution to bias in decision-making (Sieber, 2006) but without some agreement on common standards, confidence in the visualization work of interest groups such as developers, industry, environmental NGOs, or even

computer experts may be compromised, important in Batam City, Tunjuk Island, Indonesia. Many of these problems are not completely new, however. Existing principles and emerging codes of ethics, developed primarily for landscape visualization in the field of urban and land use planning, are relevant to the new generation of web-based GIS and visualization tools, and could be adapted and integrated into the software delivery systems for 3D building in Batam City, Tunjuk Island, Indonesia. This is particularly important in assessing the accuracy and validity of predictive visualizations after the construction of the proposed development project or land use plan. 3D building using Google Sketchup (GE) and combining GIS system be done officially on a sampling or auditing basis by a professional body or by researchers, or it could be done by volunteers and

user groups. Frequent virtual earth users might develop an informal code of conduct through negative feedback and public exposure of inappropriate visualization material, drawing on the wisdom of crowds (Crampton, 2009), and perhaps serving to discourage poor practice in creating visualization. While there is often a tangible body of knowledge and opinion in Indonesia.

## 5. Conclusions

This paper presented a rapid visualization tool for supporting the joint decision making in evaluation of design/renewal proposals in Batam City, Tunjuk Island, Indonesia. With the incorporation of development-based applications, GIS, and Google earth can know the location, size and design of the appropriate building we want. The original participatory GIS movement seems to advocate a multiplicity of voices and perspectives as the solution to bias in decision-making. 3D computer modeling skills, and understanding of social responses to landscape imagery is needed. 3D building using Google Sketchup (GE) and combining GIS system be done officially on a sampling or auditing basis by a professional body or by researchers, or it could be done by volunteers and user groups.

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