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Management of Stakeholders in Urban Regeneration Projects. Case Study: Baia-Mare, Transylvania

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Abstract: The process of regeneration of abandoned areas or deteriorated structures in the cities of Romania has become a strategy of urban-integrated development. Conversions and/or regeneration of facilities in the form of assets, with different destinations, are part of the new trend of urban regeneration and a strategy used to attract investment capital. The disappearance of mining industry sites in Maramures County, Romania, has allowed the expansion and planning of new spaces for public use and/or semipublic, and most cities have opened new development perspectives. The study is based on empirical research conducted on the brownfields of Baia-Mare City. This research investigates how stakeholders of an urban regeneration project can be more actively involved in the decision-making processes with regard to the strategic elements of the renewal project of Cuprom, as a former mining industry area. This research contributes to the development of the investigation of new types of knowledge of stakeholder analysis and improves the available practices for stakeholder salience. Social networks created and consolidated by stakeholders of an urban regeneration project are the object of analysis, evaluation, and monitoring of the equilibrium between project management and grant of resources and capital. This paper studies the salience of stakeholders of the SEPA-CUPROM project from Baia-Mare using the social networking approach. Visualization by graphical methods of social networking analysis is a useful instrument in the decision-making process of brownfield projects as part of sustainable strategies in Romania.

Keywords: brownfields; stakeholders; social networking analysis

1. Introduction

In most urban regeneration projects, beginning with the design phase and continuing into implementation, several urgent modifications of an action plan might occur, and the influence of stakeholders on the results of the project can be high.

In recent times several significant renewal projects have been successfully implemented (Table 1). The authors of paper [1] present within a comprehensive report a general outlook of the main urban regeneration projects in Europe in recent years and for each project, the definitive elements of the main products obtained as key success factors. In spite of the role and the importance of stakeholders in these projects none of them, except the REVIT project, makes reference to the so called "Stakeholder Management Kit" which uses traditional stakeholder management methods.

Table 1. List of urban regeneration projects.

ACRONYM	Name of Project
CABERNET	Concerted Action of Brownfield and Economic Regeneration Network
INCORD	Integrated Concepts for Regional Development
LUDA	Improving the Quality of Life in the Large Urban Distressed Areas
MASURIN	Management of Sustainable Revitalization of Urban Industrial
NICOLE	Network for Industrially Contaminated Land in Europe
PROSIDE	Promoting Sustainable Inner Urban Development
REVIT	Revitalizing Industrial Sites
SAUL	Sustainable and Accessible Urban Landscapes
SEBCO	City-Hinterland Cooperation as Motor for Regional Development in the South Eastern Baltic
SULFANET	Sustainable Use of Former and Abandoned Landfills Vitalizing City Centers through Integrated Spatial Planning
SURE	A Time Oriented Model for Sustainable Urban Regeneration
VISP	Vitalizing City Centers through Integrated Spatial Planning

The gap of stakeholder management is excellently emphasized in another paper [2], where authors present an integrated analysis of the deficiencies of stakeholder management, highlighted through ample identification, grouping, and interpretation of information contained in the works studied in specialized literature. The authors state that most studies focus on the relations and few show the real impact of stakeholders networking on project results.

Identification of stakeholders is often done through brainstorming sessions. This is a good way to stimulate thought and produce a more complete list of potential stakeholders of a project. Based on the list of stakeholders, a project team creates a classification of the stakeholders. This classification is done in several ways. According to Mitchell, Agle, and Wood (1997) [3], the classification of stakeholders has one or more of the attributes: power, legitimacy, and urgency. Achterkamp and Vos (2007) [4] take into account the classification based on the role of an actor in a project, as a client or actor.

Current practices developed by Freeman (1984) [5] and Mitchell, *et al.* (1997) [2] are widely used; however, not all situations deliver the expected outcomes. The immediate need for a more sophisticated analysis is imposed because complex situations and urgent actions arise in the design phase as well as in the implementation phase of the project.

Of course, these are useful techniques, but they do not provide project managers with an external view of stakeholders by the interdependencies between stakeholders in the project social networks. Large and complex stakeholder contexts are a matter of analysis; especially in the investment sector, infrastructure projects have been characterized by *complex and dynamic environments* containing a *large range of stakeholders*—from hostile to conciliatory and from obstructive to collaborative [6]. The analysis framework is therefore complex, too.

In current theory, most models focus on the same basic principles to assist project managers in their decisions, regarding the involvement of stakeholders: identification and classification of stakeholder, while stakeholder salience is the degree to which stakeholders have the potential to influence decisions [3,7].

We may conclude that the literature is abundant in stakeholder management research studies, but only a few works are related to an efficient method of analyzing and visualizing of a project's stakeholder through social networks.

The purpose of the study, thus, is to identify the intensity of relations between an urban regeneration project's stakeholders through social networks analyses as a tool for stakeholder management.

The research hypothesis states the following assumptions, which are the target of the study:

- ○ If there is a utility of social network analysis of stakeholders in the management of an urban regeneration project.
- ○ If the social network analysis can quantify the most important properties of the network about setting objectives and choosing the optimal design of the project.
- ○ If, by visualization of social networks, rapid decisions in stakeholder management can be altered in order to reduce risk or/and achieve maximum project performance.

The main results of the study reached pertinent conclusions, which validate the assumptions (hypotheses) made.

1.1. Need, Importance, and Role of Urban Regeneration

The disappearance of industrial sites in European cities has allowed, in recent years, for the expansion and planning of new public and/or semipublic spaces and opened new perspectives for developing cities. Rehabilitation of old industrial sites in an environmental approach is the main concern in many European cities [8].

New urban management is concerned with achieving sustainable development through which to ensure physical structures and the appropriate framework for current needs and trends created by economic growth, technological development, and society [9].

Numerous papers [10–12] in the current urban practice and literature discuss urban regeneration, which is seen as an action that leads to solving urban problems and finding long-term improvements for economic, physical, social, and environmental objectives in an area that needs to be changed [8,13].

