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An Integrated Assessment framework for the requalification of districts facing urban and social decline

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Abstract The ecologic issue highlighted by the Encyclical letter *Laudato Si'* (2015) is a complex problem involving environmental, economic and social aspects. The aim of this paper is to propose an Integrated Assessment (IA) framework based on the systematic application of the Stakeholders' Analysis (SA), the Strategic Choice Approach (SCA), the MACBETH Multicriteria Analysis and the Discounted Cash Flow Analysis (DCFA) to support the decision process related to the requalification of districts facing urban and social decline. In the proposed approach the SA is used to determine the key actors involved in an urban and territorial transformation. While the SCA is used to identify potentialities and constraints of an urban area to define a master plan, the MACBETH method is applied to compare different alternative projects and the DCFA aims at evaluate the economic performance of the proposed intervention. As a case study, the IA framework has been applied to a simulated academic process for the transformation of the Tūr und Taxis district near the Molenbeek district in Brussels (Belgium). During the research we interfaced with many real stakeholders involved in the transformation of those areas.

CHAPN.1 Introduction

In recent years, the urban and territorial transformations are at the core of a huge debate that focuses on the multidisciplinary sustainability concept and involves economic, environmental and social aspects. As a matter of fact, the growing consumption of natural resources, the global financial crisis and the profound social changes highlighted the need for a radical improving in the urban transformation approaches. In this sense, the human factor has become fundamental to pursue the integration of different social groups and the improvement of the living conditions (Lami and Abastante 2017). With this respect, one of the main argument of the Encyclical letter *Laudato Si'* (2015) is the “fragmentations of the cities” (p.38) understood as physical and social wounds. In the aforementioned Encyclical letter, the Pope Francesco I underlines that “the components of the global change include the social exclusion, the growth of the violence and rage and the lost of the social identity [...] This shows that the current idea of progress did not bring to a bettering of the quality of lives [...]. Those signs are symptoms of an alarming social decline” (p.34). [In order to face this complex problem] the decision processes should be transparent and opened to the dialog [...] to produce sensible solutions shared among the parties involved in the transformation at stake” (p.140).

This concept requires for qualitative and quantitative methodologies able to support the urban and territorial transformations considering environmental,

economic and social aspects in an integrated perspective. According to Bryman (2006), “combining quantitative and qualitative research has become unexceptional and unremarkable in recent years” to pursue the concept of “knowledge generation” (Te Brömmelstroet and Bertolini 2010). This concept is essential to find planning solutions not only coming from the “expert knowledge”, but also legitimated by “common knowledge” (Cerreta and Del Toro 2012).

The present research contributes proposing an Integrated Assessment (IA) framework (Lee 2006, Creswell et al. 2011) in which the concept of “evaluation” is conceived as deeply embedded in the urban transformation decision processes, affecting and evolving with them. The IA framework proposed is based on the systematic application of the Stakeholders’ Analysis (SA - Ackermann and Eden 2010), the Strategic Choice Approach (SCA - Friend and Hickling 2005), the Multicriteria Analysis (MCDA - Figueira et al. 2005) and the Discounted Cash Flow Analysis (DCFA - DeFusco et al. 2015).

As a case study, the IA framework has been applied to a simulated academic process for the transformation of the Tūr und Taxis district near the Molenbeek district in Brussels (Belgium). Despite this area is located near the city centre of Brussels, it is characterised by a physical and social decline. The huge discomfort felt by the people living in it, brought to the recent exacerbation of the social relationships resulting in international terror phenomena. It is important to underline that the IA framework proposed does not intend to solve terrorism matters but it can constitute a useful method for assessing complex urban and territorial problems.

The reminder of this paper is organised as follows: Section 2 overviews the proposed IA framework. In addition, the main principles of the four methodologies applied are represented. Section 3 illustrates the simulated academic process in which the IA framework has been tested and finally, Section 4 proposes a discussion of the results and possible developments.

