



## Practitioner's Guide:

### Defining Suitable Areas by Selection, Exclusion, Buffering & Overlay



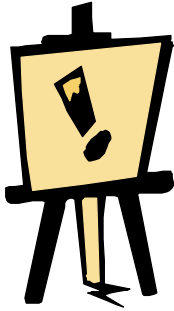
Deutsche Gesellschaft für  
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(GTZ) GmbH



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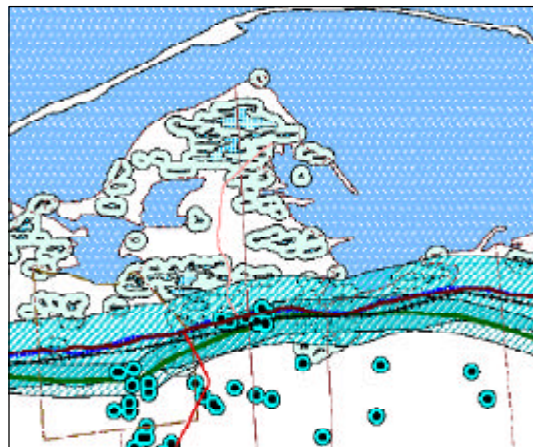
# Defining Suitable Areas by Selection, Exclusion, Buffering and Overlay

### Brief Description



Many planning tasks can be enhanced or in some cases simplified through the use of spatially presented data and information using Geographical Information Systems (GIS). However, in order to be able to use the technique effectively it is important that the planner defines the criteria and appropriate procedures so that the planning information he/she wishes to generate is actually produced through the use of the GIS technique. Defining the information that should be generated by the GIS is a pre-requisite for effective use of the instrument in development planning and management.

For example, if the planner wishes to determine areas that are particularly prone to soil erosion, the factors that are common causes of soil erosion need to be known. Soil erosion could depend upon the slope (i.e. the steeper the slope the higher the probability of erosion). A further cause could also be the intensity of precipitation (i.e. the higher the precipitation, the higher the probability of erosion). Further factors could be soil types (i.e. sandy soils may be more prone to erosion) as well the vegetation cover (i.e. grass cover tends to be less prone to soil erosion compared to areas covered by eucalyptus trees). If the information is presented spatially (i.e. on thematic maps) these maps can be overlaid and the planner is better able to determine the soil erosion prone areas. While the GIS technique helps in depicting the final information the planner still has to decide in advance what factors cause soil erosion and how the combination of different factors are interrelated with each other.



*Using GIS,  
a combination of selected,  
excluded and buffered map features  
lead to a desired result*

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#### Proposed Main Users

Technical staff, regional,  
urban or sectoral planners.



#### Purpose of the Method



Many different criteria and factors can be used to assist decision-makers in actually reaching a decision. Very complex issues may be based on different factors, variables or criteria. A considerable amount of information may be available in digital form and may also be available in a GIS. The GIS allows the planner to overlap different pieces of information in order to generate additional information that can be of use for the decision-makers.

For example, if population data is available then this can be depicted on a map. The map may depict population densities, or depict where population growth rates are highest and so on. Whatever information is available digitally and can be referenced to a map can be depicted using the Geographic Information System (GIS).

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Assuming, that GIS data are available, suitable map features can be found using different techniques:

#### **a) Selection:**

Features that meet a particular criteria can be selected using GIS in order to visualize a subset of map features that are needed in order to be able to answer a certain planning question (e.g. all areas that are covered with grass land or shrub land, etc.).

#### **b) Exclusion**

Features that do not meet a particular criteria can be excluded (i.e. filtered) from the map being depicted (e.g. areas not located on fertile soils or have a slope greater than 30% should be excluded).

#### **c) Buffering**

Some aspects of the map feature may be considered by the planner as being (un)suitable; perhaps because they are located close to a neighboring feature. For example, a planned factory must be located close to a river. Therefore, the areas that are deemed suitable for the planned factory can quickly be reduced to those one that are inside a buffer of 2 km left and right of the river.

