Use of space-based technologies and national SLM-IS for forecasting and reduce of disaster risks in Fergana Valley, Uzbekistan

Gulchekhra Khasankhanova, UZGIP, MAWR, Uzbekistan

The Central Asian Countries Initiative for Land Management (CACILM)
Use of space-based technologies and national SLM-IS for forecasting and reduce of disaster risks in Fergana Valley, Uzbekistan
Growing Concerns:

- Land degradation and desertification and water shortage and water resource contamination in time and in space is major environmental challenges, threatening the country’s natural resources and social and economic development;

- Stable warming tendency is observed today in Uzbekistan and other Central Asian countries. Average rates of warming since 1950 along the territory of the Republic have been 0.29°C per decade, which is more than twice the world average.

- Worsening of water and energy infrastructure and rapid growth costs for its maintenance represent serious threat for food and environmental security in the region.
Drought

Drought is very negative event which cause substantial losses in agricultural production and difficulties in the fresh water supply for population.

The assessment of the extreme climate change scenarios 2050 shows that vegetation flow in Amudarya and Syrdarya river basins could be reduced by 25-40%.

Expected losses of crop yields to 2050 because of deficiency of water will make on the average 35-50%.
Mudflows and avalanches

12% of Uzbekistan territory (foothill and mountain areas) are mudflow and avalanche prone;

468 water courses in Uzbekistan are mudflow prone;

the intensive rain is the reason of 80% cases of the mudflows and avalanches.

territory of Republic is threatened with 271 lakes of various origins, and their majority is located outside Republic.

Expected change of rain-related mudflows for the Climate Change scenarios (A2, B2) is as follows:

- up to 2030-2050 the increase of the mudflows frequency to 17-19% and mudflow risk periods are expected;

- probability of avalanching is expected to decrease about 1,2-1,3 times up to 2030 and 2050.
CACILM - a multi-country and multi-donor partnership program aimed at restoring, maintaining and enhancing productive functions of land in Central Asia countries leading to improved economic and social well-being, while preserving the ecological functions of these lands in the spirit of the UNCCD.

The oversight of CACILM program is performed by the Steering Committee, that includes representatives of the participating Central Asian countries and partner organizations (ADB, GTZ, CIDA, FAO, GM, IFAD, SDC, UNDP, UNCCD Secretariat and other).

CACILM National Programming Frameworks on SLM forms its strategic basis under GEF-3 OP-15 focal area programmatic goal.

CACILM Multicountry Partnership Framework Support Project (CMPF), sponsored by GEF, supports the adaptation an integrated approach to land use planning and management, taking into consideration current international efforts towards a harmonization of land data and information management.
Objective and Methods

**Project objective** is to enhance the countries’ institutional capacity to assess and monitor land degradation and to adopt integrated land use planning and management in support of SLM.

**Specific objective** is an application of FAO LADA approach and methodology for design and development of SLM-Information system in assessment and mitigation of land degradation and climate change impact.

The global datasets (GLC-2000, AgroMaps, SRTM data) and guidelines has been supported by FAO LADA.

**MODIS Vegetation Indices Dataset** (MOD13Q1, 250m) of 2007-2008 and LANDSAT TM has been the primary data source.
Targeted tasks and achievements

- Assessment of baseline land degradation and rural livelihoods, and hotspot and bright sports analysis based on FAO LADA approach;

- Establish baseline information to assess and monitor of climate-related risks for decision making in land/water management with using landuse, landcover, socio-economic data, and recent spaced-based techniques data and indicators;

- Integration into global FAO Land Use System (FAO LADA LUS)
FAO-LADA-LUS
National cut-outs from Global (1:5m) LUS layers & replacement with higher-resolution (1:1m) national layers: Soils; Land Use / Land Cover, etc.

National Coverages:
1: 500,000 - 1:1,500,000 (national)
1: 200,000 - 1:300,000 (oblast)
1: 50,000 - 1:100,000 (rayon)
1: 10,000 - 1:20,000 (municipality; irrigation schemes)
Point data: location of municipality and former kolkhoz / sovkhoz centres (old & new names), etc.

ECONET
(updating of Econet layers, particularly on protected areas, and correcting any errors, etc.)

ICARDA
- agro-climatic layers, etc...
- any updating, as necessary

REMOTE SENSING IMAGES
- MODIS, LANDSAT ETM (particularly of higher-resolution coverages)
- Google Earth imagery updates, moderate resolution (1:50,000 – 1:100,000) and high resolution (1:5,000 – 1:10,000) coverages, etc

National Statistics Agency Rayon and Municipalities Data
- Land Use, Crop Areas,
- Crop Yields, Crop Production
- Population, employment, income, poverty
**Baseline Years:** 1990, 2000, 2006; also other years over period 1987 – present.

GEF Project Area Coverages (NSIUs)
- 1:200,000 (Rayon + Oblast)
- 1:50,000
- 1:20,000, 1:10,000 (Municipalities)
- updates & corrections...

