

# DESIRE

## 3<sup>rd</sup> Plenary Meeting

### Guide for Field Trip

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17 - 22 November 2008  
Eskisehir / TURKEY

## ABOUT KESKIN HOTSPOT...

### 1. General information

The Eskişehir region which is situated in the inner NW Anatolian region (Figure 1) and suffers from a variety of land degradation processes, among others erosion by water, erosion by wind, salinization and urbanization are the most pressing factors.

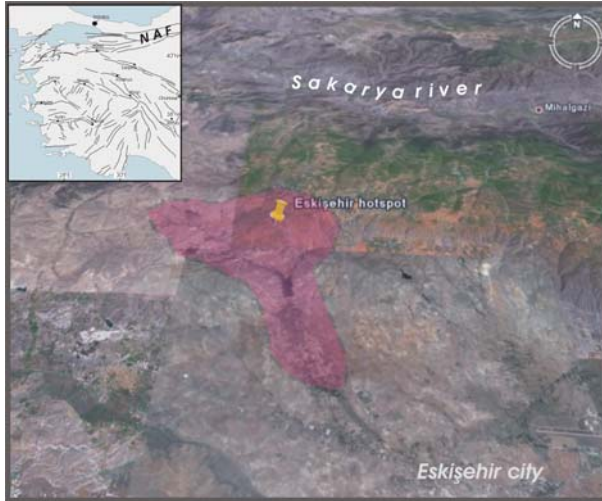


Figure 1. Location and land use properties in vicinity of the Keskin Hotspot.

Increasingly drier continental climate together with very weak natural plant cover accentuate the through-going degradation processes. The proposed Eskişehir hotspot is found in the north of the Eskişehir plain and covers about 90 km<sup>2</sup> surface area (Figure 2). It has been heavily influenced by the heavily populated Eskişehir settlement which is significant both from the viewpoints of agricultural activity and industrial complexes.



Figure 2. Landscape in vicinity of Keskin hotspot.

In coming years, economic significance of the Eskişehir area is anticipated to increase as the share of agriculture and industrial investments rise in the country. The sensitivity to erosion by water of widespread agricultural areas and the expected strong draughts as well as the heavy urbanization and the dependence of agriculture to rapidly polluting surface and groundwater irrigation in places necessitate an integrated approach, that overlap the purpose of DESIRE initiative, in order to provide a sustainable development in the region.

Almost all desertification related governmental and non-governmental organizations together with many experts from various universities are involved in the DESIRE project.

- **Eskişehir Osmangazi University:** Faculties of Architecture-Engineering and Agriculture, and Department of Biology involve in DESIRE with experts and laboratory facilities for various WBs. Management of the project in locale is also achieved by this institution.
- **Hacettepe University:** Experts from Department of Geological Engineering contribute in DESIRE with mass movement and erosion modeling.
- **Ankara University:** Departments of Biology and Landscape Engineering involve in DESIRE with two experts.
- **Anadolu University:** Experts from Department of Sociology contribute in DESIRE with preparation of socio-economic questionnaires and application of them in the field.
- **Selçuk University:** Experts from Faculty of Agricultural Engineering contribute in DESIRE with their knowledge about erosion control measures.
- **Middle East Technical University:** Some jobs related with remote sensing and GIS in the project will be held by an expert from this institution.
- **Mineral Research and Exploration General Directorate:** Existing geo-

information data and expertise of a person in GIS-related jobs will be provided from this institution.

- **TEMA Eskişehir Branch:** A branch of Turkish NGO for combating soil erosion, for restoration and protection of natural habitats.
- **Foundation For The Reinforcement of the General Directorate of National Parks and Game-Wild Life :** A Turkish NGO focused on the protection of environment with its wild life.

From the viewpoint of ethnicity and languages in the hotspot, almost all villagers are of Turkmen origin and talk Turkish. History of certain villages such as Uludere traces back to early 14<sup>th</sup> century. Some tumulus within the hotspot even indicates definitely older prehistoric human settlement. Several families in the northernmost Karaçobanpınarı village are the Crimean Turks migrated during the Ottoman-Russian war in the late 19<sup>th</sup> century. According to Turkmen population they are more successful in agricultural practices in general.

### 3. Bio-physical description

The Eskişehir region is situated in the western part of the central Anatolian Plateau. This plateau generally lies at 900-1000 m above sea-level and is dissected by some volcanic edifices, and depressions and uplifts of tectonic origin. The Eskişehir hotspot is located in the northern margin and partially at the floor of such a through-going depression, called the Eskişehir Basin (Figure 3). The Porsuk River and Sarısu Creek drain the basin floor as well as the surrounding plateau to feed the larger Sakarya River in the east. A variety of rocks crop out in vicinity of the hotspot area. Metamorphic rocks with mappable ultramafic and carbonate subunits are found at high altitude and steep slopes. Consolidated terrigenous conglomerates and sandstones particularly are widespread in the basin margin. The younger loose fluvial terraces and Recent alluvial deposits mostly distributed over graben floor (Figure 3). Marble lenses within the metamorphic rocks in vicinity of Keskin and Uludere villages in the hotspot are actually mined in spite of resulting environmental problems.

