

SOIL AND WATER CONSERVATION

SOIL AND WATER CONSERVATION IN CHINA

MINISTRY OF WATER RESOURCES, PEOPLE'S REPUBLIC OF CHINA



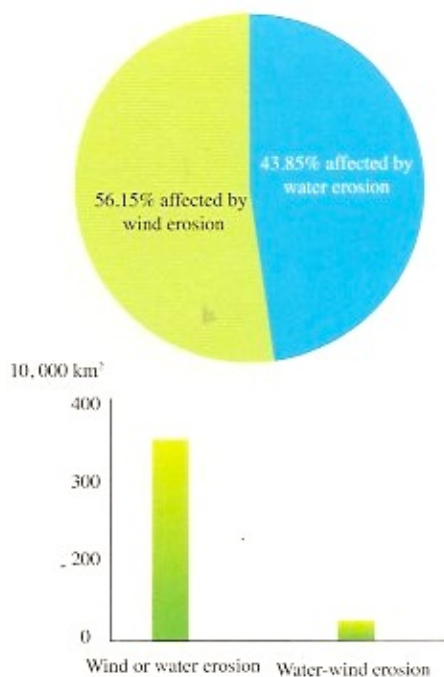
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1. Overview

China is one of the countries with the most severe soil and water erosion in the world. Nationwide soil and water erosion affects a total land area of 2.9491 million km², accounting for 30.72% of the nation's entire territory. Of the affected land, 1.2932 million km² suffers water erosion, and 1.6559 million km² wind erosion. Land surface and vegetation have been subject to constant disturbances associated with rapid modernization, urbanization, industrialization as well as massive and frequent production and development activities. Human activities have further exacerbated soil and water erosion.

1.1 The Resultant Land Degradation and Damage to Arable Land Endanger the Country's Food Security

For nearly five decades, the country as a whole has



Proportion of areas affected by different erosion types



Soil erosion in Ganzhou City, Jiangxi Province

lost 3 million-plus ha of arable land due to soil and water erosion, averaging 60,000-odd ha per year. The part of the Loess Plateau that is affected most by soil and water erosion has lost more than 1 cm of surface soil each year. In some parts of the black soil northeast region, the thickness of farming layer has dropped below 20 cm, down from 1 m or so at the very beginning of reclamation. Up to 77% of the earth-rock regions in North China has a soil layer thickness of less than 30 cm. The ratios are 42.1% and 18.8% respectively in the karst area in Southwest China, the upper and middle reaches of the Yangtze River and various rivers in Southwest China.

1.2 The Resultant Sedimentation in Rivers, Lakes and Reservoirs Aggravate Flood Disasters and Take a Toll on the Country's Flood Control Safety

As a result of soil and water erosion on the Loess Plateau, the downstream channel of the Yellow River was silted up by 9.2 billion metric tons of sediments from 1950 to 1999. The river bed was elevated by 2-4 meters in most sections. In some downstream sections of the mainstream Liao River, the river bed has already stood 1-2 m over the land surface, making itself a "Earth Suspended" river.

1.3 Erosion adds to Non-Point Source Pollution with Negative Implications for the Nation's Water Supply Security

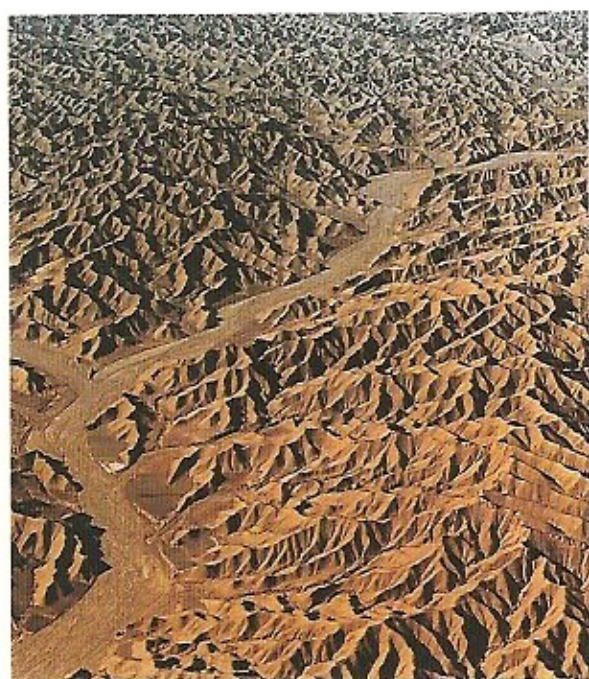
Sedimentation worsens water supply-demand imbalance by impeding comprehensive development and effective utilization of water resources. In order to mitigate the loss to reservoir capacity associated with sediment deposition, some reservoirs along the trunk stream and tributaries of the Yellow River have to adopt the operation mode of releasing sediments by emptying the reservoir. Large amounts of precious water resources are discharged along with sediments. Every year, 20 billion m^3 or so of water is needed to carry the sediment flux in the lower reaches of the Yellow River into the sea in order to lower the river bed. While simultaneously carrying sediments in large quantities, soil and water erosion, as a carrier of non-point source pollution, also releases into the water body massive amounts of hazardous substances including fertilizer, pesticides and household garbage. This poses a grave threat to drinking water safety.



