
EXCELLENT DEVELOPMENT:
Pioneering sand dams.
Excellent | Pioneers of Sand Dams

CONTENTS

WHAT IF...?

What if there was a solution that would transform the lives of people in drylands – home to 80% of the world's poorest?

What if there was a solution that would address some of the world's most pressing problems: desertification, climate change and conflict?

What if this solution naturally regenerated the environment and sustained people, livestock and wildlife?

What if it had no operational costs, required virtually zero maintenance and didn't rely on complex technology?

What if it only required locally available materials and didn't need water engineers or machinery?

What if it happened to be the lowest cost form of rainwater harvesting – providing clean water close to need all year-round?

What if you could read all about it, right here, right now?

What if you could get support to assess it, test it and implement it?

What if you could make a sustainable difference to people, livestock and wildlife in drylands?

In this document, I want to share with you an holistic technology called sand dams.

Sand dams have already transformed hundreds of thousands of lives.

Sand dams transformed my life.

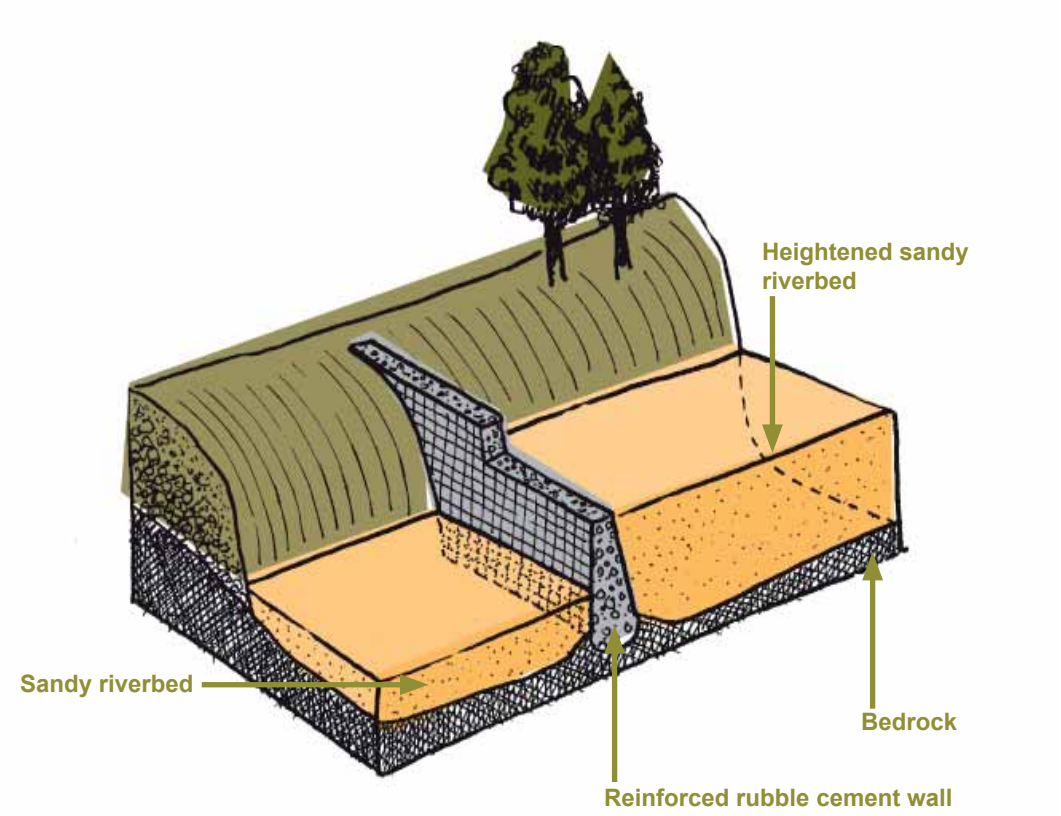
And, sand dams will transform millions more.

With your help, anything is possible.