Some authors [14] note there is currently progressive reorientation of the construction sector from making new buildings to reusing existing buildings—many of them abandoned and in an advanced state of degradation. This phenomenon [11,15] is due to complex social, economic, psychological, and aesthetic reasons, of which the most important are:

- ✓ The need to stop development of cities by expanding urban limits [12]. Development of towns caused a large increase in the price of land, especially in central areas occupied by old constructions. Therefore, the need for efficient use of existing old buildings is real.
- ✓ Acute dissatisfaction of the population with monotone [15] depersonalized assemblies, newly built urban spaces in which people can conduct a normal, balanced life, based on respect for the privacy of individuals and the importance of social relationships in the community.
- ✓ Reconsideration of the role of traditions, the value of old urban tissue and traditional urban spaces (streets, squares, pedestrian alleys) decorations.
- ✓ Expanding the boundaries of protected heritage to old buildings, modest in terms of architectural value but which constitute cohesive historical ensembles, fronts of architectural monuments, traditional urban typologies, or parts of neighborhoods [13].
- ✓ The need to stop certain negative social phenomena, such as social migration, due to people leaving old dwellings considered inappropriate, and the exodus to the suburbs; de-inhabiting of old city centers (related to the same phenomenon stated before) by turning them almost exclusively into commercial and administrative areas; social mutations, due to the phenomenon of impoverishment encountered in old unattended neighborhoods (progressive abandonment by original inhabitants following the degradation of buildings and ambient conditions), replacing them with tenants belonging to the poorer layers of the population; increased delinquency, establishing a direct relationship between the level of social delinquency and the quality of the living environment [16]; creating a sense of alienation of the urban population, thus solving previous problems by demolishing the old assemblies and replacing them with new constructions. This remodels new urban areas where old landmarks are no longer present, the old urban typology is lost, and the feeling of belonging to the environment, the feeling of familiarity, and integration of the population disappears.

- ✓ Economic considerations. The calculations made, both general and broken, reveal that, in the current technical conditions, achieving new constructions is almost twice as expensive as the rehabilitation works.
- ✓ Changes in the level of comfort, which have evolved in line with the rise in living standards and the reduction of housing deficit.
- ✓ Environmental issues, which require reducing harmful emissions and energy consumption.
- ✓ Management of urban development and the challenges regarding brownfield conversion, as general policies of the EU.

1.2. From Brownfields to Integrated Interventions for the Reuse of Urban Environment

The notion of reuse of areas inside the city has evolved over time: in the first phase, interventions within cities were aimed at protecting the environment. European projects that have approached the reuse of brownfields were oriented toward the recovery of soil quality and pollutant removal in order to preserve environmental resources and limit the long-term impact of industrial heritage [17,18].

Rehabilitation operations, which originally referred only to the repair and renovation of the buildings in question in order to conform to current standards of comfort (space, hygiene, isolation) and stability, gradually expanded their scope from remodeling interior spaces to expansion works and even transformation/conversion (for disused buildings, the original function is replaced by a new function, whose choice is determined by various considerations) [19].

Urban environmental quality has significant effects not only on the quality of life of citizens but also on the economic opportunities offered to investors and city competitiveness [9].

Due to changes in technology and the spread of high-tech techniques as well as the transfer from manufacturing to services, the economic profile of European countries appears radically altered. Conservation and conversion of historical particularities as social, economic, and cultural assets are part of the new trend of urban regeneration as well as strategies meant to attract capital.

1.3. Management of Urban Development Using Integrated Interventions: Quality Issues

Local initiatives for the conversion of buildings and brownfield sites are becoming more numerous [1,14]. Their consistency with a medium-term territorial diagnosis, larger and better, is a necessity. This goal requires factors involved to perform a phase of analysis and confrontation of their aspirations and values, to share objectives and guidelines in order to draft an integrated rehabilitation project [1,13].

Among the generally accepted principles of urban regeneration, there are:

- regeneration based on adequate analysis of local conditions;
- regeneration should aim to simultaneously change the physical condition of buildings, social structures, economic base, and environmental conditions;
- regeneration consistent with sustainable development objectives;
- regeneration must set clear and measurable goals;
- regeneration must make effective use of natural, economic and human resources;
- regeneration based on participation and consensus among stakeholders, working as partners.

According to these principles, brownfield reconversion projects aim to:

- organize, develop and protect the natural and built environment;
- improve quality of life through urban and social innovation;
- develop, maintain and create activities and jobs;
- position people as factors of development and construction of urban identity.

The quality of interventions aimed at reusing space within cities is a fundamental aspect to be taken into account. The quality of interventions may depend on development and design tools as well as the managerial approach of local authorities.

Currently, the perspective has changed, and the reuse covers a whole range of target areas, in which environmental goals represent only one aspect of the intervention. Meanwhile, rethinking old functions in order to produce an urban change, with effects on economic, social, and physical components, involves reprioritization of urban interventions in order to limit the consumption of land [20–23].

The urban plan and its operations clearly reveal the need for a collective approach. It involves the organization of multiform partnerships, *i.e.*, the adhesion and mobilization of a large number of actors, initiators, supporters, and entertainers: local communities, often the state, professional, economic, cultural, and social environment. The key terms of the results of implementing these projects are numerous and exciting: sustainable development, social cohesion, pollution control, greater coherence and interaction between different areas of the city; dynamic neighborhoods and trade; improving services, protection of natural, cultural, and built heritage; diversification of activities; increasing the number of recreation, education, and entertainment facilities; increasing the attractiveness of the city, improving the city's image, creating jobs, information and training of citizens; creating and structuring partnerships [10].

1.4. Identifying the Main Areas Covered by Urban Regeneration in Baia-Mare, Transylvania

The strategic lines of the Baia-Mare City Hall, when planning capital investments, are fully in accordance with the strategy for sustainable development of the municipality, thus aiming to meet the needs of the population. Capital investments held by local authorities in Baia-Mare mainly targeted the primary needs of the local community—by improving the built environment and by upgrading basic infrastructure. Actions that aim at achieving the strategic objectives are:

- creating modern means of communication, improving accessibility, connectivity, and traffic;
- promoting the city as "development engine", thus responding to pressure from investors;
- promoting the role of dispatcher in tourism, given the area's potential;
- protecting cultural and architectural urban values and revitalizing historical sites;
- improving quality of life;
- improving the quality of the urban area, infrastructure, and public services.

It should be noted that the multi-sectoral integrated projects launched by city hall wish to develop the business environment, attract foreign investment, increase GDP, therefore transforming the municipality in an urban pole of economic growth, both in the county and in the entire northwest region. City hall relies on the urban regeneration strategy and pays special attention to the quality of public space [24,25]. Currently, there are five priority areas for urban regeneration:

(1) North Area: ROMPLUMB;
(2) East Area: Phoenix Baia Sprie (including the CUPROM platform);
(3) City Center and Rivulus Dominarum;
(4) South Area: Vasile Alecsandri;
(5) West Area: Railway Station/Warehouse Area.

