



**Supporting Protected Areas for the Conservation of Ecosystem Services  
(SPACES) Project - Output 4**

**Khangal Lake**

**Environmental Education and Exploration Trail**

June, 2022

# Khangal Lake Environmental Education & Ecosystem-Exploration Trail

(Khan Khenttii Special Protected Areas, Khangal Lake Natural Monument)

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## Abbreviations

CoC	Code of Conduct
EEC	Environmental Education and Communication
GE	Google Earth
GIZ	German International Cooperation Agency
GPS	Global Positioning System
KKSPA	Khan Khentii Special Protected Areas
PA	Protected Area
SPACES	Supporting Protected Areas for the Conservation of Ecosystem Services
ToR	Terms of Reference
WSCC	Wildlife Science and Conservation Center of Mongolia

# 1 Introduction

The Khangal Environmental Education and Eco-System Exploration trail is planned by Khan Khentii Special Protected Areas Administration and supported by GIZ SPACES Project. The preliminary idea of the trail was developed already in 2020 but due to Covid19 pandemic the trail was not yet constructed. The trail will be linked to the Environmental Education Center / Camp planned around the existing cabin.

Objective of the trail is to raise awareness about local eco-systems and increase motivation for Nature Conservation among school children (12-16 years) in summer-school-camps (integrated in curricula of schools), but also for families who come as individual visitors to Khangal Lake during summer season.

The main target group are children from the surrounding soums (villages/towns) of Khentii and Central provinces and Ulaanbaatar. The capacity will be 30-40 children at a given time. The learning focus will be on the local ecosystems (meadows, rocks/soil, forest, water), on environmental protection (resource use, waste management, potential use conflicts etc), local history and culture (e.g. excursions to nearby Baldan Baldan Bereeven monastery), but also practical experiences regarding waste management, eco-toilet (already available) etc. The program will be attractive to children from approx. 10-16 years as it contains many practical exploration activities (and could also include English language components) etc. The information trail stations can be easily connected to the curriculum developed by EEC Center in UB. A continuation of cooperation with EEC Center Ulan Bator is recommended.

In a first step, the Environmental Education trail is planned to be constructed as a stand-alone component for EEC at the Khangal ranger station and will as such increase the attractiveness of the location for EEC workshops and school camps. For potential future extension of EEC activities e.g. through construction of an EEC center and organization of regular school-camps, the trail can be a major attraction.

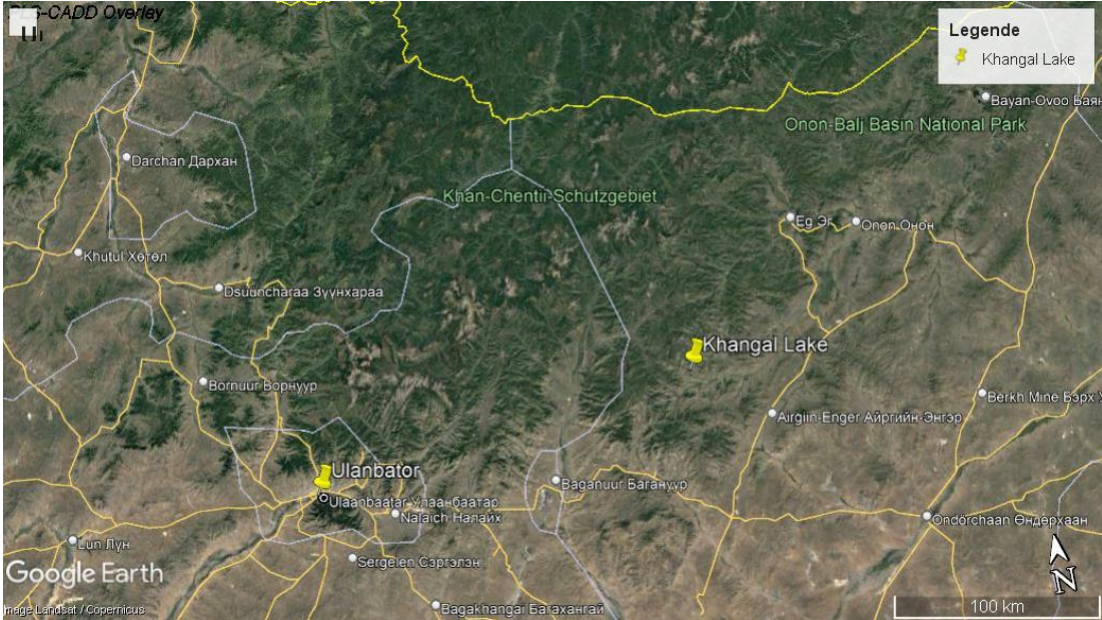
Various additional hiking opportunities exist: e.g. Khangal Lake round tour (8km), Baldan Bereeven Monastery (8km one way), Mountain Lake (6 km one way), Rock Trail (7-8km round trail). An adventure playground / movement trail can be constructed as an additional attraction in proximity of the camp.