Simon Maddrell, Executive Director, Excellent Development.

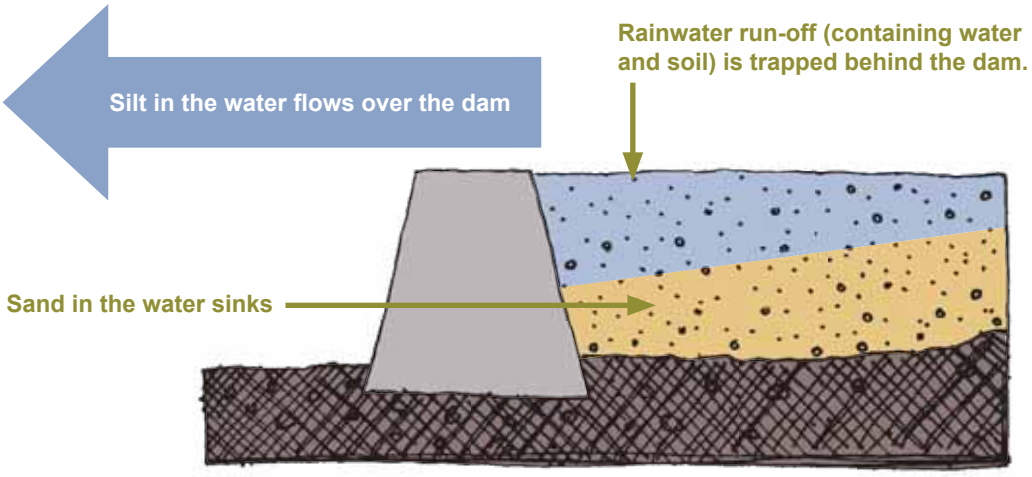
WHAT ARE SAND DAMS?

A sand dam is a reinforced rubble cement wall built across a seasonal sandy river. They are a simple, low cost, low maintenance technology that retains rainwater and recharges groundwater.

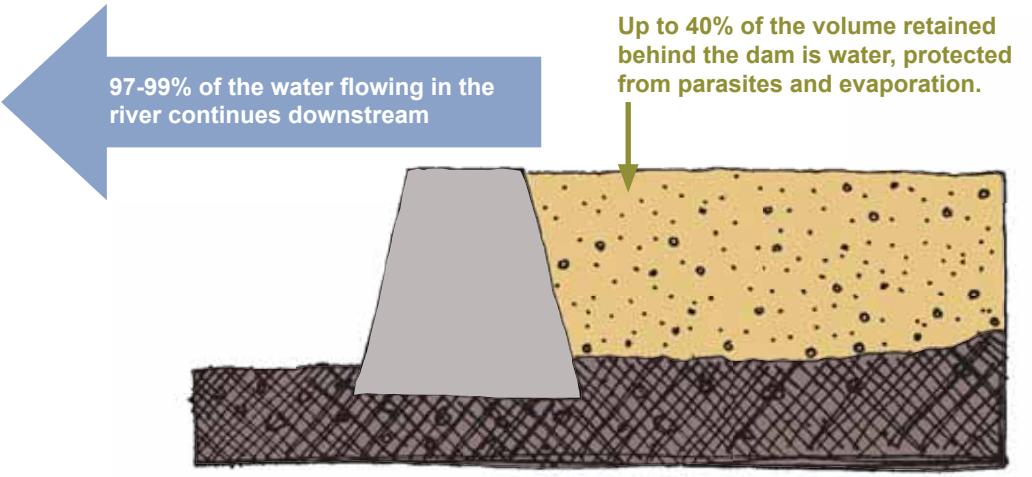


A mature sand dam stores up to 20 million litres of water - supporting up to 1,000 people with a clean, reliable, local water source during dry seasons.
They are widely suited to dryland regions of the world.

HOW THEY WORK



During the rainy season, a seasonal river forms that carries soil (made up of silt and sand) downstream. The heavier sand accumulates behind the dam, while the lighter silt is carried downstream.



