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Chapter 4

Application of a Participatory Ex Ante Assessment Model for Environmental Governance and Visualizing Sustainable Redevelopment in Gorj County, Romania

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ABSTRACT

This chapter presents an approach for the development of a decision-support process for sustainable development planning. The Indicator Scoring System (ISS) incorporates the ex ante assessment of environmental, infrastructure, economic, and social impacts of proposed projects, and links these assessments with a geospatial model of sustainable development potential. The overall process is designed to encourage public participation, provide unbiased quantitative and qualitative evaluation, integrate

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agency database compilation, and provide data analysis tools/techniques and viewing applications. The ultimate goal is to facilitate a process under which local authorities, governments, and international organizations, are able to visualize sustainable development initiatives as well as coordinate and evaluate their own independent activities. Sustainable development tools that are well integrated with decision-making processes and valued by decision-makers will contribute to the implementation of the objectives of sustainable development.

INTRODUCTION

A vision for sustainable development implies a long-term process, in which decisions focusing on the economic, environmental, and social/cultural assessments are based on the best available information and coordinated at the local, regional, and global levels. Sustainable development brings these three vital assessment categories into balance with each other and negotiates among the interest groups and stakeholders involved in the process (Campbell 1995). It requires the consideration of disparities in spatial and temporal scales, and an understanding of the intricate interdependence between the economic, environmental, and social/cultural factors. Therefore, a sustainable development strategy is a functional synthesis of economic development, environmental protection, and quality of life for the stakeholders and residents.

The economy and social structure of Gorj County, located in southwest Romania was heavily dependent upon mining prior to the early 1990's. During Romania's transition from communism to capitalism, the inefficient mining industry shut down many active mines, which resulted in large numbers of unemployed and environmentally unstable mine closures. As Gorj County integrates into a competitive market-based economy, the expressed vision for the county embraces both the natural geographic characteristics and the cultural resources of the region in an environmentally and economically sustainable manner. Operationalizing this vision requires a framework for organizing and evaluating potential and realized impacts for development projects.

The primary goal of the research described in this chapter was to develop decision-support tools to aid in holistic and sustainable project planning – not only from the standpoint of the environment and the economy, but also from social, cultural perspectives. This chapter develops a methodology to score proposed projects using an *ex ante* “Indicator Scoring System (ISS)”, specially adapted for Gorj County, Romania.

The two broad project themes were:

1. To integrate the principles of sustainable development smoothly into the region's on-going economic and environmental initiatives; and
2. To develop a knowledge-based and participatory method of evaluating and prioritizing sustainable development projects for Gorj County and its local communities.

These two themes are interrelated and reflect the current social, economic, and environmental situation in the county. The first theme relates to the sustainability of the future initiatives focused on developing a mixed market, multi-sector economy and represents a long-term goal that is fundamental to the mandate and mission set forth in Romania's accession into the European Union. Sustainable communities are defined here as those that are able to further social, economic and environmental objectives without creating problems for another group, community or generation. Oftentimes, not all stakeholders will choose to participate in and embrace sustainable development strategies. The second theme of integrating sustainable development principles into ongoing initiatives

was very evident as the project progressed. Gorj County was in the midst of creating a Strategic Development Plan and therefore, much of our early research focused on understanding those reports and integrating them with our analysis and stakeholder interviews.

BACKGROUND

An Informational - Assessment Framework for Sustainable Development

“Along with the questions ‘should we?’ or ‘can we implement sustainable development?’ more and more the question ‘how can we apply this concept?’ dominates the literature” (Chifos 2007). Policy makers frequently speak about sustainability; however, tools for the integration of quantitative and qualitative analysis for sustainable development planning on either the regional or the local level are still in their infancy (Keiner 2006; Grosskurth 2007). Practitioners and academics alike have explored the role of sustainability in planning theory and practice (Healey and Shaw 1994; Beatley 1995; Spain 1995; Campbell 1996; McDonald 1996; Houghton 1999; Wheeler 2000; Jepson 2001; Berke 2002; Godschalk 2004; Jepson 2004), and have proposed numerous testing tools and techniques (Berke and Manta - Conroy 2000; Innes and Booher 2000; Kakee 2002; Jepson 2003; Portney 2003). As such, sustainable development is recognized as a central concept for planning and building sustainable places (Beatley and Manning 1998; Godschalk 2004; Jepson 2004). To be successful at planning at any scale, appropriate methods, procedures, and instruments are required (Keiner 2006). Furthermore, the proper choice of indicators is essential for monitoring progress towards sustainable spatial development (Presscott - Allen 2001; Bossel 1999). The planning community recognizes the need

for implementation but it struggles at putting the concepts into action.

Most discussions of sustainable development begin with what has been called the “Three Pillars” model - where the trade-offs among economic, environmental and social consequences of projects and programs are estimated and balanced according to the objectives established by decision makers. The anticipated outcome of this approach is eventually to *“improve the performance of the strategies by enhancing the positive effects, minimizing the negative ones, and avoiding the transfer of negative impacts to future generations”* (Arbeter 2007). Although this approach seeks to find “win-win” situations to emphasize, in fact the “Three Pillars” model by its very nature establishes a conflict mentality among competing interests.

An extension of this model is to emphasize a “social learning” component to the process and integrate sustainable development as a regulatory idea into monitoring and governance (George 2007). The key elements of this model are based upon stakeholder involvement in the decision- and policy-making process. In this extended approach, the principles of sustainable development are expressed in national strategic planning and passed down to local administrations. This results in sustainable development being expressed as a steering and regulatory overlay on society, wherein the social, economic and environmental aims of the society are embedded (Stormer and Schubert 2007). If this social-learning aspect of stakeholder input can be repeated over time, and if the results of previously developed policies can be assessed, evaluated, and communicated, then this extended process of sustainable development has the long-run potential to change social values (Thierstein and Walser 2007). At its core, this iterative process acknowledges that we have imperfect information and that disagreement is inevitable, but that postulating the impacts of programs, projects and policies in an *ex ante* manner can serve to implement sustainable development as a dynamic and evolving process.

Ex ante evaluations are to be conducted early in the decision process for project prioritization, which allows for the analysis of strengths, weaknesses and potentials for a region. This not only provides authorities with input relative to policy, program and project priorities, but it also presents an opportunity for transparency in the decision-making process (Stormer and Schubert 2007). *Ex ante* evaluations evaluation need to be conducted at the time when discussions and negotiations are underway to set a future program in motion, often before the program is fully defined. One key aspect is that *ex ante* evaluation may be done when stakeholders are in position to express desired outcomes and, as such, contribute to the inclusion of revised aspects into projects that may not have been part of an original proposal (Thierstein and Walster 2007).

