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Practitioner's Guide:

Mapping Central and Marginal Areas

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und Entwicklung

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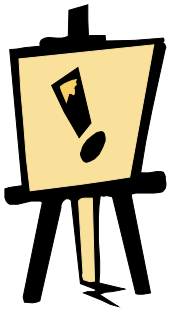
Mapping Central and Marginal Areas

Brief Description



In many developing countries, lack of spatial information persists on central and marginal areas of a region. Due to this information deficit, regional planners can not easily justify planning measures in order to overcome the disparities between the centers and the remote areas or to separate the issues between them.

Furthermore, it is difficult to develop Land Use Plans without knowing about the infrastucture, which is on the one hand a prerequisite of plan implementation, and on the other hand indicating deficits.

The following model provides an approach for mapping central and marginal areas specifically to model and highlight:

- existing development deficits and demand that exists for infrastucture within a region;
- Areas are of a high economic interest due to access to the infrastructure (such as roads, water, electification);
- Inaccesible areas from where local infrastucture is almost not accessible;
- Which forces and frictions are limiting factors for accessing infrastructure from a given point;

Photo 1: Discussion of maps are part of the planning process in Ethiopia

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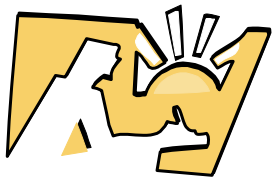
Proposed Main Users

Regional planners and decision makers,
Development Institutions and Projects.

Purpose of the Method



The elaboration of maps on central and marginal areas is a relevant tool for the following purposes:

- Obtain spatial information where merely basic maps are available;
- Identifiy local demands for infrastucture;
- Increase awareness of cost distances within a selected region;
- Incorporate the population density into the modelling of demand and supply;
- Increase transparency in planning for solving sophisticated questions by modeling with Geographic Information Systems (GIS);
- Merge various sources of information into one model;

The method can be applied in various sectors of analysis, management and planning, for example:

- regional planning,
- land use planning,
- buffer zone managment,
- environmental impact assessment,
- fuelwood-demand analysis,
- public health analysis, etc.

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Advantages

- The method is suitable in areas, where detatailed spatial information is barely available and access to topograpic maps is sufficient for using the methodology;
- Spatial awareness about an area can be increased;
- Development potentials can be identified;
- Development deficits can be addressed in a demand oriented way;
- The model can be applied within different contexts, depending on spatial data on the infrastucture available (such as social infrastructure, agricultural infrastructure etc.);
- A higher transparency in planning and decision making can be achieved, this is important, where the public is involved in the planning processes and therefore contributes to "good governance";
- Centrality is one component which reflects the value of land, therefore it can be used for land value assessments;
- A Global Positioning System (GPS) can be used to collect additional spatial information;
- By-products (such as maps indicating cost distaces) can be used for other purposes

Limitations

- Using Geographic Information Systems (GIS) for modelling requires a detailed technical knowledge;
- The development of a digital elevation model using the topographic map is time consuming;
- The selection of a infrastructure and its weighing is based on a subjective decision of the planner, therefore resulting maps vary accordingly;
- The GIS-model can not be applied, where topographic maps are not available or in almost flat areas;

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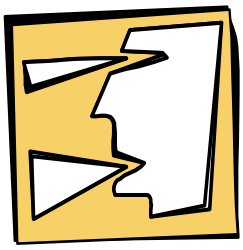
Principles & General Procedures



GIS analysis with respect to central and marginal areas can be undertake, when the following data is available:

1 **A digital elevation model (DEM),** which is mostly developed from digitised elevation contour lines of existing topographic maps. This forms the basis of Slope and Exposion maps, and can be futher used to develop a hillshading map, which facilitates map interpretation.

2 **A land cover map,** which includes the forces and frictions which makes an area more or less accessible (e.g. it takes more time to pass through a dense forest than an open field).

3 A number of **spatial data sets of the selected infrastructure**, which depends on the aspects which are relevant for centrality analysis. Most of the spatial data can be extracted from the topographic or other maps, otherwise surveys using GPS can help additionally. Infrastructure data sets can include:

- Asphalt roads,
- Gravel roads,
- Market places,
- Rural administrative units,
- Water points,
- Churches,
- Clinics,
- Schools,
- Agricultural Extension bureaus,
- Milk processing facilities, etc.

The selection criteria listed above depends on the planning demand as well as on the availability or feasibility of acquiring spatial data.

Using GIS (e.g. ARC/INFO, ArcView and Idrisi), models can be developed to produce maps on central and marginal areas based on the above listed data. Figure 1 shows a GIS model where selected datasets have been processed into a centrality map .

