SUMMARY REPORT ON THE LDN TARGET SETTING PROGRAMME IN THE REPUBLIC OF UZBEKISTAN

2019

This document has been prepared with the support of the Land Degradation Neutrality Target Setting Programme (LDN TSP), a partnership initiative implemented by the Secretariat and the Global Mechanism of the UNCCD, with support of the following partners: France, Germany, Luxembourg, Republic of Korea, Spain, Trinidad and Tobago, Turkey, Venezuela, the European Space Agency, Food and Agriculture Organization of the United Nations, Global Environment Facility, ISRIC – World Soil Information, International Union for Conservation of Nature, Joint Research Centre of the European Commission, Soil Leadership Academy, United Nations Development Programme, United Nations Environment Programme, World Resources Institute.

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Introduction

The Republic of Uzbekistan is located in the central part of the Eurasian continent in the Aral Sea basin. Uzbekistan has a sharp continental and arid climate; almost the entire territory of the country is located in the arid area: 25% of the land is in the extra-arid area, 68% in the arid and semi-arid area (Fig. 1). Almost 80% of the country's territory is occupied by deserts and semi-deserts, including Kyzylkum, the largest desert of Central Asia.

The total land area of the Republic of Uzbekistan is 44,410.3 thousand ha. Agricultural land, which is the most valuable and multifunctional category of land and the main means of agricultural production, accounts for about 46% of the country's total area. The natural ecosystems of the arid and semi-arid areas of the country are historically prone to natural salinization and are threatened by the spread of moving sands, dust storms and dry winds, exacerbated by a lack of water resources.

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In September 2015, Uzbekistan, along with other United Nations (UN) member states, supported the adoption of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs). The list of priority national SDG goals and targets includes target 15.3, which states that "By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world". The indicator for this task is formulated as follows: "Proportion of land that is degraded (irrigated and non-irrigated) over total land area".

Being a party to the United Nations Convention to Combat Desertification (UNCCD), Uzbekistan considers the concept of land degradation neutrality (LDN) as a powerful tool aimed at preserving land productivity and ensuring economic sustainability and social stability of the population. The main purpose of this work was to assess the possibility of using global indicators proposed by the UNCCD for the assessment of LDN and determining the baseline state of land degradation.[1]

The UNCCD Committee for Science and Technology proposed to use three global indicators for assessing LDN: 1) Net primary land productivity; 2) Soil carbon stock; 3) Land cover. Within the framework of the LDN target setting process, the above three indicators were verified and adapted to the conditions of Uzbekistan, including determining the current state of land degradation. Also, in the framework of these activities, the main / priority measures and actions taken by Uzbekistan to improve the state of the land were analyzed and given below.

In addition, a number of national indices were considered as indicators, including: salinity index (mainly for irrigated areas), normalized difference vegetation index (NDVI), and a comprehensive indicator on exposure to desertification, land degradation, and drought (DLDD) processes (average for the 10 years period).

[1] The baseline is the initial (numerical) value of the selected LDN indicators used as proxies of the land-based natural capital.

Analysis of the possibility of using the three global indicators

The "soil organic carbon stock" indicator. SOC stock is an indicator of soil quality associated with nutrient cycles, water retention, and overall stability and structure. Sinks of SOC or the productive capacity of soils is an indicator that reflects well the anthropogenic activities, targeted use of soils and methods of land management. To verify global data for the "soil organic carbon stock" indicator, ground-based research was conducted in a number of regions in the country. The purpose of research was to compare soil carbon data provided by the UNCCD with the results of national ground monitoring for the determination of humus in soil, since the content of carbon in soil can be calculated according to the content of humus in selected and analyzed samples.

Uzhydromet conducts monitoring of soil humus content on agricultural lands in 260 points located in various landscape areas for the last 60 years, in accordance with the GOST methodology "Soils. Methods for laboratory determination of organic substance content". In connection with that, it is possible to recalculate the humus content according to soil carbon (as required by the LDN indicator) on the territory of country where monitoring is conducted.

At this stage, three areas were surveyed - Samarkand, Bukhara and Navoi. According to preliminary estimates, the correspondence between global and national soil carbon data matched in 70% of cases, which allowed us to conclude that this indicator can be used to determine the baseline.