As proposals are received for projects to promote economic development, a process is needed to evaluate proposals so that development is directed in ways that support community vision for sustainable development. As Romania integrates into the European Union, much of the information gathered by various governmental units, ministries and departments is seldom collected or distributed in a manner that promotes collaboration. In addition, long term planning is not done at the local level and is typically not done in an integrated manner. This does not allow for a knowledge-based decision making process and for any feed-back of information from past decisions to be used to improve future decisions. This presents a challenge for both the development and deployment of a decision-support tool for sustainable development. There is a growing body of literature suggesting that a combination of local knowledge and scientific knowledge may empower local communities to monitor and manage their local sustainability needs (e.g., Folke et al. 2002; Thomas and Twyman 2004; Fraser et al. 2006; Reed et al. 2008).

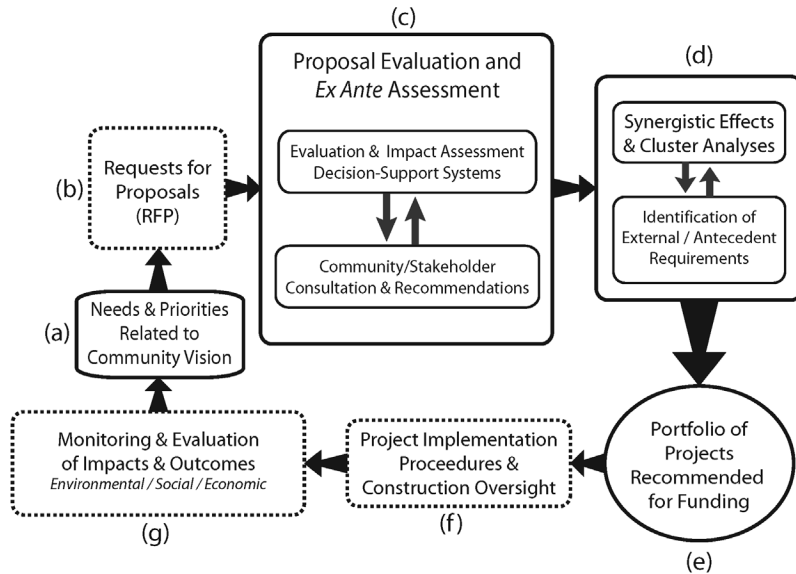
A central aspect critical to the success of any sustainability plan is the existence of the adminis-

trative capacity to gather input from stakeholders regarding visions and problems, to solicit and evaluate project proposals, to implement projects, and then to assess the outcomes of the selected projects. The establishment of a formalized and coordinated infrastructure for handling, processing and interpretation of economic, social, and environmental information related to sustainable development is an essential step in the process (Figure 1).

The decision-support system for sustainable development we envision will eventually incorporate seven components (Figure 1, a-g). The components are as follows:

- (a) The first aspect is the establishment of procedures for *Needs and Priorities Assessment Related to Community Vision*. This was initiated in Gorj County as part of several projects such as the Planificarea Strategică Participativă Pentru Dezvoltarea Socio-Economică a Județului Gorj – Dezvoltarea Culturii Participării 2007 (hereafter referred to as “Gorj County 2007), and the Targu Jiu Agenda 21 Plan (Targu Jiu 2004). Needs assessment may often be conducted effectively using GIS analysis of geospatial data and with differential weighting to the specific needs relating to economic, infrastructure, environmental, and social/cultural data layers based upon public input. Given the spatial and temporal resolution of the data, a “hot-spot” analysis can serve as a first step in identifying needs and opportunities for public investments to promote private entrepreneurial activities.
- (b) The second step in the process is the creating *Request for Proposals (RFP)* guidelines and formats and an online/electronic submittal process for project proposals. The RFP system serves at least three functions. It establishes the goals for the specific funding cycle/competition (including initial sustainable project goals), formalizes the criteria

Figure 1. A general informational and assessment framework for implementing a sustainable development strategy



that will be used for evaluating proposals, and provides an opportunity for equal access by all applicants to information regarding the competition for funding. The RFP will request information to be provided from applicants, which will support the assessment of proposals. The idea is that criteria specifically related to the sustainability issues identified are incorporated into the proposal development and selection process.

- (c) The third component encompasses *Proposal Review, Evaluation and Assessment*. This involves two distinct steps.
 - a. *Impact Assessment using criteria developed for decision-support*. This step will develop a series of scoring metrics to be applied to projects in an objective fashion. Separate suites and process will be created the evaluation of impacts on (1) economic factors, (2) social and cultural factors, and (3) the natural and built environment.
 - b. *Community and Stakeholder Consultation*. This second step in

Proposal Review will gather information and develop scoring metrics for the relationship of project impacts relative to local (municipal), regional (county), national, and European Union priorities, including: (1) Gathering local input regarding perceived impacts/reach of proposed projects, (2) Evaluating “match/mismatch” between local perception and assessed impacts from step (a) above, and (3) Ground-truthing and validating reasons for mismatches.

- (d) The fourth component of the framework examines suites of projects submitted for *Synergistic Effects and Necessary Antecedent Conditions* (e.g. infrastructure). This step will be supported through geospatial analyses such as: “hot-spot” and weighted overlay, sensitivity, uniqueness, economic value, time, and spatial reach and duration of impacts. Currently in Romania, GIS databases are in the early stages of development. Often data lack consistent and adequate resolution, scale, completeness,

and metadata, thereby limiting its utility. As data quantity and quality improve, the greater use of GIS tools will (1) develop more refined data standards, procedures and models to examine and evaluate the linkages among proposed projects, (2) assess spatial connectedness of locations and reach of impacts, (3) construct “critical path” timeline for staging of projects, (4) identify “bottlenecks” in project implementation, and (5) conduct spatial and temporal clustering of project with respect to impacts and rankings to identify probable facilitation of economic development, investment potential, and social and environmental costs/benefits among projects.

- (e) Based upon this clustering and cost-benefit analysis, a *Recommended Portfolio of Projects* can be assembled and put forth for support and funding assistance. Project awards and verification of applicant information will be conducted in accordance with established Romanian contractual protocols and financial requirements.
- (f) The sixth component of the framework entails post-award *Project Implementation Monitoring and Oversight*, assuring adherence to the specific stated project objectives and deliverables. The monitoring needs to be directly linked to the criteria used in the evaluations in step (c), thereby allowing for the eventual evaluation of whether or not the project met its expectations.
- (g) In completing the circle of the administrative framework, a comprehensive and integrated *Monitoring of Impacts and Outcomes* for social, environmental, and economic indicators must be established. This will allow for both the evaluation of implemented projects as well as the baseline for assessment of needs for additional “Request for Proposals (RFP)” cycles.

The ultimate goal is to facilitate a process under which local authorities, governments, and international organizations are able to support sustainable development initiatives as well as coordinate and evaluate their own independent activities. Sustainable development tools that are well integrated with decision-making processes and valued by decision-makers will contribute to the implementation of the objectives of sustainable development.

Components of an Indicator Scoring System (ISS)

A critical first step in implementing the process outlined in Figure 1 is to develop a method to evaluate the *ex ante* impact of various redevelopment projects (Figure 1c). An integrated model combines simplified criteria descriptions of the assessment categories with expert judgments and empirical data used to define model input. In addition to impact assessment, the purpose of *ex ante* evaluation is to provide authorities with stakeholder input relative to policy, program and project priorities. This feedback can contribute to project revisions that better reflect (and define) community priorities. A side benefit is that it can establish transparency and confidence in the decision-making process.