## 2 Overview and general description

This chapter presents a general description of the trail and project area.

The following satellite image shows the location of Khangal Lake and Khan Khentii SPA in relation to Ulan Bator:



Source: GE (2022)

Figure 1: Overview Ulanbator, KKSP and Khangal Lake

The next satellite image shows the trail start at Khangal cabin, the location of lake, the Baldan Bereeven Monastery and the small mountain lake, as destinations for other exploration hikes.



Source: GE (2022)

Figure 2: Overview map Khangal Lake, Khangal Cabin and Baldan Bereeven Monastery



The following satellite image shows a trail map with the planned trail stations, start is at the cabin / EEC camp; direction of the trail is clock-wise:



Source: GE (2022)

Figure 3: Trail overview map



Figure 4: Trail Overview

## Khungal Lake

The Khungal Lake is situated at 1-1.5km distance of the trail start / cabin.



Figure 5: Khungal Lake and EEC cabin

The lake itself was not included in the trail in order not make the trail too long and because the access to the lake is long and relatively less spectacular. The lake is visible from the cabin and an info-board on lake eco-system is planned to be included as a trail station at the cabin. An in-depth learning session on Khungal Lake Ecosystem including a visit of the lake shore can be covered separately on a different day in the EEC camp program. Appropriate bird-watching infrastructure (e.g. hide) or a boardwalk at the lake-shore can be additionally constructed as a separate activity. A round tour of the lake is 8km long (2-3 hours).



Figure 6: White-naped cranes at Khungal Lake shore



## General Trail Description

The education trail is designed with 9 trail stations that enable visitors / school groups to explore different ecological features in natural surroundings. The trail has a planned length of 4 km and can be completed in 1.5- 4 hours (depending on length of explanations and exploration tasks at each station). The trail uses existing horse-paths and will be marked with colour markings at trees / rocks as well as directional signposts. Signposts with numbers of the station will be installed in order to support orientation. At all station simple benches (in circle) will be constructed to provide sitting space during explanation/teaching sessions. Information boards are planned to be installed at the cabin only (Station 1, 8, 9) and not at the other trail stations, due to harsh climate conditions / maintenance requirements. This suggestion could however be discussed if there is a wish to have information boards at all stations.

The following stations are planned):

- Station 1: Infoboard KKSPA, Trail Map (installed at Khangal cabin) and Entrance Arch at trail start, Do's and Don'ts
- Station 2: Viewpoint / Panorama Benches and Telescope
- Station 3: "South Slope - Meadow Microcosmos " / Exploration of biodiversity of plants and insects
- Station 4: "Animals of the Forest"/ Observation Points, Sculptures, Animal Tracks
- Station 5: "Rocks" / Geology / spectacular rock formations with 'tafoni' erosion
- Station 6: "Forest & Fire" / Succession of birch, larch and pine
- Station 7: "Water" / Watercycle and Watershed / Catchment Area, Erosion, landscape perspective
- Station 8: Infoboard "Khangal Lake Ecosystem" / habitat of fish, bird, reptiles, invertebrates (installed at Khangal cabin)
- Station 9: Infoboard "Human Activity & Threats" / Traditional use, Overuse, Pollution, Waste-management, Climate Change (installed at Khangal cabin).

Stations will be described in detail later in this document.

Teachers with school groups can use the stations to facilitate learning sessions (with explanation and exploration elements). For this purpose, trail stations will feature sitting areas with benches set-up in a circle for groups to listen to explanations by facilitators and then complete tasks in the immediate surroundings of each station.

Exploration elements, such as animal sculptures, display-boxes (showing animal tracks, tree species, tree rings, water cycle, etc. will be installed. Additionally to info boards (mainly for stations at cabin), descriptions will be offered as on-line and paper documents (PDF for download / print-outs available at cabin). A booklet for documentation of exploration findings, drawings, questionnaires etc. could be developed (in cooperation between KKSPA specialists, EEC consultants and together with teachers as appropriate for each age-group.)