For a more complete picture, it is necessary to carry out this type of exercise for all landscape zones of the country (mountain, foothill and Aral Sea basin areas (Priaralie)), which is now a priority. The preliminary analysis on land status using the "soil carbon" indicator, on the basis of global data (Fig. 2), showed that during the period from 2000 to 2015, 98% of the lands were in a stable state, about 1% was in a state of deterioration and 1% was improving. Thus, in accordance with the concept of LDN on the "soil carbon" indicator, we have a neutral balance of land degradation.

The "land productivity / net primary land productivity" indicator. Land productivity is understood to mean the biological productivity of land defined as the constant energy of plants minus their respiration. Maintaining and increasing productivity in agricultural systems in a sustainable manner reduces the need for expansion and thus minimizes the loss and degradation of natural ecosystems.

This indicator shows the state of land productivity and its trends from year to year, but it has considerable variability, because it depends not only on the state of land resources, but also on the types of crops planted on agricultural land, on the availability of irrigation water in the year under study, etc., on everything that affects the biomass of plants.

A big advantage of this indicator as well as the "soil organic carbon stock" indicator is that there is a global database available for the country based on remote research methods. This method is widely used in many countries, including in Kazakhstan, which has similar soil types, climatic and ecosystem characteristics. This indicator can be used with a high degree of probability to assess the state of non-irrigated lands (pastures, areas under forests) for which ground monitoring and monitoring based on remote methods require large financial and technical costs.

Further field studies are needed to verify this indicator are included in the future work program.[2] According to data provided by the UNCCD, an analysis was carried out for Uzbekistan for 2000 - 2013 (Fig. 2). In general, according to this indicator, we observe that in 2013, relative to 2000, 80% of the land is in a stable state, 15% in a state of deterioration and 5% is improving.

The "land cover" indicator. Land cover is the visible physical shell of the Earth's surface. Land cover is the basic parameter of the earth's surface, which is used to interpret and examine the other two indicators. Changes in land cover are also important indicators in themselves, as they contain the first signs of a decrease or increase in vegetation, fragmentation of habitat and transformation of land resources.

Most often, this indicator is determined based on Earth observations. This requires geospatial mapping of land cover classes using comparable methodologies over even time intervals. For further comparison at the global level, it is necessary to use the adopted ontology (i.e., formal names and definitions of types, possessions and interrelations). It is recommended to use the Land Cover Meta Language (LCML) of the Food and Agriculture Organization (FAO) (FAO, 2016). The following hierarchical classification is proposed as a guide. Level 1 is based on IPPC categories (IPPC, 2006). Level 2 is based on land cover classification, temporarily used in the System of Environmental-Economic Accounting (SEEA), which uses the FAO LCML (United Nations, 2014). Countries should use this hierarchical classification as a guide at a level corresponding to the amount of information available to describe each class of land cover. If national land use classification system of the country does not correspond to the classes of levels 1 and 2, land use classification should be combined or divided to correspond to the classes presented in the above document.

To date, there are some differences in areas according to land use classes, in particular “forest” and “pasture”, according to global and national data. For instance, there is a discrepancy between the definition of "forest" given by the IPCC and the definition of “forest” that is implied in Uzbekistan. The IPCC global classification of “forest” means boreal forests, and in Uzbekistan it is mostly desert forests and a small amount of juniper forests.

According to national data (State Committee for Forestry) for the period 2000-2013, there was a 2.3-fold increase in forest areas and a reduction in areas under hayfields and pastures. These changes were most likely due to the increase of desert forests areas (saxaul and shrubs), and due to reforestation on desert lands (about 39% of total reforestation), while global data do not indicate such changes.

It is clear that the use of this indicator, despite the availability of global database and the importance of determining the baseline, will require significant, complementary studies with the efforts of Goskomzemgeodezkadastre, Uzhydromet and others.