Similar to any larger planning project, a practical and critical barrier to sustainable development is how to make and coordinate a wide range of priorities and decisions at local and regional levels and keep track of how the projects may change over time. To address these factors, we developed a database tool for sustainable development to support the decision making process. Technical tools are essential for information and judgment-driven decision making, project tracking and for consideration of economic, environmental, and social/cultural factors of the region. The tool developed through the process of this project is called the *Indicator Scoring System (ISS)*. The ISS is a simplified, hierarchical decision-support tool

to investigate the impact of various redevelopment projects using the first principles of sustainable development. It is an attempt for projects to be assessed in a transparent and objective manner and be reviewed by experts in each of the categories – environmental, social/cultural and economic. The tool also tracks the physical location of projects and can be integrated into GIS analysis for spatial and synergistic analysis of projects. Most importantly, the tool helps track multiple projects and also allows for both quantitative and qualitative evaluation data to be monitored for projects.

“Indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems” (UNSD 1992). By accepting the sustainable development challenge, governments have created a demand for indicators (Moran et al. 2008). Numerous sustainability and sustainable development indices have been proposed specifically to help decision - makers (Mayer 2008), and sets of these indicators are used increasingly to guide policy decisions (Oras 2005; Hezri and Dovers 2006). At the same time, the push to include such “information-based” indicators emphasizes the critical need for us to better understand their strengths, weaknesses, scale dependence, etc. when using them (Morse and Fraser 2005; Ness et al. 2007).

With respect to applicable Romanian legislative frameworks, it was decided that this project would adopt a basic format recommended for Strategic Environmental Assessment (SEA) as outlined in the “Handbook on SEA for Cohesion Policy 2007-2013” and further elaborated within the Interreg III C project “Greening Regional Development Programmes” (hereinafter GRDP Handbook). The SEA methodology is typically used for evaluation of policies or programs that involve impacts on a wide temporal or spatial scale. SEA assessment fully incorporates the requirements and methodological recommendations contained in the GRDP Handbook and the

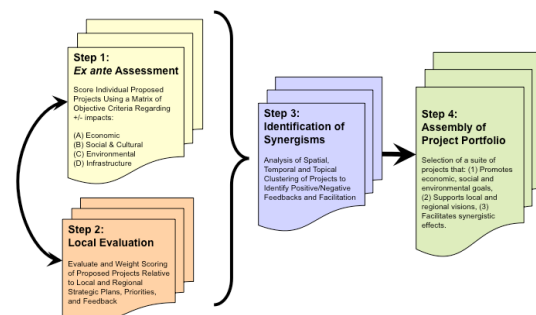
national SEA requirements in Romania set by GD no.1076/2004. An *ex ante* analysis using the SEA approach was adopted for evaluation of the Romanian Sectoral Operational Programmes (SOP) for EU Cohesion Policy in 2007-2013.

The *ex ante* approach is central to SEA methodology, and core elements include the development of categories and criteria for assessment of likely impacts of projects. As such, the identification and development of *ex ante* assessment categories and parameters became a primary goal set by the Project Team as part of the stakeholder meetings, as well as assessments of environmental, economic and social existing conditions. These parameters would then be adapted and incorporated into the methodology for the ISS database system to be used in needs assessment, impact analysis, and examination of synergisms (Figure 1 parts a, c and d respectively). The specific objectives involved 4 steps (Figure 2).

The *first step* is to develop a matrix for *Scoring Metrics* for projects to be scored by stakeholders. These should include axes related to (1) Environmental Impacts, (2) Infrastructure Impacts, (3) Economic Impacts, and (4) Social and Cultural Impacts.

The *second step* is to evaluate the proposed metrics relative to local (municipal), regional (county), national, and European Union priorities. This would be accomplished by gathering local

Figure 2. Steps for Formulating a Prioritized Portfolio of Projects for Sustainable Economic Development in Gorj Co. Romania



input regarding perceived impacts and the spatial/temporal reach of proposed projects; which could produce different weighting schema for different regions. Lastly, analyses would evaluate dissonance between local perceptions and assessed impacts from Step 1 with further studies to validate the scoring and paying attention for mismatches between Step 1 and Step 2.

The *third step* is to develop procedures to examine and evaluate the linkages among proposed projects, to assess spatial connectedness of locations and reach of impacts, to construct a “critical path” timeline for staging of projects, to identify possible “bottlenecks,” and to conduct spatial and temporal clustering of the project with respect to impacts and rankings created in step 1 and step 2. The ideal in this case is to identify synergistic facilitation of economic development, investment potential, and social and environmental costs and benefits among projects.

The *fourth step* is to assemble groups of projects and develop procedure for measuring combined impacts of sets of projects from Step 3. This is the stage where financing and investment opportunities are targeted. The portfolio of projects should be presented to stakeholders to collect and incorporate feedback to explore impacts of alternative projects within groups. The final selected portfolio would then be chosen along with the development timelines and budgets.

DEVELOPMENT AND APPLICATION OF AN EX ANTE ASSESSMENT TOOL

Creation of Ex Ante Assessment Matrices

A set of four scoring matrices were developed to assess the *ex ante* impacts of proposed projects on the environmental, infrastructural, economic, and social aspects of Gorj County. Specific indicators and criteria were selected based upon

the application of first principles of sustainable development, and refined through recursive feedback with stakeholders (USTDA 2009). The focus of this process was to establish assessment categories and questions that capture the essence of community concerns and priorities.

Environmental Assessment: With respect to environmental impacts, this approach established that each project should be assessed on the basis of preservation, conservation, restoration, and protection of the natural environment. The goals and criteria presented in Table 1 relate to general assessment categories of environmental quality, environmental quantity and environmental function. Specific assessment questions were developed pertaining to topics of environmental ethic, air quality, water quality, soil quality, native flora and fauna, ecosystem integrity, unique landscapes, system interaction.

With respect to each of these topics, specific goals are set to consider: (1) *preservation* of existing natural environments, (2) *conservation* of utilized natural environments, and (3) *restoration* of plighted natural environments, all. All of which are subject to European Union standards and regulatory requirements. Evaluator scores should objectively represent the needs of all inhabitants of natural systems associated with the project. Scoring of projects should be based on the degree of benefit of “high/good” with higher scores given to projects that promote quality, quantity, and functioning.