The priority strategic objectives in the areas of intervention in order to achieve urban regeneration are as follows.

Objective 1. Promote the cultural identity and social cohesion of the community by improving public space and creating structures for meeting, dialogue, and socializing.

Objective 2. Reduce the risk of ghettoization/isolation of the community by improving accessibility and urban mobility and strengthening the link between neighborhoods and surrounding areas.

Objective 3. Raise the living standards by improving environmental quality and protecting (sustainable use) natural resources through:

- cleaning polluted areas (including bodies of water);
- rehabilitation and/or landscaping of green areas (including intra-residential ones);
- development of green corridors;
- rehabilitation and modernization of water-sewage infrastructure.

Objective 4. Create conditions for social inclusion for all citizens by improving access to basic social services and infrastructure.

Objective 5. Facilitate economic restructuring and strengthening the role of the Old Town and Alecsandri neighborhood in a municipal economy by developing the business support infrastructure, thus promoting innovation and sustainable use of resources.

So far, the task of identifying urban regeneration areas has encountered difficulties related to the lack of detailed/reliable information and lack of political decisions and methodologies for:

- ✓ The relationship between the level of pollution/contamination of areas in the city and the dangers for the community; the issuance of building permits and general urban plan zoning for the three areas identified by recent studies as having the highest level of contamination and, consequently, toxicity, should be related to health screening, and the negative effects on infrastructure and housing due to improperly closed mines.
- ✓ Abandoned or degraded buildings in every neighborhood.
- ✓ The relationship between the current areas owned by the municipality of Baia-Mare and Baia-Mare's natural expansion directions.
- ✓ The ratio among public spaces, industrial areas, and residential areas.
- ✓ Maintaining the cultural and architectural identity of the city (the historical center).

Facing the main public health issues arising in this area, a specialized study is required to be made on the toxicological aspects related to residential, industrial, and green areas where there are high levels of contamination with heavy metals, especially lead and cadmium. The new rules of urbanism also administratively "spur" the resolving of situations that endanger public safety and affect the look of the city, while finding ways to transform those areas that are absolutely necessary for sustainable urban development into public spaces, including spaces that, according to the legislation in force, should exist on both sides of the river, and the situation of Ferneziu and Firiza neighborhoods, as tourism corridors. The new urban planning regulation defines the directions and functions (industrial, commercial, tourist, residential) of areas of expansion in Baia-Mare.

The new rules of urbanism emphasize the alleviation of negative effects of mine closures and the construction of a means of transport (train or cable car), which would stop in the interest areas designated above and which would be connected to logistics parks.

Maramures County's current challenges mean that more attention must be paid to the management of change. This may be more easily achieved through the use of new approaches, tools, and more effective methods. A paradigm shift is even more difficult if the weaknesses and threats in the region are not sufficiently taken into account, nor are there concrete ways to capitalize on opportunities, strengths, and key capabilities.

2. Case Study: Urban Regeneration Project in Baia-Mare, Transylvania

2.1. Urban Development Strategy of Baia-Mare, Projects Proposed for Urban Regeneration

Over time, the municipality and a number of private companies have proposed various solutions for the urban regeneration of the city of Baia-Mare. To better understand the reasoning behind these projects, we have to specify the context in which these projects emerged, showing Baia-Mare municipality's vision to bring the city (by 2020) to the level of a developed European city [24].

The most important urban regeneration project is SEPA Eco Industrial Park Baia-Mare, which is part of the European Union Cooperation Program SEPA (Sustainable and Equipped Productive Areas)

through which seven areas in Hungary, Romania, Italy, Greece, Slovenia, and Serbia are targeted and co-financed in projects of urban regeneration.

The SEPA area of Baia-Mare is CUPROM (name of a mining industry site), identified as the former industrial site PHONIX (Company of gold and copper production).

The project aims to facilitate the regeneration of a number of production areas in accordance with sustainability criteria, thus increasing the attractiveness of these areas for Romanian and foreign investors. The project is innovative because it focuses on the environmental sustainability of production planning since the design stage of production site organization. This approach can be beneficial for SMEs (Small and Medium Enterprises), which generally do not have the scale necessary to organize sustainable production sites among themselves in an efficient manner in terms of cost. Based on best practices and experience sharing, the project will test a model of "sustainable production location for SMEs", which is applicable in any field of production, based on environmental protection and the use of renewable resources and on specific local circumstances. In order to implement the project, Baia-Mare has initiated a feasibility study on the topic of approach and application issues regarding the SEPA industrial platform (east of the municipality—Figure 1), *i.e.*, PHOENIX/now CUPROM with a total area of approximately 55 hectares where, currently, numerous buildings and facilities are specific for metal extraction from non-ferrous ore (activity suspended in 2009 when CUPROM became insolvent [25]).

Figure 1. Map of the study area.

Considering that the re-functionalization of the CUPROM platform is intended to constitute a pilot project in the city and the northwest region of Romania, it is extremely important to consider the vision contained in the sustainable development strategy of Baia-Mare until 2020. In the general urban plan, the CUPROM platform is described and included in the chapter production/storage area, technology park, which occupies an area of 459.81 ha, which is less than 10% of the town area.

Note that, when CUPROM was closed, there were approximately 150 buildings on the platform, which have been partially demolished, for scrap.

In the overall development strategy of the municipality, the re-functionalization of the CUPROM platform has the following characteristics: promoting economic growth and urban expansion with the purpose of strengthening the economic center of Baia-Mare in the local context.

For the construction of the eco-industrial park on the CUPROM platform, two technical-economic scenarios have been created, based on the reality that the site holds the structure of a dispersion chimney with a record height of 351.5 m. The differences between the two scenarios lie in building the platform in two versions:

- Technical–Economic Scenario Option 1, the dispersion chimney is removed by demolition;
- Technical–Economic Scenario Option 2, the dispersion chimney is preserved and integrated into the future architecture of the area (Figure 2a,b) [26].

Figure 2. (**a**) Eco Industrial Park-SEPA Project Proposal 1; (**b**) Eco Industrial Park-SEPA Project Proposal 2.

Given that, from the financial analysis, the two versions have significantly similar results, we believe that the economic analysis prevails when choosing a scenario. Through it, the advantages

and disadvantages of the two options can be highlighted, taking into account the effects on the socioeconomic, cultural, and tourism "brand" development of Baia-Mare, in the near future or long term.