The hotspot area typically is characterized by a dry continental climate with an annual precipitation of 380 mm. Rainfall mostly occurs in spring as

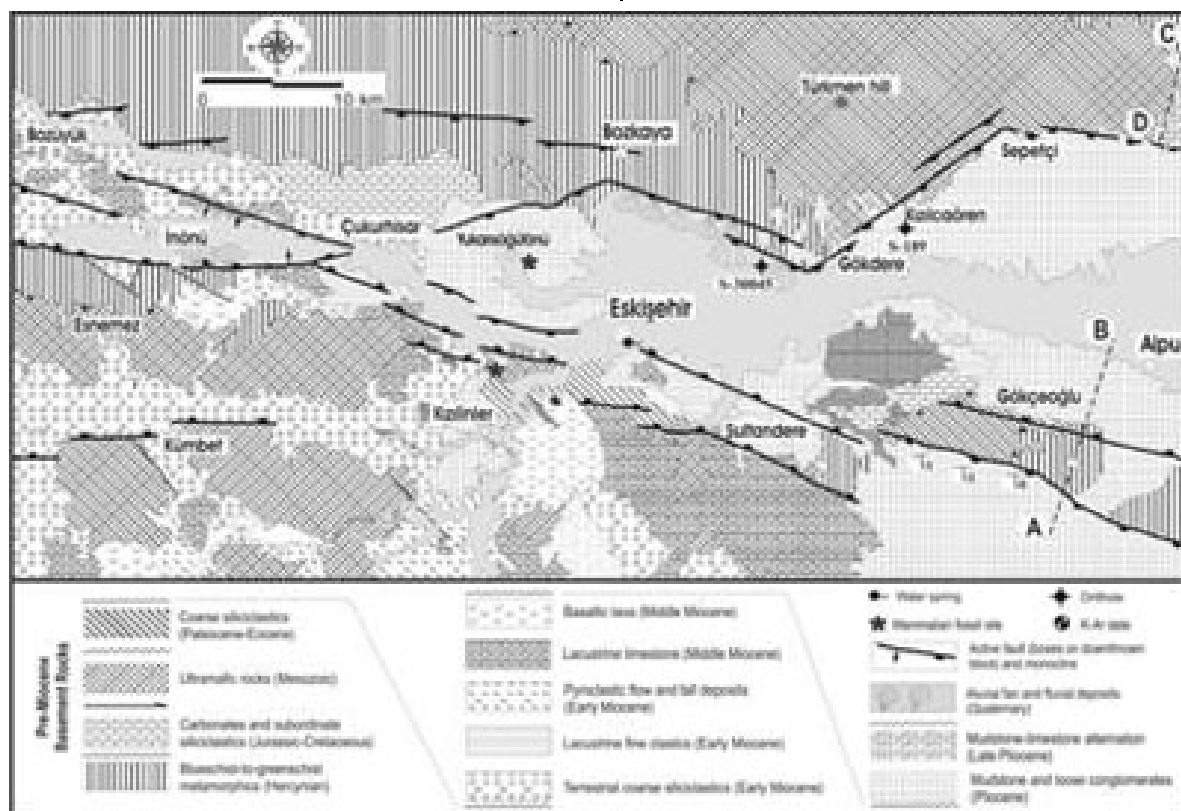


Figure 3. Geological map of the Eskişehir area.



shower, while snow makes significant part (40%) of total precipitation (Figure 4). Winds dominantly move in east-west direction and may reach the tempest limits in 21 days a year. Air temperatures generally are below 0° during winter and may exceed 40° in summer days, causing a net difference of 12°-30°. Soil temperature temporally range between -0.8-25.5 °C 5-10 cm below the surface.



Figure 4. Erosion and debris flow after heavy rain fall in vicinity of the study area.

Soils of the hotspot are dominantly thin lithosols developed on schists while a significant part of the steep slopes are bare. Only limited part of the hotspot comprises well developed and thicker probably older pinkish soils. Valley bottoms and particularly the flat graben floor is covered by a very thick (>2 m) grey colored productive soil.



Figure 5. Various aspects of land degradation in Eskişehir hotspot. 1- Cropland intrusion through degraded oak forest. 2- Wrong tillage direction and resulting gully erosion. 3- Soil trade as an industrial material (Uludere village). 4- Deep active gully erosion in a pasture land.

