



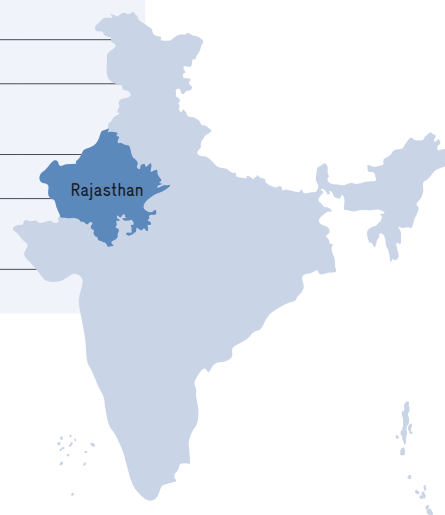
Photo: K. Hazarika

Sand drifting from the Thar Desert is a huge problem in Rajasthan. Here, mulch lines made of shrubs serve as windbreaks that counteract sand movement and create favourable conditions for the establishment of young plants. The women seen in the picture also participate in the project. Here, they carry water for saplings.

This demonstration project was realised under the Indo-German development project Climate Change Adaptation in Rural Areas of India (CCA RAI) which is jointly implemented by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. CCA RAI is financed by the German Federal Ministry for Economic Cooperation and Development. For further information see: www.ccarai.org

Sequential stabilisation of sand dunes through vegetation

Project location	Khyala village in Jaisalmer district, Rajasthan
Project duration	December 2012 – March 2014
Local implementation partner	Department of Forest, Government of Rajasthan
Project costs	1,539,837 Indian Rupees equalling 19,010 Euro
Geographic features	Thar Desert, arid region with sandy and unfertile soils
Climatic stresses	Low and erratic rainfall, high air and soil temperature, intense solar radiation and high wind velocity
Non-climatic stresses	Overgrazing by livestock, low groundwater level
Predominant livelihood sources	Livestock rearing, agriculture and manual labour in urban areas
Project beneficiaries	12 families (141 individuals)



Project context and need for adaptation

The Thar Desert is situated in the hot and arid state of Rajasthan. It is India's largest desert, covering about 70 per cent of the state's landmass. Desertification is turning more and more land into desert and poses a huge challenge in this region – a challenge that is expected to intensify over the next hundred years and that is accelerated by climate change.

The soil remains dry for most of the year and is prone to wind erosion, which leads to the movement of sand dunes. In consequence, the sand deposits everywhere: on agricultural lands, on roads, on railways. Every year, the authorities have to spend huge amounts of public funds on clearing land or infrastructure from sand that has drifted from the Thar Desert. Rajasthan's Forest Department responded to this situation by initiating and implementing desertification control programmes that stabilise sand dunes, above all through the rapid plantation of *Acacia tortilis* trees in monocultures. But due to overgrazing, temperature increase and tree demise many dunes have started to move again. This leads to the deposition of sand on agricultural land and threatens the life and livelihoods of communities.

In order to reduce the movement of the sand, Rajasthan's Forest Department and GIZ started testing an innovative approach for sand dune stabilisation that focuses on the replantation of multiple layers of indigenous species on formerly stabilised but now reactivated dunes. The implementation of this approach was planned to take five years. GIZ supported the project in its two initial years during which the major plantation work and capacity building activities were carried out. The remaining three years will centre mainly around maintenance work that will be carried out by the state Forest Department.

Adaptation hypothesis

Sequential restoration of reactivated sand dunes by using multiple layers of indigenous vegetation stabilises dunes and ensures physical protection of land and infrastructure. This improves livelihood options of communities and increases their adaptive capacities as well as the resilience of the ecosystem.