Infrastructure/Built Environment Assessment: A similar matrix was developed for infrastructure, with assessment categories related to the impact on the quantity, quality and function of infrastructure. We define infrastructure as the manmade surroundings that provide setting for human activity- from the largest-scale civic surroundings to the smallest personal place. The built environment consists of cities, suburbs, villages, buildings, and infrastructure (sewer and water, pipelines, and transportation networks), all of which have particular influences on the urban

Application of a Participatory Ex Ante Assessment Model for Environmental Governance

Table 1. Natural environment ex ante assessment parameters

Assessment Category	Assessment Question	Environmental Aspect to be Evaluated	
		Goal	Category and Considerations
Quality	Does the project improve environmental quality as established by community, regional and European Union standards?	Water Quality	Emissions
			Exposure or Risk to People
			Overall Impact (regional cumulative)
		Air Quality	Emissions
			Exposure and/or Risk to Human Population
			Overall Impact (regional cumulative)
		Soil/Land Quality	Emissions
			Exposure/Risk to Human Population
			Overall Impact (regional cumulative)
Quantity	Does the project improve the sustainable supply and/or access to a sustainable supply of environmental resources?	Potable Water Increase Availability and Safety	Supply
			Access
			Reuse/conservation
		Water for Agricultural and/or Industrial Use	Supply
			Access
			Reuse/conservation
		Soils for Agricultural Use	Supply
			Access
			Reuse/conservation
		Public Access to Green Space, Waterways, and Natural Areas	Supply
			Access
		Greenhouse gas emissions (Per capita)	Supply
Uptake (sequestration)			
Function	Does the project improve the ecological function and preserve land and waterscapes necessary for sustainable resources?	Hydrological cycle functions	Runoff/Infiltration/Flow Regimes (flooding, dams, hydroperiods)
		Soil stability	Erosion/Sediment transport
		Wetland functions	Recharge/Flood storage/Water quality/Habitat
		Natural Habitat	Corridors/Connectivity/ Fragmentation
		Natural Heritage Features	Unique region/global
		Biological Diversity	Endemic/Rare species or communities
		Education Initiatives	Schools/General Public/Tourists
Monitoring and Assessment	Air/Water/Soil		

environment. The parameters included in the *ex ante* assessment of impacts on Built Environment and Infrastructure are listed in Table 2. Each project should be assessed on the basis of several goals related to the protection, preservation, and enhancement of the built environment. The goals

considered relate to: public use and aesthetics, property, solid waste, sewage and wastewater, drinking water, stormwater, communication, energy, and transportation.

Key considerations include whether a project protects, preserves, or enhances the public use

Table 2. Built environment & infrastructure ex ante assessment parameters

Assessment Category	Assessment Question	Environmental Aspect to be Evaluated			
		Goal	Category and Considerations		
Quality	Does the project improve environmental quality as established by community, regional and European Union standards?	Use and Aesthetics Integrate with and/or enhance the environment	Public use and Accessibility		
			Aesthetic impact		
			EU Standards or Regulatory requirements		
Quantity	Does the project improve the sustainable supply and/or access to a sustainable supply of environmental resources?	Property (land)	Reuse or reclaimed land		
			Reuse or Recycling of building materials		
		Solid Waste	Generation		
			Transfer (handling)		
			Disposal (treatment)		
		Sewerage (water waste)	Generation		
			Transfer (handling)		
			Treatment (disposal)		
		Drinking water	Generation		
			Transfer (handling)		
			Treatment (disposal)		
		Stormwater	Impervious surfaces		
			Flood/ Floodplain management		
		Function	Does the project improve the ecological function and preserve land and waterscapes necessary for sustainable resources?	Stormwater	Impervious surface and BMP
				Communication	Information Technology Infrastructure
Sustainable Energy	Clean Energy				
	Renewable Energy				
	Energy Efficiency				
Transportation	Infrastructure enhancement (Road, Rail or Air)				
	Public Transportation Access				
	Shipping/ Commercial Efficiency				

and accessibility, and results in a common amenity that can be used and enjoyed to benefit all members of the public. Example questions would include the following. Will the project improve the aesthetic appearance and attractiveness of the built environment of Gorj County? Does the project conform to regulations and standards put forward by the European Union? With regard to property development, will the project reuse underutilized, blighted or brownfields land, as well as promote the adaptive reuse of existing structures, as opposed to new construction on greenfield land (agricultural land and open space)?

Consideration for wastes (solid, sewage and wastewaters), include the amount generated, whether procedures are developed for reducing, reusing, treating or recycling waste, as well as for safe and responsible disposal.

Economic Assessment: An economic analysis for Gorj County was undertaken to identify critical aspects necessary to be considered as part of a redevelopment strategy (USTDA 2009). The criteria presented in Table 3 are based on: (1) an understanding of the way economies grow (net new income and import substitution) and the role different “geographies” might play in the creation

of a regional economy, (2) an understanding of how and where public sector investments in assets and policy can improve the conditions for private sector investments, and (3) a need for the public sector to deliver the results of those investments to the most local citizens.

A region’s economic base is that set of industries (and specific businesses within the industries) that brings in the majority of regional income. These are sometimes referred to as the region’s “primary sectors” or “drivers”. As regional income comes in through the sale of goods and services from regional business entities, that income is distributed to the business’ suppliers and to its workers. Thus, the retail and consumer services sectors of an economy are tied to the health of the economic base. They are typically not base industries, but are referred to as “secondary sectors”. In addition to a secondary sector that supports workers and people, there are secondary businesses that sell to businesses in the primary sector.

Generally speaking, firms that are owned by Romanian nationals are preferred for two reasons. First, nationally-owned firms are more likely to buy and sell products from other national firms and thus have a larger effect on the Romanian economy than non-national firms. National firms are more likely to buy inputs such as advertising, legal services, financial services, and other raw products from local firms, thus giving markets and opportunities to local firms. Second, they are also more likely to keep profits in the country and pay taxes while reinvesting in local plant, equipment, and labour force. Other key economic considerations include (1) relationships with worker skills and training programs for the labour force, (2) characterizing consumer activity and unmet demand for products and housing-creating market opportunities, and (3) transportation and energy costs as they relate to the cost of conducting business.

Social-Cultural Assessment: Suites of indicators were developed to assess and rank projects according to their potential to fulfill the goals of

Table 3. Economic Development ex ante Assessment Parameters

Assessment Category	Goal / Assessment Question
Primary Economic Growth/ Markets	Grow a promising primary sector?
	Fill a new national niche?
	Fill a new international market niche?
Ownership	Grow national ownership of means of production?
Secondary Economic Sectors	Fit with needed industrial secondary sector activity?
	Fit with needed consumer secondary activity—retail?
Worker Skills	Fit with existing worker skills?
Consumer Activity/Housing	Fit with needed consumer secondary sector activity—housing?
Transportation/Movement	Facilitate movement of goods regionally?
	Facilitate movement of tourists?
	Facilitate movement of workers?
Cost of Business	Lower cost of doing business—energy?

the World Bank program. These include mitigating the environmental and socio-economic impacts of mining and mine closures and regenerating balanced patterns of development from the perspective of social and cultural sustainability (USTDA 2009). Social indicators, including the capacity of projects to replace incomes lost as a result of mine closures, reflect predefined program goals. However, assessment reports for previous initiatives to mitigate the impacts of mine closures confirm that funding strategies must be broadened to facilitate more complex economic systems at the local and regional level, and overall community development for the areas most affected (World Bank 2005; Haney and Shkaratan 2003). The five categories include (1) Social stability, (2) Social equity and human development, (3) Social inclusion, (4) Community capacity, and (5) Cultural resources. The assessment categories and associated goals and questions are presented in Table 4.

