How to support the design and evaluation of redevelopment projects for disused railways? A methodological proposal and key lessons learned

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ABSTRACT

Finding a new use for neglected infrastructures, such as disused railways, provides an opportunity for low carbon travel experiences as reconversion policies promote new uses, arrest decay processes and re-establish continuity in the environmental system, using existing linear infrastructures. Nevertheless, the decision of what to do in order to reuse abandoned railways represents a complex decision making problem, involving heterogeneous impacts and stakeholders. Within this context, Multi Criteria Analysis techniques can be used to synthesize stakeholders' preferences by accommodating conflicting and incommensurable impacts. The present study thus uses Multi Criteria Analysis to answer a real demand for transportation systems' planning coming from the Piedmont Region Authority in Italy, where 12 passenger railway lines have recently been abandoned and replaced by bus services.

The main objective of the study is to develop a methodological framework able to support collaborative planning and decision-making processes related to the requalification of disused railways in mixed urban and rural contexts.

The ultimate objective is to provide a robust recommendation to the Regional Authority with reference to the best requalification option for one of the abandoned railway lines in the Region. The contribution brought by the study is twofold and refers to: (i) improved operability of the proposed tools obtained by combining visualization analytics with consolidated preference elicitation protocols for assessing multiple impacts and (ii) the provision of a replicable working tool for policy makers. The study has thus an innovative value and may increase the use of Decision Analytics to support the evaluation of environmental impacts of different transportation systems.

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1. Introduction

The gradual increase in private mobility, dating back to the second half of the last century in western countries, has caused the shutdown of several secondary railway lines which are rarely used and therefore little profitable to any institution, either owner or manager (Guerrieri and Ticali, 2012).

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The disused railways are potential new pathways and the abandoned stations provide available spaces for new activities, supporting sustainable local development and regeneration processes.

Consequently, disused railway sites are becoming a focus of redevelopment projects in many European countries (Bertolini and Spit, 1998). First, the economically attractive location of such sites, close to or even within the central districts of cities, gives them a potentially high land value. Second, they often account for the largest, well connected development areas within European metropoles (Bertolini and Spit, 1998). Third, such railway brownfields benefit from their relatively small reclamation costs compared with former heavy metal industry areas. Last, the economic demand to develop such sites has been intensified by the reorganization or privatization of national railway groups, thereby leading to the spin-off of major real estate enterprises responsible for the development of these inner city brownfields. For these reasons railway brownfields are of major interest to urban redevelopment projects (Altherr et al., 2007).

Within this context, the identification and evaluation of feasible alternatives for the requalification of disused railways is not an easy task. It is indeed an inherent multi-attribute problem, characterized by many different dimensions pursuing heterogeneous and often conflicting objectives. Moreover, decision-making in this context is often complicated by (i) multiple stakeholder views that call for a participative decision process able to include different perspectives and facilitate the discussion, (ii) long time horizons which add further structural uncertainty to the decision making process, (iii) the irreversible allocation of scarce public resources, and (iv) the need for legitimation and accountability of both results and processes (Tsoukiàs et al., 2013).

Multicriteria Decision Aiding (MCDA; Figueira et al., 2005) which nowadays represents a consolidated approach to decision making in many different contexts, including the analysis of transportation systems (e.g. Colorni et al., 1999; Filippo et al., 2007; Karlson et al., 2016; Vreeker et al., 2002), can play a fundamental role in supporting the design and evaluation of competing alternatives against a set of heterogeneous and conflicting objectives to be achieved (e.g. Ferretti, 2013).

A solution that seems particularly successful worldwide for the functional upgrade of the disused road patrimony consists in the conversion of railways into greenways dedicated to "soft mobility" (i.e. walking and cycling routes). The following reasons support the success of this type of requalification measure: (i) separation of railway sediment from the ordinary road network; (ii) reduced number of intersections with the road network; (iii) moderate longitudinal slopes; (iv) long straight roads and large horizontal radii; (v) width compatibility between the railway platform and that for cyclists and pedestrians; (vi) interconnection between urban centers and routes passing often through areas of great natural value, hardly accessible by alternative modes of transport; and (vii) links with other public transport services (Guerrieri and Ticali, 2012).

The objective of this contribution is twofold. The first one is to provide a transparent and transferable methodological framework able to (i) support collaborative decision-making and planning processes related to the requalification of disused railways in mixed urban and rural contexts, (ii) provide insights on what needs to be improved on specific alternatives and (iii) provide justification and legitimation to the final recommendation. Indeed, public policy makers are often confronted with limited available resources and thus need tools and processes for studying competing options and selecting the best one. Moreover, both tangible and intangible impacts are likely to play a key role in the definition of the best solution and the tools thus need to be able to handle both types of information, as it is the case in MCDA. The methodological framework proposed in this paper is based on the use of MCDA and is thus able to support the negotiation among different stakeholders/ decision makers for a solution on how to tackle the functional requalification of disused railways, highlighting argument in favor and against the different options (as will be shown in Sections 3 and 4).

The second objective of the study is to investigate which role decision analytics can play to support heterogeneous impacts' aggregation in transportation planning, by discussing the operability, the applicability and the transparency of the proposed tools.

In particular, our study answers a real demand for mobility planning and management coming from the Piedmont Region in Italy, where 12 passenger railway lines have recently been abandoned and replaced by bus services. Despite the national characteristics of the territorial context under analysis, the topicality of the problem provides it with international relevance, as there are hundreds of thousands of kilometres of inactive railways and together with them station buildings that fall into disuse, thus increasingly constituting an important heritage asset worldwide.

The ultimate objective of the research is to provide a robust recommendation to the Regional Authority with reference to the best requalification option for the abandoned railway line under analysis (Section 4).

The study is intended to help urban as well as regional planners, policy and decision-makers, land managers and public organizations to understand, evaluate and manage complex territorial systems characterized by multiple values.

It is worth highlighting that this study has an innovative value due to the following reasons: (i) it tests a visual elicitation protocol for preference elicitation in order to facilitate the application of the Multi Criteria Analysis Approach in planning and design contexts with real stakeholders and decision makers, (ii) it uses facilitated modeling (Franco and Montibeller, 2010) throughout the whole decision making process, and (iii) it represents the first application of a Multi Attribute Decision Analysis approach (Fishburn, 1967) in the context of abandoned railway lines requalification, as well as one of the first applications of MCDA in the same context.

The contribution brought by the study is thus twofold and refers to: (i) improved operability of the proposed tools obtained by combining visualization analytics with a specific MCDA technique named Multi Attribute Value Theory (MAVT, Fishburn, 1967) and (ii) provision of a transferable working tool able to support planning and design processes of other abandoned railway lines to be recovered.