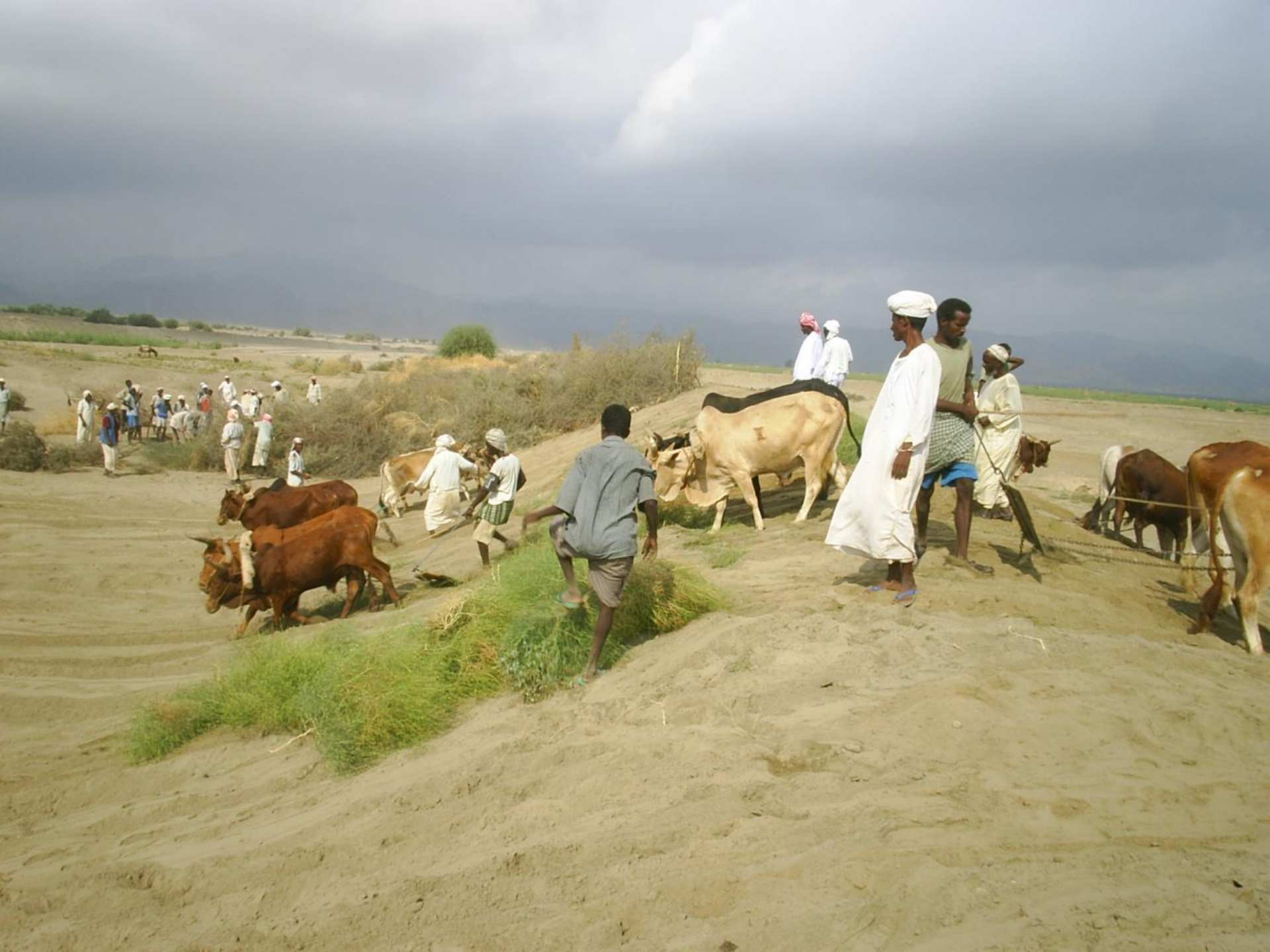
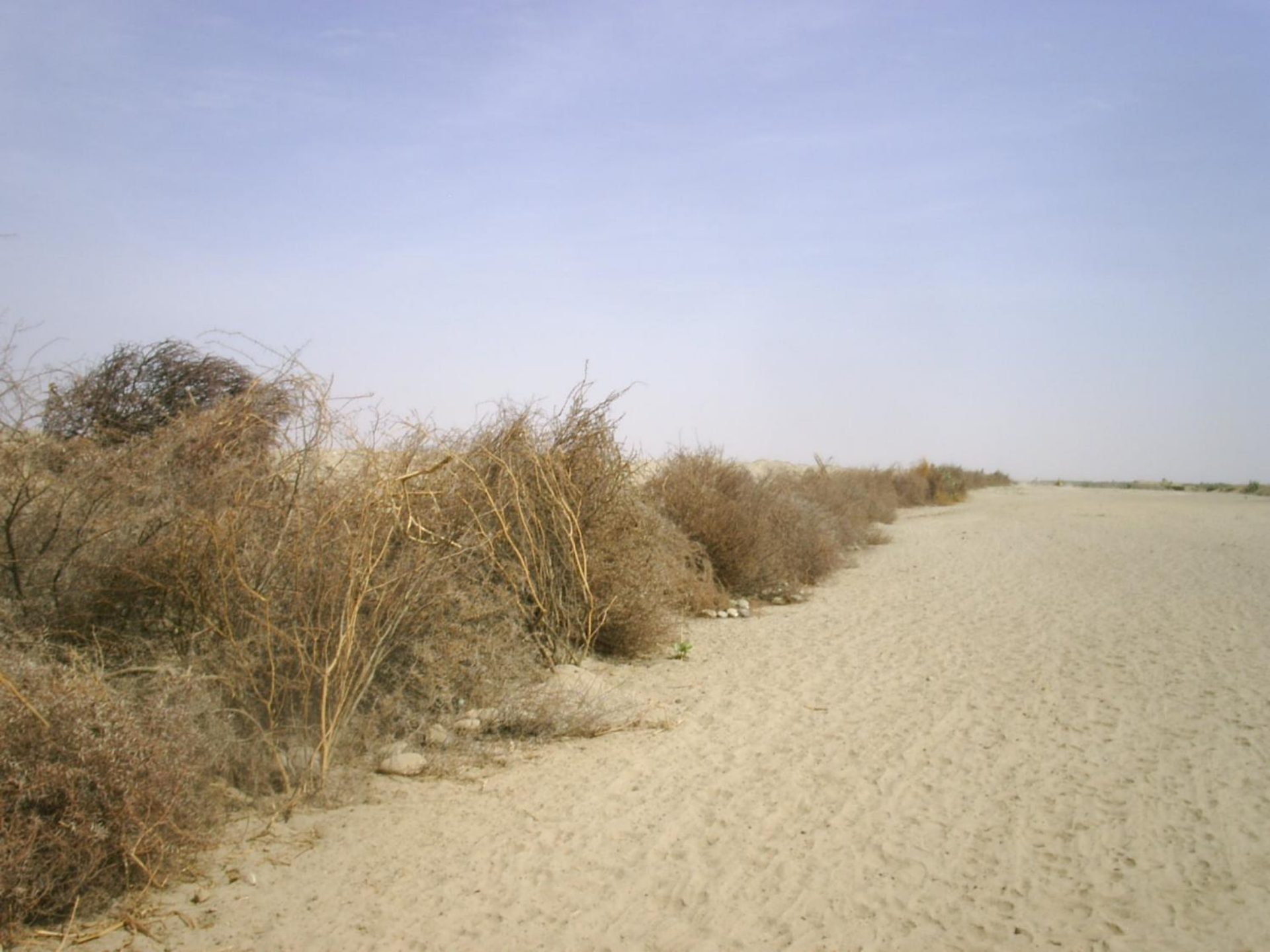
DIVERSION AND CONTROL OF SPATE FLOWS FOR IRRIGATION

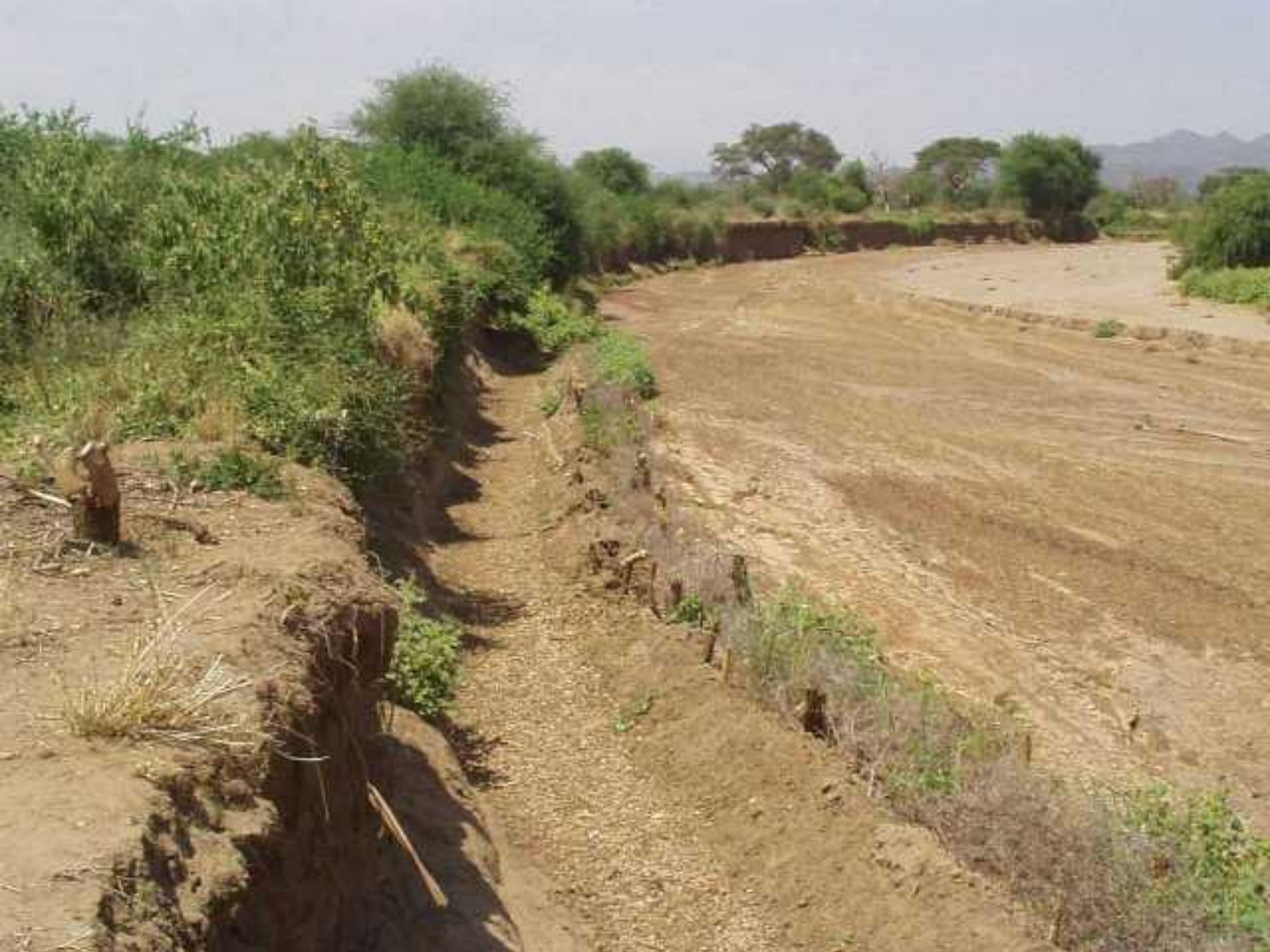
Technical Paper
(Theme 1)