We believe that the selection of the optimal scenario is required to be made following public debates, with participation of all socio-professional categories and all the stakeholders in respect of the feasibility study, which highlights the two technical–economic scenarios (as follows):

Option 1. In this variant, the construction of the eco-industrial park can be completed in less time with a more efficient employment of space available, without the constraints imposed by continuous monitoring and maintenance of the chimney.

Option 2. Keeping the dispersion chimney, although more difficult to achieve in time, would provide a platform arrangement so that the resulting park would ensure openness and interest from a wider range of integrated activities.

This large investment project needs a realistic judgment on aspects linked to the balance among urban management for sustainability, resource, and budget. Stakeholders of the project play an important part of the positive trajectory of this decision-making process.

2.2. Stakeholders' Role in Urban Regeneration Projects

In many cases, the setting of goals in a major project is the result of a process of communication and cooperation with stakeholders.

Effective management of project stakeholders is a key element of success in any project.

An investment project affecting various stakeholders in all its phases, together with a negative perception of stakeholders, may lead to blocking the project implementation. For these reasons, mismanagement will cause controversy and conflicts related to the implementation of the project [27].

Influence of stakeholders on the results of the project can be high, especially in large investment projects, in which they may have a crucial role in the design phase, but also in implementation and monitoring. They also can play an important role in setting objectives and/or in making different decisions throughout the project cycle. They often have the power to carry out legal procedures to direct the evolution of a project toward success if the actions are directed for or against their will and interests.

Often, stakeholders use the political influence they hold to gain advantages in project results. Accordingly, stakeholder analysis has a crucial role in the success of the project [28]. This analysis includes steps for identifying interests, expectations, and the influence generated by stakeholders, thus putting them in accordance with the purpose and objectives of the project.

Management of stakeholders includes the continuous identification of how the project will affect stakeholders, thus developing effective methods for addressing the various stakeholders to manage expectations and ultimately to achieve the project objectives.

2.3. Stakeholder Analysis through Social Network Approach

Social network analysis measures the relationships and flows of information among people, groups, organizations, computers, and other entities that process information and knowledge. Network nodes are people or groups, and links are represented by relationships or information flows that are established or circulate between them. Social network analysis provides a mathematical and visual (graphics) analysis of human relationships. Management consultants may use this method for organizational network analysis.

A social network is formed (as in the graph theory) from vertices represented by individuals, companies, corporations, markets, small social groups, human communities, *etc.*; the arcs are the interactions between them. Certain properties can be highlighted in complex social networks, which have a strong influence on how mutual influences spread between network components and, especially, on how the network evolves over time.

Current research in this area is focused mainly in three major directions. The first is determining the statistical properties of complex networks, with which we can characterize the structure and behavior of systems, which include such networks. The second direction is creating models of the networks with which to better understand network properties and their effects on complex systems.

A third direction is finding rules and laws governing the development of networks so that they can determine how those rules and laws affect the individual vertices or parts of the network.

2.4. Role of the General Parameters of the Network

A network is a graph in which vertices (nodes) and edges (arcs) have values associated with them.

Graph G is defined by a pair of sets G = {V, E}, where V is the set of vertices, denoted by v_1, v_2, . . . , v_n, and E is a set of edges connecting pairs of vertices vi, vj belonging to V. O is a set of vertices joined by sides and is the easiest type of network.

From this perspective, a series of measures of centrality of vertices and the roles played by them have been introduced. For example, the degree of a vertice corresponds to the number of links that reach it, and the average distance is a measure of the distance measured as the lowest number of arcs needed to move from one vertice to another. Another indicator, a vertice's clustering coefficient, measures the number of connections between neighbors of a given vertice. Finally, another interesting measure is the "betweenness" of a vertice corresponding to the number of paths of minimum length between each pair of vertices in a network going to a reference node.

2.4.1. Role of the General Parameters of the Network

In graph theory and network analysis, centrality refers to indicators, which identify the most important vertices within a graph [29]. Applications include identifying the most influential person(s) in a social network, key infrastructure nodes.

The indicator of network centrality (*Freeman's Network Centralization*) [5] should be understood in several ways. Those who are located closer to many individuals and are considered benchmarks and models for others also may exercise power. Actors located in the center of the network are stronger than those in the margins because they are at the heart of the action. The power also resides with those who act as intermediaries and links between other actors who would otherwise not be in direct contact with each other.

A highly centralized network is dominated by very few centrally positioned nodes. If these nodes are removed or damaged, the network will quickly fragment into several groups unconnected to each other. The centrally located nodes can be weak points. Poorly centralized networks are stronger to outside attacks or accidents and do not easily collapse.

Centrality refers to a group of metrics that aims to quantify the "importance" or "influence" (in a variety of senses) of a particular node (or group) within a network. Centrality includes power centrality, betweenness centrality, information centrality, and degree centrality [29].

2.4.2. Power Centrality

The concept of *centrality* of the network is essential for understanding power, hierarchy, stratification, and inequality in social structures. *Power* within a network relies on ties. The actors who have a position that gives them more opportunities and alternatives for access to information and are subject to fewer constraints are stronger than others. Those who are closer to as many individuals as possible and are considered benchmarks and models for others also can exercise power. Actors located in the center of the network are stronger than those in the margins because they are at the heart of the action. The power also resides with those who act as intermediaries and links between other actors who would otherwise not be in direct contact with each other [29].

2.4.3. Betweenness Centrality

Those playing the role of broker between two major groups within a network have a strong role within the network, but it is the network and points of vulnerability that can hinder or block the movement of information flows. Nodes that find the shortest paths are closer to others, and such other nodes in the network have a privileged position because they can monitor the flow of information and have an overview of what it is really happening inside the network [30].

2.4.4. Information Centrality

It is a measure of how information spreads onto several paths. Stephenson and Zelen (1989) [31] give us data about the movement of individuals from the center to the periphery and *vice versa*, showing (in the network) the sources (databases that broadcast messages) and connectors (social link that helps to spread information within the network). The connectors are the stakeholders that can exert influence over others, have strong knowledge and relationships in all structures, and generate benefit and economic value for individuals, groups, and organizations through dynamic exchanges between them.

2.4.5. Degree Centrality

The number of direct connections (links), which a particular node has with other nodes in the network, generates the degree of that node. In social network theory, degree centrality is often considered a measure of actor activity.

2.4.6. Clustering Coefficient

For a given vertice, v_i in a network of k_i neighbors, the degree of clustering around the vertice v_i is defined as the ratio of actually existing links with the k_i neighbors and the number of potential links. The clustering coefficient shows how well the neighbors of any link are connected in a graph [32]. The more direct connections a node has, the more active the node connecting the network is. The most important are the connections with the actors who would otherwise remain isolated inside the network. In general, most are connected with those in their immediate vicinity, with their group of friends (cliques). The clustering coefficient shows how close the nodes and their neighbors are to becoming a clique.

