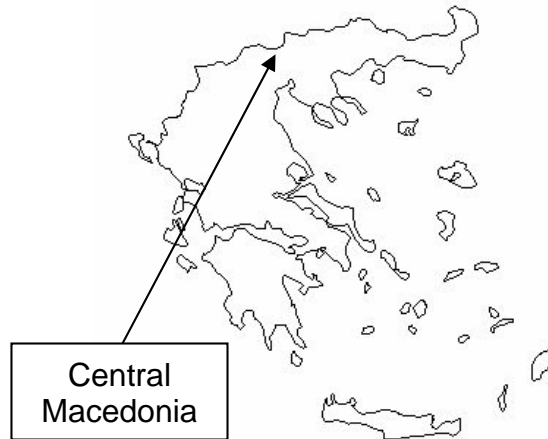


Planning for Small Hydro

Central Macedonia (Greece)

GENERAL ASPECTS

Greece has a burgeoning demand for Electricity, but most electricity is currently generated from poor quality coal. Hydroelectricity represents a possible alternative resource, but methods of appraising acceptable locations are desperately needed.



BACKGROUND

The consultancy Alpha mentor has worked in collaboration with the consultants HYETOS and DND and the Regional Council of Central Macedonia to develop a set of policies for small hydro on their territory. Most potential occurs in rivers which rise in the mountains of Northern Greece and the adjoining states of Macedonia (FYROM) and Bulgaria. Experimental approaches were adopted designed to apply multi-vector analysis of a river basin and to prepare a feasibility study of a low head small hydro site on an irrigation supply dam on a major river.

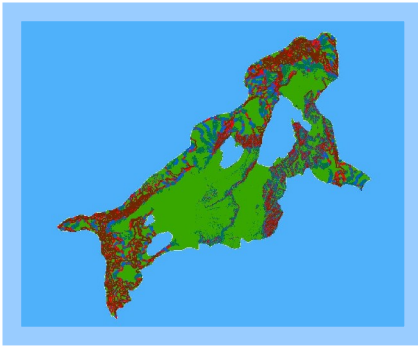
ACTION



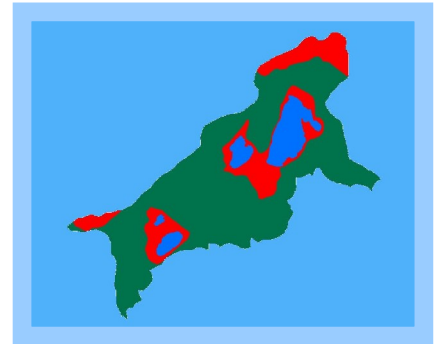
Lake Vegoritidis

The North Vegoritidis basin was chosen to demonstrate the potential of multi-vector analysis. This basin of 771km² lies North-west of Thessaloniki and acts as a closed hydrological basin feeding Lake Vegoritidis. The level of this lake has declined from 546m a.s.l. to 510m a.s.l. in recent years due to intensive use for irrigation (and water has been drawn off the lake in the past for hydropower purposes at the Agra power plant). The water in the area is already subject to pollution and the Greek Government has been subject to warnings issued by the European Union due to the poor water quality in the Lake. The water bodies in the area are of high ecological value and are designated under European Union Directives.

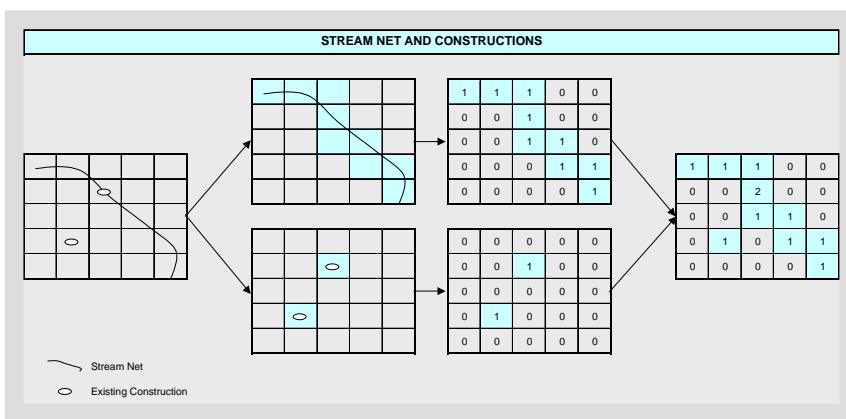
The method of analysis is a computer adaptation of the traditional sieve map approach to strategic land use planning. In sieve maps, areas are mapped on a grid overlaid on the study area. Grid squares on transparent overlays can either be allocated a weighted value or excluded from the analysis if a factor completely precludes development. Weights for individual squares are then added up to give a graphical evaluation of the suitability of a given square for development.



