

RS AND GIS METHODS IN THE INDICATION  
OF WASTE DISPOSALS IN HUNGARY<sup>1</sup>

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INTRODUCTION

At the request of the Hungarian Geological Agency we have started an investigation of young (Pliocene - Pleistocene - Holocene) sediments in the Great Hungarian Plain in connection with their suitability for temporary or long-lasting disposal of different types of wastes. During computer aided investigation we have taken the geologic, geomorphologic, pedologic, hydrogeographic, climatic and ecologic conditions into consideration. The motivation to start this examination was the fact that about 3.5 million t/year dangerous waste is produced in Hungary and the required deposition space is not solved yet, especially if we take the environmental criteria into consideration. Beside the unknown amount of waste (according to the confession of companies it was only 1.2 million t/y in 1985) the most important problem is the unknown effect of wastes. The harmful environmental effects of the poorly disposed of wastes are difficult to estimate. These effects appear in soil, the surface and subsurface water and in the biosphere. Sometimes the damage occur years after the deposition indirectly in different

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organisms. There are encouraging plans and experiments for the future in connection with the formation of waste disposal sites, for example the deposition of oil-silt formed during the drilling of oil-well. According to the former known plans 2 combustion furnaces, 3 disposals and 19 temporary disposals would have been built up to 1990, but because of the results of local elections some of them were not built up. The aim of our study was to find such places on the Great Hungarian Plain which can be suitable for the formation of one or more temporary disposals in connection with the natural environmental conditions.

It would be necessary because one third part of the confused annual waste is being formed in the area of the Great Hungarian Plain.

## RESULTS

We have investigated the complex geomorphologic - geologic - hydrogeographic systems of potential waste disposals in the Great Hungarian Plain. In the first stage the geologic - lithologic information were summarized. Those areas were delimited where the geologic composition and sediment structure make the formation of waste disposals possible. The wastes were divided into two groups:

1. dangerous wastes and
2. other industrial, agricultural and domestic waste.

In the second phase the lithologically suitable surfaces were decreased and selected from geomorphologic and pedologic point of view. In the following stage the selected areas were analyzed from hydrologic and hydrogeographic point of view. In both latter

stages Landsat TM colour compositions (TM 453 RGB and TM 742 RGB) and indices (Soil Wetness Index, CRIST 1983, and NDVI) were used.

A short PASCAL program was written for analyzing the data of boreholes which penetrated the upper sedimentary layer. Quantitative analyzing methods and governmental orders (1981) were taken into consideration. Our process was based on the quantitative system of P. BOHN (1982). The following factors were investigated:

1. Topography, geomorphology
2. Lithology
3. Spatial dimension of the rock
4. Thickness of the impermeable layer
5. Dominant grain size
6. Geologic composition
7. Macrostructural parameters
8. Tectonic relationship
9. Permeability
10. Stability of the surface
11. Deepness of the groundwater
12. Hydrogeological conditions
13. Mineral resources

For example, the geomorphologic condition can be classified:

0 point:

- steepness of slope is greater than  $12^{\circ}$
- anthropogenic effects

1. point:

- $10-12^{\circ}$  slope
- alluvial sediments

2. points:

- 8-10° slope
  - deluvial sediment
3. point:
- 5-8° slope
  - consolidated quaternary surface
4. point:
- 3-4° slope
  - consolidated pliocene materials
5. point:
- >3° slope
  - consolidated old (older than 4.point) materials

Our result can be summarized as followings:

1. Dangerous wastes cannot be disposed of on the Great Hungarian Plain. Temporary deposition of II and III class dangerous waste is possible on the places which are denoted on Map 1.

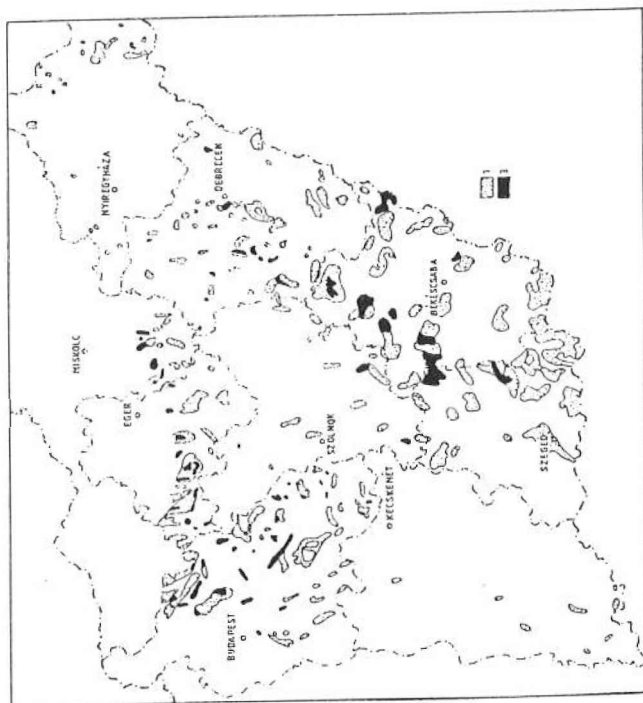
2. The most important limiting factors are in connection with the hydrologic conditions.

3. More significant clayey sediments formed in the Pleistocene and Holocene eras and situated in geomorphologically low flood plains cannot be used as potential disposals.

4. Patches denoted on the maps following the lithologic - geomorphologic boundaries show greater areas as the suitable, real area.

5. Szolnok, Bács-Kiskun and Szabolcs-Szatmár Counties are in the most unfavourable conditions, where disposals for deposition of endangers wastes can hardly indicated.

6. In general, in Békés and Csongrád Counties there are



legend: 1 - disposals of I class waste 2 - disposals of II class waste

Map 1 Potential waste disposals in the Great Hungarian Plain

those areas which can be characterized as a potential waste disposals for III class wastes.

7. Deposition of I and II class dangerous wastes can be formed only in the marginal regions: Orbottyán, Aszod and Nagyrede.

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