3. Research Methodology and Methods: Research Data

The research stages (Figure 3), take into account research methodology to meet the objectives to validate or invalidate assumptions made.

Figure 3. Research stages (source: authors).

A survey was applied on the 20 selected stakeholders. The questionnaire was designed so that it could check the number of links and the frequency of information exchange between stakeholders concerning the importance of ranking of the variants and criteria of SEPA project's implementation. The research was completed with interviews, which clarified a few dilemmas. The interesting phenomenon was the crystallization within the group of stakeholders, the mutual dependency relationship between objectives that are, by definition, loosely defined: the landscape value, an indicator highly subjective, which originally had a large share but faded along the way because this objective was achieved before other noneconomic objectives.

On a Likert scale of 1–5, which notes 1 = very weak ... 5 = very high, responses were achieved after a 20 × 20 matrix containing the aggregate scores of response items, which were completed with interviews. Twenty representatives of stakeholders were interviewed between March and June 2015.

A relation diagram between internal and external stakeholders of the SEPA project is shown in Figure 4. The next step was the integration of survey results, which were computed in SPSS 21 software, in a double-entry gird that contains the intensity from 1–5 between the actors of the network. The construction of stakeholders' network was made by importing data in the SocNet software database.

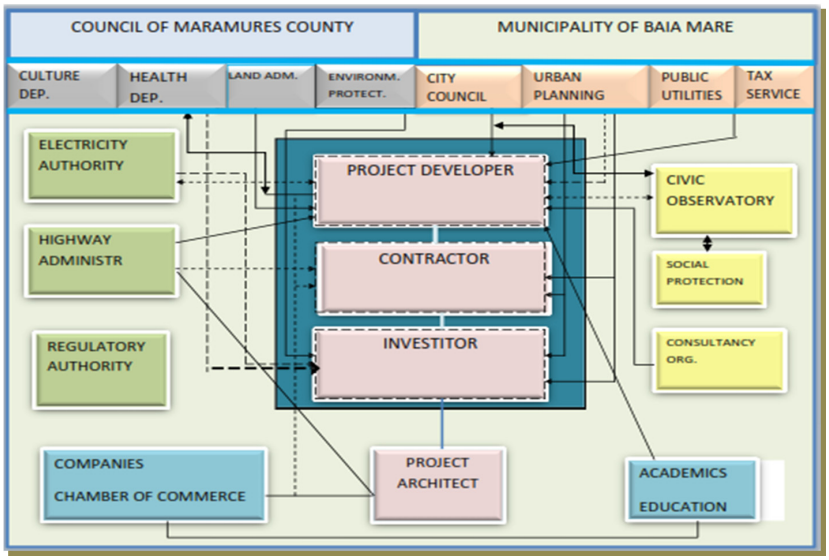

Figure 4. Relation diagram of stakeholders (source: authors).

The results are presented in Section 4.

A legend of each stakeholder (Table 2) facilitated the network construction.

Table 2. Legend of stakeholders.

Stakeholder/Node	
Project Developer-1	Culture Department-11
Civic Observatory-2	Environment Protection Agency-12
Companies/Chamber of Commerce-3	Electricity Authority-13
Urban Planning Department-4	Land Administration-14
Regulation Authority-5	Tax Services-15
Investor-6	Academics/Education-16
Public Utilities Services-7	Project Architects-17
Consultancy Organizations-8	Social Protection Agency-18
City Council-9	Contractor-19
Public Health Department-10	Highway Administration-20

The study of stakeholders rose once with the initiation in Baia Mare of the program of urban regeneration. The Municipality of Baia Mare organized a working group, which was formed from different entities that are partners, or, that are collaborating in local governance programs. Twenty partners were identified as permanent collaborators. Our research team selected them all for the study. We mention that these entities do not form a network yet, but relate with each other on various occasions.

Our purpose was to assist the project manager in selection of the most valuable stakeholders in the case of the SEPA project where the decision-making process is conditioned from starting with the phase of setting objectives, by endless talks with stakeholders regarding the best choice. In our situation, the project proposes two variants and because of the simple Cost-Benefit Analysis, results cannot be conclusive. As normal, the decision-making process within major projects is a collective undertaking of options developed in the project, starting with conception. The mission is particularly difficult because the values of the investment are almost equal. Therefore, the prioritization of the other factors which would optimize the choosing of the final variant was the subject of debates held with stakeholders. Classical methods do not fully eliminate the risk of internal discussions with the members of a decision-making body, nor the establishment of a balance between initial goals and the countless assessments needed to be able to make a decision.

In the case of SEPA, the economic decisions are not priority in the project, but rather those related to social mobility, health, and the attractiveness of areas.

Data collection was based on a survey among the twenty selected members. The questionnaires and interviews were designed in order to illustrate, from a quality and quantity point of view, the results of weighted connections between the potential stakeholders.

In the case of this research, respondents were exposed to a variety of questions that allowed for descriptions and motivations of how and why stakeholders interact in different ways.

We understood better the reasons of their involvement and how they act among themselves by encouraging them to tell stories about their closest area of interest. This was doubled with general information obtained from the officers of Baia Mare Municipality about the type, number, and frequency of ties with the group of selected partners

4. Results

SocNet V software was used for construction, visualization, and generation of the metrics of the network. In the analyzed reports, the peak values of each parameter are highlighted by text colors.

Tables display the results of the most valuable nodes from the algorithm. The ranking of the significant results was made for the first 3–4 nodes.

4.1. Power Centrality (PC)

The PC index of a node u is the sum of the sizes of all nth-order neighborhoods with weight 1/n [33].

PC′ is the standardized index: For each node u, this index sums its degree (with weight 1), with the size of the 2nd-order neighborhood (with weight 2), and in general, with the size of the kth order neighborhood (with weight k).

Thus, for each node u the most important other nodes are its immediate neighbors and then in decreasing importance the nodes of the 2nd-order neighborhood, 3rd-order neighborhood, *etc.* For each node, the sum obtained is normalized by the total numbers of nodes in the same component minus 1. The PC score divided by the total number of nodes in the same component minus 1, PC′ range: $0 < PC' < 1$ (see Figure 5).