Such a system is perfect for adaptation to GIS mapping. In multi criteria analysis different criteria are used to assess suitability of the area for small hydro development. A special GIS application was therefore used to analyse the Vegoritidis Basin to create a grading system capable of rating the suitability of sections of rivers in the basin for use for small hydro generation. Different layers of information are applied to the plan in succession and can be combined to give an overall integrated estimate of suitability. Analysis was

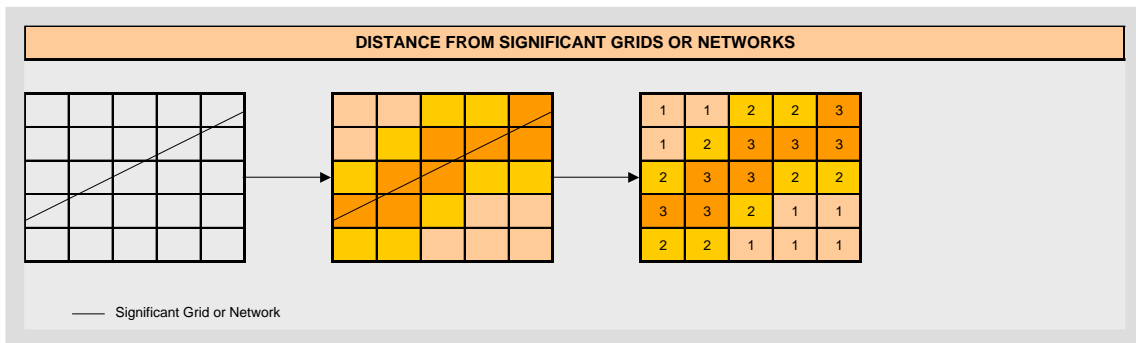


made using a grid of 50m x 50m squares which produced a very fine grain map.



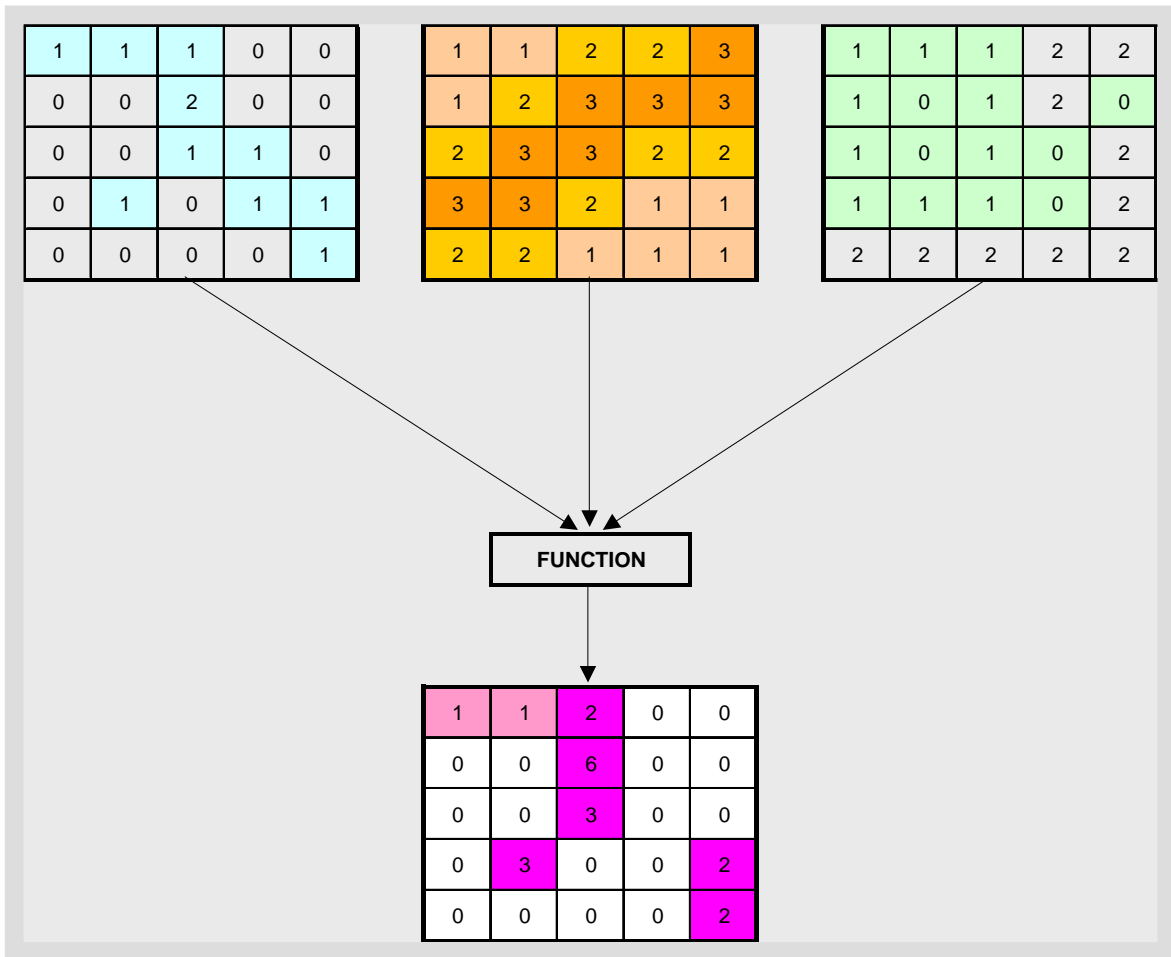
The analysis applied depends on the factor being considered – in the case of the presence or not of a water course (left), the factor is a simple 1 (present) or 0 (absent) in the square concerned.

