USE OF REMOTE SENSING FOR ASSESSMENT AND MAPPING DESERTIFICATION ON A REGIONAL LEVEL

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Abstract

Desertification maps on their scales are divided into four classes: large scale (1:100,000 and larger), medium scale (1:250,000-1:500,000), small scale (1:1,000,000-1:2,500,000), very smallscale (1:5,000,000 and smaller).

Desertification maps contain information on types of land degradation, desertification classes, desertification aspects and other criteria dealing with assessment of land degradation. A set of desertification criteria has been developed on the basis of regional approach for Central Asia. They include quantitative data on biological productivity, wind and water erosion, soil salinization, human pressure on environment etc.

Methodology of mapping includes field study, photo interpritation of aerial and space photos, reconnaissance from helicopter and literature survey. Combination of these methods depends upon map scale and general specification of project.

Methodology was tested in Central Asia, Mongolia, Libya and Mali.

Key words: Desertification, Vegetation, Erosion, Land use/cover, Photo interpretation.

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UN Convention to Combat Desertification (CCD) considers desertication as a process of global dimension (United Nartions Convention, 1994). More than 100 countries of the world with population of 250 million are affected by desertification. CCD promotes several new approaches in desertification control. Creation of a system of desertification monitoring at

national,regional and global levels is a part of these activities. Use of new technologies, in particular remote sensing and GIS could provide politicians, decision makers and planners with operative information on desertification status within countries and regions.

Our practical experience includes use of remote sensing for thematic mapping in Central Asia, Mongolia, Libya and Mali (N.G.Kharin et al.,1991, N.G.Kharin,1991, N.G.Kharin et al.,1994).

Various concepts and methodologies are used for assessment and mapping desertification. Desertification maps (maps of land degradation) can be compiled at different scales (large, medium, small and very small). Criteria for the assessment of desertification coud be regional, subregional, national and local. Above that, in different regions desertification process has its own features depending on physical environment and socio - economic conditions. Is it possible to develop a standard methodology for the assessment and mapping desertification? Our practical activity on desertification mapping testifies to the possibility of realization of

Classification of desertification maps. The main types of land degradation are the following: degradation of the vegetative cover, wind and water erosion, salinization of irrigated farmlands, soil crusting and compaction, technogenic desertification, zoogenic desertification. In Central Asia to them belong: waterlogging of desert rangelands and soil salinization due to drop of the Aral Sea level.

Maps of land degradation are divided into four classes depending upon their scales:

- large scale maps (1:100 000 and larger)

this idea on a regional level.

- medium scale maps (1:250 000 1:500 000)
- small scale maps (1:1000 000 1:2500 000)
- very small scale maps (1: 5000 000 and smaller)

Zero level of assessment. Different scales of rating can be used by the assessment of desertification:

Table 1 Possible scales of assessment **_____** Moderate Severe Without Slight Very severe changes Slight Moderate Severe Zero level Slight Moderate Severe

Five point rating is used when a zero level is unknown and a status of desert environment at definite time is taken as a zero level. Four point rating is used when a zero level is known. The three point rating could be used when relable data on a zero level are absent, the map scale is very small and the territory to be mapped is very large.

Desertification criteria. A set of criteria was used by the assessment of desertification conducted by the author in Central Asia These criteria could be used as a basis for further development of the assessment methods in desertification study in other countries of Asia.

Table 2 Criteria for the assessment of desertification Scales Medium Small Large Very small Degradation of the vegetative cover Change of speci- Change of domina- Change of domi- Dynamics of es composition, nts and subdominants, dynamics plant cover, of plant commu- loss of biolo plant cover,loss nants, plant cover, of biological loss of biologinities, plant cogical producti productivity in cal productivity ver, loss of bio- vity,%, per absolute figures in absolute figulogical produccent of nude tivities.% soil res Wind erosion Per cent of area Sod cover,%, Per cent of area Per cent of ratio of shrub covered with movi- covered with moarea covered and herb cover, ng sands, per cent ving sands, per with moving area covered of area covered cent of area cosands with barkhans with vegetation, vered with vegetaand deflation volume of soil tion hollows, volume blown out. of soil blown MT/year out, MT/year

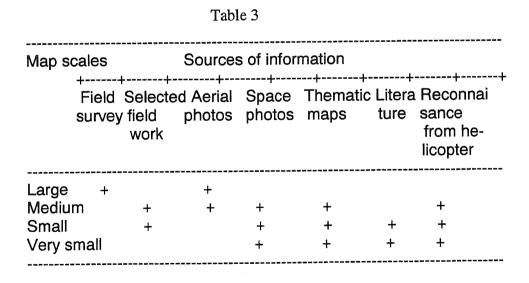
Water erosion

Type of erosion, per Type of erosi-Type of erosi- Type of erosion, loss of top soil, cent of eroded area, on, per cent on, number of gullies per 1 %, per cent of vegetative cover,% of eroded lin km.loss area covered with area of top soil, gullies, vegetatcm, depth of ive cover,% aullies

Salinization of irrigared farmlands

sidue, g/l, to- xic salt con- tent,location	tion, dense residue g/l, toxic salt content, loss of yield of agricul- tural crops MT/ha,	Type of salinazation, dense residue g/l, loss of yield of agricultural crops, %	Type of sali- nization,loss of yield of agricultural crops,%

Methodology of mapping could vary dipending on the map scale. Sources of information are given in table 3. Panchromatic photos were used by desertification study in Central Asian deserts because of the higher optical contrast of landscape features in the visible spectral band. Faulse colour and infrared films gave better results by interpretation of cultural landscapes and vegetation of river vallies. NDVI was used by desertification study in Mali.



Desertification monitoring. Decision makers and managers need information on dryland status in each country. The transfer of information from sectorial sources to decision makers is a continuing ongoing process. The problem can be solved by application of remote sensing and other modern technologies.

To realize this idea a Desertification Monitoring Network (DMN) should be established. Countries signed the CCD will set up National Monitoring Centres (NMC). For example, National Action Programme to Combat Desertification in Turkmenistan (1996) envisages setting up NMC which will be responsible for collection, processing and distribution of information about land degradation. Remote sensing will play an important role in activity of NMC. Desertification maps will be compiled annually on the basis of low resolution imagery. High resolution space photos will also be used for mapping selective key areas.

DMC will function if a standard methodology is developed. The main guidelines of this methodology should include :

- Criteria of assessment
- Standard scele of maps
- Standard format and content of reports
- Standard data sets
- Standard hardware and softawre
- Standard format of database.

A methodology proposed by N.G. Kharin et al (1990) could be used as a basis for setting up NMC in countries of Asia. These NMCs will function in the frame of joint DMN.

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