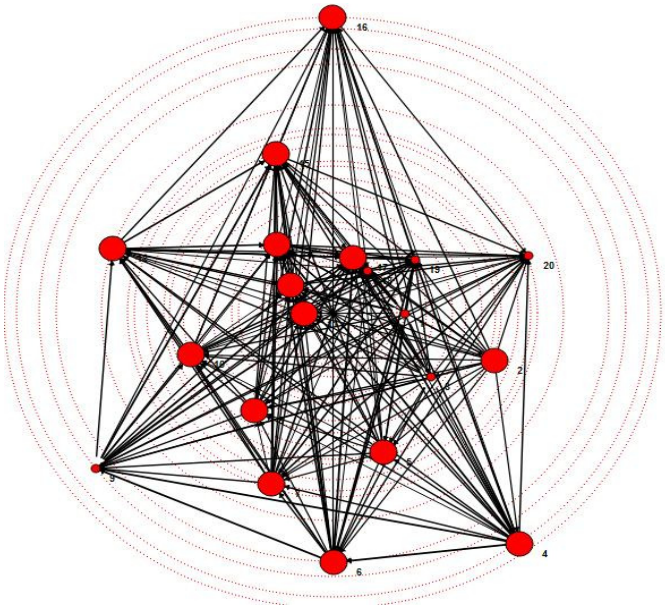

Figure 5. Plot of power centrality.

The most powerful is Urban Observatory (node 2). It is a product of the active local government policy of Baia Mare, for enhancing the power and the dynamic role of participants to decision-making, on behalf of citizens benefit; it is a specific public administration project implemented recently in Baia-Mare, which empowers the civic organizations, represented by citizens from the city to debate and participate actively in decision-making processes, including sustainable development projects.

The Environment Protection Agency (node 12) is a powerful stakeholder, too. Its major role concerning the monitoring the pollution, green fields, *etc.* has a crucial influence on setting up the general objectives of the SEPA-CUPROM project.

We can observe that nodes 8, 12, 16, 17 also have a significant power centrality (see Table 3).

Table 3. Computed values of power centrality (PC).

Node	PC	PC′	%PC′
1	0	0	0
2	1	1	100
3	0	0	0
4	3	1	100
5	4	1	100
6	1	1	100
7	2	1	100
8	1	1	100
9	0	0	0
10	4	1	100
11	3	1	100
12	1	1	100
13	2	1	100
14	2	1	100
15	3	1	100
16	1	1	100
17	1	1	100
18	0	0	0
19	0	0	0
20	0	0	0
Max PC′ = 1 (node 2); Min PC′ = 0 (node 1); PC classes = 2			

4.2. Degree Centrality (DP)

In undirected graphs, the DC index is the sum of edges attached to a node u. In digraphs, the index is the sum of outbound arcs from node u to all adjacent nodes. If the network is weighted, the DC score is the sum of weights of outbound edges from node u to all adjacent nodes (see Figure 6).

DC′ is the standardized DC.

DC range: $0 < C < 19$.

DC′ range: $0 < C' < 1$.

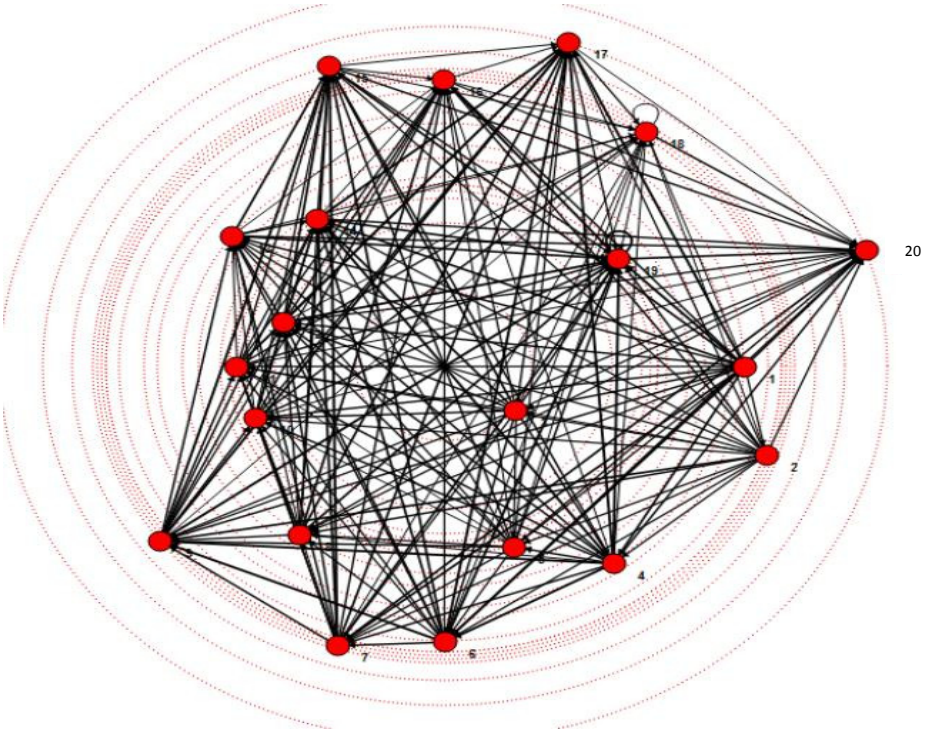

Figure 6. Plot of degree centrality.

The most important actor in degree centrality is the Project Developer (node 1), which gathers economical, technical, social, and environmental information to sustain the project. Key terms of the results of implementing these projects are numerous and exciting: sustainable development, social cohesion, pollution, greater coherence, and interactions between different areas of the city; dynamic neighborhoods and trade; improving services, protection of natural, cultural and built heritage; diversification of activities; increasing the number of recreation, education, and entertainment facilities; increasing the attractiveness of the city, improving the city's image, creating jobs, information and training of citizens; creating and structuring partnerships The Project Developer (1) is keeping in touch with the Urban Planning Department (4), Investor (6), Public Utility Services (7), and all the entities directly responsible with the implementation of the project and civic consultation. An active actor in the diffusion of information and in strengthening the trust and engagement of the stakeholders is the Urban Planning Department (node 4). Urban Planning Department is a stakeholder responsible for planning and monitoring urban sprawl, and reuse of brownfields (see Table 4).

Table 4. Computed values of degree centrality (DC).