Thus, the preliminary analysis and verification of three global indicators for assessing land degradation trends proposed by the UNCCD Committee on Science and Technology: 1) soil organic carbon stock, 2) net primary land productivity, and 3) land cover led to the following conclusions:

[2] At the national level, "land productivity" is currently estimated according to the following indicators: (1) "bonitet score" - the soil quality index, expressed in classes, relative to the soil with the highest potential fertility, the point of which is usually assumed to be 100%, (2) "soil humus content".

The use of global data on “land cover” indicator currently requires significant additional research due to differences in land use classification at the national and global levels. Uzbekistan has the possibility and capacity to conduct such research.

The two indicators “soil organic carbon stock” and “net primary land productivity” are quite acceptable and were used to determine the baseline. Analysis of the results of land degradation assessment based on two indicators above allowed us to give a preliminary assessment of the dynamics of land degradation to varying degrees in the administrative regions (161 districts) for the period 2000-2015. In Figure 4, the red color indicates the territory exposed to degradation.

Analysis of the possibility of using national indicators

National indicators of land degradation, provided with available statistical information, were reviewed too. They are the following: Normalized Difference Snow Index (NDSI) indicator - land salinity index (mainly for the irrigated area), Bonitet score, and Complex indicator estimating exposure to DLDD processes over a period of 10 years.

"Bonitet score" indicator. To date, land productivity at the national level is assessed by the complex indicator “Bonitet score”. It is an indicator of soil quality, expressed in classes, assessed relative to the soil with the highest potential fertility.

"NDSI" indicator is the index of soil salinity. It should be noted that at present 50% of irrigated lands are exposed to different degrees of salinity, while 19% of lands are threatened by soil erosion. Salinization reduces the yield of agricultural crops, for example, cotton, by 20-30% on slightly saline soils, by 40-60% on moderately saline lands, and by 80% or more on highly saline soils. The high level of groundwater, improper irrigation and poor financing of the drainage system increase the level of salinity, negatively affecting crop yields.

Remote method for revealing and assessing salinity in Uzbekistan was tested, which can be recommended as an additional method for the monitoring. The salinity assessment was based on the NDSI. Due to the fact that the reflectivity of snow and salt is the same, it can be used to determine the area of alkaline lands (Dr. Ji, 2008).

To assess the extent and condition of salinity, the following was done:

- The MODIS data archive was collected.
- In the AcrGIS system, the index calculations were made.
- Average values were obtained.
- Classification was carried out using reconnaissance survey data obtained from the selected test sites.

The following results were obtained:

- On the whole, in the republic, 37% of lands are non-saline and slightly saline lands. This is usually in irrigated areas, dry-farming areas, forest areas and parts of pasture land.
- The Aralkum Desert and alkaline lands in Bukhara and Navoi regions are considered highly saline lands (4%).

As a result, it can be concluded that this procedure works, but requires additional work. The picture obtained from the result of the NDSI calculations reflects well the alkaline lands, slightly saline and non-saline soils. A large percentage of average saline soils located in the Kyzylkum desert is observed. The reflectivity of sands typical for this area is similar to the reflectivity of slightly saline lands. For more detailed classification, it is necessary to study and analyze the soil

composition, in-situ studies and further studies, as well as the possibility of separation of sands from slightly saline lands (Figure 5).

Integrated indicator "Assessment of the degree of desertification".

Comprehensive assessment of the extent to which the area was exposed to the processes of desertification and drought was carried out. To assess this integral component, a scored approach was applied and the following indicators were used: soil erosion, bonitet score, NDSI - soil salinity, AI - aridity index, SPI - standardized precipitation index, NDVI - normalized difference vegetation index, which was calculated for the period 2000-2013.

Each indicator was classified on a five-point scale, based on the data a complex map was constructed and hot spots were identified (Figure 6).

According to preliminary estimates based on global and national indicators, the total area affected by degradation, as of 2015, is about 26-28%. The studies in this direction continue.

These indicators were discussed at a roundtable meeting devoted to the World Day to Combat Desertification with the interested ministries and departments (2017), in Tashkent and the meeting of the CACILM Coordination Council (2018). The meeting of the Round Table was attended by 74 people - representatives of key ministries and departments, deputies of the Legislative Chamber of the Oliy Majlis of the Republic of Uzbekistan, research institutes, universities, farmers and mass media.