CHAPN.2 Integrated Assessment Framework

Among the different IA methods (Creswell et al. 2011), the multi-phase one has been chosen since allows structuring the subsequent phases of the problem formulation having a dataset built on the results of the previous one (Creswell and Plano Clark 2011, Bottero 2015). The SA, the SCA, the MCDA and the DCFA are powerful methods of analysis and evaluation and that can inform each other and foster synergies. The IA framework proposed is represented in Table CHAPN.1 highlighting strengths and weaknesses of each adopted method.

Table CHAPN. 1 The characteristics of the adopted methods

	SA	SCA	MCDA	DCFA
Input	Stakeholders involved.	Positive and negative impacts, qualitative and quantitative data.	Positive and negative impacts, qualitative and quantitative data, utility functions, weights.	Costs and revenues, discounted rate.
Output	Strategy to adopt.	Strategy to manage uncertainty.	Ranking, compatibility judgement.	Judgement of private convenience.
Participation	Fundamental.	Fundamental.	Fundamental.	Possible
Strengths	It allows identify powers and interests of the stakeholders.	It decomposes complex problems.	It represents a decision process with high plausibility.	Communicative results.
Weaknesses	It requires an effort to identify the stakeholders.	It requires huge amount of information.	Subjectivity, sometimes it gives variable results.	It does not consider externalities.

The SA is used to explore the social relationships' contexts and to identify the key actors involved in the urban and territorial transformation. The SCA can be applied to structure a workshop aimed at identify potentialities and constraints of a urban area and to define masterplan's proposals. The MCDA can be utilized to compare different alternative projects and to define the main criteria to be considered for an effective project. Finally, the DCFA aims at evaluate the economic performance of the proposed intervention.

CHAPN.2.1 Stakeholders' Analysis (SA)

In territorial transformations, the stakeholders are understood as individuals or organisations that make actions able to influence the decisional outcomes (Dente 2014). They represent the core of any possible theoretical model because they have access to different resources, they can play different roles and they pursue multiple goals regarding the problem in exam and its possible solutions. Therefore, the first step of a decision process consists in the identification of the stakeholders and their objectives. To this end, many stakeholders mapping techniques exist (Ackermann and Eden 2010).

The present research focuses on the "power/interest grid" technique revised by Ackermann and Eden (2010). Through this SA technique it is possible to answer to those following questions: Who the stakeholders are; Are there any coalitions or conflicts among them; Which are the stakeholders' interests; How can the stakeholders' reach their goals. The "power/interest grid" allows analysing four categories of stakeholders according to their possibility of affecting the decision

process. The stakeholders are identified as “Subjects” and “Players”. In fact, while the “Subjects” have low influence in the transformation in exam, the “Players” have a high degree of power to support (or sabotage) the project. The two remaining categories can be seen as “potential” stakeholders; the “Crowd” is a potentially infinite category since it exhibits neither interest in nor power to influence the process. On the contrary, the “Context Setters” could have a greater power to influence the process but they have not showed interest to it.

CHAPN.2.2 Strategic Choice Approach (SCA)

The SCA is a decision-centred methodology for “planning under pressure” (Friend and Hickling 2005). It allows dealing with the uncertainty of problematic situations and decisions being carried out to assist a group of stakeholders in deciding on which strategy to follow, showing the relationships between seemingly unconnected sectors. Through the SCA, the stakeholders try to clarify situations and resolve uncertainties by raising and comparing alternatives for making decisions of strategic nature and discussing solutions. According to Friend and Hickling (2005), the SCA decomposes the decision process into four cyclical modes: 1) In the *shaping mode* the stakeholders establish which are the decision areas and the decision links in order to decide which areas are urgent. A decision area is an opportunity for choice in which two or more different courses of action can be considered. A decision link is a relationship between two decision areas expressing a belief that it could make a difference to consider them jointly instead of separately; 2) In the *designing mode*, the most urgent decision areas are analysed in details in terms of different decision options and their interconnectedness. During this phase, the Analysis of Interconnected Areas (AIDA) is applied in order to identify the incompatibilities among the options outlying the different feasible combinations; 3) In the *comparing mode*, the various combinations of the decision options previously identified are compared basing on different key criteria; 4) In the *choosing mode* the stakeholders develop considerations about the uncertainties affecting the most promising decision options schemes. Moreover, they try to identify stepwise decisions in order to deal with the uncertainties emerged.