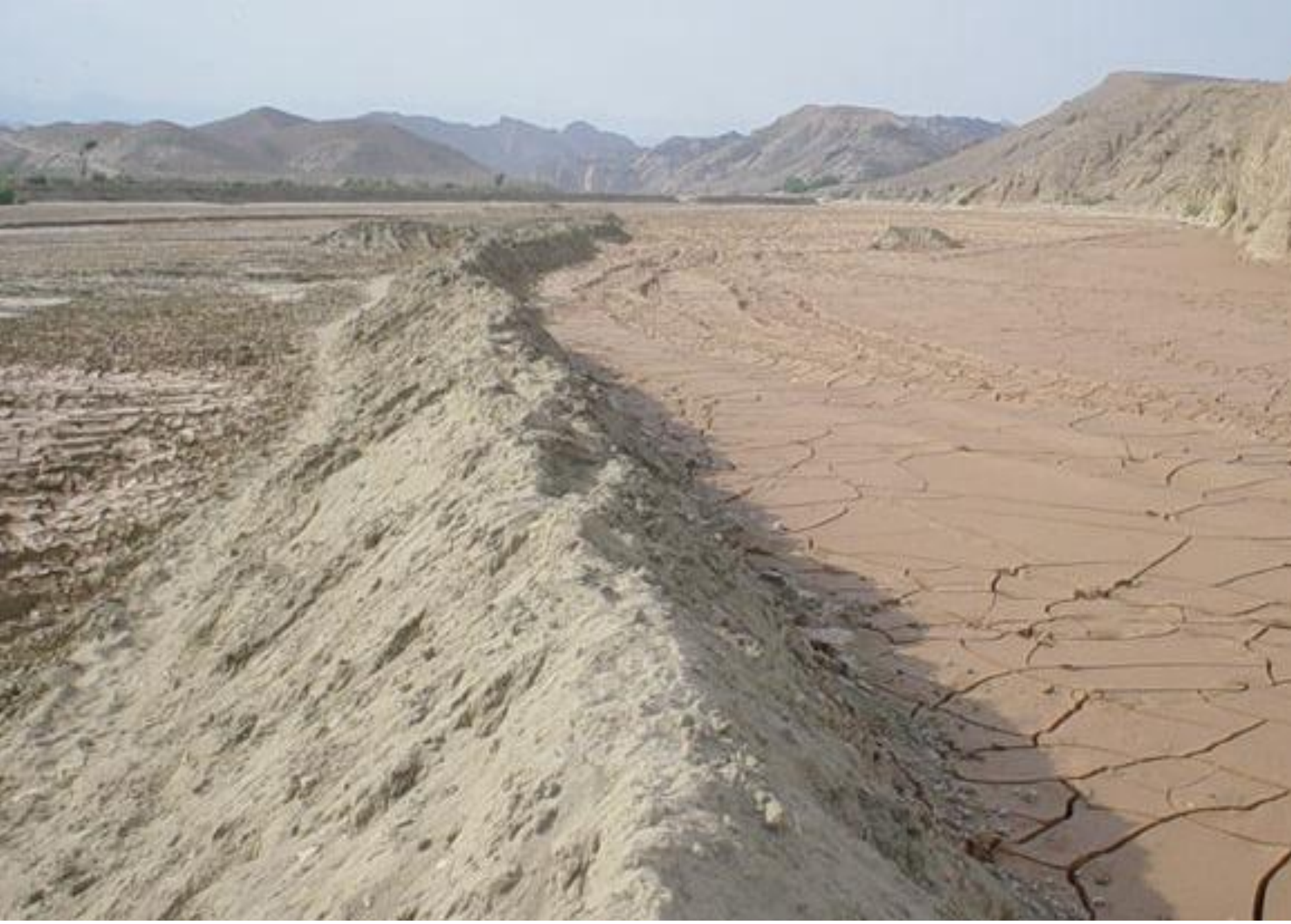
Traditional diversion and water distribution structures

- divert ephemeral rivers using only local materials and indigenous skills
- relatively high overall water diversion efficiency
- the high labour inputs needed to re-build the structures
- environmental problems resulting from unsustainable use of trees and brushwood









Disappointing performance attributed to:

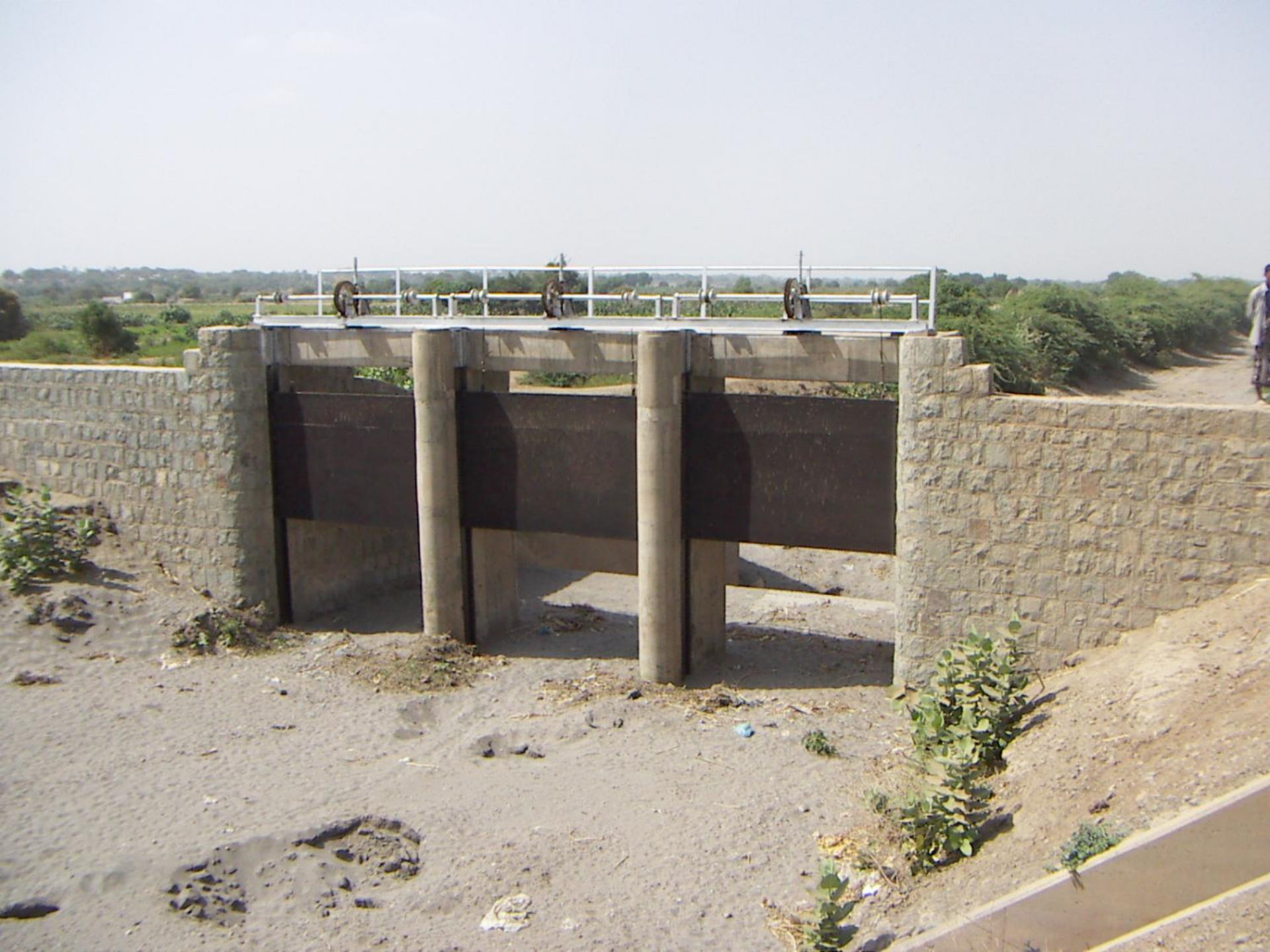
- An increased inequity of water distribution
- Command and diversion problems due to high rates of sediment deposition
- reduced the WUAs/farmers' role in diverting and distributing water
- unrealistic assumptions concerning levels and costs of operation and maintenance
- failures to achieve an expected increase in irrigated area

