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Research Note

A pictorial approach to geodesign: A case study for the Lower Zambezi valley

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HIGHLIGHTS

- It proved possible to adapt a geodesign tool for use in a data scarce environment.
- The qualitative approach provided flexibility in problem definition.
- The approach is a typical case of "less is more".
- Using a touch screen was effective in engaging participants to provide their input.
- The use of the tool generated a sense of joint ownership of the workshop results.

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ABSTRACT

This article shows how experiences with geodesign in data rich environments such as the Netherlands and the UK can be used to support interactive workshops in the data scarce Lower Zambezi valley, Mozambique. A pictorial geodesign tool was developed that relied on a combination of drawing, use of icons and visualization. The tool required no calculations. The tool was used to support stakeholder workshops as part of an ongoing planning process in the lower Zambezi. Objectives of these workshops were to identify matching and conflicting sectoral claims and to prioritize these claims. The workshops produced maps for each region representing the groups' assessment of the sectoral claims in combination with a written report of all comments made. Despite the simple design, the tool served its purpose well. It was interesting to observe that it was possible to use the principles of more sophisticated tools in an approach that was simpler but much more graphical as a means of promoting discussion and understanding.

1. Introduction

Computers get faster, models more sophisticated and human-computer interaction more flexible (Mack, 2011; Li & Milburn, 2016). These developments lead to a drive for sophisticated tools that perform calculations in real time to produce detailed quantitative results. This is fine if you have plenty of time and money, know exactly what is required and have lots of data. But even then, having a sophisticated model is frequently at the expense of flexibility, preventing adaptation to changes in problem definition or unexpected ideas from participants. This is even more the case if problem definition is vague, spatial data are of mixed quality and the skills of the participants are unknown.

The use of maps in collaborative workshops provides a shared platform for exchanging ideas (Carton & Thissen, 2009). As digital mapping tools became more easily available emphasis shifted from paper maps to digital maps. With the arrival of large touch screens, these maps evolved further into interactive maps. In the same time involvement of stakeholders in the planning process shifted from being informed to participation and collaboration (Sieber, 2006). New types of support systems labelled as participatory GIS (PGIS) and public participation GIS (PPGIS) followed this development (Alexander et al., 2012; Balram & Dragicevic, 2006; Brown, 2012; Dias, Linde & Scholten, 2015; Geertman & Stillwell, 2009). To support collaborative tasks, visualization tools, optimization tools and evaluation tools such as multicriteria analysis were added (Allain, Plumecocq, & Leenhardt, 2017; Arciniegas & Janssen, 2012; Jankowski, 2009; Stewart & Janssen, 2014). Finally, geodesign tools combine the use of interactive maps with decision support and graphical design tools (Bishop, 2013; Eikelboom & Janssen, 2015; Pelzer, Geertman, Heijden, & Rouwette, 2014). Geodesign

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Fig. 1. Lower Zambezi Valley.

tools provide the interface between stakeholders and spatial information. Geodesign is defined as "a design and planning method which tightly couples the creation of design proposals with impact simulations informed by geographic contexts, systems thinking and digital technology '(Steinitz, 2012; p.12). Using the interactive map as a common interface, geodesign can act as a medium for synthesis to promote exchange among scientist and decision makers and can engage stakeholders in affecting landscape change (see also Nassauer, 2015). Interactive tools, that use icons or drawing to identify issues on a map have matured in the last decade and have become available as commercial or non-commercial services on the web. Examples include "Greenmap' that created a set of common symbology for environmental mapping (Tulloch & Graff, 2008). 'Softgis', a methodology developed at the Aalto University also uses symbols on a web-based map to collect local knowledge and location-based classification of experiential knowledge (Kyttä, Broberg, Tzoulas, & Snabb, 2013; Rantanen & Kahila, 2009). This method has successfully evolved into a commercial service called "Maptionnaire" (https://maptionnaire.com/). Similar approaches to support valuation and evaluation of land suitability are a new development in this field.

This article demonstrates how experiences with geodesign in data rich environments such as the Netherlands (Janssen, Eikelboom, Brouns, & Verhoeven, 2014) and the UK (Alexander et al., 2012) can be used to design an approach for interactive workshops in the Lower Zambezi valley, Mozambique. Instead of a model based application that provides real time response to proposed changes, a pictorial geodesign tool was developed that relied on a combination of drawing, use of icons and visualization to facilitate interaction with the participants. The approach required no calculation steps and depended on input provided by the local stakeholders.

The workshop design and implementations described in this paper were carried out within the scope of the public participation activities of an ongoing planning process in the lower Zambezi (Fig. 1). This planning process was commissioned by Ministry of Environment and is coordinated by the Agência de Desenvolvimento do Zambezi (Zambezi Development Agency) to develop the Special Spatial Plan for Tete Province (PEOT); this plan will be embedded in Mozambique law that will constrain and facilitate future spatial developments. The workshops were conducted in the Zambezi valley in Songo, Tete and Caia in May 2015 (Fig. 1).

The Lower Zambezi Valley occupies an area around 150 thousand km^2. The Zambezi is the largest river in Mozambique and runs from mountainous regions in the north-west to low altitude plains and the Zambezi delta close to the coast. The region is inhabited by 3,5 million residents from diverse socio-cultural backgrounds with a large rural population dependent on subsistence agriculture. In the north is the Cahora Bassa hydroelectric facility which delivers a substantial share of the regional GDP. The north is also rich in mineral resources. In the centre and south the largest economic contribution is from commercial agriculture. In the south conservation and fisheries are also important sectors. The development of megaprojects for coal exploration in the Tete province and additional hydro resources exploration may deliver an additional economic boost, depending on the alternative scenarios implemented for the regional development within the framework of this study. The megaprojects include large-scale coal mining in the Tete region (expected to increase from the current yearly 4 million tons to 20 million tons per year by 2018), the expansion of hydropower generation, and irrigation projects following irrigation demand within a changing climate (World Bank, 2010). Additional challenges include threatening the already vulnerable ecology of the lower Zambezi delta, a RAMSAR site (Hoekstra, 2003), and its associated prawn fisheries (Hoguane & Armando, 2015). These developments call for an integrated and collaborative planning environment where local knowledge of sectoral stakeholders may play a crucial role in understanding the developments, trends and opportunities, but also potential local impacts of the different choices of future land uses.