There was an active discussion and exchange of views between the participants on the use of global and national indicators on desertification, land degradation and drought, to assess the achievement of land degradation neutrality as a powerful tool that would, through sustainable management, restore and maintain the productivity of land resources and ensure the economic and social stability of the population.

The main “hot spots” are the irrigated and non-irrigated zones of the Aral Sea area (Lower Amudarya River within the Republic of Karakalpakstan and Khorezm Region), which is a consequence of catastrophic environmental change as a result of the Aral Sea drying out. Vast areas of white salt fields appeared on the dried bottom of the sea; they turned into a new desert of Aralkum, with an area of 5.5 million hectares, which is a hotbed of dust and salt storms, which naturally adversely affects the quality of soil. The problem is aggravated by the climatic conditions in the region. Global warming leads to increased climate extremes, frequent droughts. Recently, in the Aral Sea region, the number of days with temperatures above 40°C in the summer period has increased twofold. Winters have become colder and more severe.

Intensive tillage (annual plowing with reservoir turnover, numerous tillages during vegetation) created favorable conditions for the emission of carbon into the atmosphere. Over the past decades, the humus content in the soil of the Aral Sea region has decreased by 30–40% and now stands at 0.50–0.80% in light and typical gray soil and 0.65–0.95% in old irrigated land. With a decrease in organic matter, the habitat of beneficial soil organisms deteriorates, which leads to their destruction. Uzbekistan is making significant efforts to stabilize and improve the state of land in the Aral Sea region, including the creation of forest protective plantings on the dry bottom of the Aral Sea, land improvement, raising fertility, restoration of degraded ecosystems, etc. A number of programs and projects have been prepared and are being implemented in cooperation with international organizations.

The next “hot spot” is Romitan district of Bukhara region, located in the desert arid zone and characterized by an extremely low content of soil organic carbon (less than 10 t/ha in the upper

30 cm soil layer). Low carbon reserves are due to natural conditions conducive to desertification and are associated with climatic features: extreme seasonal temperatures of +30 or + 40°C in the summer and -20°C in winter, scant amount of precipitation (- 100-150 mm/year). Anthropogenic causes put pressure on the low-productive desert pastures. The imposition of natural and anthropogenic factors has led to: (i) degradation of vegetation as a result of intensive use (overgrazing); (ii) desertification around watering wells (as a result of a concentration of large numbers of livestock); (iii) wind erosion of the fertile upper soil layer.

According to preliminary estimates, based on global and national indicators of the area exposed to degradation, as of 2015, it is about 22-24%, including about 4% of degraded areas due to drying up of the Aral Sea.

Sustainable development goals and LDN

In accordance with the Resolution No. 70 of the United Nations General Assembly, adopted at the UN Summit on Sustainable Development in September 2015, the Government of Uzbekistan has adopted national indicators for the Sustainable Development Goals (SDGs) - a Decree of the Cabinet of Ministers of the Republic of Uzbekistan "On Measures for Implementation of National Sustainable Development Goals and Targets for the Period up to 2030".

By this decision, Uzbekistan approved national sustainable development goals, targets and indicators for the period up to 2030, including target 15.3 in the area of land degradation neutrality (LDN). **The voluntary LDN target adopted by Uzbekistan is "By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world".**

LDN assessment indicator is proportion of land that is degraded (irrigated and non-irrigated) over total land area.

In accordance with the same Decree of the Cabinet of Ministers, a Coordination Council on the implementation of national goals and targets in the field of sustainable development was created, ensuring inter-sectoral coordination and an integrated approach to achieving the SDGs.

In addition, the Road Map was adopted and is being implemented for: a) working out a development concept for each SDG for the period of 2030 and an annual action plan for implementation of SDGs; b) developing a system of indicators for implementation of SDGs; c) monitoring and reporting on the implementation of national SDGs starting from 2019.

Leveraging LDN in the legislative and regulatory framework

For Uzbekistan, which takes concrete and effective measures to improve the state of irrigated land, reduce pasture degradation, restore forest plantations, improve soil fertility, achieving the achieving LDN" by 2030 is quite feasible. The realistic achievement of this goal is due to the fairly stable institutional structure of the country's state institutions, which covers practically all sectors of the economy and the areas of action envisaged by the UNCCD and other global agreements.