The joint construction of the trail by rangers in a construction workshop can also be considered as an on-the-job EEC training event, which raises awareness for EEC among rangers and KKSPA staff.

Further, the trail is planned to be complemented with “mysterious wood sculptures” that will be produced in a workshop with art students. Sculptures are planned to be made from local materials e.g. fallen wood, which is available in abundance, thus avoiding to cut any trees (strictly forbidden for respect of Mountain Spirits).

A local tale about the Mountain Spirits, the guardians of the area or other could be used to lead through or motivate for the trail. Especially younger children love tales that are continued through various stations. So far the local tale of Khangal Lake and Mountains was not yet discovered....

### 3 Description of Trail Stations

The following trail station descriptions are made as recommendations and basis for discussion. They basically are a write up of the discussions of the team during the site visit and added suggestions for the EEC content of each station.

#### 3.1 Station 1: Infoboards KKSPA, Trail Map (installed at ranger house) and Entrance Arch at trail start, Do's and Don'ts

The trail start is at Khangal Cabin. Infoboards with text descriptions should be fixed under the roofed area at the cabin wall and will highlight the main facts about Khangal Lake Natural Monument as an area under the administration of Khan Khentii Special Protected Areas (KKSPA), a general description of trail data, such as length, altitude profile, GPS coordinates and a trail map.

A QR Code will enable the download of trail descriptions, GPS track and descriptions of stations in PDF format (download and storage on smartphone is encouraged, as internet connectivity is not available everywhere on the trail).

A section with a Code of Conduct (CoC) e.g. Do's and Don'ts is displayed on the board. (to be adapted from existing CoC developed for Gorkhi Terelj PA). The information board Nr. 1 will have to be designed and printed including a good map.

At trail start near the cabin an arch (from material to be determined) will be erected to serve as a symbolic entrance gate. This can be made by artist sculptures or as a simple metal or wooden frame with the name of the trail.



Figure 7: Trail Start, Khangal Cabin, Infoboards to be put on wall



### 3.2 Station 2: Viewpoint / Panorama Bench and Telescope

From the starting point the trail traverses a meadow and leads uphill to the second station of the trail. On the steepest part of the uphill, a few steps (horizontally fixed tree trunks / beams with metal brackets) may facilitate climbing and avoid erosion if the trail is much used.



Figure 8: Climb to Station 2 “Viewpoint”

The second trail station “Viewpoint” is composed of a small natural platform where one or two panorama bench(es) and possibly a fixed telescope can be installed, which invite for a moment of contemplation and to catch your breath after climbing. The “Viewpoint” can be a micro-destination in itself to just climb the hill from the cabin.



Figure 9: Station 2 “Viewpoint”



Figure 10: View from Station 2

And in fact the views of Khangal lake, cabin and EEC camp area are superb.

### 3.3 Station 3: “South Slope” or “Meadow Microcosmos” / Exploration of biodiversity of plants and insects

A little further up the hill (approx 200m) across the meadow the third station is reached at the edge of the forest, where trees allow some protection from sun or wind. The meadow represents a typical south facing slope which is not forested – compared to the North facing slopes.

The station will be composed of a few simple benches installed in a circle and a sign-post with the station number. Facilitators can explain the ecosystem features and functions and divide participants into small groups, who are given different “exploration tasks”. On the following photo the meadow looks still wintery (End Mai) but in June/July it will be full of different flowers and other plants up to 50cm to 1m high).





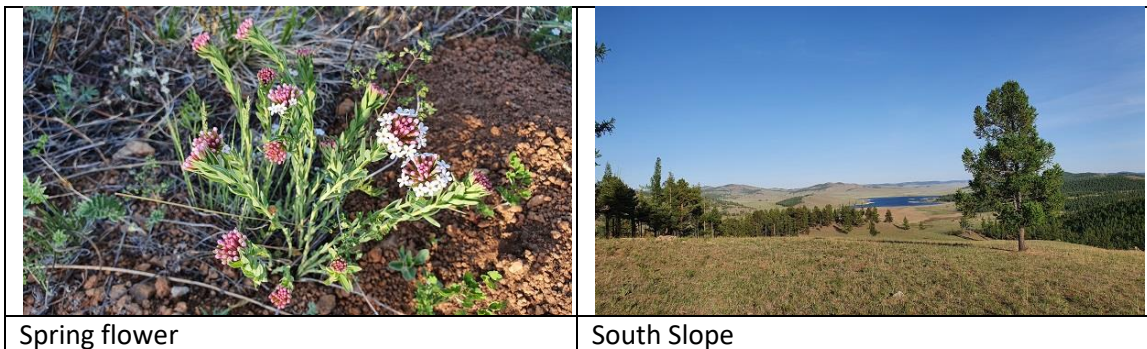
Figure 11: Station 3 “South facing slope- Meadow exploration”

One task for Youth groups (ad other trail visitors) will be to document e.g. make drawings or take photos of different flowers and to present plant biodiversity. (at least one mobile phone or photo camera needs to be available per group). Other groups can be given the task to do the same with insect biodiversity. (No cutting of flowers, no killing of insects!).