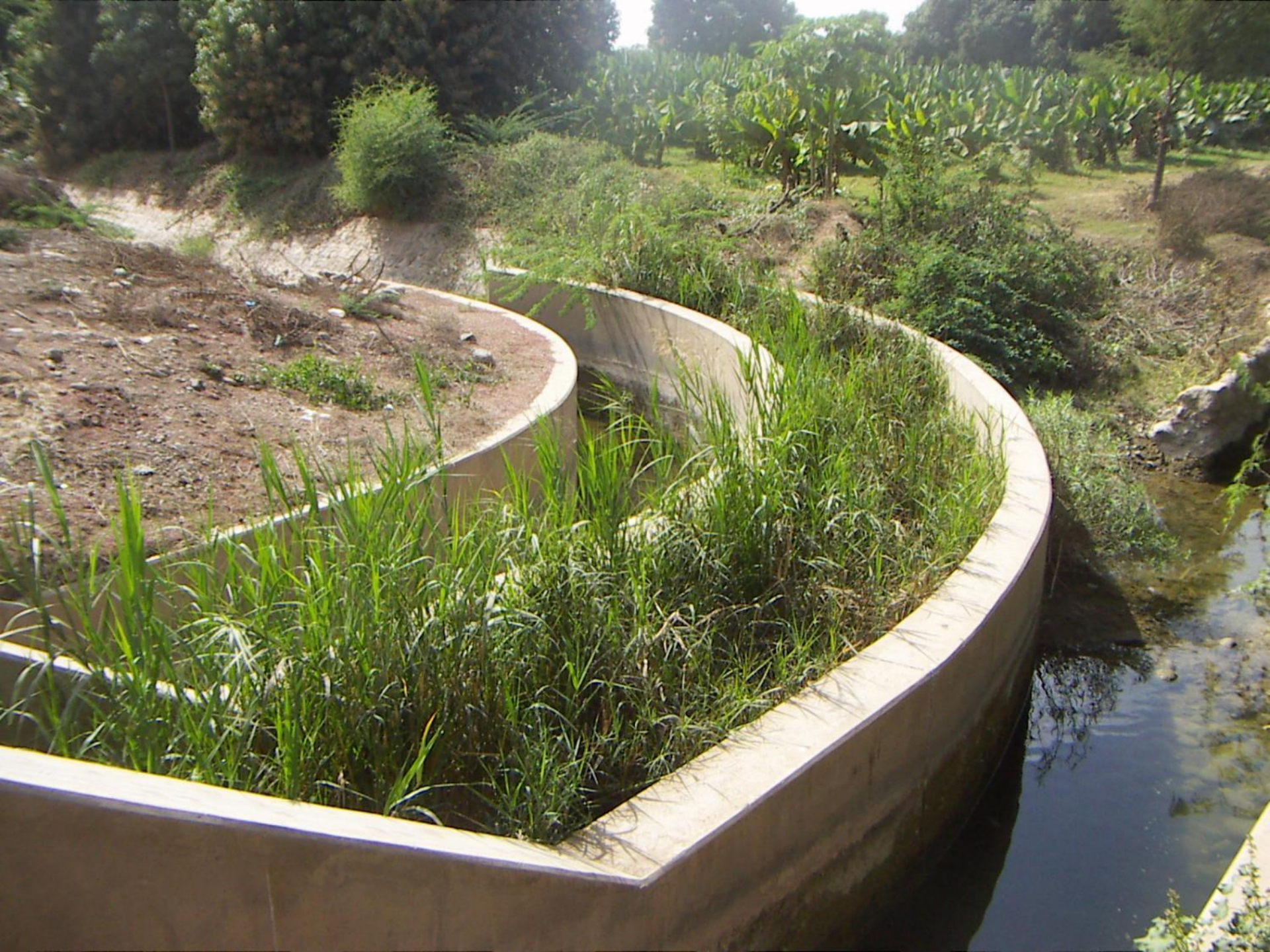
What we have learnt

- For engineering successful interventions:
  - replicate as far as possible traditional diversion practices
  - reflect time commitments and technical knowledge of the farmers
  - facilitate the control of large flood
  - replicate water distribution in line with accepted rules and rights

What we have learnt

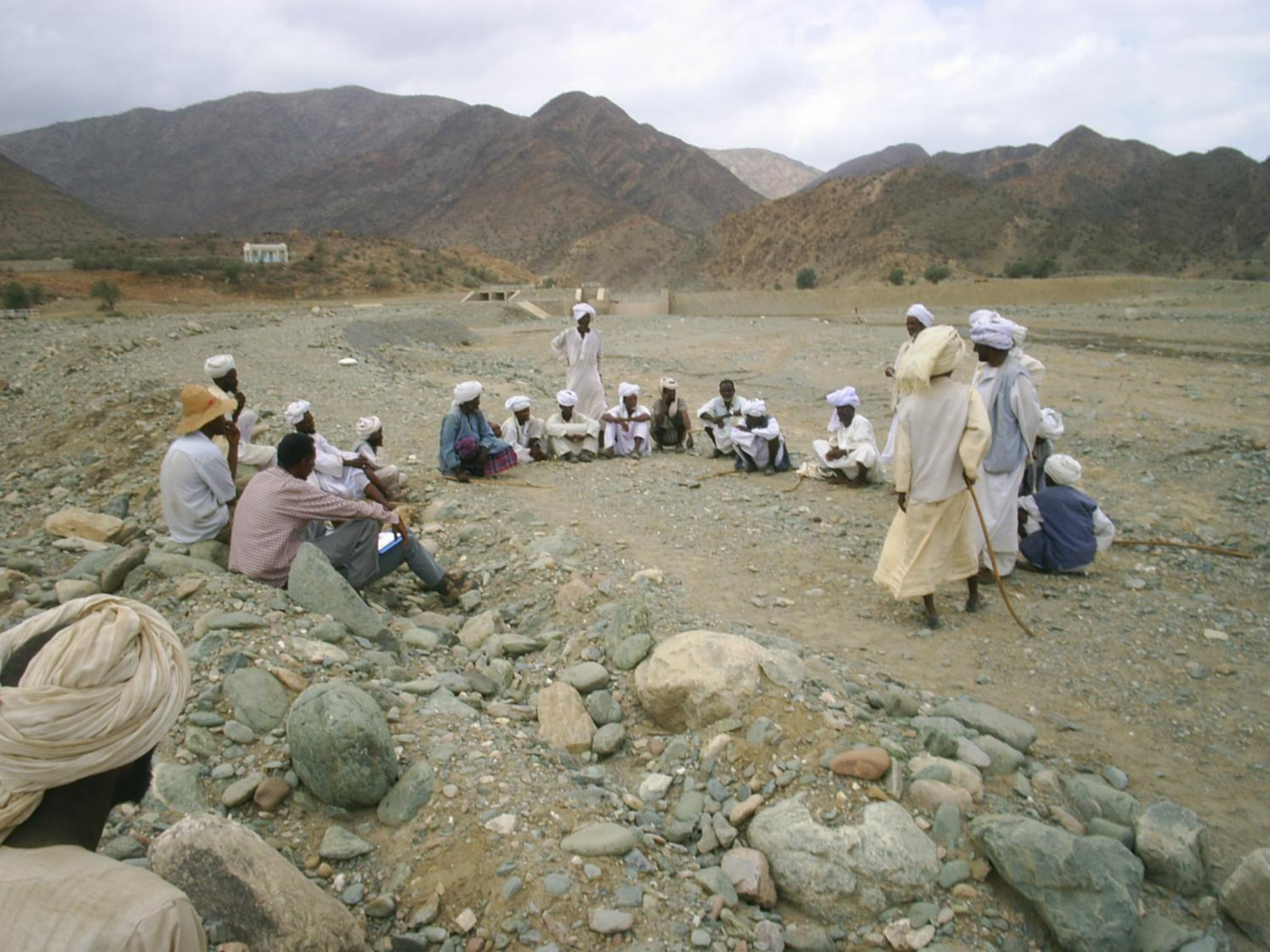
- ensure a right balance between the needs of different water uses and users
- improve the effectiveness of the systems to function with high rates of sediment transport
- improve the ability to cope with frequent and large changes to the levels and alignments

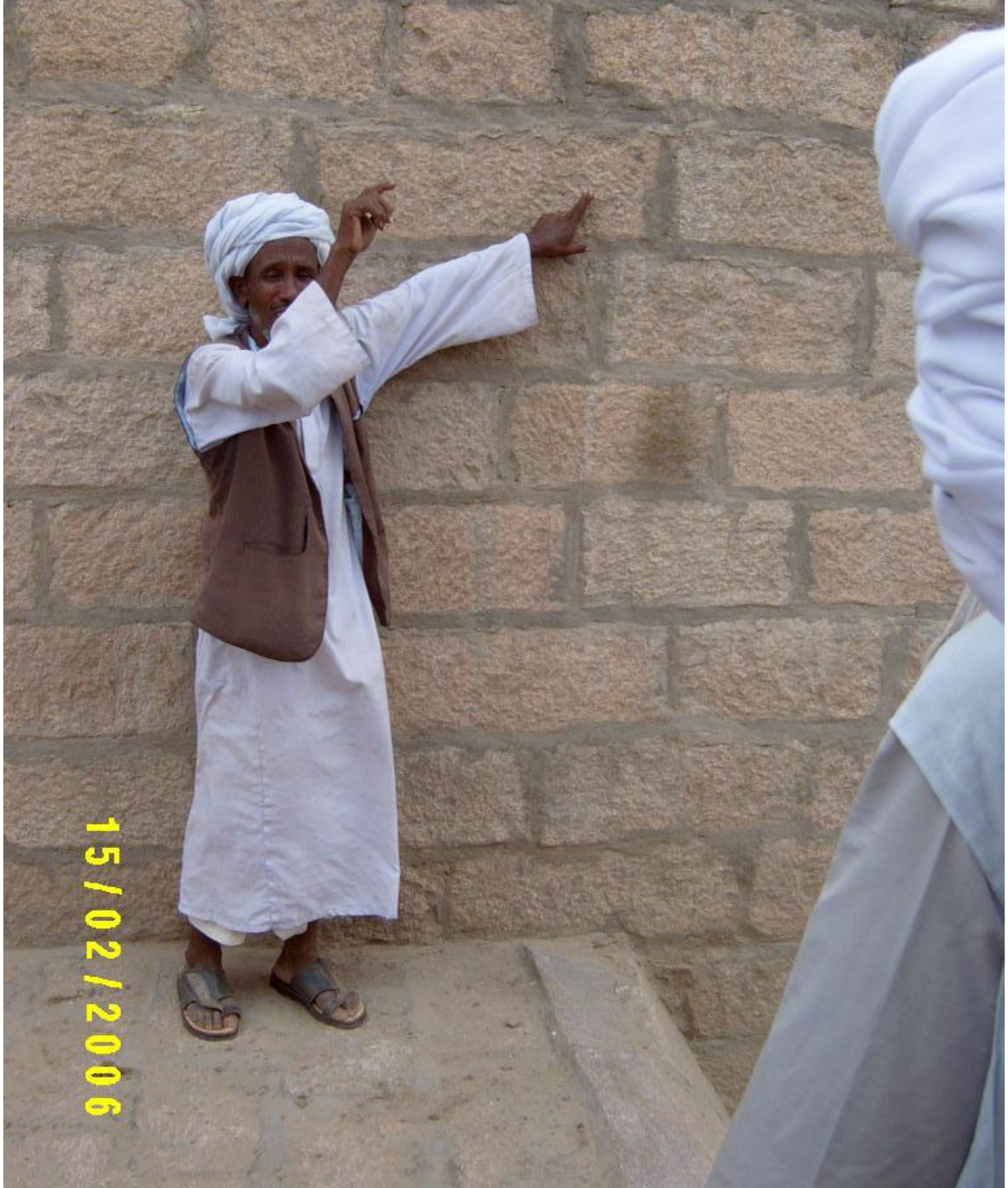




Designing a Spate System

- **Diversion structures (intakes);**
- **Spate canals and water control/ dividing structures; and**
- **Bank protection and Wadi training structures.**




15/02/2006

The advantages of traditional intakes include:

- Flexibility
- Appropriate and low cost
- Relatively efficient in water use and sharing between users
- Restrict diversion of high flows with high sediment loads

