



The Green Roads for Water Initiative aims to transform the way roads are built and maintained all over the world by incorporating water management and greening in the design and construction of roads. The aim is to improve livelihoods and resilience of communities living around roads and doing away with negative impact such as erosion, flooding, sedimentation and dust, whereas at the same time improve the climate resilience of road infrastructure itself and reduce water related road damage.

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TECHNICAL PAPER 3



GREEN ROADS FOR WATER

CONVERTING BORROW PITS FOR WATER HARVESTING

Key Messages

- » Borrow pits rather than being backfilled can be used as future water storages
- » This will benefit – as far as the sourcing of building material allows - from appropriate planning: size, location, entry
- » Borrow pits can be further upgraded with proper protection, entrance control, landscaping and if necessary lined
- » Converted borrow pits are a good option for water storage in semi-arid areas and in flood plains with high groundwater tables.

INTRODUCTION

Borrow pits provide the source material for the construction of road embankments – depending on the local area: gravel/ aggregates, silica sands, laterite sands, calcite. Once no longer used borrow pits can become an important and valuable source of water supply in different parts of the country. Rather than backfilling the borrow pits or leaving them unattended, they may be systematically transformed into sources of local water supply.

In planning new borrow pits or in converting decommissioned borrow pits into water storage, preference should be given to those pits that meet the following criteria:

- » The pit can be connected to a water source;
- » It is located in an area of water shortage;
- » It is close to water users: domestic water, livestock, or irrigation.

There are three different uses of borrow points for water supply:

- » Borrow pits may be used for water retention, i.e., direct storage of runoff water. In such cases they should have relatively impermeable beds to prevent the stored from water leaking away.
- » Borrow pits can also be used as infiltration ponds. In this case, the water that is collected infiltrates and feeds the shallow groundwater. Such borrow pits should have relatively permeable beds to facilitate groundwater recharge. They may even be supplied by excess water from nearby streams diverted or pumped into the converted borrow pit.
- » Borrow pits can also serve as seepage ponds. This is the case in areas with high groundwater levels, such as the floodplains of major rivers. In this case, the pits will fill constantly with groundwater seeping from adjacent areas and provide an almost permanent water source.

CONVERTING BORROW PITS: TECHNICALITIES

The siting of borrow pits is guided by the availability of source material for road construction, the proximity to the road and the arrangements for acquiring the borrow sites. Yet when there is choice a number of considerations should be applied.

Borrow pits (for conversion) should be close to areas where people reside or in case of use for livestock where there is a population of livestock that would benefit from the water in the borrow pits. Particularly in pastoralist areas the siting of borrow pits may consider the location of grazing areas. Where there is ample grazing area but no water, the development of an additional water resources by converted borrow pits in such areas will be extremely useful as it will reduce pressure on other existing areas that may be overgrazed. In pastoralist areas in general it is useful to plan the location of water resources taking into account the grazing resources.

In general it is important to position the borrow pits in the direction of the available water. The preferably location of a borrow pits in dry area is often downslope of the road. Downslope of the road the borrow pit may be supplied by run-off from culverts and other road drainage.

Upslope there are less opportunities to direct flows into the borrow pits from the road drain. Moreover, there is usually more and flatter land for productive use on the downslope side of a road. Also, if the borrow pit is located downslope of the road, there is less risk of human and cattle crossing the road to the drinking pond as the downslope area of a road tends to be quite large with cattle straying away from the road.



Size and shape of the borrow pits is important. Size and shape is partly ruled by the availability of material for excavation. When primarily used for the sourcing of the construction material shapes of borrow pits are often very irregular. Convex shape is preferred for water storage ponds as generally they create maximum storage compared to the efforts of excavation and because they are inherently more stable than ponds with odd and square angles. Particularly where borrow pits are not constantly recharged from shallow groundwater seepage, but depend on surface runoff, depth is an important consideration. This is particularly relevant in dry and hot periods when evaporation from the borrow pits is high. The deeper the borrow pit the less loss to the evaporation. A depth of 7 meters or more is often preferred.

SAFETY

Several measures should be taken to safeguard the safety of a borrow pit. As it is an open surface body there are two dangers. First, the water may be easily contaminated and also become a source for mosquito breeding. Persons, especially children, but also animals may fall in the borrow pit.

To improve the safety of the borrow pit a number of measures may be taken, in close cooperation with the group of people that manage the borrow pit:

- » Fencing: The borrow pit should be fenced to reduce the risk of people or animals straying into the storage pond. Tree fencing may contribute to reduced evaporation triggered from rains.
- » Reducing incidence of mosquito. Avoiding mosquito infestation is one reason to actively manage and use the water pond so that there is movement of water. The risk of mosquito infestation can further be reduced by having tilapia fish in the pond or having the pond covered with a thin layer of nonharmful algae – which also help reduce evaporation. Also the management of vegetation around the borrow pit and the removal of small water filled depressions can reduce the malaria breeding places.
- » Borrow pits do not provide safe water for human consumption. This may be overcome by placing a hand pump and sand filter on the borrow pit or by household treatment of the water.