Social Stability Indicators are intended to assess which projects best fulfill program goals of mitigating the socio-economic impacts related to mine closures. The difference between indicators of Social Stability and indicators used for the Economic Evaluation Matrix is a fundamental difference of perspective and scale: we look at how investments actually serve families, households and communities in the most disadvantaged areas of Gorj rather than abstract measures of economic growth at the county level. Indicators of Social Equity and Human Development are intended to assess the expected socio-economic distribution of benefits resulting from project investments. Rather than expecting the economic benefits of investment simply to “trickle down” to the most vulnerable and marginal sectors of the county, use of these indicators recognizes that greater social equity and fulfillment of basic human needs for everyone constitutes a key factor of sustainability. The social inclusion aspect of assessment is to assure that local investments assist to mitigate and prevent the social exclusion of minority groups on the basis of religion, race, ethnicity, or culture. While indicators of social equity and human development primarily target problems related to poverty and seek to optimize the distribution of social benefits to promote sustainability, indicators of social inclusion are primarily concerned with the status of visible minorities. The fourth component of the socio-cultural assessment considers how well a proposed project would enhance the capacity of the community to identify, organize, and achieve sustainable development goals in the future. The fifth and final component of assessment considers how well a project protects, manages and enhances the cultural resources available to a community. Cultural resources can include a variety of assets such as important landscapes, historical sites, material culture, artistic traditions, skills, local knowledge and intangible cultural heritage. In many cases, such cultural resources can provide an important platform for ecodevelopment and

reaffirm the positive importance of community. Relevant cultural resources should be identified and project proposals invited to discuss the potential to preserve, enhance, or develop them.

Application of the Indicator Scoring System (ISS) in Gorj County

The underlying principle of the *ex ante* assessment matrices in the ISS is to allow diverse stakeholder groups the opportunity to evaluate expected impacts of projects. To this end, the assessment categories and questions are meant to serve as a heuristic model for organizing review, discussion and revision of projects. This provides for feedback and adjustment in both project design and prioritization as part of the review process (Figure 1c and Figure 2). Assessment teams must exercise professional judgment to determine and weigh a range of relevant issues, based on knowledge of the local area and their understanding of the character and needs of the community in question.

A series of meetings were held in Gorj County between November 2006 and March 2008. These meetings included representatives of the Municipalities of Targu Jiu and Motru, the County Council and Prefecture of Gorj County, the village of Baia de Fier, several Environmental NGOs, as well as other agencies, groups, and associations from their area. During the review of strategic plans, background information, and stakeholder meetings, many potential projects were discussed. Discussions focused on identifying needs and priorities for the local communities and region, and a list of proposed development projects was compiled.

Following these meetings, a standardized project software tool was created to gather stakeholder input, track, evaluate, prioritize and visualize potential projects. The result was a Microsoft Access^(TM) database tool that integrates the ISS Matrix and a GIS interface. The integrated database tool was developed to allow multi-agency input of consistent project parameters, which

Application of a Participatory Ex Ante Assessment Model for Environmental Governance

Table 4. Social and cultural ex ante assessment parameters

Assessment Category	Assessment Question	Socio-cultural Aspect to be Evaluated	
		Goal	Category and Considerations
Social Stability	Does the project mitigate socio-economic impacts to mine closures?	Assistance to individuals and households affected by mine closures	Unemployed adults Unemployment: families
		Investment in communities affected by mine closures	Directly support entrepreneurial activities
			Help prevent or mitigate outward labor migration
			Directly support improved fulfillment of basic human needs
Social equity and human development	Does the project promote social equity and human development in Gorj County?	Support UN Millennium Development Goals in Gorj County	Poverty and hunger
			Child mortality / maternal health
			Incidence of major diseases
			Public health and/or environmental health risks
		Support disadvantaged groups	Target the most needy segments of the population Gender equality and empower women
Social inclusion	Does the project adequately support the social inclusion of cultural, religious, or ethnic minorities?	Include cultural, religious, or ethnic minorities as stakeholders	Economic impact
			Impact on social inclusion
			Impact on housing/ services
Community capacity	Does the project enhance the capacity of the local community to identify, organize and achieve sustainable development goals in the future?	Support development of community-led projects	Support participation of stakeholders in its design and process
			Support and facilitate transition of local economic activities from informal to the formal economy
			Support small-scale “bottom up” initiatives
		Support implementation and completion of community-led projects	Incorporate measures to account for the distribution and use of funds
			Incorporate participatory methods of ongoing impact assessment
			Support and develop civil society
			Enhance the capacity for local organizations, institutes, and/or agencies to work together
Cultural resources	Does the project enhance and develop cultural resources of the local community?	Improve cultural resources for tourism and the community	Develop cultural resources/Improve management of cultural or historical sites
			Improve local capacity for tourism eco-development
		Support individual and community cultural resource goals	Support maintenance, transmission, or revitalization of culturally important skills and knowledge
			Consistent with historical landuse, past occupational patterns, ties to the landscape
		Support local initiatives to enhance and market regional products, services, or identity	

enhances data efficiency and accuracy when tracking, managing, evaluating and visualizing potential projects. This system integrates GIS technologies for spatial analysis, visualization, and distribution of information.

A pilot project was conducted to evaluate the effectiveness of the ISS matrix. The purpose of this study was to see if the matrix database tool, if used by the stakeholders in Gorj County, would provide relevant information applicable to an *ex ante* assessment of likely sustainable development impacts for projects. This application of the ISS tool was intended only to get feedback from stakeholders about the utility of the database tool and to evaluate if the metrics and parameters evaluated were able to assess the important components of sustainable development relevant to the stakeholders of Gorj County. It is important to emphasize that the results of this first exercise were not intended for use in “prioritizing” projects. The use for the ISS tool for prioritization requires input from a wider range of citizens and stakeholders than occurred in this pilot study. A second, more detailed application by the municipality of Targu Jiu was conducted for the purpose of project prioritization (see below).

For the pilot study a subset of likely end-users of the data from the municipalities of Motru, Targu Jiu, Baia de Fier, and the Gorj County Council were trained in the use of the ISS matrix and used it to score a total of 33 projects identified during stakeholder meetings. Projects were evaluated on the *ex ante* criteria established in the matrices (Tables 1-4) for Natural Environment, Built Environment, Economic, and Social impact. Projects were rated with values ranging from negative 3 (strong negative impact) to positive 3 (strong positive impact). The projects that were chosen to be representative of the array of projects being considered, and included three related to drinking water, two in the energy sector, two related to education, two industrial parks, thirteen roads, six related to social-related structures, one for sports activities, and four related to waste management.

As a first step, the average rating for sub-components for each Assessment Category within each matrix was calculated. This avoids weighting bias among categories and to better visualize contributions to scoring among proposed projects within each Matrix type. These scores summarized by project type are shown in Figure 3. This provides visualization for how projects compare with respect to their separate environmental, infrastructure, economic and social impacts. As a second level of analysis, scores were standardized within each matrix by taking the average of the different sub-categories. This allowed for equal-weighting for each of the environmental, infrastructure, economic and social scores on a common scale from -3 to +3. These results are shown in Figure 4.