There is a developed legislative and regulatory framework for environmental protection, which includes more than 100 laws and government decrees that provide mechanisms and instruments of state regulation for the implementation of global environmental conventions, including the UNCCD. Currently, the "Law on Pasture" is under discussion, as well as there are discussions on

amending the "Code of Administrative Liability" regarding the system of penalties for inefficient land use, leading to the loss of soil, reducing their fertility, degradation or destruction.

The issues of combating desertification, land degradation and drought are integrated into a number of national programs, strategies and projects:

- Environmental Action Program of the Republic of Uzbekistan for 1999-2005, 2008-2012, 2013-2017;
- State Program for Improvement of the Ameliorative State of Irrigated Land and Rational Use of Water Resources for 2008-2012, 2013-2017, 2018-2019;
- National Action Program to Combat Desertification and Drought (2015);
- Comprehensive Program for Mitigating the Consequences of the Disaster, Rehabilitation and Socio-Economic Development of the Aral Sea Basin Area for 2015-2018;
- State Program for Development of the Aral Sea Basin Area for 2017-2021;
- National Biodiversity Strategy and Action Plan (NBSAP) of the Republic of Uzbekistan for the period of 2016-2025 and etc.

Much work is being done in the country to mitigate the effects of the Aral disaster.

In February 2017, by the Decree of the President of the Republic of Uzbekistan, the Strategy of Actions on Five Priority Directions of Development of the Republic of Uzbekistan for 2017-2021 was approved. The Strategy of Actions includes actual tasks to improve the state structure and the judicial and legal system, liberalize the economy and develop the social sphere and strengthen inter-ethnic friendship and harmony in the country. This document stimulates the purposeful sustainable development of our country and society, representing a new vision of the strategic prospects for the development of the state and society. The implementation of this strategy is carried out through the preparation and implementation of the annual State Program.

Issues related to combating desertification, land degradation and drought are reflected in priority area 3: "Development and liberalization of the economy", subsection 3.3 "Modernization and intensive development of agriculture".

The country is implementing a number of projects aimed at sustainable land management and improving land quality:

- GEF / UNDP / The State Committee of the Republic Uzbekistan on Land Resources, Geodesy, Cartography and State Cadastre project "Reducing Pressures on Natural Resources from Competing Land Use in Non-Irrigated Arid Mountain, Semi-Desert and Desert Landscapes of Uzbekistan", 2013-2018.
- GEF / UNDP / State Committee on Ecology Project "Sustainable Use of Natural Resources and Forestry in Key Mountain Areas Important for Globally Significant Biodiversity", 2017 - 2021.
- GEF / FAO / State Committee for Forestry Project "Sustainable Management of Mountain and Valley Forests", 2018-2021.
- CACILM program "Integrated Natural Resources Management in Drought-Prone and Salt-Affected Agricultural Production Landscapes (CACILM-2)", 2018-2021.

Annex

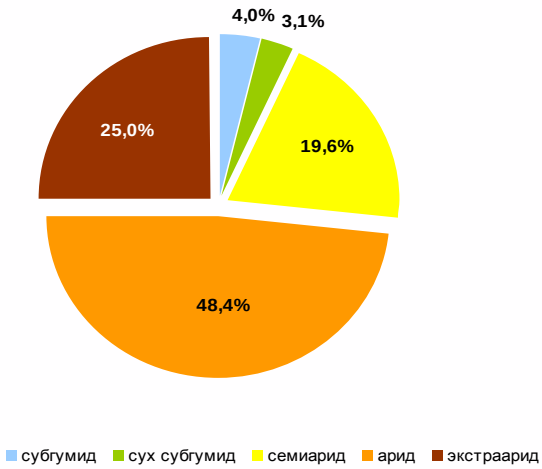

Figure 1: Distribution of the territory of Uzbekistan by the aridity index. Source of data: Hydrometeorological data (Uzhydromet)