Improved Intakes

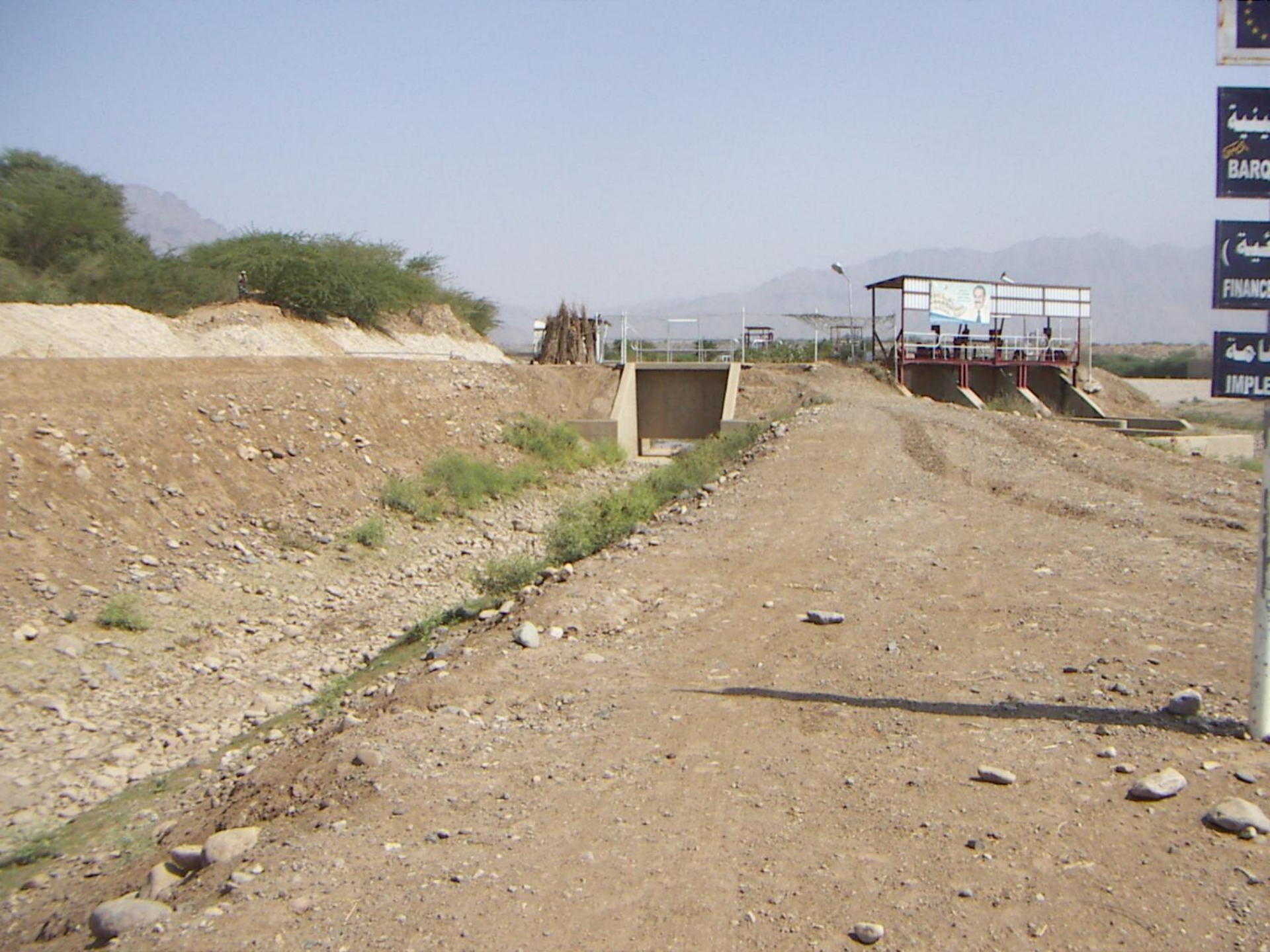
- More durable diversion spurs and division groynes;
- Improved diversion bunds and check weirs;
- Controlling the flows admitted to canals;
- Basic gated or orifice control intakes; and
- Rejection spillways.

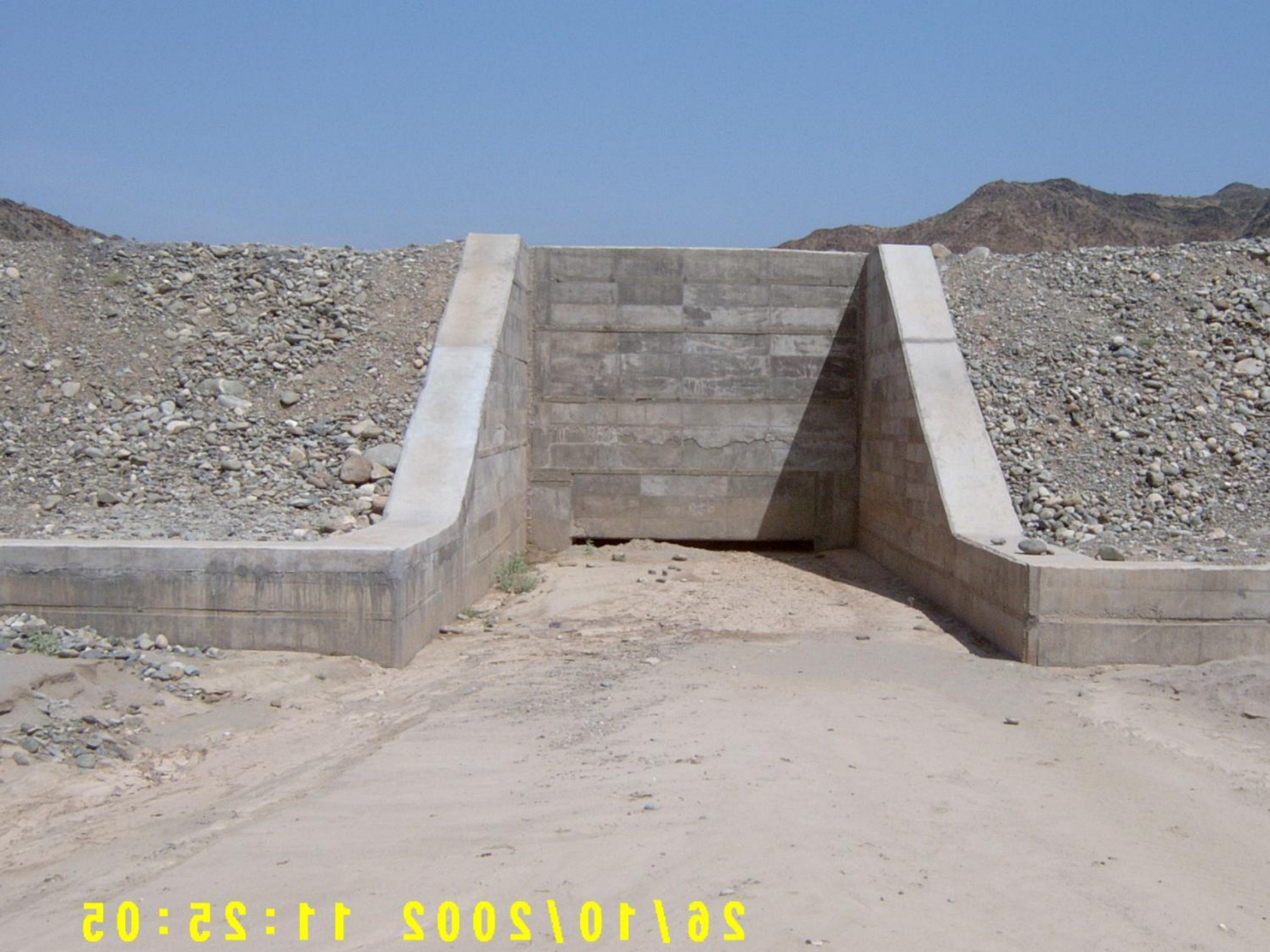
Intake Capacity

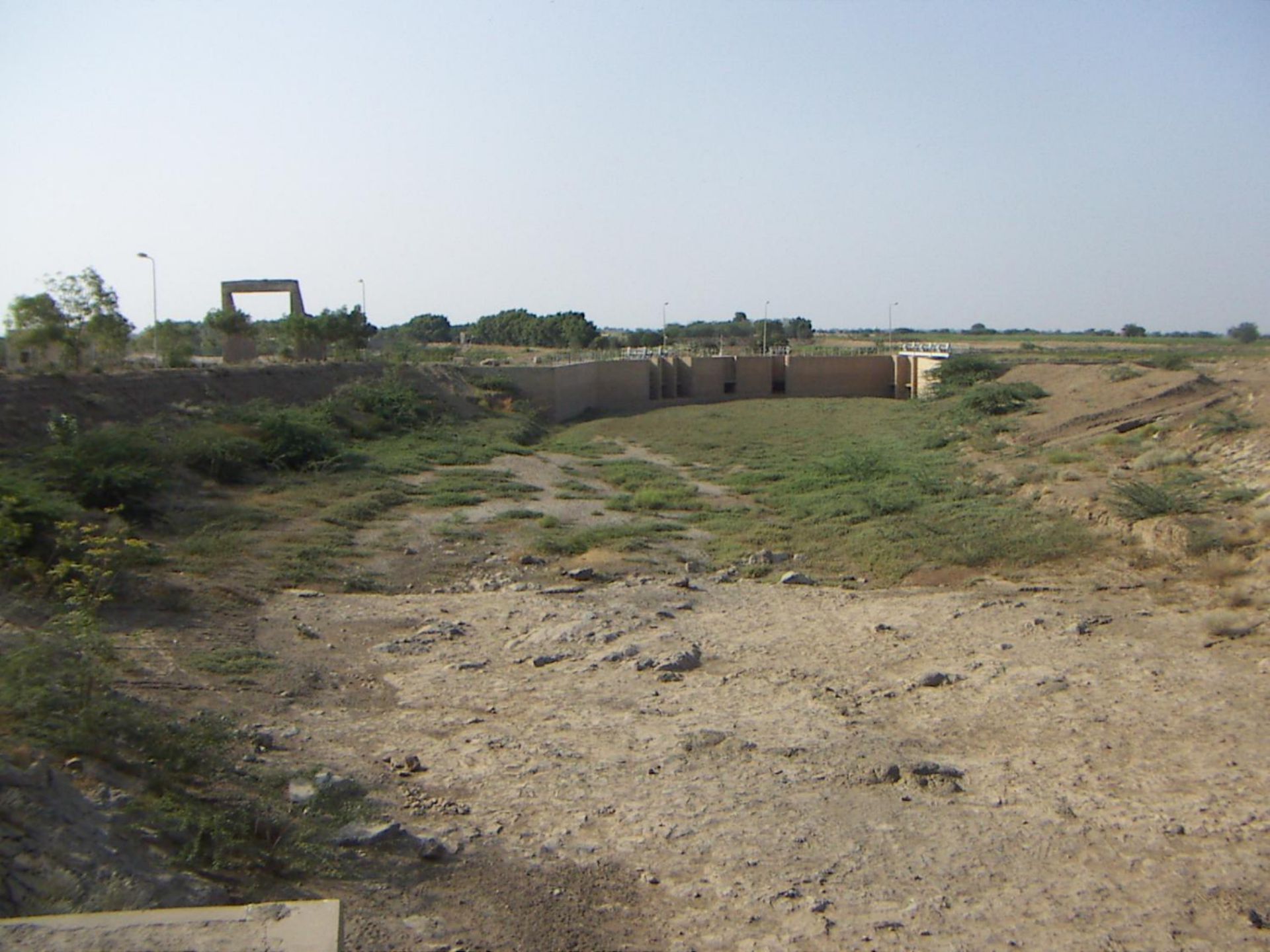
- a limited number of major diversion structures
- large new canals that connect into and traverse the existing traditional canal network
- increase in the inequity between upstream and downstream users’