Turbid water resulted from soil erosion

1.4 Erosion Deteriorates the Environment, Entrenches Poverty and Undermines the Country's Ecological Safety

Soil and water erosion leads to deterioration of the eco-environment by reducing the carrying capacity of soil and water resources. According to estimates by the Study Mission of Soil and Water Erosion and Ecological Safety in China and the Asian Development Bank, soil and water erosion causes annual economic damage to China equivalent to roughly 3.5% of its GDP. Ecological harm defies estimation. On top of that, soil and water erosion and poverty reinforce each other. China's most impoverished areas tend to, more often than not, overlap with the regions with the most devastating soil and water erosion. Those areas with severe erosion are home to 76% of the country's poverty-stricken counties and 74% of the population that lives under the poverty line.



The Loess Plateau facing the most serious soil erosion in China

2. Accomplishments and Challenges

2.1 Accomplishments

Since 1949, China has implemented a program for prevention and control of soil and water erosion. The efforts have brought preliminary improvement in 1.07 million km² of the land area suffering from soil and water erosion. Existing soil and water conservation measures can reduce the amount of soil erosion by 1.5 billion metric tons per year, enlarge water retention capacity by 25 billion-plus m³, and increase grain output by 18 billion kg. Communities living on the mountains have witnessed a significant improvement in their farming and living conditions. They are in a better position to achieve self-sufficiency in grain production. Over the last decade, 150 million residents have derived direct benefits from the improvement in soil and water conservation. 20 million-odd people living on the hills with livelihood challenges no longer struggle to make a living.

2.1.1 Vigorous implementation of the *Law on Water and Soil Conservation* has effectively placed man-made soil and water erosion under control.



Since the official enactment of the *Law of the People's Republic of China on Water and Soil Conservation* in 1991, China has evolved towards a rule-of-law approach to water and soil conservation. Under a mandatory regime governing construction projects, soil and water conservation facilities must be designed, constructed and put into operation in parallel with the corresponding phases of the underlying development project. This approach has made a remarkable difference. Soil and water conservation plans are developed for upwards of 90% of the country's large and medium-sized development projects. Project developers and owners helped prevent and control over 100,000 km² of land vulnerable to soil and water erosion. 2.24 billion metric tons of soil erosion was avoided. In 2011, the amended *Law on Water and Soil Conservation* went into effect. The law gave more teeth to the provisions on government accountability, the legal status of planning, prevention and control policies, and legal liability. Governments at all levels have taken concrete steps to increase oversight and enforcement over soil and water conservation. Man-made soil and water erosion is subject to draconian regulation. The general public has become significantly more aware of the legal obligation for soil and water conservation.



Forest for soil and water conservation in Xinjiang Uygur Autonomous Region

2.1.2 The roll-out of State-level priority conservation projects delivers enormous improvement in a holistic approach to control soil and water erosion.

China has implemented a raft of State-level priority projects for soil and water conservation. They are located in the regions that are hard hit by soil and water erosion including the upper and middle reaches of the Yangtze River, the upper and middle reaches of the Yellow River, the black soil area in Northeast China and the karst area in South China. Key sources of water such as Danjiangkou reservoir zone are also beneficiaries. The geographic scope of the initiatives has expanded from the upper and middle reaches of the Yellow River and the Yangtze River to all the



major river basins across the country. The conservation projects cover 700-odd counties and cities that are severely affected by soil and water erosion. Initial success has been achieved in developing 60-plus large-scale demonstration zones that cover more than 100 km² each, deliver immense comprehensive benefits and are powerfully exemplary. The initiatives have brought about across-the-board increases in vegetation coverage in the priority zones. The eco-environment has gradually changed for the better. The amount of sediment flow into the rivers has been on a downward trend.