Within one to four rainy seasons, the dam completely fills with sand. But, up to 40% of the volume behind the dam is actually water, trapped in the spaces between the sand. Each rainy season, the water stored by the sand dam is replenished.

ABSTRACTION METHODS

Sand dams have a range of abstraction methods, depending on the context in which they are applied.

Scoop holes.

Many dryland communities collect water from sand rivers using simple holes scooped into the sand. Sand dams permanently raise the water table, making water easily accessible from traditional scoop holes all year-round. Where the scoop hole is used for domestic purposes, Acacia and thorns are often used to protect the hole from livestock. A separate livestock watering point is usually established below the dam, in order to mitigate contamination of the water.

Abstracting water from a traditional scoop hole behind a sand dam.

Infiltration gallery connected to a pipe and/or tank.

Pipes built into the sand dam wall and connected to an infiltration gallery provide water 'on-tap' close to people's homes. Often these are also connected to a tank behind the dam which allows for water to be pumped for irrigation.

An infiltration gallery is a horizontal pipe, installed in the dam during construction. Holes are drilled into the pipe and it is covered with different grades of sand to allow water to filter into the pipe.

Tanks are built with a reinforced concrete roof, on the inner wall of the dam. Water is abstracted using a bucket or a pump. Alternatively, the pipe can go through the dam and be connected to a tap on the downstream side of the dam.

An infiltration gallery connected to an external tap, installed during construction.

Infiltration gallery connected to a shallow well.

The infiltration gallery can also be connected to a shallow well in the adjacent river bank.

Water can be abstracted using a bucket and rope, a hand pump or - if the water is to be used for irrigation or distribution to water kiosks - a mechanical pump.

THE IMPACTS OF SAND DAMS

Sand dams, as part of a soil and water conservation strategy, address the critical challenges facing people in drylands: water scarcity, food insecurity, and poverty.

Water security.

Sand dams are the most cost-effective method of rainwater harvesting in drylands. They provide a lifetime of clean water for up to 1,000 people in rural dryland regions. They provide security to rain-fed agriculture - something of a miracle for people who would otherwise depend on the unpredictable rainy seasons associated with drylands.

Groundwater recharge.

Water held in a sand dam recharges the aquifer above and below the dam to create a permanent increase in the water table. This increases the capacity of soil to absorb water and enables the natural growth of trees and plants.Studies demonstrate that vegetation biomass is consistently and significantly higher at sand dam sites than at sites without sand dams during and after periods of water scarcity.

Saving time.

In many African drylands, women and children spend more than six hours a day collecting water. During drought periods this time may increase to as much as 12 hours. The lost opportunity from the burden of collecting water has an acute and adverse affect on livelihoods.
Sand dams bring reliable access to water within 30 minutes of people's homes, creating time to invest in sustainable land management, improved food production and income generation.

Food security.

With water and time readily available, people can now invest in climate-smart agriculture. This increases the quantity and diversity of food that can be grown – improving diets and providing a reliable source of food, even during periods of drought.

Income generation.

Sand dams increase household income by reducing expenditure on water and food. They also create the opportunity to invest in new enterprises, such as exporting surplus food to local markets, or establishing small-scale fish ponds. With the money saved and earned, families are able to invest in their children's education.

Sand dams create the opportunity to grow more food to eat, store and sell.

APPLICATIONS OF SAND DAMS

Sand dams can be applied in three key contexts: as a method of community self-supply, municipal supply, or as rural road crossings over seasonal rivers - either as part of a public works programme or within wildlife reserves.

Community self-supply.

Sand dams are a tested solution for enabling grassroots sustainable development, with mutual benefits for environmental and human well-being. They create the conditions required for land restoration and empower people to overcome poverty based on a model of green economic growth.

Sand dams are particluarly suited as a method of community self-supply.