The station has the objective to raise awareness about the botanical composition of a healthy meadow and its importance for Mongolian traditional pastoralist lifestyle. The threats of overgrazing and the loss of plant biodiversity (happening in many other areas of Mongolia) can be explained and the reason why protection and sustainable use of meadows are important.

Facilitators can also give explanations about the south slope as a habitat for insects and their roles in the eco-system e.g. pollination, food for birds etc. Explanations would take around 15min, exploration time would be another 15min. Results can be displayed in the evening and entered into the Baigali Biodiversity App.

A bit further, upon reaching the hill-top a sculpture can be installed as an additional attraction. The distribution of art sculptures along the trail needs to be decided depending on productivity of the planned artist / art student camp.





### 3.4 Station 4: “Animals of the Forest”/ Observation Points, Sculptures, Animal Traces

From the hilltop, the marked trail (incl. installation of directional signs) leads downwards (approx 200m) to reach a small forested saddle on which the trail continues left in a northerly direction.



Figure 12: Station 4 “Animals of the Forest”

On the saddle, station 4 “Forest Animals and their habitats” is installed. The station is composed of benches in a circle (as station 3) and a sign-post with station-number. Additionally, wooden sculptures of various animals that live in this habitat are displayed in the forest (not further than 50-100 m). Animal sculptures can include wolf, bear, lynx, roe deer, ground squirrel, marten, wood-pecker, buzzard, eagle, black vulture, hoopoe, jackdaw, red-throated thrush, cuckoo, pine bunting, coal tit etc.). Birds and animals that fly or can climb trees can be displayed on trees.

Exploration task is to find, count (and photograph) all animals. For animals displayed on trees small wooden “mock” telescopes can be installed to allow children to look through the hole and identify the bird on a branch (for example). At the same time children can be encouraged to look for real animals, especially birds. Animals can be carved and painted wooden sculptures (in real size and colour) or just black painted metal shapes, as a less costly version.

Facilitators can explain about tracks, animal habitats, food-chain, threats to animals, human wildlife conflicts etc.



Figure 13: Forest area for animal “observation” (sculptures or shapes)

Groups have to remain in visible distance (not more than 50m), if this is an issue, limits can be demarcated by installing stop signs or a thread fixed to trees, that should not be crossed thus demarcating an exploration zone.

Explanation time is estimated to be 15min.; exploration time another 15min. Results / Photos can be presented and analysed in the evening.

### 3.5 Station 5: “Rocks” / Geology / spectacular rock formations with tafoni erosion

The trail continues following an existing horse track, downhill into a small valley that is traversed (=> here a right turn would enable a short cut in case of bad weather or incident) After traversing a patch of forest, approx 700-1000 m walk from station 4, a spot with a spectacular scenery is reached, marked by rock pillars and rock faces of 10 to 50m in height.





**Figure 14: Station 5 “Rocks and Geology”**

The rock is a coarse granite, shaped by ‘tafoni’ weathering (e.g. similar to Corsica/France), which has left honeycomb and other interesting structures that can resemble all sorts of shapes, including human faces, animals, hearts etc. Station number 5 is installed in the midst of these rock formations, with similar benches and sign-post as the previous stations. Exploration task would be to photograph the funniest or most interesting shapes and structures and think about how they came to stand at these places.



**Figure 15: Natural Granite Sculptures / Tafoni Erosion**

Explanations could include geological features and how the valley and its rocks were shaped by wind, water and ice, as well as volcanic activity and tectonic movement. Different rock mineral structure (granite, limestone etc.) and rocks as habitats for animals, especially as nesting places for birds are further topics. The station is the landscape highlight of the trail.



Children will not be allowed to climb the rocks! Risks of falls!

The station Number 5 would be appropriate for a small break / snack and drink.