#### **d) Overlay**

Aspects that may have to be considered by the planner can also be derived by selecting a combination of criteria rather than just a single criteria. (For example, the planner may decide to depict all areas that are covered by a certain soil type, where the slope is less than 30 % and where the area is neither covered by forests or residential housing.) The information generated by overlaying the information provides the planner and decision-maker with new and additional know-how that he/she would not have had if they had only considered the information individually. The overlay technique provides a vivid new insight which in turn helps in the development of the most ideal solution or a better vision of the future.

### Defining Suitable Areas by Selection, Exclusion, Buffering and Overlay

#### Advantages



- ▶ More criteria can be presented and used during the planning process, making the search for a decision more transparent (e.g. especially during participatory planning exercises)
- ▶ The information generated can be used in order to develop different planning scenarios, which in turn provides decision makers with different options to choose from.
- ▶ A multitude of functions can be undertaken within a short period of time and with comparative ease using the GIS technique. The computer can calculate complex interrelationships rapidly and the product can be depicted in a visually appealing manner for decision-makers.
- ▶ Improved criteria can be defined once information in the GIS has been visualized and linkages between various map layers or features have been established. The new criteria will improve the overall information available for the decision-makers and will (hopefully) improve the consensus that they reach.

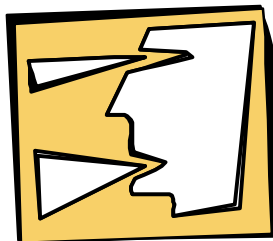
#### Limitations



- ▶ The information selected for the criteria has to match with available map data in order to apply the method. If map data is not available then it is necessary to painstakingly acquire / digitize the relevant map data first before the next step can be undertaken. This can be a time consuming and costly task.
- ▶ Defining appropriate selection, exclusion or buffering criteria often proves to be quite difficult. Generally speaking, the result produced by the GIS is only as good as the quality of the previously selected criteria. Therefore, planners must be familiar and practiced in defining the most appropriate criteria.
- ▶ Poor quality data (including map data) may lead to the production of inaccurate maps.
- ▶ The criteria used can often be defined in a rather subjective manner

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## Principles and General Procedures



### General Procedures:

#### Step 1:

The first step in the process requires that the planner defines precisely the planning issue and the area of interest (i.e. in the forestry sector the planner wishes to define the forest cover)

#### Step 2:

The selection criteria that have been set need to be discussed with other experts or with other people working in the relevant sector. In some cases it may be necessary to discuss the criteria selection with the general public (i.e. areas that are to be classified as having a low potential. In this case the criteria defining what constitutes a "low potential" needs to be discussed).

#### Step 3:

The data that is needed for the mapping process has to be acquired. It may be necessary both to acquire the spot data as well as the map data. This may require that topographical maps have to be digitized.

#### Step 4:

It may prove necessary to reclassify a copy of the digitized map data according to previously defined criteria.

#### Step 5:

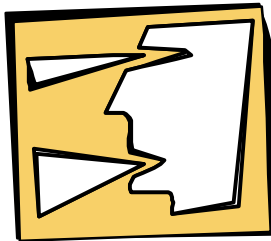
The criteria need to be adjusted according to the available map data. It may also be necessary to refine the criteria, this should be done in an iterative process.

#### Step 6:

A flow chart has to be developed that defines the exact technical procedures that need to be undertaken. The technical procedures include defining which criteria / procedure has to be applied to which layer in order to get a layer or an intermediary (or final) result of the analysis.

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#### Step 7:

The GIS overlay or other procedure is then undertaken in accordance with the steps defined in the flow chart developed during step 6.

#### Step 8:

Finally, the planner prepares a presentation of results (or options) and these are then given to the decision-makers, general public, etc who are then expected to undertake action accordingly.