Sand dams are the most cost-effective method of rainwater harvesting in drylands. They store up to 20 million litres of water within sand, where it is protected from evaporation and water disease vectors, such as mosquitoes. They have minimal operations and maintenance costs and last for over 50 years.

The low cost of operating and maintaining sand dams means they are well suited to remote and poorly served regions. They do not require water engineers and can be built with the skills and contribution of locally trained people. Sand dams are therefore particularly suited as a tool for community self-supply.

Municipal supply.

For sand dams with high yields, they can be connected to a distribution system of water kiosks - improving locally available supply over large areas.
With yields exceeding 40m litres per year they are, in effect, ‘horizontal boreholes.’

A water kiosk in Makueni County, Kenya.

APPLICATIONS OF SAND DAMS

Sand dams as rural road crossings.

Rural road infrastructure is key to human development. It enables people and produce to reach markets and services that would otherwise be inaccessible for many isolated communities.

Yet, where they cross seasonal rivers, rural roads are vulnerable to erosion. This is especially true in flood-prone drylands.

In many dryland regions, culvert bridges are traditionally built under small rural roads to allow water to flow underneath during rainy seaons. However, they are rarely able to accommodate the largest floods and are often washed away. This results in soil erosion upstream and downstream of the culvert, undermines the stability of rural road systems and limits the economic development opportunities for rural communities.

Sand dams are an improved alternative to traditional culverts in seasonal rivers. They are more cost-effective and sustainable and provide reliable access for people to access markets and services. They also have the key additional advantage of providing an important source of water.

Sand dams in nature reserves.

African drylands are home to many of the largest and most important nature reserves in the world. They are major tourist attractions, focal points of biodiversity conservation and significant sources of local and national income.

However, the natural resources and flora and fauna within these reserves are regularly threatened by prolonged water scarcity.

Large water points, such as boreholes, can result in degradation hotspots due to the concentration of animals at these points. They also deplete groundwater. Converesly, sand dams recharge the aquifer. The higher aquifer supports the natural growth of vegetation and improves the local ecosystem and food supply.

Sand dams, built as rural road crossings in wildlife reserves, would permanently increase the water table and enable the growth of vegetation to support large mammals during periods of drought. In this way they would contribute to the conservation of local biodiversity and the sustainability of an economic resource.

A double sand dam used as a rural road in Machakos County, Kenya. An infiltration gallery is connected to a shallow well and a pump. This dam crossing yields an estimated 40 million litres of water per year.

Sand dams contribute to combating desertification by recharging groundwater and creating the opportunity to invest in sustainable land management.

Land is often the only asset available to the world's poorest people. Yet every year an estimated 75 billion tonnes of fertile soil is lost due to erosion. Drought and desertification cause a further 12 million hectares of land to degenerate into desert each year.

The most immediate impacts of desertification occur locally, but the long-term impacts are a major threat to livelihoods worldwide. Water and food insecurity, hunger and poverty, migration and conflict are all exacerbated desertification.

With 44% of global food production and 50% of the world's livestock sustained by the world's drylands, it is critical to act now to prevent significant adverse impacts on livelihoods and biodiversity.

Dryland smallholder farmers need to be in the front line of combating desertification.

Sand dams, as part of an integrated, pro-active and sustained investment in soil and water conservation, create the opportunity for smallholder farmers to invest in sustainable land management and address the critical threats facing their livelihoods.

Sand dams contribute to climate change adaptation by creating water security and the time to practise climate-smart agriculture.

Drylands are at the front line of climate change. They are prone to floods, droughts and extreme weather events. This makes adapting to local climate change pressures especially challenging for people in drylands, particularly in rural areas.

The Intergovernmental Panel on Climate Change highlights three key factors that influence a population's vulnerability to climate change: exposure to natural hazards (such as reduced rainfall), sensitivity to those hazards (such as a reliance on rain-fed agriculture) and the capacity to adapt to those hazards (such as the existence of skills to grow new, drought-resistant, crops)

Sand dams, when integrated with a wider programme of soil and water conservation, are a cost-effective element of climate change adaptation and mitigation strategy. By recharging groundwater, they create a buffer against drought – providing a year-round agricultural and domestic water supply.