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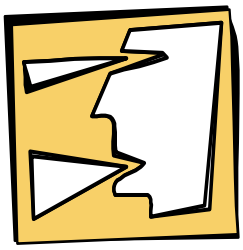
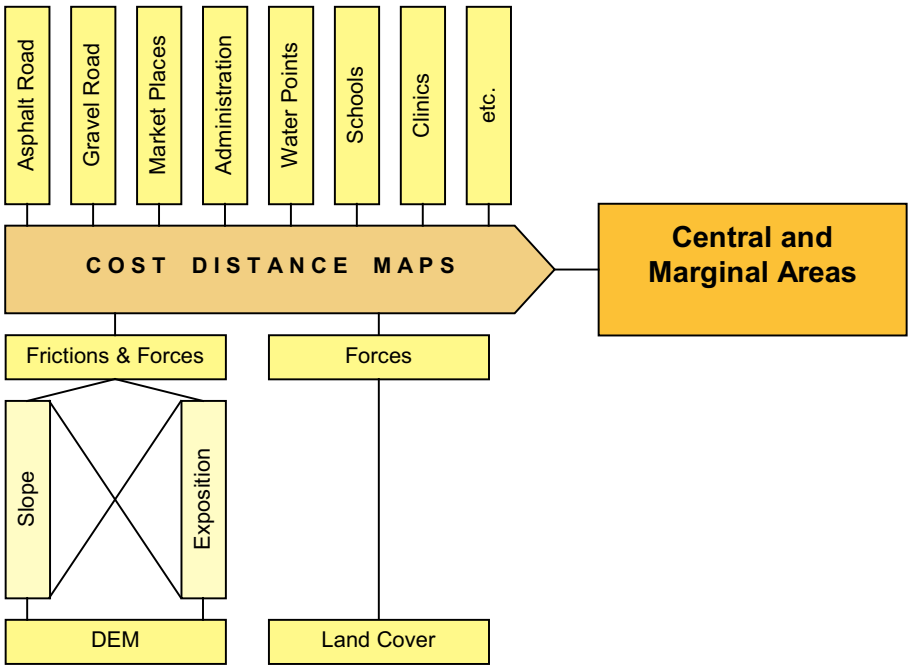


Figure 1: GIS model for developing a map of central / marginal areas



Most important in this model is, that for every infrastructure item listed on top of figure 1, a centrality map is processed, taking the following into account:

- All vector data have to be converted to raster data, as this type of modeling can only be done on raster basis.
- Moving in space incurs costs. Different land cover types imply that different efforts have to be spent to get access to a certain infrastucture, due to frictions.
- Accordingly, the slope also implies frictions and forces. For the GIS model, friction values have to be estimated for land cover types and slope gradients.
- The direction of the slope aspect affects the effort needed to cross an area. A friction map can be generated by the additive overlay of an aspect image and a reverse aspect image, whose direction of movement corresponds with the friction of slope gradients.

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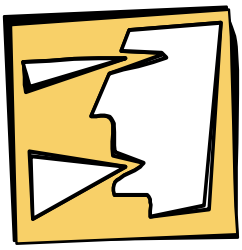
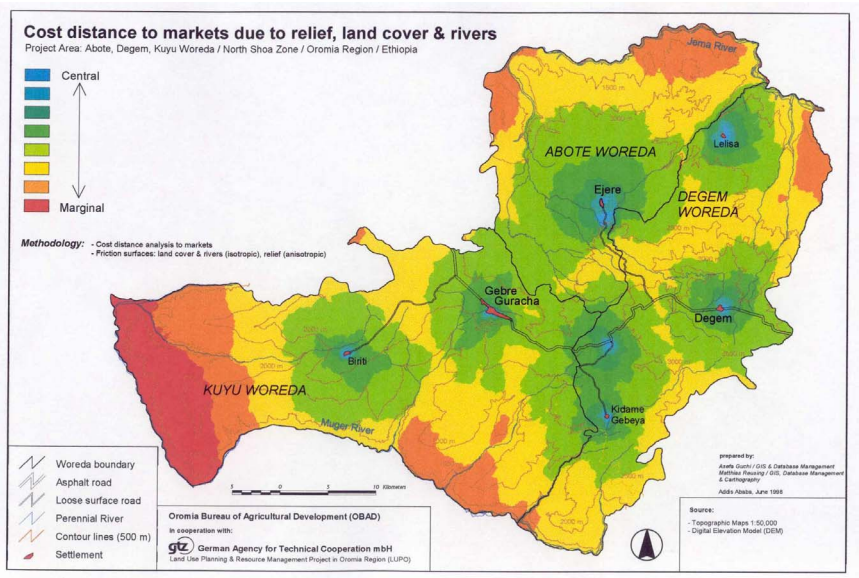
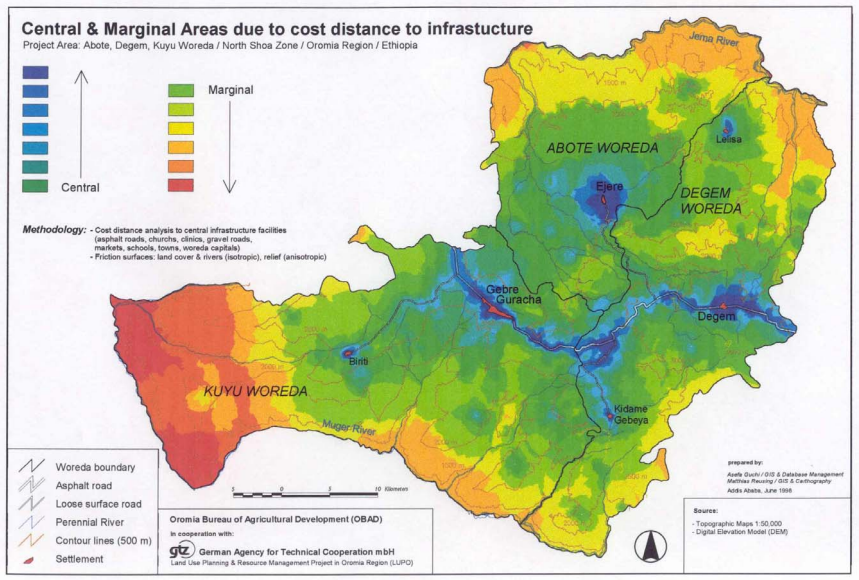


Finally, all centrality maps are merged together using a multiplication or weighted addition of centrality layers. This forms the basis of a centrality map, which, can be draped over a hillshading and improved through additional vector layer.

Map 1: Cost Distance to markets



Map 2: Central & Marginal areas due to cost distances



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