The role of Greenway Planning in the Integration of Urban and Rural Mediterranean landscapes. The case of Agrinio, Greece.

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Abstract: Greenways are corridors of protected open space that are managed for conservation and/or recreation. They link natural reserves, parks, cultural and historic sites with each other and, in some cases, with populated areas. Greenways not only protect environmentally sensitive lands and wildlife, but also can provide people with access to outdoor recreation and enjoyment close to home which is usually found in an urban environment.
Connectivity is a critical landscape characteristic important to the health, well-being, and aesthetic values of human communities and vital to the maintenance of functional native ecosystems. Though the ability of greenways to "link" other resources is important, not every greenway is a connector. Some stand on their own as important linear recreational resources, like trails and bikeways.
While greenways are important conservation and recreation areas in and of themselves, what sets the greenways concept apart from other initiatives is its emphasis on connections.
The creation of a greenway system that initiates from the city of Agrinio, Greece and stretches up to the nearby lake of Lysimahia is being used as a case study, in order to evaluate the ability and examine the validity of greenway merits whose basis lie in connecting or linking the city with the lake via a ten kilometer path, exposing as many of the local and regional physical, historical, cultural, social and economic resources.

Keywords: Greenways, cultural resources, economic resources, historical resources, integration of urban and rural Mediterranean landscapes, physical planning.

1. Greenway Planning

The term ‘greenway’ was coined by joining greenbelt to parkway. It therefore draws upon a wide range of concepts from the history of linking open space. Each of the parents has contributed to the concept.

‘Parkway’ is the older term. It was first used by Frederick Law Olmsted to convey the idea of linking public parks together. Olmsted was an American farmer who came to visit Europe and later won the design competition for Central Park in New York. He admired English public parks and the way in which parks are linked together by avenues in Paris, where the idea derives from the Baroque gardens of Italy. Olmsted applied the idea first to New York and then to Boston.

‘Greenbelt’ appears to have been first used by Ebenezer Howard to denote the idea of a ring of open space encircling a city. English authors have traced the idea back to The Bible (Book of Numbers) and one could put together a substantial history, in which the most important is Nash’s circa 1830 scheme for linking St James’s Park via Regent Street to Regent’s Park in London.

The ‘Greenway’ idea is therefore concerned with open space linkage.

In America, the predominant meaning is 'a multi-purpose linear park' (ie a patch of land).
In Europe, the predominant meaning is closer to 'a route' [13].

2. Mediterranean Landscapes

Biodiversity within the Mediterranean Basin is increasingly at risk since pressures on natural areas often lead to change in land-use patterns. Conversely, economic activities such as agriculture and tourism, which depend to a large extent on the vitality of ecosystems, will suffer if anarchic development region-wide is not contained. Moreover, further loss of species will diminish the aesthetic value of the region, which may have an irriversible effect on future generations [2].

The capacity of Mediterranean ecosystems to replenish resources and absorb waste, will eventually be outpaced by population growth and accompanying activities, constraining future economic growth and development in the region. In a span of less than half a century, the cradle of civilization will be potentially transformed into an environmental graveyard.

The dramatic economic and social transformations that took place during the 20th century have led to: a) further demographic increase, b) natural resources overuse within landscapes, c) abandonment of productively low agricultural land, and d) accelerated speculation of land for urbanization, industrial development and tourism purposes.

3. Urban Mediterranean Landscapes

The continuous population increase in the urban centres particularly in the South, have raised concerns about the quality of life and the function of urban and urban fringe landscapes for improving this quality. Ecological approaches to urban landscape design such as greenways and ecological networks have been developed in order to reintroduce nature to cities as a means to improve quality of life [8].

This rapid growth of urban and tourism development over the last four decades, is wholly responsible for a discerning loss of biodiversity and habitats of high ecological value. This has much been the case in many Mediterranean locations, where biotopes have become pocketed and often relegated to restricted refuges around abounding and conflicting land-uses. Frequently, the only physical connections between these patches of natural and semi-natural habitats are plots of agricultural land intersected by a multitude of crisscrossing dry stone rubble walls and a network of freshwater conduits or courses that bisect entire stretches of landscape.
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4. Rural Mediterranean landscapes: a changing and threatened agricultural landscape

4.1 Agricultural practice

The most significant factor that has influenced land-cover within the Mediterranean territory has been agricultural practice. This singular activity, which has stretched over thousands of years and is still ongoing, has dramatically modified the terrain into contemporary Mediterranean landscapes. Considerable tracts of territory were transformed from natural habitat into arable land and vast quantities of groundwater were and are still extracted from freshwater aquifers. Agricultural activity has altered the face of the Mediterranean, transforming the landscape into one that is predominately rural in character, with strong human interaction. Landscape change commenced in antiquity when vast tracts of woodland fell to make way for agriculture and use as fuel. As Mediterranean populations grew and became less sustainable in their manner, more and more land was reclaimed for cultivation putting colossal pressure on resources.