From the viewpoint of land use, almost half of the Eskişehir region is suitable for agricultural activities while a forth is occupied by meadows and remaining by forests. In the hotspot area, the most common land use type is unirrigated cultivation (mostly cereals) followed by meadows, irrigated cultivation (sugar beet and sunflower) and very rare fruit vegetation and man-made forests (mainly pine and oak trees). In the pasturelands, vegetation cover consists of steppe vegetation and degraded forest remnants as dominantly result of antropogenic effects. Although herbaceous cover is generally high (70%) and relatively rich herb species occurs in the hotspot (Table 1). But heavy grazing in vicinity of villages still causes intense degradation due to water erosion. A few monumental juniper trees of probably many hundred years old witness once occurrence of widespread mountain forests in the region. A significant amount of fish production also is made from several dams in the region. Keskin dam in the hotspot serves only amateur fishery activities. According to national agriculture statistics, the Eskişehir area is the 4th among the national league with respect to agricultural production per person.

The hotspot site is also under stress of urbanization related to Eskişehir city (population of 500.000) with many industrial complexes in the sectors of sugar, ceramics, cement, flavor production as well as plane motor and locomotive factories. These agro-economic activities rise the area 14th most developed province (total 81) with respect to added value in manufacture sector.

Table 1. Herb species during late summer in meadows of Eskişehir hotspot.

Species	Abundance
<i>Coryllus calurna</i>	32
<i>Quercus petraea</i>	22
<i>Carataegus monogyna</i>	++
<i>Quercus cerris</i>	++
<i>Koeleria cristata</i>	++
<i>Arenaria</i> sp.	++
<i>Prunus</i> sp.	++
<i>Asyneuma rigidum</i>	++
<i>Euphorbia macroclada</i>	++
<i>Dianthus cibraricus</i>	++
<i>Jurinea pontica</i>	++
<i>Allium</i> sp.	++
<i>Minuartia</i> sp.	++
<i>Juniperus oxycedrus</i>	++
<i>Tanacetum armenum</i>	++
<i>Astragalus angustifolius</i>	++
<i>Plantago</i> sp.	++
<i>Genista sessilifolia</i>	++
<i>Pyrus elaeagnifolia</i>	++
<i>Hypericum perforatum</i>	++
<i>Torilis arvensis</i>	++

Most of the farmers in the hotspot use their very fragmented own lands. Land hiring may be particularly significant due to insufficient agricultural income and high costs in certain stagnant periods.

Although groundwater resources are rich they are confined within the alluvium of low-lying Eskişehir Plain. But state authorities carefully allocate the irrigation licenses with the thought of a future drought. For the steep slopes of the northern hotspot, groundwater resources are almost lacking or probably confined in the small karstic aquifers. Running water is particularly scarce or highly contaminated. Flow and sprinkler irrigation are the

most common while drip irrigation is encouraged by state institutions. Agriculture in most of the area relies on rainfall, for this reason fallow is a common obligatory practice. Villagers use scarce spring waters that generally not enough for their daily domestic needs. Propriety of the Keskin dam in the area is under discussion. Municipality authorities want to use dam water for domestic use in Eskişehir city while State Water Affairs inclines agricultural usage of this dam.

A very limited part of the hotspot is covered by weak remnant oak forests. Some older (50 years) and particularly more recent reforestation initiatives are under way by state organizations and some NGO here and there, and especially in the northern steep meadows of the hotspot.

In the present situation, land use practices aim only to survive; in other words no special care was paid to protect soil and other resources since they hardly provide income to live due to increasingly harder economic bottlenecks. For this main reason, biodiversity is rapidly vanishing in meadows, topsoils are removing and soil fertility is declining in croplands. The actual land use practices are regarded uneconomic mostly due to low market prices and very high costs.

A comprehensive land degradation assessment has not been realized up to now in the Eskişehir area neither in the hotspot, though some studies have aimed for determination of water and wind erosion as well as for remediation of soil and the irrigation systems in the Eskişehir Plain.

#### 4. Socio-economic description

There are 6 villages within the hotspot. Mountainous villages are less populated (in some cases only several families) while villages on flat landscape comprises higher population (see table 2 for gross demographic info).