CHAPN.2.3 MultiCriteria Decision Analysis (MCDA)

The Multicriteria Decision Analysis (MCDA) is a widely used tool in territorial transformations context (Figueira et al. 2005). MCDA allows several criteria to be taken into account simultaneously in a complex situation making comparative assessments of alternative options or heterogeneous measures. They are designed

to help the stakeholders to integrate the different options in a prospective or retrospective framework (Lami et al. 2014, Lami and Abastante 2014). As MCDA approaches are countless, it is necessary to reflect on the most suitable method for the decision context at hand (Roy and Slowinski 2013). In the present research, we choose to apply the MACBETH method (Measuring Attractiveness by a Categorical Based Evaluation Technique) (Bana y Costa et al. 2010), which is based on the Additive Value Model and requires only qualitative judgements about differences of value to help a group of stakeholders quantify the relative attractiveness of the options. Starting from the qualitative judgements, the MACBETH method allows the construction of quantitative values model supporting an interactive learning process about the problem and the elaboration of recommendations.

The MACBETH method application can be divided into three main phases: i) During the *Model Structuring* phase, the options and their performances as well as the values of concern are identified and organised in a visual overview; ii) In the *Evaluating* phase, the MACBETH involves a series of pairwise comparisons, where the stakeholder is asked to specify the difference of attractiveness between the alternatives and the criteria according to the following semantic categories: Extreme, Very strong, Strong, Moderate, Weak, Very Weak, No (no differences between the elements); iii) the *Analysis of the results* aims at discuss the results in the form of ranking allowing identify the attractiveness of the problem's criteria and/or alternatives.

The choice of this particular MCDA methodology is due to several reasons. First the MACBETH is a simple and understandable methodology even by those who are not experts in the decision process. Second, its technical parameters have a clear and easily explicable substantive interpretation allowing the processing of difficult problem of relative importance of criteria in a precise way. Final, the M-MACBETH software involved and the interaction protocol are compatible with the way of reasoning of the inquired people and with their meaning of useful results.

CHAPN.2.4 Discounted Cash Flow Analysis (DCFA)

The DCFA is a very well known economic and financial analysis, which aims at the maximization of the monetary income that can be obtained from an investment. The DCFA identifies the full range of costs and incomes of a project in order to allow the stakeholder understanding if minimum objectives are achievable (Bottero 2015). Generally speaking, the realization of a territorial transformation is not an immediate monetary operation: the costs and incomes connected to the transformation at stake are distributed in a time span and are not

homogeneous. Therefore, it is necessary to face two different problems: to evaluate the transformation's costs and incomes related to each year of the project and to homogenize all those values and actualize them to the present time.

A DCFA involves four main steps: i) defining the cash-flow (cash payment and disbursement) period; ii) determining the final value; iii) choosing the period of the analysis; iv) determining the economic and financial performance criteria. The fourth step is crucial in order to allow the stakeholders to interpret the indicators and understand if the transformation is feasible or not. The most used performance criteria are the Net Present Value (NPV) and the Internal Rate of Return (IRR). The NPV is the principal profitability indicator representing the difference (in monetary terms) among the costs and revenues. The IRR is the interest rate at which the net present value of all the cash flows from a project equal zero. It is possible to state that the transformation at stake is feasible if the IRR is greater than a pre-determined threshold.

CHAPN.3 Case study

The IA framework presented has been applied to an academic process³ for the transformation of the Tūr und Taxis district in Brussels (Belgium). However, the case study has been subject to a real discussion from the Municipality of Brussels around the possible transformation of the area in exam. Tūr und Taxis is located in the city center near the sadly known Molenbeek district. Despite they are normative separated, they are considered as a big district in the hypotheses of new masterplans of the Brussels municipality. In this sense, the aforementioned districts are social mix collectors characterized by the presence of many bottom-up social initiatives. Nevertheless, it is possible to recognize three different architectural and social areas: i) the area of the big streets and the middle class; ii) the area of the small single houses in which the quality of life is still quite good; iii) the crumbling area configured as a slum in which most of the immigrants live and characterized by a high unemployment rate. This contributed causing a physical, architectural and social discomfort highlighting the recent frustration of the second immigrant generations living in the districts and providing a breeding ground for radical elements.