### 3.6 Station 6: “Forest & Fire” / Succession of tree species

From station 5 the trail leads back following the valley (to be marked and signposted) for a few hundred meters to reach Station 6 “Forest & Fire”. The station will be equipped with benches and a signpost with station number similar to all other stations.

20 years ago a huge forest fire has burned the entire forest of a large area and traces are still very visible. The re-growth of species as birch, larch and pine is also very visible and represents a showcase for natural succession.



Figure 16: Succession after forest fire



Figure 17: Station 6 “Forest & Forest Fire”



The exploration task of the station will be to identify the different tree species, the different habitats that are dead trees/branches (e.g. for fungi/mushrooms, insects) and a research of how trees are growing.



Figure 18: Re-growth of larch and pine

Explanation topics can be counting tree rings to determine the age of a tree as well as various forms of seed dispersal (through wind, through birds etc.). EEC Ulanbator has a good module curriculum for this aspect that could be used during Training of teachers/facilitators.

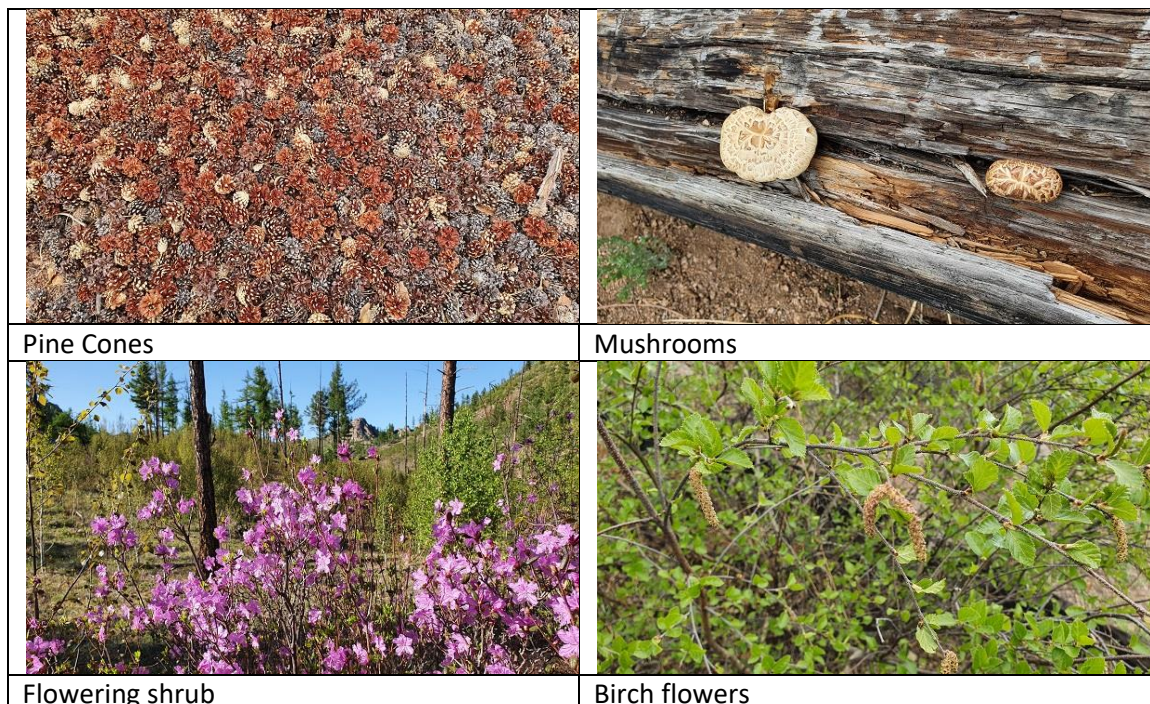


Figure 19: Forest Features



Explanations should also cover the reasons of forest fires (mostly man-made), the devastating effects, the link to climate change and the long-term recovery of Nature through succession. Guidance will be given how to avoid and prevent forest fires.

The uses of different sorts of wood for different purposes can also be an interesting topic.

Explanation time is considered to be 15min, exploration time another 15 min. The results can be collected and presented in the evening (or next day) at the camp by different groups in a presentation game. Different groups can be charged with presentation of different stations.

### 3.7 Station 7: “Water” / Watercycle and Watershed / Catchment Area, landscape perspective

Station 7 is situated on the way from the Forest Station back to the cabin, where the trail comes close to the small stream flowing out of the valley towards the lake. The station will be equipped with benches and a signpost similar to all other stations.

One exploration task would be to identify small water animals (invertebrates), mosses, water plants etc. Another exploration task would be to identify the water uses and why it is so important as a life-support system.