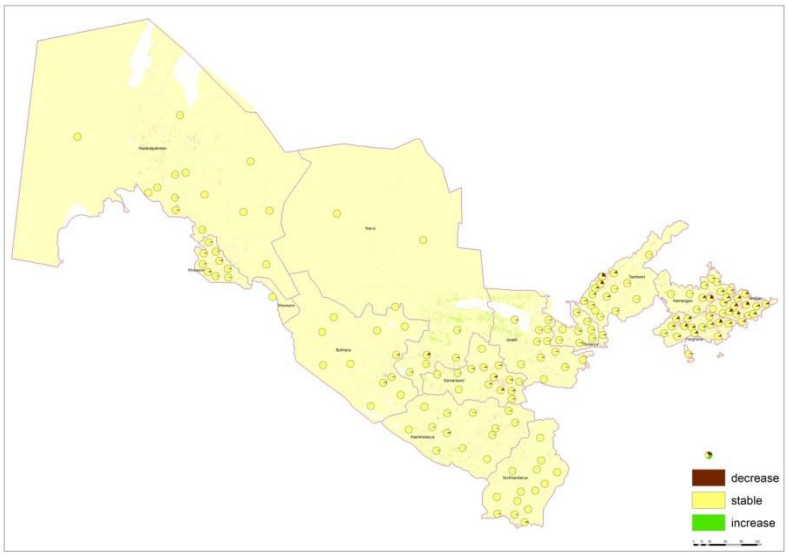

Figure 2: Soil carbon dynamics for the period 2000-2015. The map shows the difference in soil carbon content between 2000 and 2015. Source of data: UNCCD global data.

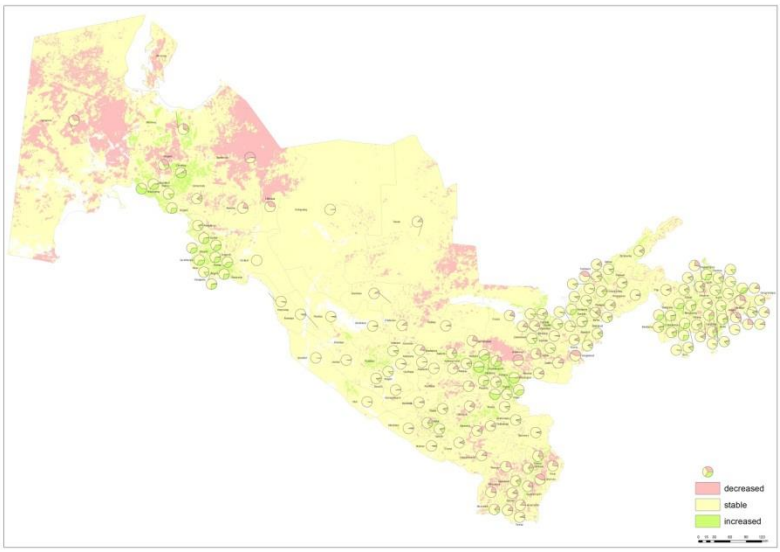

Figure 3: Land productivity dynamics for the period 2000-2013 (the difference between 2000 and 2013). Source of data: UNCCD global data

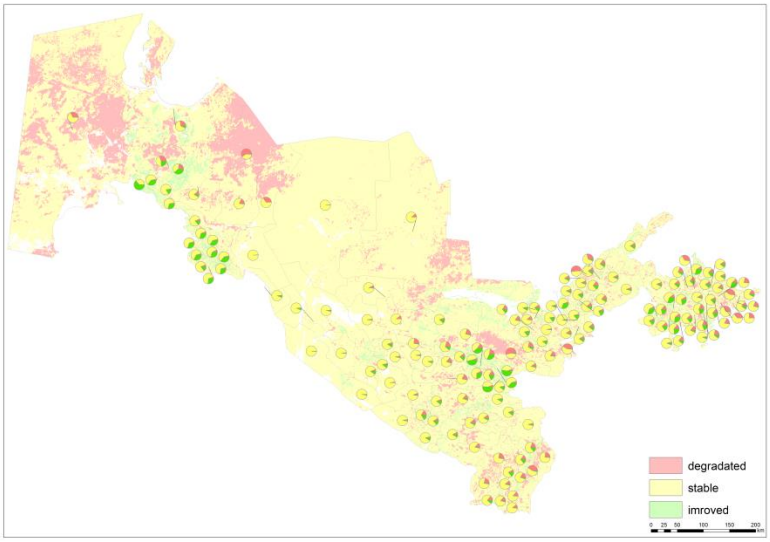

Figure 4: Land degradation trends for the period 2000-2015, according to indicators "soil organic carbon" and "land productivity". Source of data: UNCCD global data