As a result, Mediterranean environment and society, over time, merged to produce the cultural landscapes that are characteristic of the region. Traditional agricultural systems comprising small plot mixed type farming, e.g. terrace cultivation, in Greece and Italy, are testimonies of different more sustainable practices of the past. These systems were the result of management practices optimising typical annual fluctuations in productivity without causing ecological degradation.

However, during recent decades these habitats have been subject to irreversible deterioration through intensification, extensification and land abandonment.

4.2 Agricultural land abandonment the result of a non – taditional social lifestyle

Changes in lifestyle, a better income and an all-round improvement in social benefits meant that

more and more young people opted for employment within the service sector, rather than cultivate the land as their predecessors had done relentlessly. The effect that abandonment has on landscapes varies according to a number of factors, such as topographic characteristics, soil type and availability / scarcity of water resources.

Changes in land-use leading to abandonment highlight the need for a better understanding of the patterns and processes underlying colonization and early succession. Much more important however, are policy decisions concerning the future of abandoned agricultural land. With abandonment taking place at an increased rate, for different reasons, the issue poses a question of an ethical nature, that is, what should the environmental management response to accelerated abandonment be? The answer lies with restoration ecology. Vast tracts of land could be tactfully and strategically restored into public parks, conservation areas or landscape corridors to link important ecological sites. The decision as to which option should be considered depends largely on site characteristics, geographical location and land-use priorities, but also on long-term conservation policy, commitment towards nature protection, and foresight.

5. Landscape Study: A ''Multidisciplinary - Integrated - Wholistic'' Approach

Mediterranean landscapes are intricately linked to human activity. Therefore the conservation of biological diversity and its habitats should be seen from a holistic dimension, bringing together other important components - economic, social and political - that promote sustainable development strategies with success and constitute a challenge for the decades ahead.

The European Landscape Convention conceives landscape as “an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”. This definition reflects the notion of evolution through time and reinforces the idea of landscape as a whole, where natural and cultural components are interconnected. Accordingly, landscape should be understood as a resource composed of the assembly of natural, physical, cultural, economic and visual components. From a sustainable development perspective, the protection of this resource requires actions “to ensure the upkeep of the totality of characteristic features of a landscape justified by its heritage value derived from its natural configuration and/or human activity” (European Landscape Convention)[11].

Protected areas management plans, as a type of landscape planning, aim to produce technical reports and zoning maps with guidelines and strategies to ensure the preservation of the characteristics that determine the quality and/or uniqueness of a landscape, through assigning land uses to the most suitable places [13][9][10]. Generally, these plans are drawn upon methodologies in which natural and physical components are studied and assessed as separate entities, despite their interconnectivity.

On the other hand, the cultural character of a landscape expresses the interaction of man with the territory. As such, this interaction is a display of socio-cultural influence and allows the acknowledgment of the connection between specific site features and the history of a society, thereby contributing to the uniqueness and identity of a landscape.

Furthermore, landscape quality today is endowed with economic value (e.g. for tourism). Elements like historical, cultural, economic or aesthetic factors thus demand a joined and interrelated approach in which the relationships between them and with the physical and biological factors would be considered among the assessment criteria, because nature conservation together with the preservation of the cultural heritage of a territory values the landscape [10] [7].

6. Economic and other benefits of Greenways (Pedestrian / Bicycle - based Tourism)

Across Greece, bicycle and pedestrian greenway tourists can make significant contributions to local economies. In some areas, the contribution made by these non-motorized tourists can be as much as tourists using motor vehicles.

Studies show that where greenway bicycle and pedestrian tourism is fostered and promoted, and where investments are made in bicycle and pedestrian facilities, the economic impact may be even greater. A thriving tourist industry, in turn, can attract and revitalize businesses, create jobs, and increase public revenue [3].