CACILM / MSEC / ADB Coverages (CAC-5)
- Major River Basin Boundaries
- Dams & Water Diversion Structures
- Hotspot / brightspot areas
- Met. & Hydromet Stations
- ADB, WB, EU, GTZ project locations
1. Current state of land degradation
Fergana Valley - the most populous and vulnerable region of Uzbekistan (7.5 million people):

(i) *Density of population in the Andijan (575 men/km²) is ten times higher than the its average level by the republic.*

(ii) *The area of irrigated land per one rural inhabitant is 0.19 ha, as compared with 0.27 ha by the rest of Uzbekistan.*
## SLM-IS hotspot: Fergana Valley

![Map of Fergana Valley](image)

### Comparative analysis of land degradation and socio-economic conditions

<table>
<thead>
<tr>
<th></th>
<th>Irrigated area '000 ha</th>
<th>Rural Thousand people</th>
<th>Area with land degradation,'000 ha</th>
<th>Water salinity, g/l</th>
<th>Income per capita of rural, $USD</th>
<th>Poverty Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Soil erosion</td>
<td>Soil salinization</td>
<td>Water logging</td>
<td></td>
</tr>
<tr>
<td>Andijan</td>
<td>272</td>
<td>1710</td>
<td>14,2</td>
<td>12,3</td>
<td>133,3</td>
<td>0,59</td>
</tr>
<tr>
<td>Namangan</td>
<td>281</td>
<td>1352</td>
<td>54,52</td>
<td>27,0</td>
<td>77,5</td>
<td>0,40</td>
</tr>
<tr>
<td>Fergana</td>
<td>359</td>
<td>2111</td>
<td>16,5</td>
<td>170,2</td>
<td>167,0</td>
<td>0,89</td>
</tr>
</tbody>
</table>

Source: Dr.C.V.Ji, ADB, 2009
SLM-IS hotspot: Fergana Valley

Waterlogging and salinization of the irrigated croplands

At present about 67-70% of the irrigated area at the right bank and central part of Fergana valley is rise of groundwater table and associated with that processes of water logging and soil salinization. The area with a groundwater table in the range of 0 to 1.5 m has almost doubled in the period 1996-2006. Due to continuous waterlogging and salinization, agricultural lands are being abandoned and houses and other buildings are affected.

Baseline of Waterlogged Areas using MODIS spectral reflectance data supplied together with the 250m MOD13Q1 datasets.

Source: Dr.C.V.Jr, ADB, 2009
2. RS interpretation of seasonal change of NDVI

MOD13Q1 May 8, 2008

NDVI
-3 000 - 0
0 - 400
400 - 800
800 - 1 200
1 200 - 2 000
2 000 - 3 500
> 3 500

Grasslands
Shrubs
Rainfed
Agro-cultural lands - mod intensive
Agriculture - large scale
Open water - fisheries
Wetlands-agro-pastoralism
Urban land

-3 000 - 0
0 - 400
400 - 800
800 - 1 200
1 200 - 2 000
2 000 - 3 500
> 3 500

January  February  March  April  May  June  July  August  September

NDVI vs. Month for different land cover types.
RS interpretation of seasonal change of NDVI

MOD13Q1 August 12, 2008

NDVI
-3 000 - 0
0 - 400
400 - 800
800 - 1 200
1 200 - 2 000
2 000 - 3 500
> 3 500

Legend:
- Blue: Grasslands
- Pink: Shrubs
- Green: Rainfed
- Brown: Agriculture - large scale
- Purple: Wetlands-agro-pastoralism
- Cyan: Open water - fisheries
- Red: Urban land

Graph showing seasonal change of NDVI for different land cover types.
Seasonal Change of NDVI (MODIS, 2008). Fergana Valley

a) MODIS-May, 2008
b) MODIS-August, 2008

Hotspot: Water logging and salinization of irrigated lands
On the bases of compilation of national ecosystem and biophysical resource base with global system (GLCN,2000) 9 main classes of land cover was defined.
National Map of FAO Land Use System consists of 25 classes, each of them is divided into 3-4 sub classes depending on biophysical attributes of ecosystem, land use attributes and social economic features.
Conclusions

- Land use/cover information is the most important for sustainable land use planning decision making and emergency response.

- Established SLM-IS of Uzbekistan i) improved the current weaknesses the national information base and ii) enhanced the institutional capacity to assess and monitor land degradation and climate change risks;

- Experiences gained during design and implementation of the SLM-IS have clearly demonstrated capacity building needs on new diagnostic and spaced-based management tools, integrated M&A approach to mitigate and predict possible emergence situation through modifications of the technical and institutional interventions and adaptation specific measures against droughts, mudflows and other uncertainties.
THANK YOU FOR ATTENTION

Welcome to Uzbekistan

Dr. Gulchekhra Khasankhanova
UZGIP Institute
Ministry of Agriculture and Water Resources
Republic of Uzbekistan
National Secretariat, CACILM Uzbekistan