2.1.3 Vegetation recovers swiftly in extensive areas via full leverage of the self-rehabilitation capacity of ecosystems.

Since the turn of the century, China has embraced a shift in its approach to soil and water conservation. In addition to stepped-up efforts on comprehensive control over erosion, China has resorted to mountain closure for afforestation, grazing prohibition and rotation grazing. The autonomous rehabilitation capacity of nature is brought into full play. Efforts are made to speed up vegetation recovery, reduce soil and water erosion and improve the eco-environment. The Ministry of Water Resources has launched two



Small Watershed Restoration Project in Anhui Province

batches of ecological restoration pilot projects for soil and water conservation in more than 200 counties in 29 provinces (autonomous regions). A prevention and protection project was implemented for soil and water conservation in Qinghai Province's headstream regions of three parallel rivers (the Yellow River, the Yangtze River and the Lancangjiang River). Six provinces (autonomous regions and centrally administered municipalities) of Beijing, Hebei, Sha'anxi, Qinghai, Ningxia and Shanxi have issued decisions on mountain closure and grazing prohibition. Similar decisions have been taken in 136 prefecture-level cities and nearly 1,200 counties in 27 provinces (autonomous

regions and centrally administered municipalities) nationwide. Conservation in the form of mountain closure has been adopted across-the-board in the State-level priority projects for soil and water conservation. Self-rehabilitation of ecosystems has been pursued in a total land area of 80,000-plus km² across the nation.

2.1.4 A viable technological pathway for comprehensive improvement in small watersheds has been developed, contributing a key lesson on effective control against soil and water erosion.

Building on its long-standing experience on the ground, China has developed a technological pathway for erosion control. Comprehensive improvement in small watersheds lies at the heart of the approach, which has contributed to successful improvement in more than 70,000 small river basins.

In recent years, places around the country have succeeded in blazing a new trail in managing small watersheds with locally relevant solutions. Under this approach, soil and water erosion is managed alongside sewage, rubbish, toilets, the environment and river channels in water source protection zones, and the surrounding areas of cities. Three lines of defense, namely, ecological rehabilitation, ecological improvement and ecological protection, are put in place under this mode of developing small ecologically

sound and clean watersheds. Over 1,000 small river basins have been developed under this philosophy, which has effectively reduced non-point source pollution and improved the habitat environment. In those areas susceptible to debris flows and landslides, the development of ecologically safe small watersheds has decreased the incidence of hazards and enhanced the protection of human lives, assets and public facilities.

2.1.5 More technological advances and better monitoring helps modernize soil and water conservation efforts.

In recent years, China has made a number of key technological strides in such fields as the underlying mechanism for soil and water erosion, critical technologies for soil and water conservation, analysis of comprehensive benefits of soil and water conservation. 104 State-level technological demonstration parks for soil and water conservation have been set up in regions with different types of erosion around the country. These regions also host 24 State-level on-site educational facilities on soil and water conservation for primary and high school students. Initial progress has been made in developing the country's planning system and technical standard system for water and soil conservation. 51 technical standards on water and soil conservation have been issued. When it comes to erosion monitoring and forecasting, the Ministry of Water Resources has implemented two phases of State-level projects for developing monitoring networks and IT systems on water and soil conservation. High priority has been accorded to the development of 7 central monitoring stations for river basin authorities, 31 provincial-level monitoring stations and 175 local monitoring stations. Nationwide 738 monitoring points have been built, forming a conservation monitoring network that covers the whole country and enjoys a sound lay-out. Such a system has gradually enabled dynamic monitoring and forecasting of soil and water erosion as well as the effects of prevention and control



Shentangyu Small Watershed Landscape Project in Huairou of Beijing City

efforts. The system generates information that helps inform decision-making processes on comprehensive prevention and control of soil and water erosion as well as national ecological improvement initiatives. 4 rounds of national remote-sensing census on soil and water erosion have been conducted. The resultant data illustrate the status and trends for soil and water erosion nationwide. Since 2003, the *Bulletin of Soil and Water Conservation in China* has been published to the public on an annual basis.