The academic research presented provides an IA framework to propose effective masterplans considering the complexities of the districts in exam (Table CHAPN.2). The physical and social discomfort characterizing the districts can be schemed through the keywords recognizable in the Encyclical letter *Laudato Si'*

³ The figures contained in section 3 are the result of the work conducted by the students participating to the decision process here presented and attending the Master class of "Project Appraisal" (Prof. Isabella M. Lami), part of the Design Unit "Living social and sustainable", Politecnico di Torino, 2015.

(2015). The physical discomfort can be identified as: i) a lack in the policy governance; ii) a problem in the affordability of houses; iii) the bad quality of the buildings. The social discomfort can be identified as: i) the social rage and violence; ii) the fragmentation of different ethnicities; iii) an economic debt. In line with the Encyclical letter *Laudato Si'* the ecologic issue has been considered as cause and result of both physical and social discomforts.

Table CHAPN.2 Physical and social discomfort

	PHYSICAL DISCOMFORT			SOCIAL DISCOMFORT			
	Policies	Affordability	Quality	Ecologic	Violence	Fragment	Debt
SA	X			X	X	X	
SCA	X	X	X	X		X	
MCDA	X			X	X	X	
DCFA		X	X	X			X

Operatively, the students participating to the present research have been grouped. This resulted in different application of the IA framework proposed and dealing with the identified keywords in an integrated perspective.

CHAPN.3.1 Application of the SA

In order to identify the main actors involved in a transformation of the TÜR und Taxis district, we first propose the application of a SA (Dente 2014). Despite we propose an academic application of the IA framework, we interfaced with many stakeholders as: the municipality of Brussels, citizens, private investors, associations, experts on the territorial context and the Community Land Trust. Understanding the dynamics of the stakeholders within the decision process and the available resources was fundamental to focus on one element in particular of physical discomfort (defined as “policies” in Table CHAPN.2) and several elements of social discomfort (“environment”, “violence” and “fragment” in Table CHAPN.2) of the area, characterised by the overall complexity of the Belgian system to harmonize the three communities that form the country, and some critical situations that connote the particular site.

Following the theory of Ackermann and Eden (2010) each group of students analysed the stakeholders providing a “power/interest grid” (Figure CHAPN.1). The stakeholders in this case were all the individuals or entities/institutions related to or affected by a new masterplan for the TÜR und Taxis district.

The development of the SA allowed the stakeholders to be declared and their interest/power to be discovered. In this sense, the SA has been used as a tool to

create a knowledge base for the definition of the following steps of the IA framework.

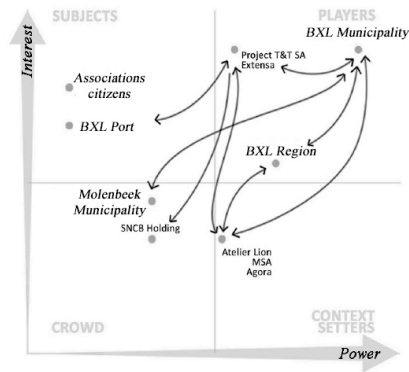


Figure CHAPN.1 Example of power/interest grid for the Tūr und Taxis district

CHAPN.3.2 Application of the SCA

Starting from the SA, the second step of the IA framework proposed involves the application of the SCA approach to structure the problem situation and discuss possible solutions through workshop.

Following the SCA methodology, the groups of students first identified the decision areas (i.e. transport, affordability, parking, functions) as well as the links among them. Second, starting from the urgent areas, the group of students proposed different decision options. During this phase they applied the AIDA to identify the incompatibilities and design feasible sets of options. Finally, the combinations of decision options identified have been compared basing on different criteria.

The SCA in the present application of the IA framework has been very useful allowing a deep analysis of the territory in exam taking into account different perspectives, focusing on the elements of physical discomfort. The SCA largely contributed to reduce the projects' uncertainty, supporting the definition of the main strategic masterplans' guidelines.