By saving people time from collecting water, they also create the opportunity for people to learn new skills and invest their time in climate-smart agriculture – including the planting of drought-resistant crop varieties.

Sand dams reduce conflict by increasing access to water for people and livestock in water-scarce dryland environments.

Climate change and desertification put extreme pressure on water and land resources. This creates tension between the needs of people and animals - often as the result of migration. Whether the tension is intra-community or inter-community, such as between farmers and pastoralists, disputes over water and grazing access can easily escalate into serious conflict.

Droughts and dwindling resources serve to exacerbate the risk of conflict between farmers and pastoralists as livestock migrate through agricultural land in search of water and pasture during dry seasons.

The same issues may exist between wildlife and people when drought and/or land degradation causes large mammals to migrate into human settlements, often resulting in crop devastation and the killing of wildlife.

Sand dams contribute to preventing conflict by increasing the availability of water, both in terms of the volume and the period that it is locally accessible throughout the year. Smallholder farmers in Kenya have freely shared water from their sand dam with wildlife, and pastoralists who had migrated from Somalia during periods of severe drought in 2011 and 2012.

Sand dams support disaster resilience by creating a buffer against drought and enabling vulnerable people in drylands to improve food production.

Disasters pose a significant and growing threat to human development and security. They damage infrastructure and adversely affect livelihoods, productivity and economic growth. The frequency of disasters will increase as climate change generates more severe weather-related events.

This is especially true in drylands where droughts and floods are becoming more common and where 80% of the world's poorest people live. Disasters affect poor people the most and exposure to disasters increases the vulnerability of the poor - deepening their poverty and preventing them from taking advantage of economic opportunities.

Sand dams are a simple and cost-effective intervention that addresses the fundamental elements of vulnerability in drylands: water scarcity, soil erosion, deforestation, food insecurity and poor rural roads infrastructure.

Unlike other 'water solutions', such as boreholes, sand dams create a buffer against drought by recharging the aquifer and providing reliable access to water for isolated communities and their livestock.

SCALING-UP SAND DAMS

Excellent Development and Africa Sand Dam Foundation (ASDF) have a strategic partnership to promote the global potential of sand dams as a key enabler of land restoration in drylands.

It is our shared vision that the lives of millions of the world's poorest people will be transformed through sand dams.

The potential of sand dams:
Drylands (regions with arid, semi-arid or dry sub-humid climates) cover 40% of the world's land surface and support 80% of the world's poorest people and 50% of the world's livestock. There are significant dryland regions in six continents and 110 countries.

Rivers suitable for sand dams are found across the world's drylands. However, although they are centuries old, sand dams have yet to be adopted or researched on a significant scale.

The highest concentration of succesfully implemented sand dams is found in Kenya, although there are examples in many other countries with dryland regions.

The key to successful implementation of sand dams in new regions and contexts is their flexible application to the local Political, Economic, Social, Technical, Legal, and Environmental (PESTLE) conditions.

Excellent and ASDF support organisations active in dryland regions to pilot sand dams in new contexts through the provision of on-site technical expertise, and the supply of learning resources and technical manuals.

Primarily this is with organisations that aim to resolve water and food insecurity for subsistence farmers and pastoralists.

Services provided include:
- Technical and management support to pilot sand dams in different regions and contexts.
- Advice and consultancy for different elements of the pilot process.
- Provision of our Sand Dam Manual: a practical guide for the siting, design and construction of sand dams.
- Learning visits and staff training at ASDF's centre of Excellence in Kenya.

We also provide in-country consultancy and visits, including:

- Technical advice on sand dam siting, design and construction.
- PESTLE analysis and pilot design.
- Piloting the integration of sand dams within wider water and food programmes.
- Scaling-up programmes and building staff capacity.
- Organisation strategy and development support.
- Joint advocacy and research programmes.

