

# ENVIRONMENTAL MAPS MADE BY COMBINED PHOTOGRAMMETRY AND PHOTOINTERPRETATION

By

MARIA DOMOKOS

Department of Photogrammetry, Institute for Geodesy, Surveying and Photogrammetry,  
Technical University, Budapest

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Healthy life of man has healthy environment as precondition. Neither the results of air pollution tests, nor the particular importance of green areas, vegetation etc. need be stressed here. The law of environment protection, nature or landscape protection (thus, the law protecting our health) will be intended to specify duties related to the protection and development of the existing natural resources, forests, green areas. To prevent irresponsible persons or establishments from causing further destructions, it is urgent to prepare the environmental map of the whole country, and to issue by-laws controlling and making dependent on rigorous conditions e. g. to build up a green area, or to fell a tree. Also in designing new factories, likely consequences of the industrial process have to be taken into consideration, and the site has to be chosen so as to do little harm to the environment.

Nature or environment protection would be much helped by a map system indicating with a purposeful precision, so to say inventory-like, on one hand, all existing natural values, peculiar landscapes, developable green areas and establishments, and on the other hand, establishments causing air, water, thermal or noise pollution; it could be completed by a specification.

The environmental map, recording the actual condition, would be the basis of development planning and environment protection project, backed by the environmental law.

Rather than to make a costly new basic map, the environmental map would be quite simple to make by purposefully completing the existing state maps. No environmental program can be realized without an environmental map.

## Kinds of environmental maps

Separate environmental maps are needed on towns and inner areas, on industrial areas and on different free areas.

1. Historic or urban "Monumental and Urban Environmental Map" with an accessory "Micro-Environmental Map".

2. "State Map of Industrial Environment Condition" demonstrating harmful effects of industrial establishments, with an accessory "Map of Mining Micro-Environment".
3. "Landscape Environmental Map" indicating the actual condition of natural reservations, park lands and bosquets, completed by a "Micro-Environmental Map of Depths".
4. "Water Environmental Map" indicating the actual condition of natural and artificial water surfaces and their surroundings, with an accessory "Micro-Environmental Map for Thermal Waters".
5. "Environmental Basic Map" on agricultural areas with two kinds of completion: "Micro-Environmental Archaeological Map" and "Micro-Environmental Soil Map".
6. "Air Map".
7. "Noise Map".
8. "Light Map".

### Purport of the environmental map

#### 1. *Historic or urban environmental map*

This is a map of urban or built-up areas indicating all roadside lines of, or individual, trees and their sizes, any park, playing ground, lawn and flower bed, any unbuilt or to be cleared area, public squares, monumental buildings and complexes, fountains, courtyards of living houses or public buildings, flat roofs planted or susceptible to. Industrial premises polluting air or nearby fresh water have to be specially indicated. Pollution degree of natural or artificial waters has to be determined and indicated. Prevailing building elevations and eminences have to be marked to analyse for an eventual adverse crowdedness in space. The map is based on the true to size copy of the urban survey map, indicating the above features by keynotes and sizes.

Lesser closed units such as housing estates, public establishments, in particular, school gardens and courtyards, nurseries, kindergardens, hospitals and environment, house courtyards, lesser botanic gardens, model farms, work cure institutions and their environment have to be represented in special "Micro-Environmental Maps" indicating any natural and artificial landmarks in the given terrain. Basic material of this map is the epitomized print of the urban survey map enlarged to scale  $M = 1:500$ . Representation is by multi-colour lines and keynotes. Representation may involve for e. g. prefabricated housing estates, the condition of façades, and the displacement, settlement of buildings. These latter may be determined by photogeodesy and represented on photographic annexes with written data, with accessory technical specifications.

## 2. *Map of industrial environment condition*

Industrial plants and their surroundings in a range of 5 km beyond their boundary have to be represented in industrial environmental maps, indicating both features and extent of each kind of pollution. In case of water pollution, data have to be determined from photogrammetric images made on negative film of special sensitivity. Also intensive smoke formation can be determined by photogrammetry. The prevailing wind and the zone most exposed to pollution have to be indicated.

Extent of noise pollution and applied preventive measures have to be cleared and indicated.

Particular stress is to be laid on, and detailed drawings made of, open mining, e. g. quarries and gravel pits. their environment and landscape effect. For mining areas, special "Maps of Mining Micro-Environment" are needed, representing all undermined or to be undermined areas, with all mine establishments. Basic material of this map is the line map of industrial plant and mine operation and development.

## 3. *Landscape environmental map*

Maps on natural reservations, parklands and bosquets are based on planimetric and configurational (black and brown) representational compendia to scale  $M = 1:4000$ , derived from the state basic map, completed by recent infrared and normal aerial photo interpretations and graded by means of site surveys. The map has to indicate all trees over a given size, with dimensions, species, eventual diseases, specially indicating undergrowth, soil grade, and any natural and artificial landmark.

Special care is due to the ground level appearance of rocks, rock groups, caves, underground formations and establishments, while subsurface features need to be represented in separate, detailed "Micro-Environmental Maps in Depth". In preparing the maps, service maps of forestries as well as surveys by miners and speleologists have to be involved.