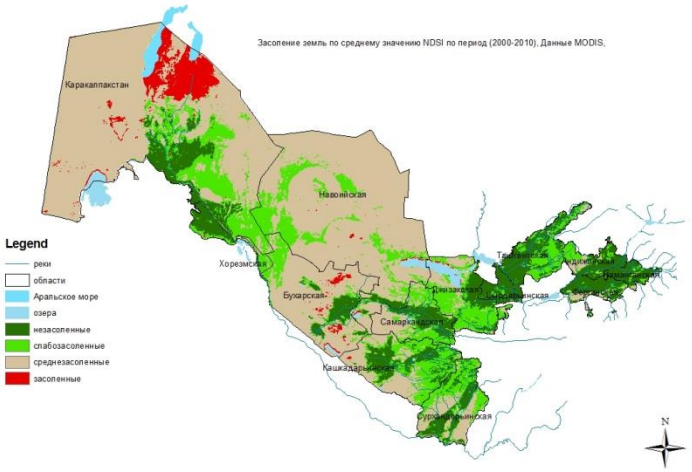

Figure 5: Salinity levels using average NDSI value for the period 2000-2010. Source of data: MODIS

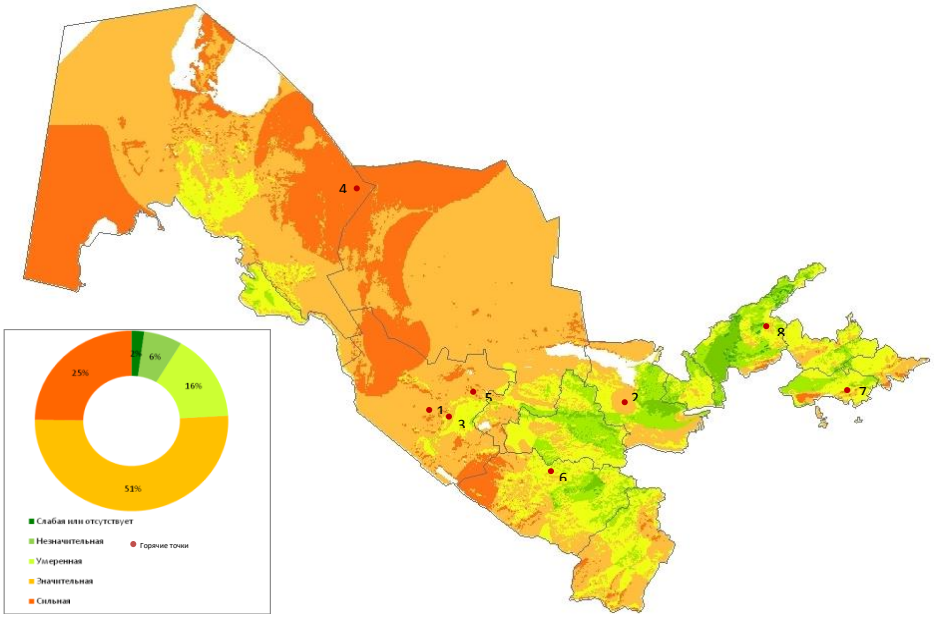

Figure 6: Integrated map of the exposure of the territory to the processes of desertification. Source of data: N.I. Rakhmatova et al., 2016.

References

N.I. Rakhmatova, L.Yu. Shardakova, R.V. Taryannikova. Assessment of Desertification Processes in the Territory of Uzbekistan. The Issues on Protection of Land Resources and Their Rational Use under Conditions of Changing Environment. Collection of Reports of the Republican Scientific Practical Seminar dedicated to the Earth World Day, 22 April 2016 - Tashkent. Pp.88-94.