The total *ex ante* scores for the 4 categories of indicators show that the Infrastructure and Economic impacts (Figure 4, red and green respectively) for the projects tended to be evaluated consistently more positively than the Environmental or Social-Cultural impacts (Figure 4, blue and purple respectively). This pattern is likely due to the specific projects selected by the stakeholders, which emphasized construction activity for economic development. The moderately positive social impacts across projects were often attributed to the positive social impacts of economic development on reducing impacts of poverty.

Geospatial Integration of the ISS as a Planning Tool

An example of a GIS model application was performed to demonstrate an objective, spatial method for evaluating the “functionality” of lands for sustainable development and to help prioritize locations for appropriate projects. It is critically important to note that this process is not meant to determine which locations are more or less suited for development, but rather provides insights into factors that may promote or constrain sustainable

Application of a Participatory Ex Ante Assessment Model for Environmental Governance

Figure 3. Ex ante impact scores for projects rates using the ISS Matrices. Data shown are averages calculated for each assessment category within (A) Environment, (B) Infrastructure, (C) Economic, and (D) Social-Cultural ISS Matrices

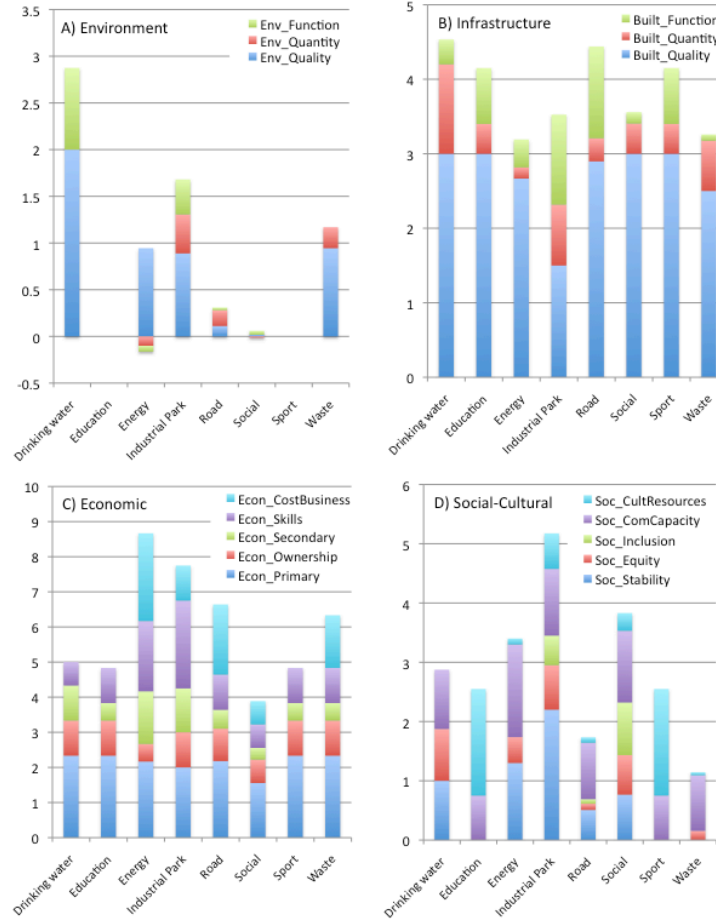
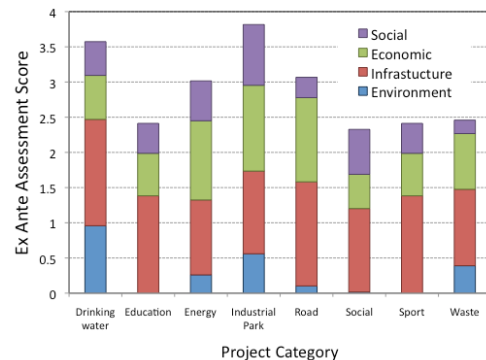


Figure 4. Ex ante assessment scores from ISS Matrix application. Averages within each project category were calculated from each sub-category with each matrix category



development. While the example model has many limitations and built-in assumptions it is an example of how an information tool can be useful in visualizing and analyzing spatial relationships tied to the ISS.

A GIS database was compiled with data provide by the following sources: County Council, Cadastral Office, City of Targu Jiu, Romanian Environmental Protection Agency and United States Geological Survey (USGS). In addition to the above data sources, the project team created a number of data sets via spatial analysis and/or digitization to fill necessary data gaps. In order to determine if data was to be included into the

model, information was evaluated for appropriate resolution, completeness, accuracy, precision and the ability to act as a surrogate for various components of sustainable development.

The following example illustrates the *ex ante* ISS approach used together with GIS mapping and expert local knowledge to integrate smart growth theory and practice. Value classes for each data layer (listed above) were calculated for input into the model by two methods: (1) by distance/proximity from a mapped feature or (2) by the ability of a feature or feature attribute to contribute to components of sustainable development. All data inputs were converted into raster format preserving an 80 meter (maximum of inputs) pixel resolution. When determining the distance/proximity score of a data layer, multi-buffer distances were calculated using inverse distance weighted (IDW) function and grouped into 10 classes every 15 km. The ten distance classes were then valued 0-10 with 10 being the highest and nearest in proximity to the feature of interest. Distances greater than 150 km were reclassified with a value of 0. Previously stated methods were conducted primarily within the Spatial Analyst toolbox, ESRI ArcGIS 9.3.

Scores on the following data layers were based upon distance and proximity from mapped features (highest values are given to areas at or nearest to the mapped feature).

- Tourism locations were mapped using gathered hard copy maps, which were georeferenced and digitized as point locations. These points represent areas of interest to a tourist, such as monuments, hotels, gas stations, museums, etc. Tourism points were included because these locations are key areas for economic growth, environmental protection, social interaction and infrastructure development.
- Open water includes lakes and large rivers which are both key attractions and resources which enhance everyday life and require environmental management.
- Rivers include linear waterways that are a key means of water conveyance requiring environmental protection and act as a means of transportation, sustenance and recreation.
- County-protected lands are natural resources that necessitate protection and serve as wildlife habitat and recreation.
- Nationally protected areas are significant natural resource areas that have been prioritized for protection.
- All roads provide public access and serve as means for social interaction. Roads act as key surrogates for economic and social development.
- National roads provide public access and serve as a significant means of social and economic interaction within the county as well as throughout the nation.
- Railroads provide public access and serve as a significant means of social and economic interaction with adjacent regions and throughout the nation.
- Mines and dumps represent key areas that require restoration and intense environmental management. Often these are locations of intense environmental hazards that can have catastrophic impacts to human health.
- EIS sites are areas of interest or locations that have already been identified for financial assistance and intervention by Environmental Impact.
- Romanian Agency for Mining Zone Redevelopment (ANDZM) project sites, areas of interest or locations that have already been identified for financial assistance and intervention by ANDZM.
- Both sites are areas of interest or locations that have already been identified for financial assistance and intervention by environmental impact analyses and ANDZM.