If you would like to talk to us about how we could work with your organisation, please contact us.

email: projects@excellent.org.uk

phone: +44 (0) 20 8232 9050

websites: www.excellent.org.uk
www.SandDams.com

SCALING-UP SAND DAMS

Excellent | Pioneers of Sand Dams

Africa Sand Dam Foundation

Excellent Development is a UK registered NGO founded in 2002. The purpose of its work is to:

1. Support communities in rural dryland regions to gain access to clean water and grow enough food to eat and sell.

2. Promote sand dams as a means of enabling sustainable development.

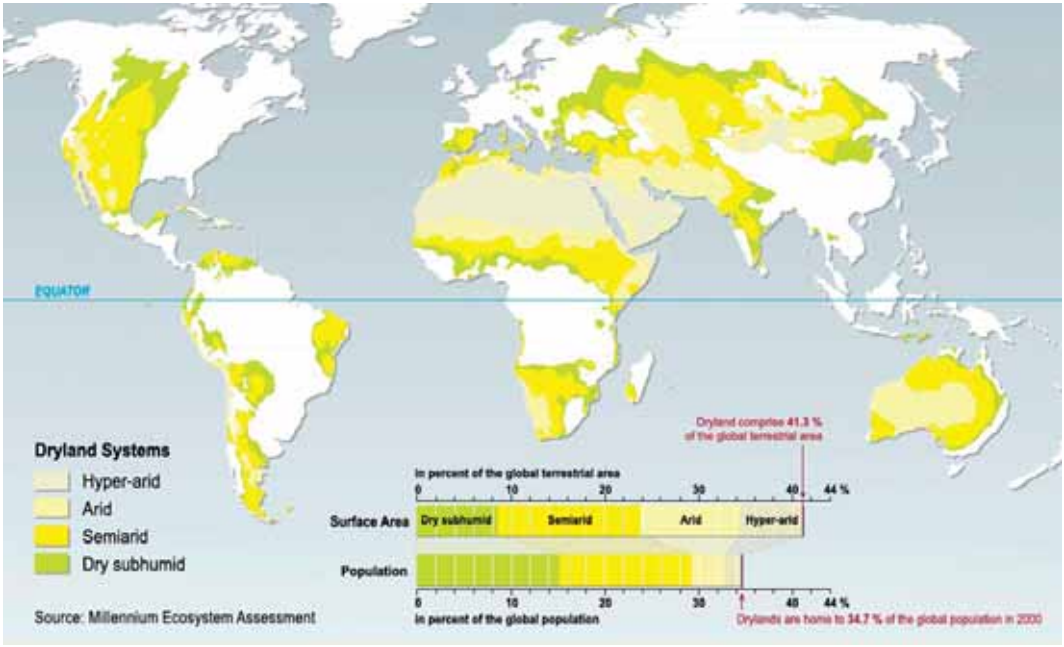
3. Support organisations to apply and implement sand dams in different regions and contexts.

Africa Sand Dam Foundation (ASDF) is a registered Kenyan NGO founded in 2010.

ASDF works in rural, dryland areas to empower marginalised communities to sutainably improve environments and livelihoods for poverty alleviation.

They support communities to gain access to local, clean water for improved food production, health and income. Excellent Development and ASDF have a strategic partnership based on our shared values, philososphy and vision.

40% of the Earth's land is classed as drylands. Sand dams are applicable to all drylands that have seasonal rivers with sandy sediments and accessible bedrock.




EXCELLENT DEVELOPMENT.
Pioneering sand dams.
Excellent Development
Studio 59
The Market Building
195 High Street
Brentford, TW8 8LB
United Kingdom
www.excellent.org.uk
www.SandDams.com
+44 (0) 20 8232 9050
projects@excellent.org.uk
Excellent
Pioneers of
Sand Dams