## 4. *Water environmental map*

Natural and artificial water surfaces and their environment can be represented on maps prepared similarly to the former ones. In addition to a detailed vegetation survey, the water pollution degree and causes have to be determined and described. Special attention is to be paid to the exact survey of thermal waters and their surroundings, and represented in "Micro-Environmental Maps for Thermal Water", bases of recreational area development programs. Survey is to be based on photogrammetric material and on existing maps.

A comprehensive water map is a small-scale national map representing the pollution of artificial and natural waters. It represents only the network of rivers with pollution emittants and the overall pollution with map symbol overprint. A steady data recording service is needed. The starting condition map could be produced by photogrammetric means.

The urban water map of the concerned riverside areas may be prepared on a compendious copy of urban survey map printed in a dim colour, representing sewage outlets and industrial waste effluents, with keynotes corresponding to the pollution degree. The pollution extension area will be expressed by gradually brighter tone-block overprint.

### 5. *Environmental Basic Map*

Environmental map of agricultural areas has to be prepared on the true to size compendium of state basic maps to scale  $M = 1:10\ 000$ , pointing out the existing green areas and denoting developable areas by map symbols with pecked outline. The same map has to include compendia of the other maps.

A special care is due to the representation of archaeological excavations and surroundings, in "Archaeological Micro-Environmental Maps". In preparing the basic map, the likely sites of excavation have to be explored from air photos used for grading and completion, and represented by means of a special overprint. Disease of the arable soil, or the spreading of pathogens will be represented in "Micro-Environmental Soil Maps".

Both latter maps have to be made on enlarged compendia of the "State basic map" to scale  $M = 1:5000$ , making use of maps made by institutions of archaeology and soil testing.

### 6. *Air map*

Air maps are small-scale survey maps of the overall atmospheric pollution, including settlements and industrial establishments, pollution emittants printed in red, and air pollution percentages determined once a month during a year. A steady data recording service is needed. The starting condition map can be made by photogrammetry.

The urban air map may be made on a compendium of the urban survey map printed in a dim colour, indicating smoke emittants by a keynote expressing the pollution degree, with a screen overprint to represent the extent and area of road pollution determined by probing or indicator, indicating also the prevailing wind direction determining the flow of pollution, as well as building elevation data.

### 7. *Noise map*

This is a small-scale survey map indicating the constant noise sources like airports, roads, railways, motorways etc. Special urban noise maps have to be made to the scale of urban survey maps, indicating traffic junctions and noise contour lines. Each kind of noise may have its keynote. Areas of equal noise level may be represented with noise contour lines.

### 8. *Light map*

Light maps indicate harms due to urban sign-lighting superimposed to light sources of public lighting. Areas with equal light intensity may be contour lined. Light intensities on both vertical and horizontal surfaces should be indicated. Urban light maps and universal public lighting data have to be processed in national light maps by cartographic means.

Preparation of the listed map types is the business of different co-operating institutions.

Maps 1 to 5 involve no special survey work but to update and specialize existing maps, at a minimum cost and labour excess. Maps 6 to 8 are newly prepared, although map basic data are given. Expenses depend on the desired precision.

### Map scales

1. Working maps containing all data relating to specialities should be of the largest scale and precision possible. Scale is governed by the area size and particulars; the less there are map sections, the easier it is to handle. Working maps are updated each year by the preparing institution.

2. Purpose maps are developed from working maps according to the quoted decomposition, with line keynotes and polychromatic print. The scale is advisably selected in dependence of the task and the environment details, in general from  $M = 1:500$  to  $1:10\ 000$ .

3. Survey maps are made from purpose maps, with cartographically enhanced map symbols. Markedly negative or positive phenomena are enhanced, e. g. a pollution emittant is a negative phenomena and a thermal source a positive one. Scale is advisably selected as  $M = 1:25\ 000$  to  $1:100\ 000$ .

Environmental maps are of use for: Ministries (e. g. Ministry of Building); Building authorities; Monuments inspectorates; Investors; Horticultural enterprises; Forestries; Public Services; Health Institutions; Water Authorities; Research Stations; Publicity Enterprises; Authorities in charge of air cleanness; Judicial experts etc.

### Map making

In general, environmental maps are to be prepared in the same phase as the correction of state basic maps, urban survey maps etc. to redistribute expenses. As new basic material, recent aerial photo on infrared or colour paper, to scale  $M_{pict} = 1:10\ 000$  is needed.

The new photos are used first to correct the existing map, then the new purpose map is deduced from the improved map enlargement by site survey, data collection, eventual descriptions.

Atmospheric pollution may be represented by pale grey overprint, of a hue depending on the pollution degree, marking the pollution emittant by a violet keynote.

Noisy works and their environment may have fine corrugation overprint, shorter or longer depending on the noisiness. The noise source is marked with a dark orange keynote.

Water pollution is marked with tiny circle keynote overprint of brighter or duller colour depending on the pollution degree, indicating pollution emittant by a red keynote.

### Mapping schedule

A rather urgent step of great importance is to develop environmental programs for densely inhabited areas based on data contained in environmental maps indicating both actual conditions and development possibilities. Along with the surveys, environmental maps for all towns, built-up areas and industrial zones have to be developed.