Trying to live with the desert: Fatah Khan

Fatah Khan, 48 years
Khyala village, Rajasthan

*"Shifting sand dunes used to encroach our agricultural land and sand even used to deposit in our village ponds. The government helped us with programmes in which lots of *Acacia tortilis* trees were planted on sand dunes in order to prevent the dunes from moving and thus protect our farmland and other infrastructure from sand. However, *Acacia tortilis* is not a very useful species when it comes to providing fodder and fuel wood. Not even grass grows under the shade of this tree. Things are different with the new pilot project. It utilises various indigenous grass and tree species. Many of them will provide good fodder for our cattle in the years to come and also fruits that we can eat."*



Multiple layers of grass, shrubs and trees stabilise dunes and ensure physical protection of fertile lands and infrastructure.

Adaptation interventions

- Realisation of an **assessment** to select the intervention area. This included a survey of the vegetation cover and the identification of patches that had been stabilised through government desertification control programmes earlier, but were barren again
- **Protection of the intervention area** through fences that keep away livestock as well as through the establishment of small windbreaks on sand dune slopes that counteract sand movement
- **Planting of multiple layers of indigenous vegetation** consisting of native species, e.g. of creepers, grass like *Lasiurus sindicus*, shrubs like *Calligonum polygonoides* and trees like *Acacia senegal*, *Prosopis cineraria*, *Tecomella undulata* or *Salvadora oleoides*
- **Technical training** of community members on planting, fencing and maintenance

Benefits and added value for adaptation

- **Protection of the intervention area** through the establishment of small fences allows to protect agricultural land, infrastructure, livestock and people
- **Planting of multiple layers of indigenous vegetation** will contribute to people's livelihood base and improve the local economy by providing additional fodder, fuel wood, fruits and vegetables as well as different types of minor forest produce. The expected benefits will only be visible after three to six years when the plants are mature. For example, the grass species *Lasiurus scindicus*, when used as fodder, could achieve up to 6,660 INR equalling 81.5 EUR per hectare and year (from the third year onwards) and the tree *Acacia senegal*, when used for fuel wood, could achieve 10,000 INR equalling 123 EUR per hectare and year (from the third year onwards). Additionally, all trees planted in this project would have an estimated carbon sequestration potential of around 3,720 kilogrammes per hectare and year
- Overall, the project has contributed to an improvement of the **micro-climate** and to an enhancement of the local **biodiversity**

Cost estimates* for main interventions (in INR / EUR)

*81 INR = 1 EUR

Selection of the intervention area and protection of the area through fences and windbreaks (per hectare)	11,248 INR / 139 EUR
Planting of multiple layers – seeds and labour for sowing and planting (per hectare)	11,606 INR / 143 EUR
Technical training of community members (50 participants)	1,832 INR / 22.6 EUR



Community members posing questions in a technical training session.

Success factors

- All project activities were carried out in **close cooperation with official authorities** from Rajasthan's Forest Department. This guarantees a high degree of ownership and sustainability and may lead to the replication of the approach in other areas of the state
- **Community participation** throughout the project resulted in a high acceptance of activities as well as in personal involvement. Creating additional livelihood options for the communities can further reinforce acceptance and personal engagement

Recommendations for project replication in the Indian context

The Thar Desert lies mostly within Rajasthan and extends into portions of the Indian states Haryana, Punjab and Gujarat. The total area of India affected by sand dune shifting comprises 88,078 square kilometres, most of it located in Rajasthan. Dunes that were formerly stabilised, but now face reactivation are typical sites for implementation of this approach of sand dune stabilisation. However, before this approach is applied in any other area, an assessment of the existing vegetation cover as well as the identification of suitable indigenous species that can be used for plantation activities should take place.

Linking the plantation and maintenance work related to sand dunes stabilisation with ongoing programmes of the government, e.g. the employment programme Mahatma Gandhi National Rural Employment Guarantee Scheme, would further contribute to successfully replicate this approach.

Further information

Rajasthan State Pollution Control Board
Government of Rajasthan
www.rpcb.nic.in

Forest Department, Government of Rajasthan
www.rajforest.nic.in

Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
Natural Resources Management Programme
www.giz/de/india | www.ccarai.org