Intake Capacity

- conventional economic analyses
- are insufficient to meet the requirements of the previously commanded areas
- design duties too low
- numerous intakes and canals reveals consolidation into one system supplied
- An overall Water User Association


BARQ
FINANC
IMPLE

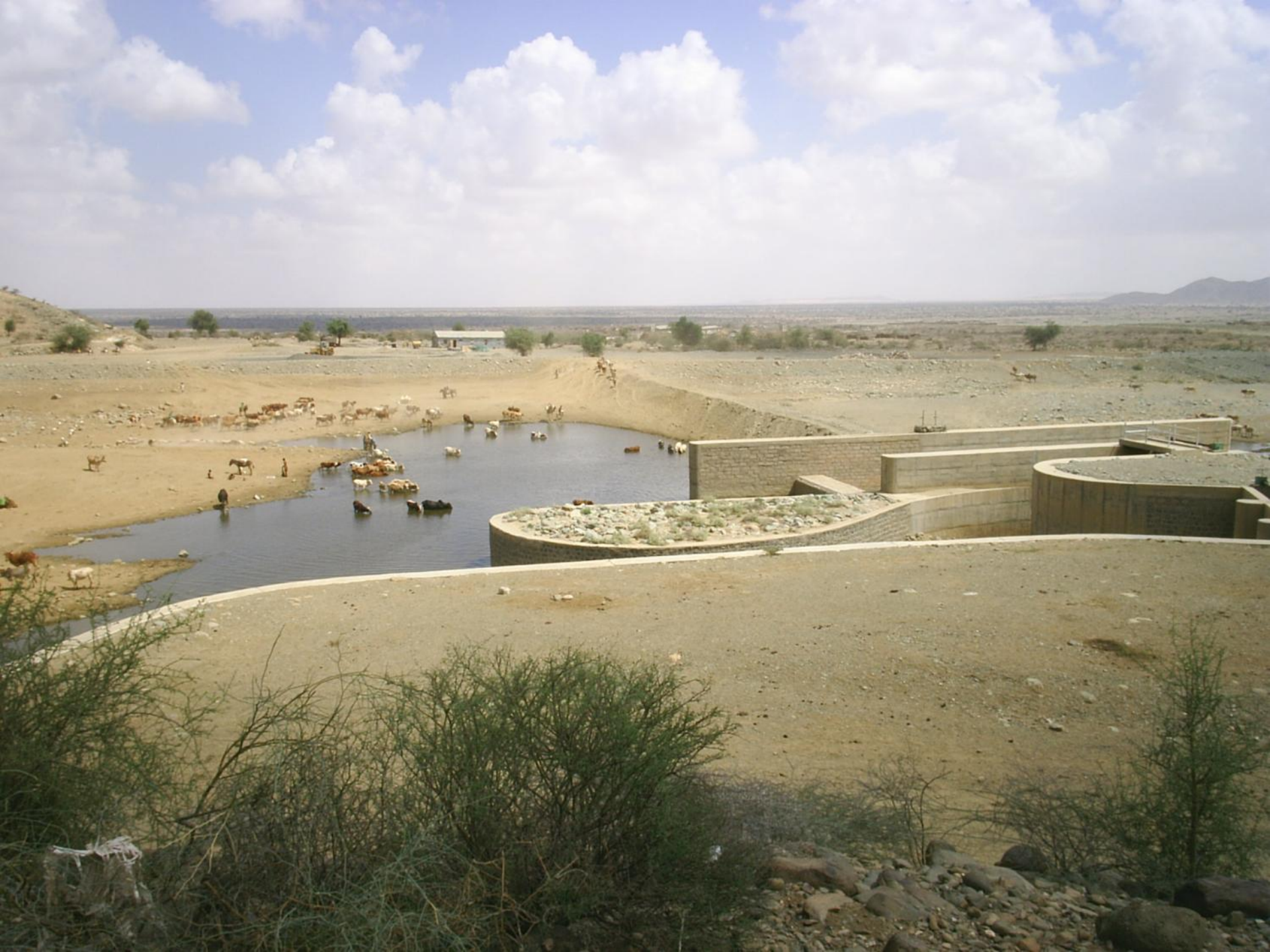

26/10/2002 11:25:05

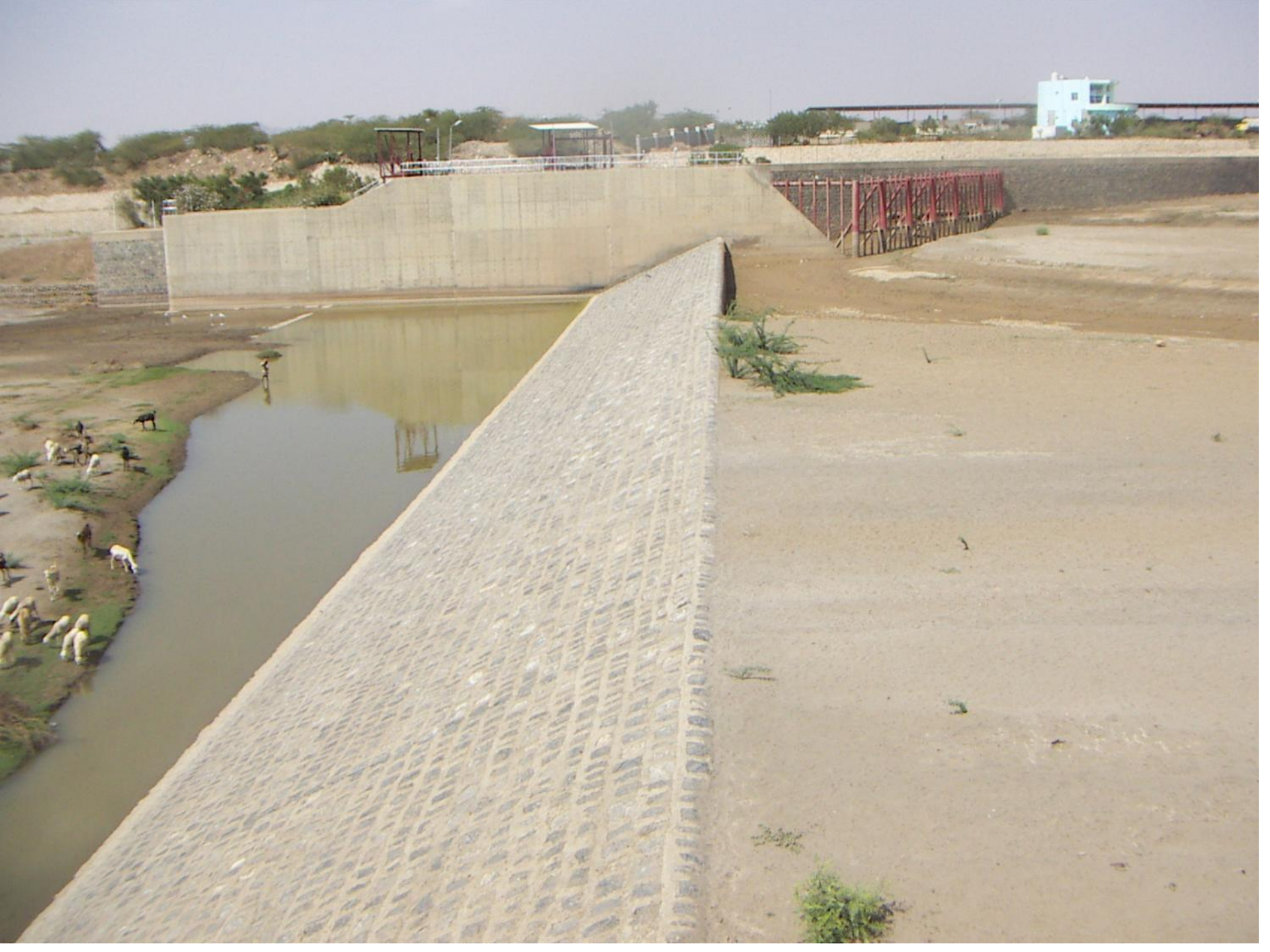