Node	DC	DC′	%DC′
1	88	0.13	13
2	49	0.0725	7.25
3	55	0.0814	8.14
4	75	0.111	11.1
5	34	0.0503	5.03
6	61	0.0902	9.02
7	56	0.0828	8.28
8	39	0.0577	5.77
9	52	0.0769	7.69
10	30	0.0444	4.44
11	23	0.034	3.4
12	38	0.0562	5.62
13	22	0.0325	3.25
14	26	0.0385	3.85
15	10	0.0148	1.48
16	11	0.0163	1.63
17	3	0.00444	0.444
18	4	0.00592	0.592
19	0	0	0
20	0	0	0
Max DC′ = 0.13 (node 1); Min DC′ = 0 (node 19); DC classes = 19			

4.3. Betweenness Centrality (BC)

The BC index of a node u is the sum of delta (*s*,*t*,*u*) for all *s*,*t* in V, where delta (*s*,*t*,*u*) is the ratio of all geodesics between *s* and *t*, which run through u. BC′ is the standardized BC.

BC range: 0 < BC < 342 (number of pairs of nodes excluding u, see Figure 7).

BC′ range: 0 < BC′< 1 (C′ is 1 when the node falls on all geodesics).

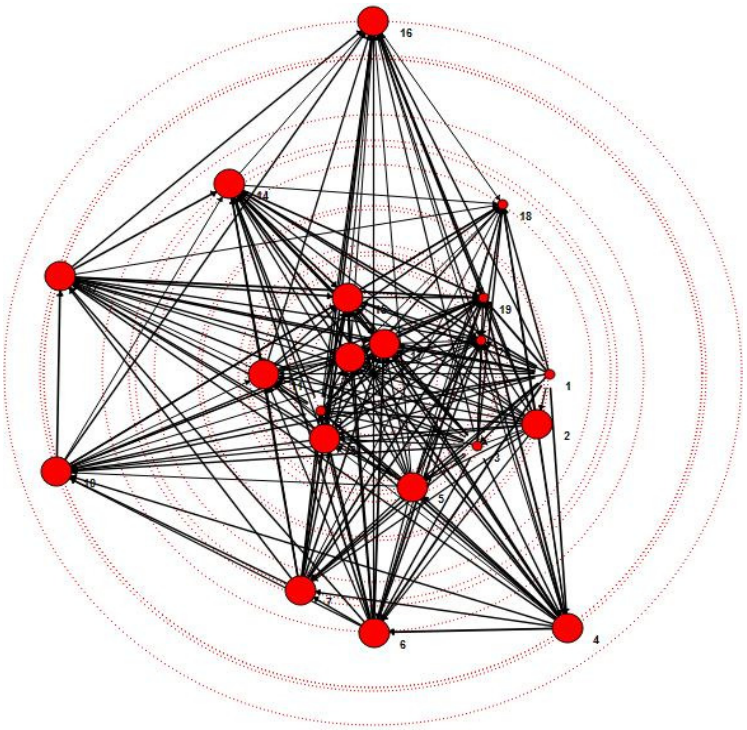

Figure 7. Plot of betweenness centrality.

Node 6, Investor, has the maximum value of the betweenness centrality, which can be interpreted as a measure of potential control, as it quantifies just how much the actor acts as an intermediary to others. The Urban Planning Department (4) resides between others: Environment Protection Agency (12); Land Administration (14) (see Table 5).

Table 5. Computed values of betweenness centrality (BC).

Node	BC	BC′	%BC′
1	0	0	0
2	0	0	0
3	0	0	0
4	2.08	0.00609	0.609
5	0	0	0
6	5.08	0.0149	1.49
7	1	0.00292	0.292
8	1	0.00292	0.292
9	1.33	0.0039	0.39
10	0.667	0.00195	0.195
11	0	0	0
12	2.75	0.00804	0.804
13	1	0.00292	0.292
14	1	0.00292	0.292
15	0.5	0.00146	0.146
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
Max BC′ = 0.0149 (node 6); Min BC′ = 0 (node 1); BC classes = 8			

4.4. Information Centrality (IC)

The IC index measures the information flow through all paths between actors weighted by strength of tie and distance:

IC′ is the standardized IC (IC divided by the sum IC).

IC range: 0 < IC < inf (this index has no max value).

IC′ range: 0 < IC′< 1 (see Figure 8).

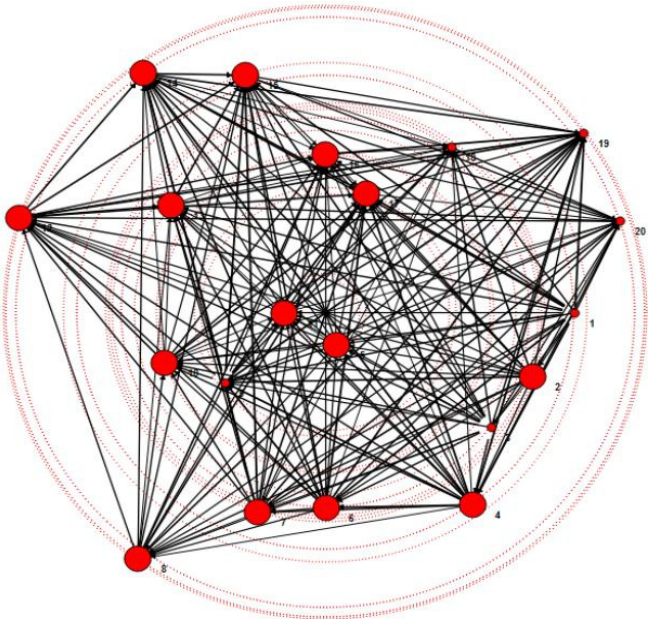

Figure 8. Plot of information centrality.

Active actors in the diffusion of information and in strengthening the trust and engagement of the stakeholders are the Academics from Baia Mare (node 16). The Northern University is a powerful stakeholder responsible for knowledge transfer, applicative research and an engine of start-ups and spin-offs. The Social Protection Agency (18), a significant stakeholder has the following categories of tasks: tasks on social protection, security and development provided to the citizens and is responsible for the tasks on inter-institutional cooperation internally and externally.

Information centrality is thus significant for: Land Administration (12), Culture Department (11) (see Table 6).

Table 6. Computed values of information centrality (IC).