6.1 Trails and Greenways

Trails and greenways are very popular among vacationing bicyclists and pedestrians. Visitors appreciate and often return to communities that provide places for bicycling and walking safely removed from busy roads and streets. Trails offer scenic recreation opportunities suitable for a wide range of ages and abilities. Where popular trails exist, lodging providers can encourage extended stays among their guests, thereby increasing occupancy. For residents, investments in trails and greenways can increase property values and improve the overall livability of a community.

6.2 On-road bicycling

Bicycle tourism often takes place with little or no investment in facilities or infrastructure normally required to sustain motor vehicle-based tourism. In regions where networks of lightly traveled back roads and hospitable accommodations are prevalent, on-road bicycle routes can provide visitors and residents alike an ecologically sound alternative to cars for sightseeing and recreational traveling purposes. Bicycle tourists attracted to such regions are important customers for motel, restaurant and service providers in even the smallest of communities.

Communities that embrace and encourage bicycle- and pedestrian-based tourism can expect the following benefits: a) positive contribution on local economy, b) improvement in public health by providing opportunities for physical activity, c) better air quality, d) negligible impact upon the visual landscape, e) no-cost or low-cost improvements such as shoulders and restrooms, f) a scale of travel that can enhance the quality of life within local communities.

7. The case of Agrinio – Lysimahia Greenway: Integrating Urban – Suburban – Rural Agricultural and Lake Landscapes

7.1 Terms - Introduction

Greenway is a corridor of protected open space for nature preservation and/or recreation [12]. Greenways not only protect environmentally sensitive regions and wild life, but can also provide access to outdoor recreation and enjoyment near in the home [4]. The planning of greenways is a strategic action that incorporates theories of landscape ecology with theories and methods of landscape planning [1].

Case study within the limits of the above mentioned theoretical background, is the creation and planning of greenways at the region of Agrinio, a region that through the landscape planning action can benefit greatly at the level of regional / physical planning design and ecological, cultural and aesthetic resources management [14].

7.2 Goals and objectives

The main goals of the case study were to: a) bring nature close to the city - connecting the city and the lake ("Making the Connection-Analysis and Evaluation / Restrictions and Potentials of Greenway Planning"), b) unify the proposed land uses and activities, c) offer opportunities / alternatives / multiple uses (recreational, cultural, athletic, wildlife/nature reserve) to the citizens of Agrinio, d) offer economic benefits (increased parcel values along greenways, new job positions etc.), e) promote the advantages of this land use, (contribution to the physical planning at regional, and local level)

1. Ecological objective of greenways.

To plan an ecological functional local greenway system that: a) will contribute to ecosystem and landscape preservation of the Agrinio region, b) will restore linkages among indigenous ecological systems and processes, c) will enhance the indigenous ecosystems and landscape's ability to function as dynamic systems and d) will allow habitats of indigenous ecosystems and landscapes to be adapted to future environmental changes (fast ecological rectification).

2. Cultural objectives of greenways.

To create paths for a local greenway system in order to: a) provide public access and promote the preservation and promotion of the system's natural, cultural and historical characteristics and points of interest such as the region's thermal springs and churches, and b) provide for outdoor recreation and alternative, non motorized transportation - soft surfaced autonomous street for pedestrians /bikers.

7.3 Site description - Zoning

The region that is extended at the southern and south-western part of the city of Agrinio is characterized as a flat rural region with: a) cultures of olive trees, corn and clover, b) important livestock-farming, c) extensively developed system of irrigation channels, streams and imposing

presence of aquatic natural life (lake Trichonida, lake Lysimahia, Acheloos river), d) extensive network of rural streets and e) intense biodiversity of land and aquatic ecosystems.

The almost exclusive agricultural land use and the beyond control pollution of streams that supplies the two lakes and Acheloos river (due to the thoughtless cast of waste and sewages of Agrinio city and the rural settlements around it) constitute the two main reasons, responsible for the valley and lakeside rural landscape perception as well as the area's land uses.

The selection of four distinct regional physical zones that reflect different ecological path characteristics of the Agrinio case study was made based on their ecological connectivity process:

Zone A: Urban Landscape (Agrinio)

Park Papastrateio, new regional road at stream Rebelia, creation of a separate hard surfaced path for pedestrians /bikers up to the national road.

Zone B: Suburban - Urban Fringe Landscape (Dokimio)

Separate hard and soft surfaced pedestrians / bikers path, stretching from the national road to Dokimio.