Five years may be given to elaborate the environmental program for water and surrounding natural reservations, parklands and bosquets, including four years to prepare basic maps.

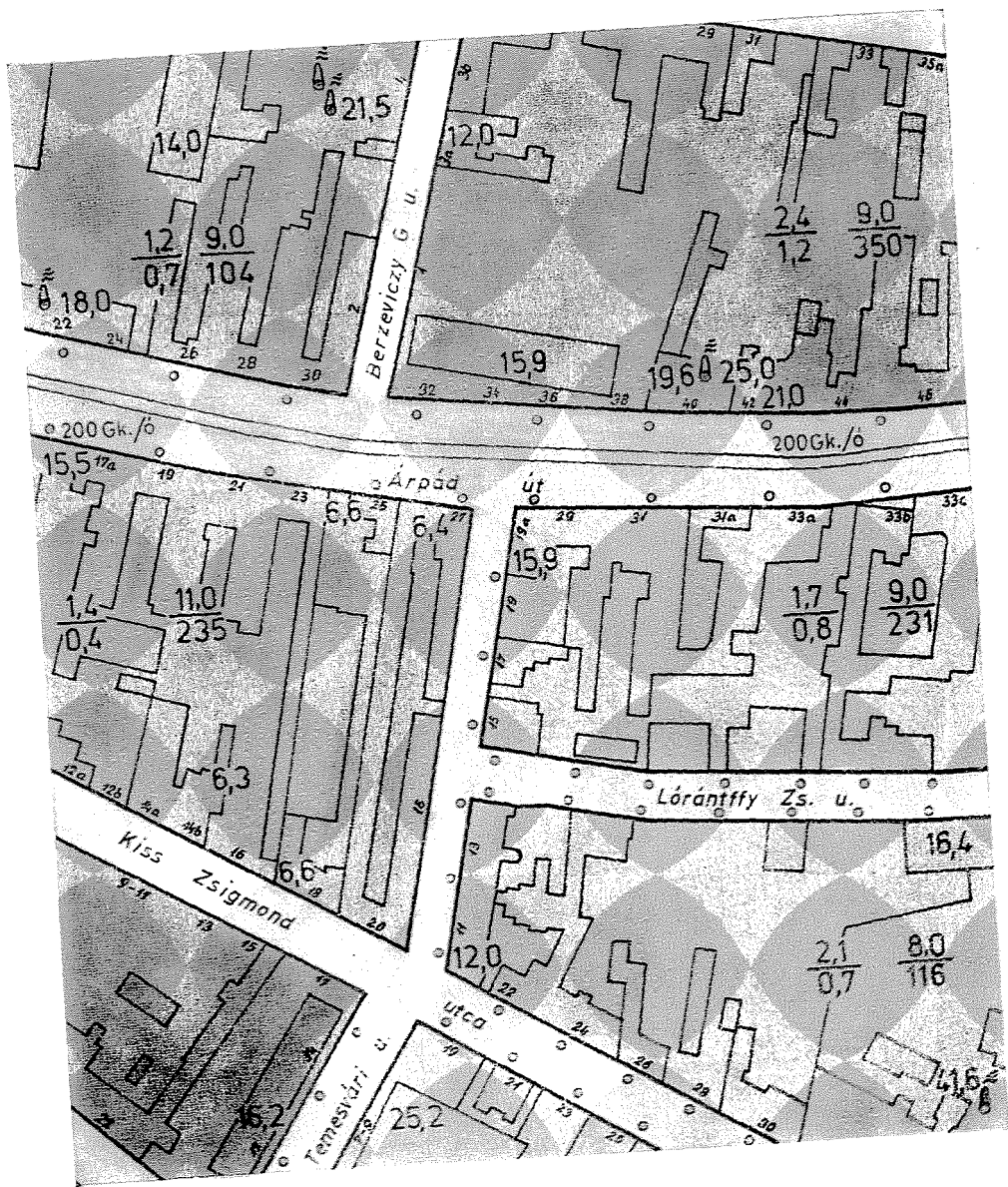
The environmental program of agricultural areas should be realized in ten years, hence the needed mapping work has to be done in five years.

National basic maps, preconditions of the described work, are available for 80 per cent of the Hungarian territory. The proposed work of environmental mapping is being launched. The next step is to refine the procedure and to approach other aspects of environment protection such as thermal pollution, disposal of pollution synthetics, radio-active pollution.

### Summary

To facilitate realization of a comprehensive environmental program, environmental mapping has been suggested, involving: historic and urban environmental maps, industrial environmental maps, landscape environmental maps, water environmental maps, agricultural environmental maps, air maps, noise maps, light maps. This proposal is on the way of realization.

Ass. Prof. Dr. Maria DOMOKOS H-1521 Budapest



MAP OF AIR POLLUTION SOURCES  
 BUDAPEST IV. (detail) Scale 1:2000

Block area in ha:  $\frac{2.1}{0.7}$  Typical height:  $\frac{8.0}{116}$   
 Built-up area in ha

Shades express pollution source density as a percentage of coal firing