Scores on the following data layers were done by classification values and professional judgment of a feature or its attributes to measure sustainable redevelopment components.

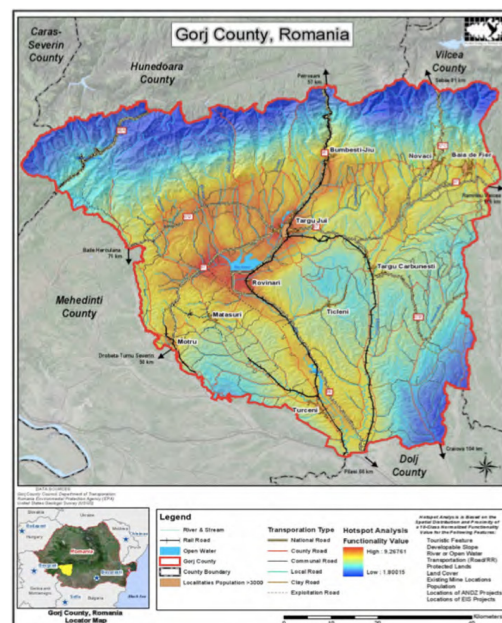
- Population was generated by interpolating population data per locality and is representative of where the majority of social, economic and environmental interactions occur. Population also identifies areas where the most people can benefit from services as well as where people have the greatest impacts on their resources. Areas with the highest population density were given a 10 and areas of lowest population were given a 0.
- Slope was generated using an 80m DEM grid that was acquired from the USGS. Slopes were classified into 0-10 classes, 0 identifying the highest sloped areas and areas most susceptible to degradation and impacts from development. A 10 was given to flat areas that would most adequately support development.
- Land use was acquired from the CORINE dataset with a generalized classification scheme used in the model. Cover types were ranked by classes appropriate for development. The following values and classes were used in the model: Disturbed land (10), Developed Lands (9), Agriculture (8), Open Lands (nonforested) (7), Natural Lands (nonforested) (6), Natural Lands (Forested) (5), Wetland (4), and Water (3).

Utilizing map algebra, value classes were added together to generate the mathematical sum of all 17 inputs. Areas with a high sum value would represent “hotspots” or areas of spatial clustering and centralize proximity to input data.

Results from the model are presented in Figure 5, with the highest values being represented by the “hotter” colors (red, orange, and yellow). On this map, Rovinari, Telesi and Calnic stand out

as the centralized hotspots within Gorj County. A secondary hotspot can be seen just north of this area around Targu Jiu. Generally higher values within the county take on an upside down “L” shape spanning east to west from Baia de Faier, Novaci, Bumbesti-Jiu, Targu Jiu to Rovinari. From Rovinari higher values run southeast following the national highway, rail and river to Turceni. Smaller hotspot patches can also be observed around Motru as well as near Bumbesti-Jiu. In order to better understand the modeling trends, GIS statistical calculation can summarize hotspot results by governmental jurisdictions. By looking at land uses associated with developmental ‘hotspots’ one can identify dominant land use development and strategy opportunities per cover type composition. When combined with project *ex ante* impact assessments, such visualization can provide an opportunity to modify the locations of proposed projects potentially increase positive or decrease negative impacts.

Figure 5. Results of a geospatial “hotspots” analysis using criteria related to sustainable development principles. Hot colors (red and orange) indicate areas of higher development potential



This hotspot example is intended as a proof-of-concept and has significant limitations. For example, data are limited to Gorj County and do not account for regional influences from other areas of Romania that could impact weighting of metrics. All input layers were weighted equally; layers of most interest and/or importance to a specific task should be weighted differently in an actual application. Data availability set limits the types of variables included in the analysis, particularly related to population, land ownership and economic activity. Before such a model can be applied, significant additional data will be needed to properly calibrate, confirm and further refine the model.

An additional ISS *ex ante* assessment and geospatial analysis was conducted on a smaller local scale as part of an integrated urban development plan (PIDU) developed for the city of Targu Jiu, under the Regional Operational Program 2007-2013. An analysis was conducted regarding the different developing areas of the city, the state of urban infrastructure, the state of social infrastructure, and the economic characteristics. As part of this process three types of situations were identified within the municipality:

- (1) Developed areas in terms of infrastructure and without major social problems (the central and semi-central areas), characterized by a high density of well-developed economic activities,
- (2) Developed areas in terms of infrastructure, but with social problems caused by the restructuring that affected the mining sector (unemployment, low incomes of the population, clusters of housing). These are characterized by clusters of small economic agents/businesses, with activities like trade and services to people (constructions, small furniture store, presentation shops, etc.), and
- (3) Urban areas with poor developed or non-existent infrastructure, but with high potential for economic and social development (land

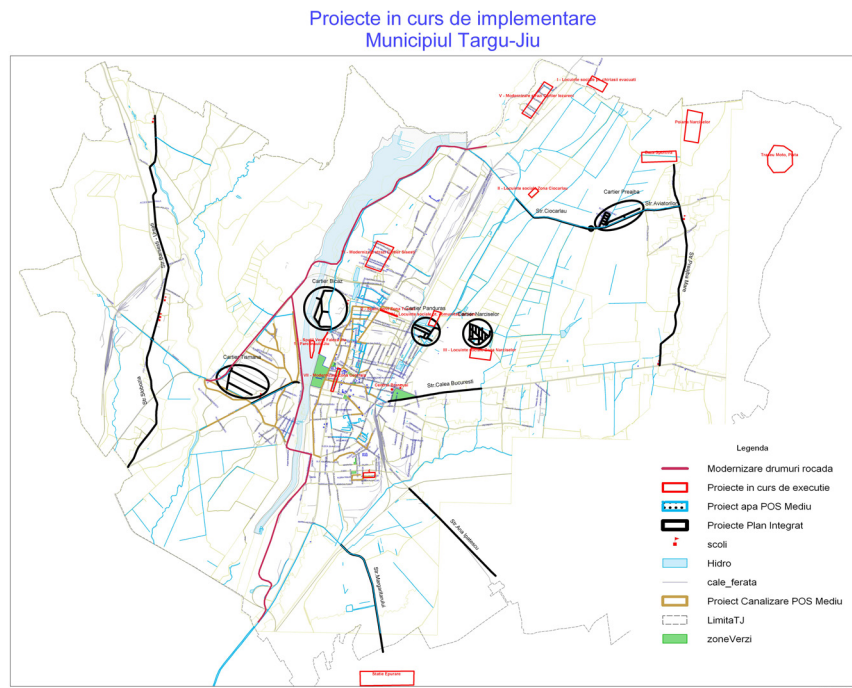
were investments can be done, business centers and individual or collective housing).