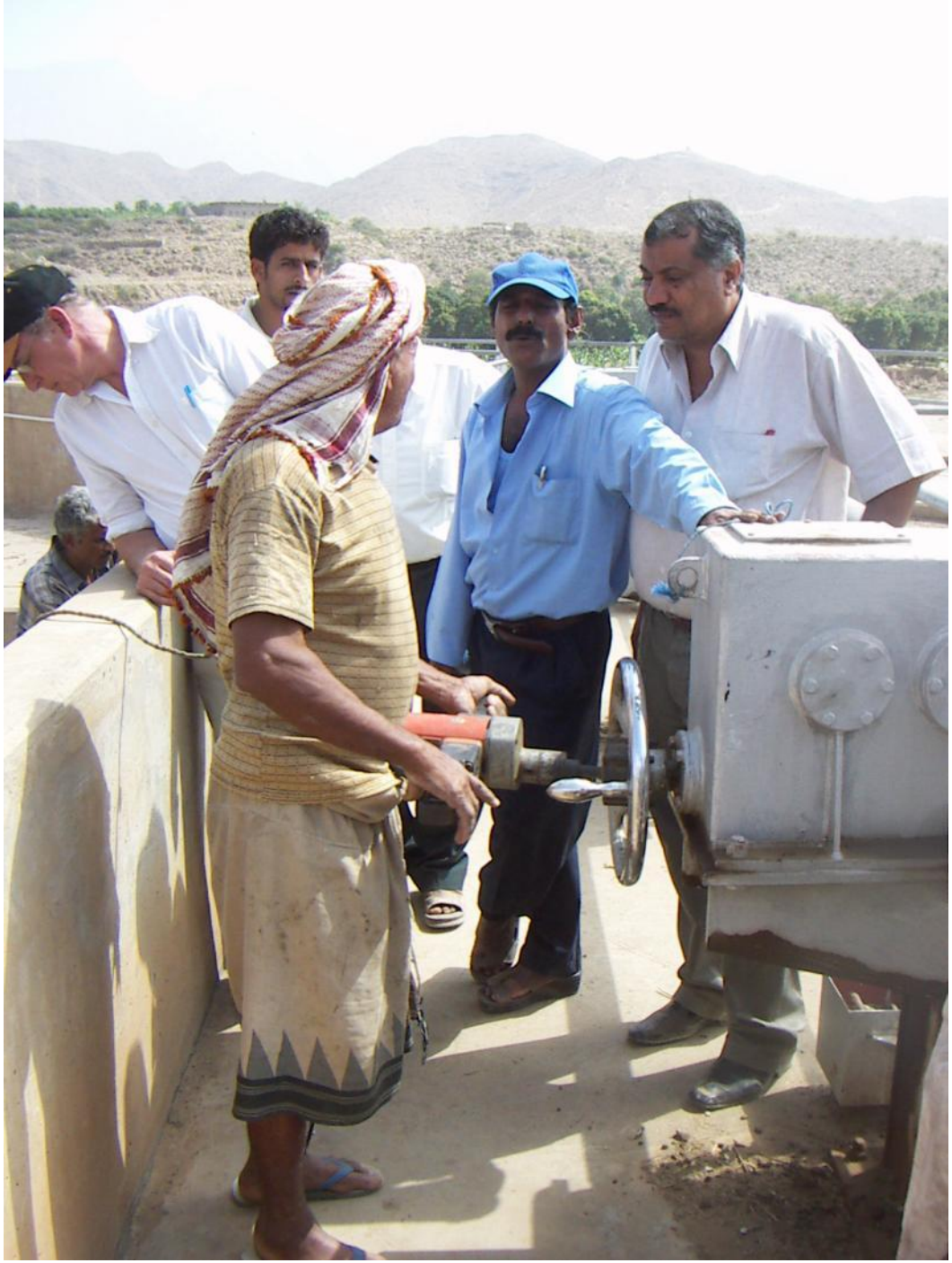
Improved diversion structures

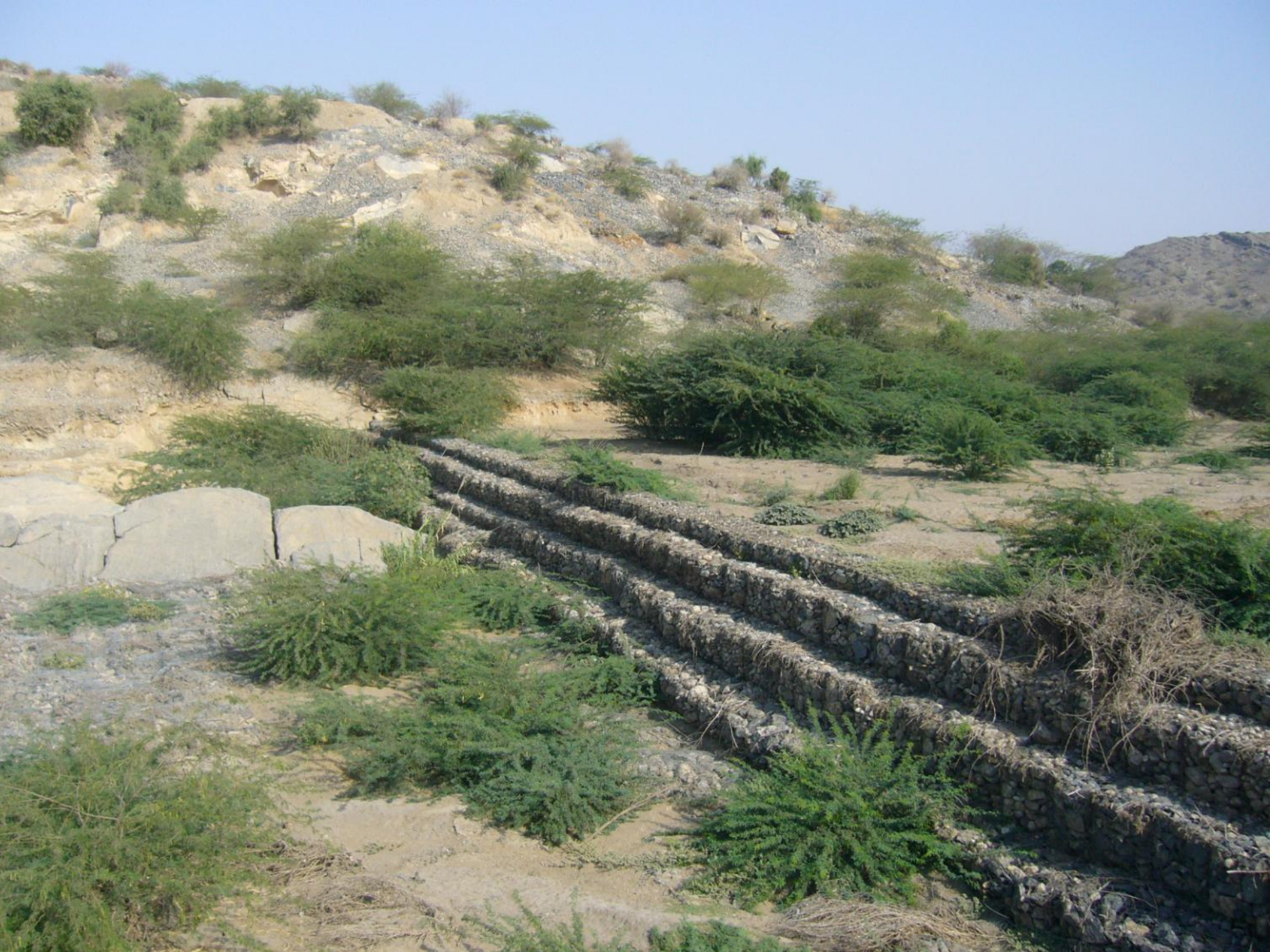
- Raised weir;
- Gated scour or under sluice;
- Gated canal head regulator; and
- Guide or divide wall.

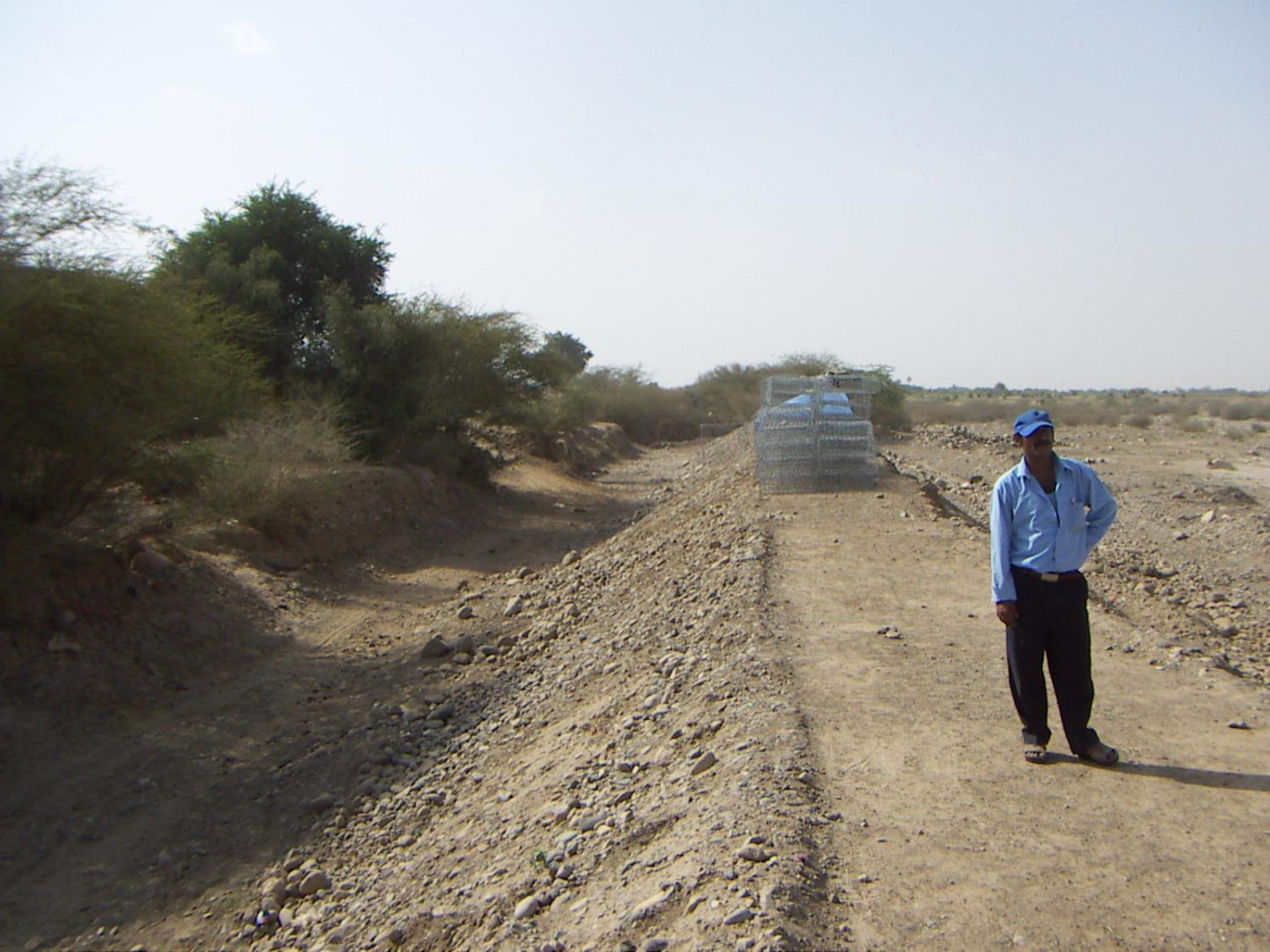
- divert the maximum possible amount of water
- capacities per unit area being 10 to 20 times perennial irrigation schemes