Where the locational factor has a measurable impact, as in distance from an electric grid, then a weighted figure can be applied as in the chart below.



A wide range of factors were considered over the whole 771km² of the Vegoritidis basin. These included the following:

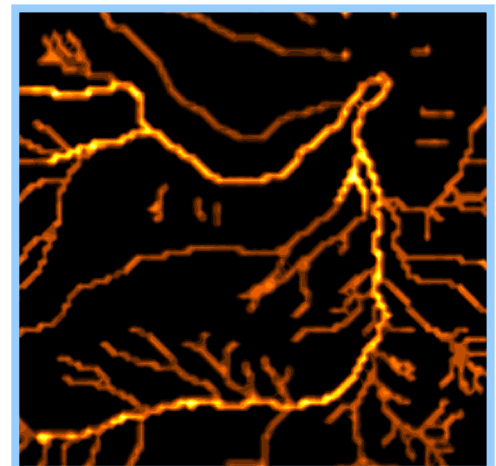
Watercourse network Slopes (above left) Height Roads and railways	Protected Ecosystems (above right) Forests Urban areas Archaeological sites	Military facilities Major structures Coal mining areas
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These were integrated by an analytical calculation and this produced a final appraisal of the suitability of the water-course network for small hydro (left). This is presented graphically so that the most suitable sections of river appear a brighter colour on a computer generated map. (See below)

Application of the Plan

In Greece applications for small hydro plant are considered by applications for the three licences needed by a small hydro plant, the Electricity Generation Licence, the Installation Licence and the Operation Licence. The installation licence, which has a life of two years, is the one that creates the bulk of the problems. The RES installation licence application is made to the regional authority and the process is very complicated, taking about 1 to 2 years to complete, requiring the official approval of the proposal of about 40 public-sector entities at central, regional, prefecture and local levels. It needs to be checked, in terms of conformity, with 4 National Laws and 7 Ministerial Decrees. The transfer to the regional authority, designed to simplify the process, has not really helped since the local level has no specialist expertise in this field.



The consultation procedure with interested bodies which takes place during this procedure of applying for a licence, is very time consuming and expensive. The GIS provides a framework to identify areas considered suitable by these interests and to eliminate those that create the most intractable problems. It can enable the interested parties to respond quickly and accurately to request for proposals.

EVALUATION

The evaluation of the Vegoritidis Basin was prepared in cooperation with the local Office for the Development of Water Resources and two local municipalities. However when it came to taking the development beyond the simple appraisal of a computer generated map, no local interests were willing to invest time and resources into identifying locations for small hydro plant. It simply did not have the political weight to generate interest among the local elected members.

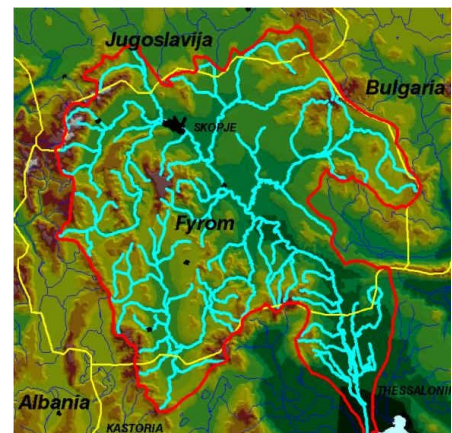
This demonstrates the importance in the plan making process of a real political commitment. With all the data one could possibly ask for (for this area was heavily studied on account of the pollution problems in the internal drainage basin of Vergoritidis), it still proved impossible to prepare a guidance document due to lack of interest at the municipal level.

FURTHER ACTION

Therefore the partner consultancy in the SPLASH project cooperated with the Agios Athanasios municipality in the Axios River Basin. This municipality is interested in the promotion of small hydro in its area and will provide the local commitment to make such plans work.

The same appraisal approach developed for Vergoritidis was applied in the Axios River basin (right). The Axios River arises in FYROM and the majority of its catchment is there – only a 701km² of its 23,747km² catchment, including its delta, lies in Greece. The flow in the Greek part of the catchment – near the river's mouth, is of the order of 120m³/sec. A multi-criteria analysis was carried out on the Greek part of the basin and in total 10 sites were identified.

The document thus produced cannot be a formal plan since planning for small hydro in Greece is carried out by central government. However, providing it has the support of local and regional authorities and the Water Agency in the target area, it can hope to provide a framework to guide developers and set a context for decisions by the national decision making authorities. It is hoped that this technique will be adopted throughout Greece to identify areas worthy of further detailed study to find small hydro sites.



One of the ten sites identified, the Ellis Dam, was far more attractive than the others and has been the main focus of attention. This dam, which lies on an irrigation canal within the Agios Athanasios municipality, handles one third of the flow of the Axios River. A detailed feasibility study was carried out on this site and a 3.5MW turbine on a 12m head is proposed.

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Photo credit: Prefecture of Pella.