The Microsoft Access™ ISS program was used to evaluate impacts of 17 projects. These projects included (1) Modernization of streets in Targu-Jiu municipality, (2) Assistance Centre for people in need - social housing pavilions, (3) Integrated social services centre (elderly care and child care), (4) Centre for visitors and interpretation, Calea Eroilor redevelopment, (6) Monitoring, measurement and control system, (7) Youth Centre, (8) Modernization of beltline roads, (9) Rehabilitation and modernization of health care infrastructure, (10) Rehabilitation and modernization of social services infrastructure, (11) Modern learning technology for education institutions, (12) Rehabilitation and modernization of educational infrastructure, (14) Improved of emergency response equipment, (15) Restoration and capitalization of the cultural resources in Targu-Jiu, (16) Rehabilitation of Targu-Jiu railway station, and (17) Extension and rehabilitation of water supply systems and sewage systems.. The development objectives set by Local 21 Agenda (Targu Jiu, 2004) were as a starting point for *ex ante* evaluation.

An analysis of sustainable development potential was made by comparing the impacts of projects among the 3 different development areas of TarguTg-Jiu. The 17 projects were mapped and the *ex ante* ISS impact scores for projects were compared among the 3 development zones (Figure 6).

This geospatial analysis of the *ex ante* ISS scores was used to visualize the anticipated impacts of the funding requests to the Sectoral Operating Program in 2009. By framing their proposal in the context of social, economic, environmental and infrastructure impacts, the Municipality of Targu Jiu was able to demonstrate clearly how the funding would be used to promote the short-term and long-term objectives of their Local Agenda 21 plan. This approach resulted in a suc-

Figure 6. Locations of the 17 projects evaluated using the ex ante ISS tool for the Municipality of Targu Jiu



successful application, with over 100 million euros approved for development projects. Based upon this success, other municipalities in Romania are looking to incorporate similar analyses into the formulation and presentation of their funding requests.

Solutions and Recommendations

Understanding how data will be utilized in the overall process is critical to proper data collection and compilation. Data that are collected to support sustainable development decisions must be collected in a fashion that will contribute to multiple facets of project design by maximizing key data linkages. Looking at Figure 1, the schematic steps (c), (d) and (g), data must be collected and created in order to maintain or drive the overall planning and evaluation process. For example, interested parties pursuing a possible project will be required to collect data necessary to answer in the appropriate environmental, social

and economic questions in the ISS matrix. These data must then be compiled and scores generated to provide new prioritization data that will feed analysis in step (d). In the end, data relevant to the ISS evaluations must be gathered, and managed in a database system so as to be used by others to submit future proposals.

In contrast to steps (c), (d) and (e), step (g) requires more of a monitoring approach in which data will be used to assess the progress of implemented policy and projects. The primary role of collecting the appropriate data at this level is to allow evaluation of the effectiveness of the assessment process and eventually to contribute recursively back into steps (c), (d) and (e). An example of utilizing this type of data would be to compare land use change over a 5-year span to see if the county has minimized the acres (or, maximized the redevelopment) of disturbed land. By setting up appropriate data collection updates, one can evaluate the progress of land use change and the degree of progress or regress.

Standardized methods of data analysis must be created and formatted in a user-friendly operation that will allow a trained individual to perform calculations and evaluations. Decision Support Systems (DSS) are computer-based systems used to assist and aid decision makers in their decisions.

Access to Key Technologies: Often software, equipment, and IT infrastructure can be very expensive and require major monetary investments from agencies involved. Key investments must be made in computer and IT technologies that allow users access to the internet and other software that utilize the standardized data being developed.

Web Mapping Tools: Web mapping sites can allow land planners access to critical spatial data for a specific area of interest without the expensive investment in GIS software. An example of such a tool would be Google Earth. Applications similar to this one with a focus on regional data can make the planning process very efficient and allow users the ability to view and overlay various GIS data created by other professionals.

GIS Data Clearinghouse: This would be a centralized depository of regional data in which users can search, upload, and download GIS data layers. Such a data depository does not need to be strictly limited to GIS data but will allow interested parties immediate access to critical data needs.

Access of users to the appropriate software: Customized GIS toolbox, tools and models can be developed to analyze data in a systematic repeatable fashion. Once a model or tool is created by experts, analysis can be repeated very efficiently by less skilled users. Another advantage to using tools and models is that updated or comparable data sets can be rerun through the same tool or model and comparison evaluations and results can be generated. Such tools can allow a user to play out planning scenarios and quickly evaluate potential options.

FUTURE RESEARCH DIRECTIONS

Important aspects for future research include:

1. Further development of appropriate GIS based data is necessary to continue to develop, refine and improve overall quality of GIS models.
2. The model should be refined to include new and improved data as well as an integration of fieldwork and findings in order to confirm, calibrate and refine model results.
3. Other GIS based models should be used in combination to improve findings. For example, a model that could identify and prioritize environmental constraints of Gorj County could be used in union with this example model.
4. The refined model should be used in combination with the decision support system developed for this project. Potential project locations and scores should be mapped and overlaid onto the model in order to identify a sustainable functionality score for a project location.
5. The use of web-based portals for project initiation, *ex ante* review, and revision should be established and evaluated to expand the accessibility of the ISS to stakeholders.

CONCLUSION

Sustainable development has emerged as an approach to the dilemma of balancing trade-offs between the needs of current versus future generations, as well as resolving conflicts between economic development and resource conservation. Sustainable development is by necessity a dynamic process; new advances will change the way business is done, completed projects will influence new projects, social, economic and natural landscapes and resources will change daily. Because of this, the tools presented in this Chapter allow

stakeholders to further develop, refine, visualize and implement a project management process to fit the detailed needs of Gorj County. The overall recursive process is designed to encourage public participation, provide unbiased quantitative and qualitative evaluation, integrate agency database compilation, and provide data analysis tools/techniques and viewing applications.

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KEY TERMS AND DEFINITIONS

Decision-Support Process (DSP): A framework for using information systems to support

policy development and decision-making activities. In the context of sustainable development, DSPs incorporate quantitative and qualitative information into a cycle of decisions, including proposal development, funding prioritization, project monitoring and evaluation.

Evaluation Matrix: A database tool used by stakeholders to guide and provide relevant information applicable to *ex ante* assessment of perceived potential impacts for sustainable development projects.

Ex Ante Impact Assessment: Evaluations conducted early in the decision process for project prioritization, which allows for the analysis of strengths, weaknesses and potential environmental, economic and social effects of a proposed project on a given location or spatial region. These assessments can be based upon both qualitative and quantitative information.

Geospatial Integration: Incorporation of the inputs and outputs of the Indicator Scoring System (ISS) into a geographic information system (GIS), allowing for the examination and analysis of spatial synergies or conflicts among potential projects.

Indicator Scoring System (ISS): A simplified, hierarchical decision-support tool to investigate the impact of various redevelopment projects using the first principles of sustainable development.

Scoring Metrics: Specific indicators and criteria selected along axes related to environmental, infrastructure, economic, and social-cultural impacts.

Stakeholder Participation: Process of refining scoring metrics and evaluation matrix through recursive feedback from members of the local and regional community to establish assessment categories and questions that capture the essence of community concerns and priorities.