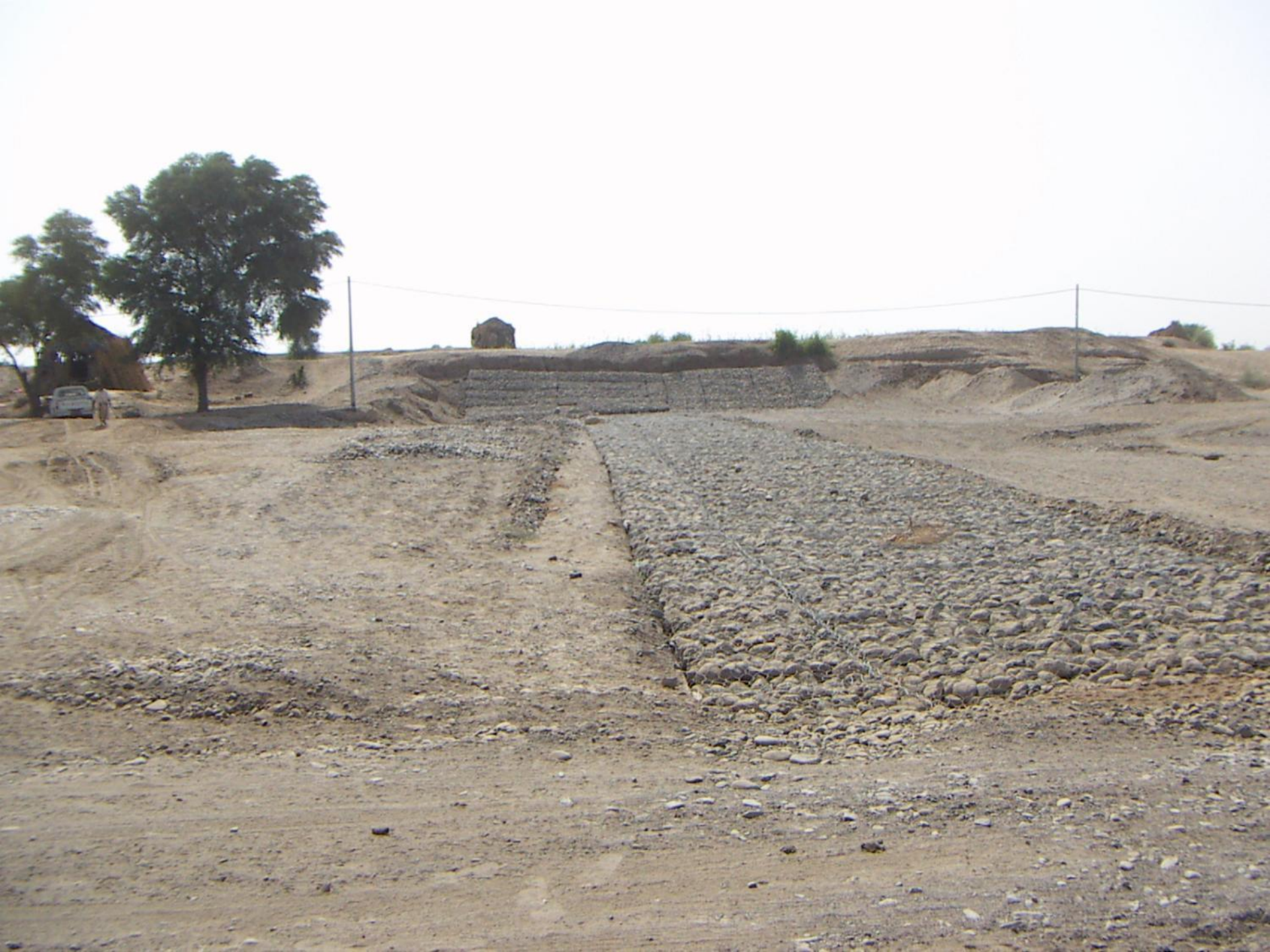









26/10/2002 13:20:04

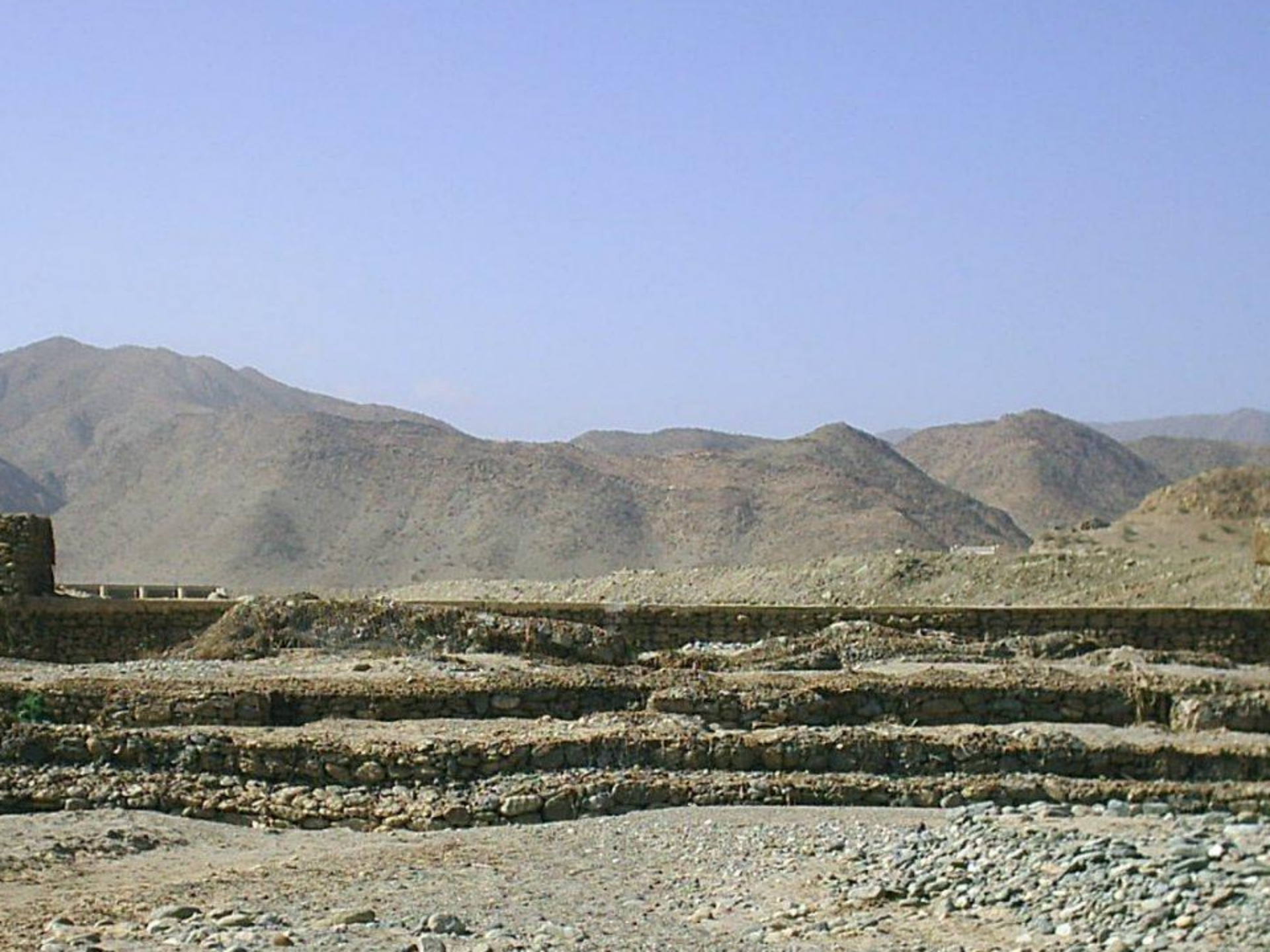


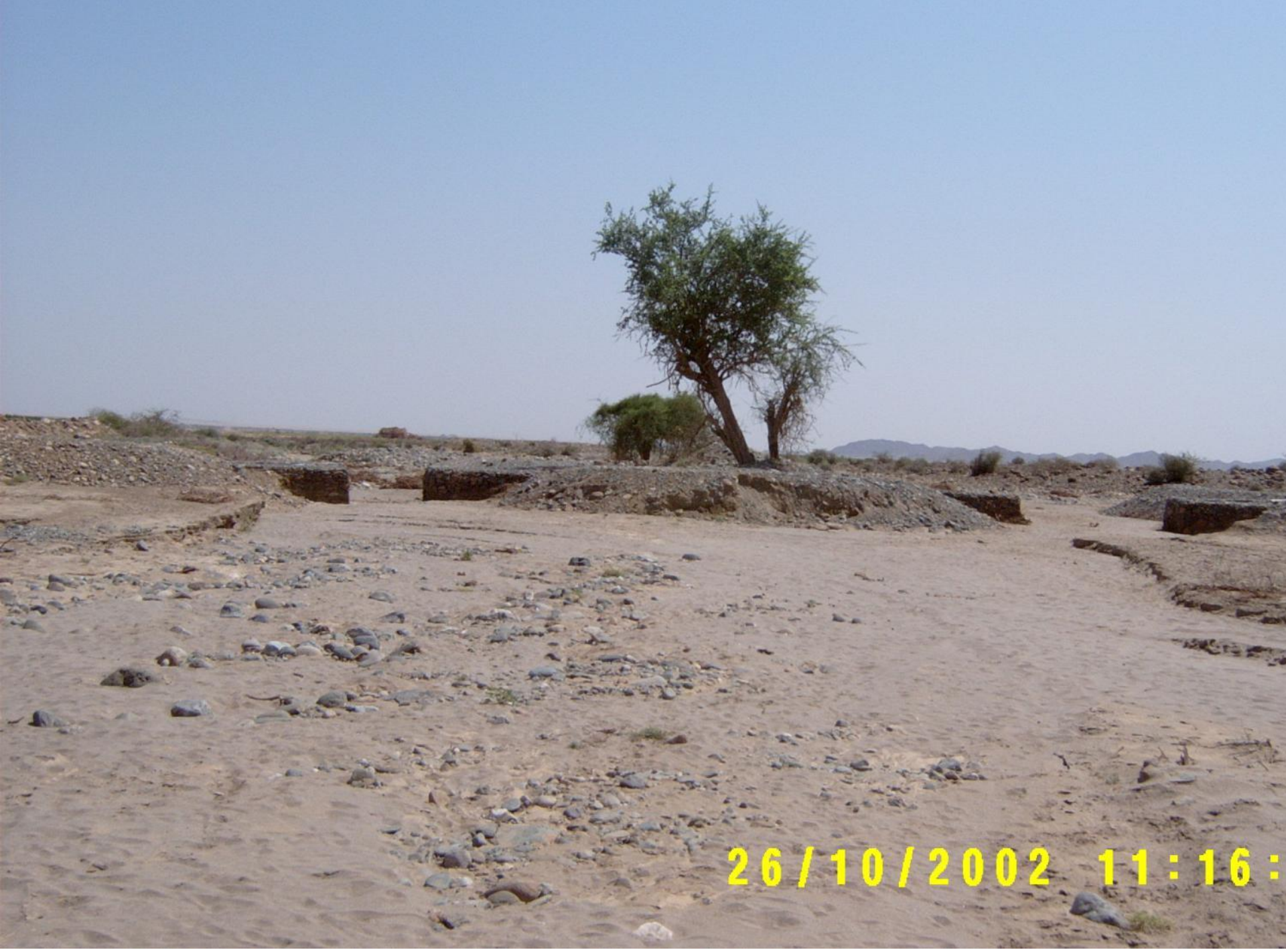
Canals in Spate Schemes

- traditional systems are diverted to short, steep canals
- split flows to reduce flood discharges to manageable flow rates
- Gates not used; control of flows by proportional dividers/farmer management

New/improved canal structures

- Check and drop structures;
- Flow splitting structures;
- Field offtakes; and
- In-field structures