CHAPN.3.3 Application of the MCDA

After having defined different masterplan' proposals, the IA framework provides a changing in the transformation scale: from the strategic level of the master plan to the architectural level of the buildings. This step is fundamental to tackle the aspects concerning the physical discomfort: the affordability of houses and the

quality of the buildings. Starting from the directions of the municipality of Brussels, each group of student has been asked to define the best architectural characters of a specific building typology. For sake of simplicity, we report here the analysis conducted for the “Heavy houses”, which are massive multi-functional buildings characterised by an external hard shell and a flexible use of internal spaces. In order to support this step of the process, the third phase of the IA framework provides the application of the MACBETH method.

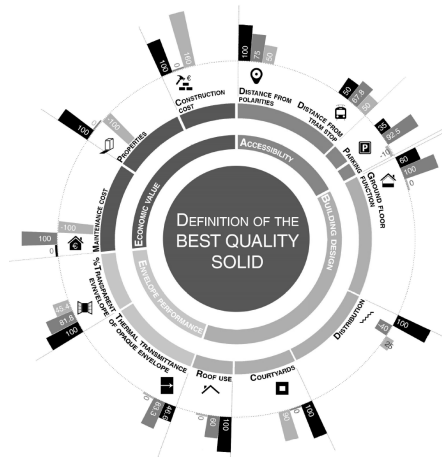


Figure CHAPN.2 Example of MACBETH priority ranking

First, each group of student proposed three alternatives of “heavy houses” starting from the strategic guidelines identified in the previous steps and to be evaluated and ranked according to the main criteria that characterise the problem namely: economic values, building design, energy envelop performance and accessibility. Second, the criteria have been structured and compared to come to a priority ranking both of the criteria and the alternatives (Figure CHAPN.2).

The results of the MACBETH method show that the buildings’ design and the economic values of the transformation are the most important aspects in order to design a sensible architectural project able to contribute solving the physical and social discomfort of the Tür und Taxis area.

CHAPN.3.4 Application of the DCFA

The last step of the IA framework is related to the DCFA that has been developed for the best performing alternatives resulting from the MCDA application.

In this phase of the analysis, each student worked independently paying particular emphasis to the energy performance of the buildings. Each student’s project is the result of a preliminary study in which different energy savings solutions have been

tested in terms of: technology to be adopted, costs of the energy technologies, maintenance/disposal costs and energy requirements of the building. In this sense, the DCFA is a tool able to relate aspects of both physical and social discomfort according to Table CHAPN.2. For the solution showing the best energy and economic performances the NPV and IRR have been calculated. In order to do that, each student determined the costs related to his own project (as land costs, technical expenses, building costs and others) as well as the incomes deriving from the future sell of the buildings.

CHAPN.4 Conclusions

This research complements the Integrated Assessment (IA) studies (Creswell et al. 2011, Creswell and Plano Clark 2011) with a proposal of a IA framework based on the systematic application of the Stakeholders' Analysis (SA), the Strategic Choice Approach (SCA), the Multicriteria Analysis and the Discounted Cash Flow Analysis (DCFA) to support the decision process related to the requalification of districts facing urban and social decline. The experiment reported in this paper represents one of a series of the IA framework's application on different case studies of urban transformations during the Master's courses at the Politecnico di Torino (held by the second author), which allows us to make some generalisations. Through the different steps presented we are better situated to affirm that this IA framework is able to tackle the issue of the "fragmentations of the cities" taking into account the social exclusion, the growth of the violence and rage and the lost of the social identity emphasized by the Encyclical letter *Laudato Si'* (2015). In fact, the IA framework proposed can contribute making the decision processes more transparent and opened to the dialog to produce sensible solutions shared among the parties involved in the transformation at stake (Encyclical Letter *Laudato Si'*, 2015). In this sense, the systematic integration of qualitative and quantitative methods is suitable to identify and tackle the physical and social elements of discomfort at a different scale and with technical perspectives (due to the architectonic nature of the problem).

The further research direction will improve the IA framework proposed through the integration of Information and Communication Technologies (ICT) with particular reference to the Visual representation. This would enhance the quality and quantity of the information available helping the stakeholders "getting on the same page" and having a collective insight about the issue involved in the decision process.

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