Soil retention ecosystems services in Aral Sea bed in Uzbekistan

The loss of the Aral Sea has changed the region's environment and caused significant economic and social consequences. The desert on the former seabed, Aralkum, has joined the list of global hotspots of sand and dust storms. A new project will measure the impacts of these storms and evaluate the effect of soil restoration measures to propose new mitigation measures.

Dried Aral Sea bed near Muynak, Uzbekistan.
Photo by Sanobar Khudaybergenova.

Aralkum desert is a relatively new addition in global hotspot sources of sand and dust storm with high salt concentration. Its appearance spanned over the last several decades only. The current area it covers is around 60,000 sq. km, of which 70 percent is salt desert.

The loss of the sea has not only transformed the region's environment, triggering enhanced degradation and desertification processes, but also resulted in the loss of livelihoods, unemployment, malnutrition, poor health and migration issues. The inter-relationships between the environment and production, human health and rural livelihoods are complex to estimate and require proper attention and investigation.

There are various restoration options to reduce the negative impact of salt and dust storms. Tree plantations indigenous to the region offer improved ecosystem services via soil and water retention that will prevent polluted dust from being transported. Such an initiative has been launched and tested in different parts of the dry seabed. Recent efforts are directed to saxaul (haloxylon) plantations on an estimated area of 500,000 ha.

The effect of such restoration options need to be evaluated for large-scale investments. Within the Project "Measurement and valuation of soil retention ecosystems services in the Aral Sea bed in Uzbekistan", ecosystem services provided by restored seabeds will be modelled using InVEST or other suitable models. The following indicators will be studied:

- Annual and perennial crop damage;
- Reduced soil quality;
- Human health (respiratory problems, eye infection, internal diseases, anaemia etc.);
- Displacement/migration;
- Cost of cleaning infrastructure from sand and dust (road, airport, irrigation and drainage canals).

Over the years, there have been significant advances in the impact assessment literature. However,

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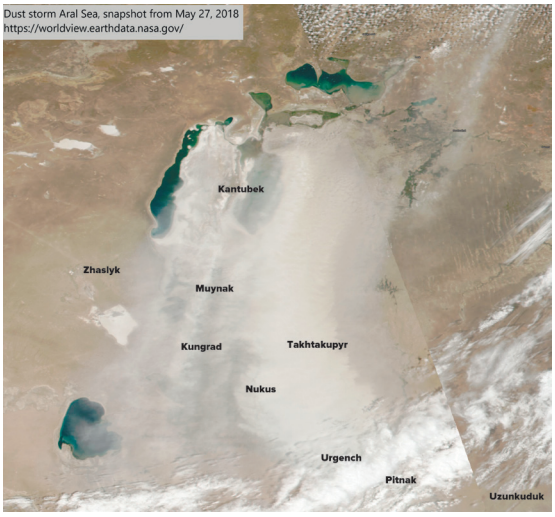

Dust storm in the Aral Sea area, 27 May 2018. *Source: NASA.*

Effect of the dust storm in one of the households 300 km from Muynak, 27 May 2018. *Photo by Sanobar Khudaybergenova.*

identifying and quantifying the direct and indirect impacts on natural resource degradation and/or the ecosystem services generated from natural resource management remains a challenge. This is even more so for the valuation of these impacts as some of the use and non-use functions of the ecosystem services are not marketable.

The project will focus on the intrinsic use values associated with soil to measure and value the direct and indirect impacts of dust storms in the Aral Sea area. The direct and indirect effects of sand storms include some losses in eco-system services that have a market value (such as food, fiber and bioenergy) and others that are not marketed at all (such as loss of biodiversity, ecological health, clean air and clean houses). A challenge to making sound measurements of non-market economic values is to capture the kinds of relationships that exist in markets. Therefore, a combination of revealed preference and stated preference valuation methods will be used to assign dollar values to different effects of dust storms. In cases where revealed preference methods are used, the project will use information on current expenditures and revenues (e.g. in agricultural production) and hedonic and travel cost approaches to deduce the implied willingness to pay for benefits derived from ecosystem services lost due to dust storms or generated from measures to curtail dust storms. For those ecosystem services for which the measurement of revealed preference is difficult or impossible, different methods (including stated preference methods) will be used to determine the value.

The quantification and valuation of the ecosystem services affected/lost due to dust storms will take various factors into consideration:
1. Identification of the nature (physical, environmental, social, economic and other) of the effects of dust storms;
2. The scale (or spatial magnitude) of the effects, i.e. the study team will have to determine the boundaries for each type of effect and hence limit the measurement and valuation to what happens within those boundaries;
3. The temporal dimension of the effects of dust storms. While some effects such as loss of visibility are temporary and hence last only from a few hours to a few days, other effects of dust storms such as health and pollution of water bodies have long-term impacts. Therefore, the study will determine the time dimension of each effect under consideration and carry the measurement and valuation accordingly;
4. The intensity of the effects. Dust storms can have varying levels of effects (e.g. anemia) on the entire population, pregnant women, and children; or varying levels of effects on the productivity of adjacent or far away crop fields. Therefore, the quantification and valuation of the impacts will need to establish different broad (but sufficiently homogenous) categories based on the distinction between the nature, scale, spatial and temporal coverage, and intensity of the effects.

Project:

"Measurement and valuation of soil retention ecosystems services in the Aral Sea bed in Uzbekistan"

Partners

State Committee on Forestry of the Republic of Uzbekistan

Contact us

Dr. Akmal Akramkhanov,
Project Manager, ICARDA
Regional Office for Central Asia and Caucasus,
6/106, Osiyo St, 100084,
Tashkent, Uzbekistan
Tel: +998 71 2372130,
+998 71 2372169
Fax: +998 78 1207125
A.Akramkhanov@cgiar.org

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