Figure 20: Station 7: “Water Ecosystem and Water Cycle”

Erosion through water is an important topic that can be explored at this station. Signs of erosion are visible and causes can be researched and documented. As the river is used as a drinking water source downstream, pollution must be prevented during exploration tasks. This is also an important learning.

In order to demonstrate the forces of erosion a sand box could be constructed and installed with some inclination (20-30°). Research topic for students is to pour water on the sand at the top and to see what happens with the sand and how erosion channels are created. This topic naturally leads to the understanding what happens to land when top-soil is eroded, fertile soil is washed away, accumulating in the lake and not available anymore for growth of forest and pastures...





**Figure 21: Slope erosion and loss of top-soil**



**Figure 22: Water stream and water uses by humans and animals**

Explanations could cover the topics of Water Cycle (Evaporation at the lake, building of clouds, rain in the mountains when air cools down and flow of water back to the lake. Understanding of the water cycle raises awareness for the catchment area and systemic landscape approach. Issues of water pollution could be further explained.

### 3.8 Station 8: Infoboard “Khangal Lake Ecosystem” / habitat of fish, bird, reptiles, invertebrates (installed at Ranger house)

Upon return to the cabin station 8 is included in the trail as an information board at the cabin. The board is used to inform about the ecosystem of Khangal lake. This includes the formation of the lake and its biodiversity, bird, fish, amphibian, invertebrates etc. Awareness could be created about reed plants at the shore and reed islands in the lake as important habitats that need to be protected. The issues of human disturbance should be covered. Especially for younger kids, this and the next station (9) may be included in a second day session in order not to overload them with content / information.



Figure 23: Khangal lake shore

Exploration of lake ecosystem could be included in an excursion on a separate day (e.g. lake tour, walk to the deer or elk/moose statue). Explanation would also include the status and rationale of protection for the lake. The idea to extend the protection zone of the lake and include the shore should be considered and implemented as feasible.





Figure 24: White-naped crane and arctic swans at nest



Figure 25: Use of lake shore for watering of horses

### 3.9 Station 9: “Human Activity & Threats” / Traditional use, Overuse, Pollution, Waste-management (installed at Khangal Cabin)

The last station (Nr. 9) of the trail is about the human role in the eco-system and the use of natural resources (forest, water, pastures). For this station an infoboard would be installed at the cabin wall (weather protected). Explanations would include the traditional way of life of Mongolian Pastoralists / nomad herders, the style of housing etc.), the seasonality of the



traditional migration pattern and the difficulties and changes that this way of life is subjected to. Threats through hunting, overgrazing, use of the lake shore by animals (trampling of bird-nests), unsustainable fishing and other topics can be addressed during explanation and discussions.



**Figure 26: Traditional livelihood pattern at rangers' gers**



**Figure 27: Gers of ranger families**

The importance of KKSPA rangers and their tasks should be highlighted on the info-board and during explanations.

The bee-keeping activities of rangers could be explained on the infoboard and during station 9 explanation session.



For a next day an interesting demonstration visit could be made to learn more about a sustainable livelihood activity and the challenges related to it (e.g. honey collection, medical treatment, wintering of bee-hives etc.).

Explanation should include the topic of waste management, different sorts of waste and their decomposition periods, harmfulness of toxic substances, human wastes, plastic etc. The topic of sanitation could be added with the demonstration of the eco-toilet at the cabin, which is of course always a sensitive cultural issue that can be discussed in very funny ways during children camps. Content of the explanations should be age-group specific.



**Figure 28: Eco-toilet and traditional pit latrine at Khangal cabin**

An exploration task at this last station would be to find which land and resource uses can be sustainable and which practices are unsustainable or creating harm to Nature based on the information learned at the other stations. Station Number 9 completes the trail with an information board, but opens plenty of other topics for the duration of the entire EEC camp.

The trail is planned to be integrated into school camps with a duration of one week. There is more than enough potential in terms of EEC to explore the area during 5-7 days.

Complementary activities, such as the round tour of the lake, the visit of Baldan Bereeven monastery, the construction of some adventure movement-trail elements in the forest nearby the cabin / EEC camp create an innovative offer that may also be attractive for individual & family visitors.

The sculpture elements that are planned be included in the Environmental Education & Ecosystem-Exploration Trail will also increase its attraction value. (examples from the Black Forest are presented below).

**4 Examples of sculptures (Waldhaus Freiburg / Black Forest / Germany)**