Zone C: Rural agricultural landscape (Bouzi)

Innate landscapes that include irrigation channels, watercourses of natural streams, dykes, cultures of olive trees, corn, clover from Dokimio up to the lakeside area. Soft surfaced path for pedestrians /bikers.

Zone D: Lakeside landscape (Lysimahia)

Indigenous landscapes that include lakeside reed thickets, stream estuaries, a connecting channel supplying water from lake Trichonida to lake Lysimahia, Dimikos river that redirects water flow from lake Lysimahia back to Acheloos river, systems of wetlands, where the main ecological process is the flow of water associated with the hydrologic processes. The main ecological hazard is water pollution resulting in habitat shrinkage. Creation of separate soft dirt and wooden - above ground level - path for pedestrians / bikers can accommodate barrier - free access.

7.4 Model Organization

With the use of GIS software a model was organized for examining the ecological, cultural / historical and recreational characteristics of the case study area. It was developed in order to preliminary define suitable regions and corridors that will be included in the local greenway system.

The model used an integrated approach of landscape analysis in order to: a) select connected - protected and other suitable areas so to protect an ecologically functional system [5] and b) establish main paths, green corridors and cultural-historical areas that provide barrier – free public access and promote preservation and enhancement of the system's natural, cultural and historical characteristics [11].

7.5 Methodology

The study, follows a methodology of inventory, analysis and evaluation of appropriate alternative design proposals aiming at the formulation of the most suitable and viable greenway route, applying principles of greenway planning that emanate from the theoretical documentation of the fields of landscape planning and landscape ecology. Geographic Information Systems (GIS) manage geographic data (territorial and statistical) contributing in the inventory, analysis (processing), and synthesis of ecological, social, historical, and other land use types of landscape data.

Methodologically the paper follows four steps: a) inventory of existing data (topography, irrigation channels / streams, vegetation, road network, land uses), b) multicritiria analysis of the above data using greenway suitability weighting factors, c) greenway path alignment according to factors that recorded highest evaluation scores for recreation, environmental awareness / education and direct non motorized access from the urban web up to the lakeside area of Lysimahia.

A multicritiria approach was used in order to calculate the contribution of individual suitability criterion at the final suitability of selected zones [6]. The following equation constituted the multicritiria approach of pedestrian / bicycle path suitability with the entrusting of weighting factors in each suitability factor individually. For example: Suitability of pedestrian/bicycles paths = (ecosystem and landscape preservation x .25 + existing land use x .20 + view x .15 + physical access x .20 + proximity to cultural / historical sites x .20)

A land suitability method was used for the optimum selection and alignment of the most appropriate greenway recreation path. For the establishment of greenways, the most suitable corridors were evaluated and selected through a complex algorithmic calculation of spatial data (maps) and quantitative data (values). An area, suitable for recreation paths was chosen in order to locate exact greenway path alignment, according to suitable prerequisites / criteria, such as the following: a) the path, in the rural and lakeside area will not be within 1000 meters from dense urbanized

regions, b) the path can cross wetlands, protected regions, and agricultural land that are used primarily for these uses, c) the path can only cross water by a bridge, and it is not allowed to cross regions that are threatened by natural hazards or degradation, d) the path alignment in no way should cause degradation of natural ecosystems.

The final step for path selection suitability of the greenway was carried out with the aid of GIS software (ArcView, ESRI) in order to establish the most suitable greenway route, through the four zones.

8. Final Proposition of Greenway System. Benefits - Conclusions

1. Through establishment of a suitable greenway network the fundamental study goal was fulfilled which was the creation of an alternative form of soft non- motorized transportation for the residents of Agrinio providing easy and free access to lake Lysimahia.
2. Creation of greenways achieved all main study goals and objectives:
- Promotion of rural landscape
- Promotion of lakeside landscape
- Promotion of social/historical elements of the region
- Implementation of interdependent linkages
- Preservation of land and aquatic ecological processes.

3. The proposed land uses of:
- Recreation
- Environmental education / pubic participation
- Restoration of degraded natural landscape
- Protection of streams and irrigation channels

were strengthened and enriched.
4. Successful implementation of greenways largely depends on:
- A well documented inventory and analysis of data (ecological, social / historical approach),
- Public awareness / participation, and society's project acceptance (NGO's, participative, recreational, educational approach),
- Need for educating government administration and non government organizations. Support, protection and legal consolidation of responsible administrative local, regional, and national authorities - institutions - agencies through legislative mechanisms (Bylaws, Acts etc).

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