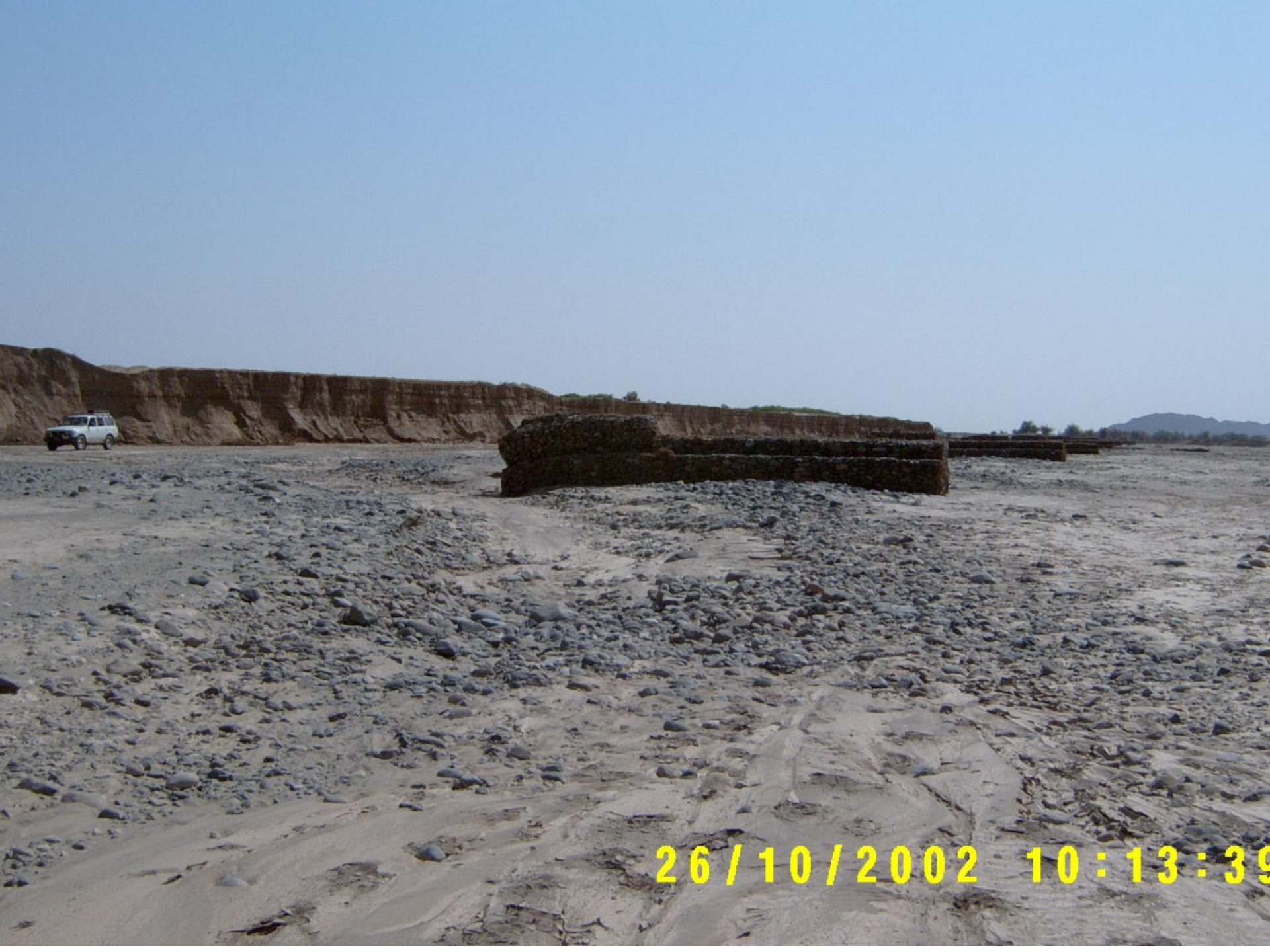

26/10/2002 11:16:

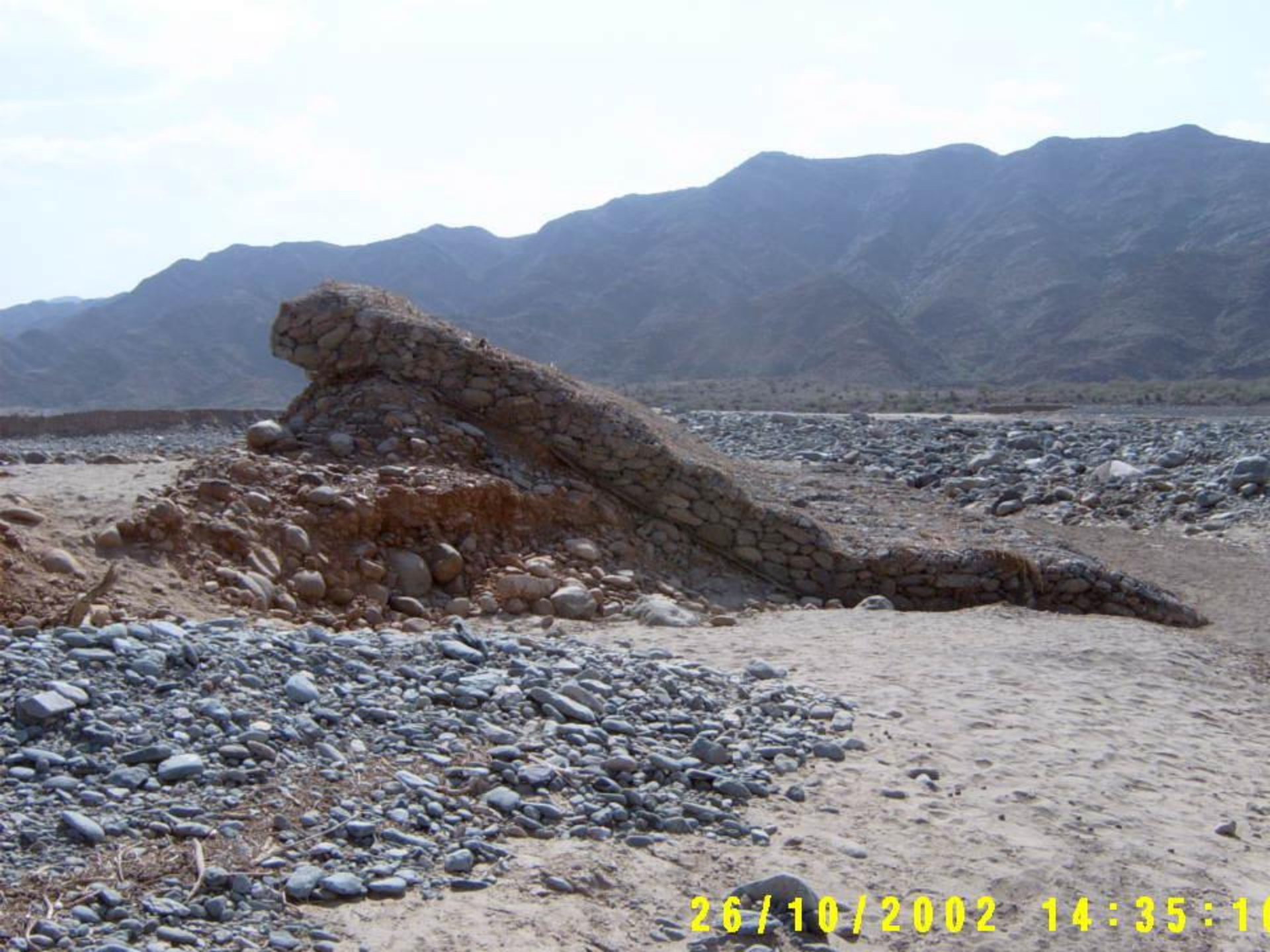
Bank protection and Wadi training

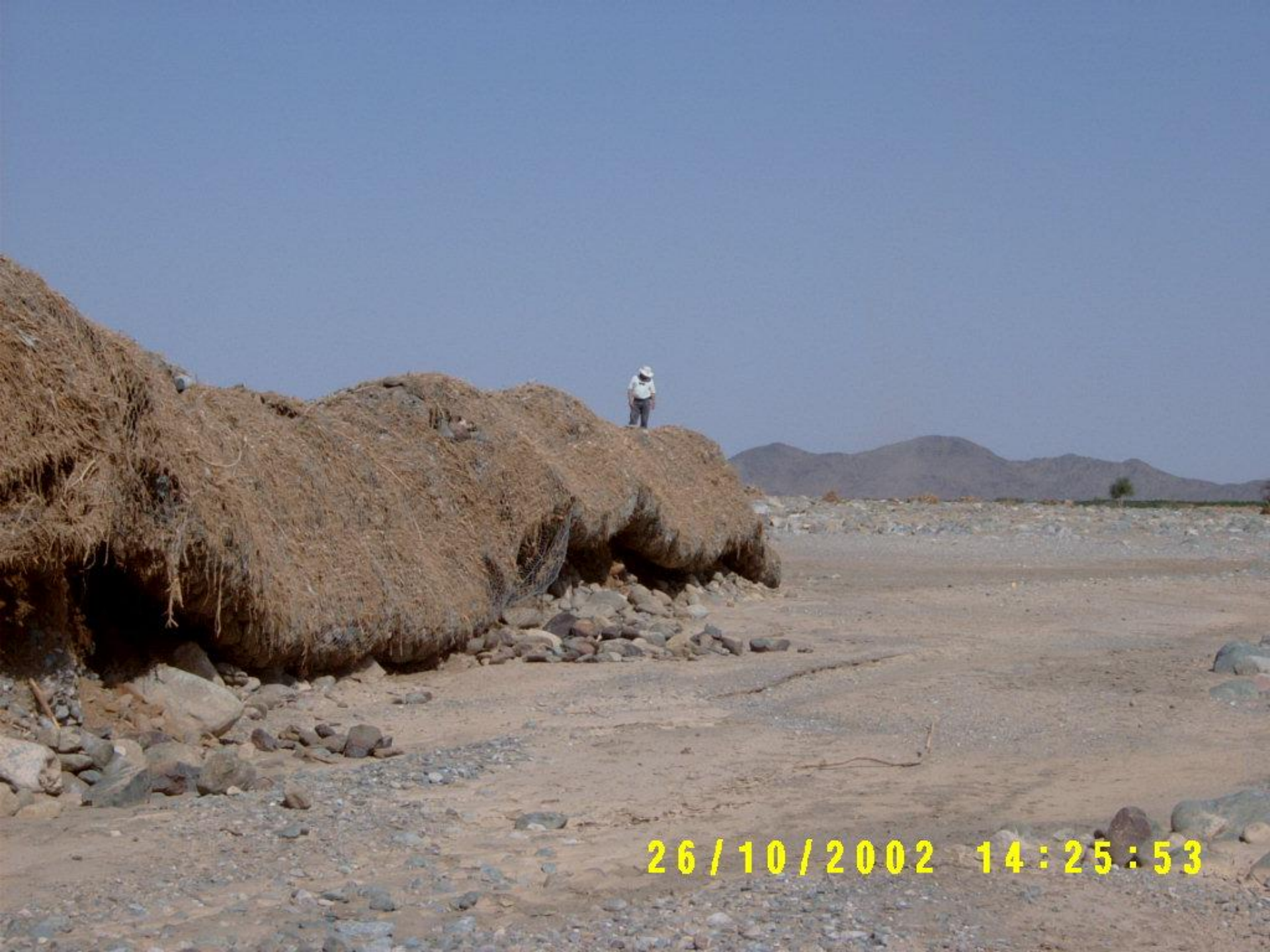
- High flow velocities during spates often erode Wadi banks
- meander patterns to develop and migrate downstream
- Wadi beds can be significantly lowered during the passage of large floods
- traditional intakes to be left stranded

- Providing engineered structures to control bed levels
- Farmers give bank protection work a high priority
- training and back protection works that cause damage elsewhere
- River training and bank protection approached in a holistic manner


26/10/2002 10:04:


26/10/2002 10:13:39


26/10/2002 14:35:1


26/10/2002 14:25:53