Node	IC	IC′	%IC′
1	3.19	0.0416	4.16
2	4.18	0.0546	5.46
3	3.9	0.0509	5.09
4	4.48	0.0585	5.85
5	3.63	0.0475	4.75
6	3.56	0.0465	4.65
7	3.67	0.048	4.8
8	4.08	0.0533	5.33
9	3.13	0.0408	4.08
10	4.26	0.0557	5.57
11	4.45	0.0581	5.81
12	3.58	0.0468	4.68
13	4.19	0.0548	5.48
14	3.76	0.0492	4.92
15	3.76	0.0491	4.91
16	4.4	0.0575	5.75
17	3.27	0.0428	4.28
18	4.48	0.0586	5.86
19	2.54	0.0332	3.32
20	4.03	0.0527	5.27
Max IC′ = 0.0586 (node 18); Min IC′ = 0.0332 (node 19); IC classes = 20			

4.5. Clustering Coefficient (CLC)

The clustering coefficient shows how well the neighbors of any link are connected in a network. The more direct connections a node has, the more active the node connecting the network is (see Table 7).

Table 7. Computed values of Clustering coefficient.

Node	CLC
1	0.965
20	0.487
Average clustering coefficient =	0.639
Node 1 has the maximum clustering coefficient:	0.965
Node 20 has the minimum clustering coefficient:	0.487

Of course, the Social Networking Analysis method has a strong relevance when the network is already consolidated and when the connections between members are permanent and relatively stable.

Results of the analysis of a network are strongly dependent on the number of actors and ties between them. The network indicators can give us a clue of the managerial recommendations to be implemented in order to achieve a denser and more connected network in the near future.

In our case, the small values of parameters resulting from the network metrics are due to the project's stage, which is only in the feasibility study phase and the members of the working group which do not yet form project networking.

Nevertheless the method adds value to the stakeholder management and streamlines decision-making process of the project in terms of reducing duration and costs.

5. Conclusions

The study reveals that urban regeneration is seen as an action that leads to solving urban problems and finding long-term improvements for economic, physical, social, and environmental objectives in an area that needs to be changed and that there is currently a progressive reorientation of the construction sector from making new buildings to reusing existing buildings—many of them abandoned and in an advanced state of degradation (brownfield-type projects). The reuse covers a whole range of target areas, in which environmental goals represent only one aspect of the intervention. Reengineering of old functions of the site in order to produce an urban change, with effects on economic, social, and physical components, involves a reprioritization of urban interventions, in order to limit the consumption of land.

The reuse of brownfields contributes greatly to sustainable development, as it relates to the three objectives: improving the economy, social cohesion, and the environment. Brownfield regeneration helps recycle underutilized urban land and restore beneficial use. The reuse of an urbanized land helps improve the urban economy of land use.

The study is based on empirical research conducted on the brownfields of Baia-Mare, Transylvania. The research investigates how the stakeholders of an urban regeneration project can be involved in more active participation in the decisions taken upon the strategic elements of the renewal project of CUPROM, as a former mining industry area.

Social network analysis is a tool that can help project managers and external stakeholders. In investment projects, project managers are directly responsible for the proper implementation of the project. The decision-making process is complex and takes place most often in hazardous and uncertain conditions. The role of social network analysis is to identify the individuals and categories of stakeholders who play central roles and who are the most peripheral, and to get a picture of how they can be trained in project management. The study reveals that, in order to get a quick overview of all groups, key actors, and stakeholders, project managers must identify interdependencies among these concerned stakeholders. This means establishing links through which interested parties can reach fast and efficient communication. Analysis of these links and their visualization helps us to determine the most influential groups and the stakeholders who are part of these groups. The aim is to influence the behavior of stakeholders through key actors in the network.

Efficient sector policies of sustainable development and urban regeneration rely on the stakeholders contribution to the participatory dimensions of community involvement in their own development, through community participation and, individual analysis in public decision making, as well as different manifestations and public involvement in this process.

The practice of stakeholder management often gives good results in local or regional government.

One such best practice in Baia Mare through its municipality, has had performed such policies by implementing a project named: *Urban Observatory* which is the latest instrument for involving the community in the development planning process, successfully applied both in the European Union and throughout the world, as well [34].

Classical methods of stakeholder analysis consume a lot of time and money and in the perspective of Public Policy planning and decision making Network Analysis can become a valuable instrument.

Our study proposes an analysis of stakeholders who can help identify categories of stakeholders to ensure that the main groups are not marginalized, and specify representatives who are well connected and respected by the groups. Such information also is essential for management initiatives in brownfield-type projects. In the case of the SEPA CUPROM project, this study highlights the

main social network analysis parameters: centrality, power centrality, degree centrality, betweenness centrality, information centrality, and clustering coefficient.

The analysis and visualization using social networking analysis of listed parameters is a quick and less-expensive method. This gives stakeholders a better understanding of the opportunities to cooperate with other parties concerned. It also provides a better understanding of decisions taken by project leaders on the degree of commitment of stakeholders in the project, their grouping, and their representatives. In the case of SEPA-CUPROM, the project's specific goal setting is a decision problem that ultimately leads to choosing the optimal project implementation because the cost-benefit analysis is not able to designate the final version. For this reason, the usefulness of stakeholder's involvement in the decision-making process is crucial.

Every stage of the project lifecycle requires the active involvement of stakeholders in order to achieve expectations and needs and solve problems as they arise. Identifying the most relevant stakeholders represents an important step in knowing and organizing engagement and participation processes, thus reaching a coherent and broad consensus throughout the project, achieving performance and success-oriented behavior.

From this point of view, management of *stakeholders gains a social nature*. Interested parties (stakeholders) form a complex social network that project managers must understand in order to support the best relationships that form within the network and to be able to fully use the power of the network, formed by interdependencies between its members. The effects of applying this management method should reflect in a better commitment of the stakeholders but also in a coherent and efficient decision making process.

6. Limitations of the Method

Major projects and investments involve massive resource allocation A key success factor of urban renewal projects is a balance between resource results time .These are the preconditions or hypothesis that every stage of the project may change the stakeholder's arena.

These changes alter the network, and possibly lead to new key players. This suggests the analysis of the social network is an on-going process and mitigation of the risk of changes must be made accordingly.

Although local residents increasingly demand influence in decision-making processes that impact on them, the structure and composition of initial stakeholders may change in time too, due to macroeconomic environment changes (such as political, social, legal, *etc.* changes).

Regarding The Social Networking analysis its value or importance might be lost or diminish since the stakeholder's arena is not perceived with certain neutrality.

Often the analysis is conducted by a consultant without input from the stakeholders' network. In most of cases the specialist is faced with skepticism from the stakeholders. The collaborative problem solutions or even fast decision deliberation issues may collapse since the result is a fragmented engagement approach [35].

The method implemented by our research has given satisfactory results. However, it requires a combinatorial method when the number of stakeholders is very high and/or decision options are defined as fuzzy.

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