2.2 Challenges

At present, China has yet to initiate improvement efforts in 2.95 million km² of land that is affected by soil and water erosion. 24 million ha of slope farmland and

960,000 erosion gullies remain to be treated. It remains a pressing and enormous task to protect the black soil in Northeast China and salvage the land resources in regions suffering from stony desertification in Southwest China. Since the 1990s, over 15,000 km² of previously unaffected land has succumbed to soil and water erosion due to development activities with each passing year. The increased amount of soil loss has exceeded 300 million metric tons. The trend towards heightened erosion attributable to human activities has yet to be effectively arrested. The dynamics in the erosion control area falls far short of the country's overall objectives for ecological improvement and evolving towards a moderately better-off society.



A traditional terraced paddy field in Guangxi Zhuang Autonomous Region

3. Future Goals and Steps

3.1 Short-Term Goals

Efforts will be made to strive for initial improvement or rehabilitation in the areas affected by soil and water erosion nationwide within the next 15-20 years. The eco-environment in most regions will evolve in a positive direction. Soil and water conservation measures will be introduced to all existing slope farmland by resorting to slope-to-terrace conversion, retiring of steep slope farmland, contour tillage and soil-friendly cultivation. Those areas with severe erosion will see a massive drop in the intensity of soil loss. The size of areas with erosion at or above the intermediate level will shrink by 50%. More than 70% of erosion gullies will be brought under control. The amount of sediments discharged will decline significantly. The general public will become dramatically more enlightened about the ecological significance and legal obligations associated with water and soil conservation. Man-made soil and water erosion will be largely kept in check. Mandatory conservation requirements will be enforced for all development projects. Effective protection will be afforded to priority areas against soil and water erosion.

3.2 Strategic Initiatives

- A strategy of ecological rehabilitation will be implemented to foster vegetation recovery by leveraging the power of nature.
- A strategy of comprehensive improvement will be implemented to press ahead comprehensive improvement in areas that are seriously affected by soil and water erosion.
- A strategy of using conservation projects as a driving force will be implemented to tap the positive spillover effects of the projects for wider progress in water and soil conservation.
- A strategy of preventative protection will be



Silt retention dam built in Jiuyuangou River Basin in Shaanxi Province

- implemented so as to pursue preventative protection in areas that enjoy sound vegetation and are ecologically fragile, to scrutinize areas that are subject to intensive exploitation of energy and resources.
- A region-specific prevention and control strategy will be implemented in order to apply tailor-made solutions to soil and water conservation in the eastern, central and western regions of the country.
 - A strategy of allowing technological advances a greater role will be implemented so that more technological innovation will keep improving the effectiveness of erosion prevention and control efforts.



*Terraced fields in Yuanyang County,
Hunan Province*

4. International Cooperation and Exchanges

China hosts the office of the Secretariat of World Association of Soil and Water Conservation (WASWAC) which currently consists of 1,202 members in 82 countries and regions. In 2010, Chinese experts were elected President of the WASWAC Council and Secretary General of WASWAC. In April 2015, the Chinese government officially approved the WASWAC registration. China also holds the presidency of International Seabuckthorn Association (ISA) and is home to the office of ISA's Secretariat. ISA represents a key player in the field of international seabuckthorn

ecological improvement and industry development. China has successively played host to a number of important conferences including the 12 International Soil Conservation Organization Conference (ISCO 2002), the 2nd and 5th International Seabuckthorn Association Conference, the International Symposium on Prevention and Control of Soil Degradation that concurrently served as the 1st ISCO Annual Conference, China-US Workshop on Water and Soil Conservation, and China-Africa Workshop on Water and Soil Conservation. China has strengthened multilateral cooperation and exchanges by pursuing cooperation with international organizations including the World Bank, the EU and the Asian Development



Bank. The Loess Plateau Watershed Rehabilitation Project of Soil and Water Conservation with the World Bank Loan marks China's first large-scale project using foreign funds to tackle soil and water erosion. The project received the 2003 World Bank President's Award of Excellence. Under the auspices of the Ministry of Water Resources (MWR), implementation of the Project of Seabuckthorn Cultivation Demonstration Zone in Bolivia with Chinese Aid started in 2001. Subsequently, the MWR has overseen the implementation of the project of soil and water conservation in the 4 provinces (municipality) of Yunnan, Guizhou, Hubei and Chongqing with World Bank lending, and the project of small watershed

improvement and management with UK grant. Thanks to the rollout of these projects, China's successful experiences in soil and water erosion control and project management have been generalized and found growing acceptance and deployment in other developing nations.

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