Table 2. Settlements in the Eskişehir hotspot

Village name	Number of families	Population
Yukarısöğütözü	250	1000
Keskin	450	1200
Uludere	150	600
Egriöz	70	200
Karaçobanpınarı	15	40

Sex ratio in different settlements is grossly equal while mean age is generally very high due to intense migration of younger population to large cities. It can be said that villages in flat areas with more productive soils have younger population compared to others. Level of education is medium compared to the overall country; 85 percent of the 75 women interviewed graduated from primary school. The percent of illiterate women is 8. The number of women who did not complete primary school but are literate is 2. There are only two women who graduated from secondary school. Moreover, there is only one woman who has a university degree. From the viewpoint of male population 79 % of men graduated from primary school. While 9 percent of men graduated from high school, 12 percent of men graduated from high school. We met rarely some university graduates who come back to their mother home after their retirement. Major income category of the elder village population is wage of retire, a special retirement system based on prepayment irrespective of profession (Bag-kur). Annual income distribution in the hotspot is slightly skewed to poorer population

around 5000-9000 NTL. Almost 50% of the population gains 5.000-20.000 annual income (Table 3).

Majority (73%) of the families in the hotspot sustain their livelihood from various combinations of livestock (cows and sheep) and agricultural

activities to lower the costs. Cropland are dominantly unirrigated (%85) while the remaining is irrigated by either flowing water or shallow groundwater.

Our preliminary investigations showed that although farmers have a clear desertification perception, they do not take into consider the land degradation in their agricultural activities, but only save their today. The very ultimate reflection of this altitude is sometimes to sell their soils as brick raw-material. As a result land degradation processes significantly affect the life of local stakeholders in various ways in combination with the socio and agro-politics. Decreasing quality and surface cover of meadows directly influence the shepherd families. Lower productivities due to less care to soil and particularly water erosion are definitely hidden features. Decreasing biodiversity is a very well defined phenomenon. Tens of plant species seen in the hotspot's meadows some 30-40 years ago are almost disappeared left behind only several drought resistant types. Number of wild animals follows this trend as well. As a result, 68 % of the farmers interviewed evaluate their lives as worst

Table 3. Distribution of income levels according to population

Ann. income range (NTL)*	900 - 999	1000 - 4999	5.000 - 9.999	10.000 - 19.999	20.000 - 28.000	30.000 - 50.000
% of population	17	20	32	21	7	4

\* 1NTL (New Turkish Lira)=0.5 € (May 2008)

than past. The 20% of the farmers consider their living conditions better than past while 12% of the farmers distinguish no change in their life conditions. Future expectations of the farmers are generally pessimistic. Of the 78 households in the hotspot, most of the farmers (60%) think that their living conditions will be worst than now. The 20% of the farmers preserve their hopes of better future living conditions while a minority (10%) does not anticipate any coming change.

The on-going land degradation processes are feeding by many drivers in varying intensities. Supports from governmental organization have been always very low and was weakly welcome by farmers if any. Farmers are always complaining from fragmented fields that make difficult the agricultural practices and lower the income.

### 5. Institutional and political setting

Management of the soil is achieved by several state organizations (General Directorate of Rural Services, Soil and Water Research Institute, Anatolian Agricultural Research Institute, Provincial Agricultural Directorate). Among others Soil and Water Research Institute is particularly authorized for combating desertification. Anatolian Agricultural Research Institute is another experienced structure actually doing successful researches on production of specific seeds suitable to various environments, grassland amelioration etc. The remaining institutions mostly provide extension services to villagers. Three local civil societies can be reminded in the area of natural resource management: Chamber of Agriculture that normally informs villagers in all aspects of cropping, Agricultural Credit Cooperative that refund villagers in their agricultural activities and Irrigation Union that serve facilitating management and financial aspect of water provision.

TEMA is the only countrywide NGO in terms of desertification that paying significant education efforts of different levels (for pupils, villagers etc.). She sometimes leads for reforestation activities and other social projects too.

Within the boundary of the Eskişehir municipality, the ultimate land use decision-maker is the municipality board elected by the city people. Water management mostly is carried out by the local branch of the General Directorate of State Water Affairs and partly by two other state

organizations, the General Directorate of Rural affairs and the Bank of Provinces.

The existing law (no: 5403) on soil preservation and land use is effective since 2005. According to law and related regulations, a soil protection board headed by local governor (vali) was formed in each province to provide all kinds of insights on the issues of land use and soil preservation. This structure also is authorized to decide and make researches on land degradation processes and new soil preservation projects. As a general view of existing legislative situation, main gap is in the coordination of various institutions and structure related to land use and soil protection. Low capacity of the country in creating multidisciplinary studies, as well as lack of base data and maps on land use and soil protection forms other major bottlenecks.

Extension and training services in the Eskişehir hotspot is extremely scarce. Villagers quoted that there is no periodic information flow given by related state institutions. As with those institutions, availability of suitable (number, quality etc.) personnel is very rare mostly due to existing state personnel regime (i.e. trend to decrease number of officials). Only some villages received random information flow from Provincial General Directorate of Agriculture. Actually there is an agriculture engineers who stays 2 days in one of the hotspot villages (Keskin village) to inform villagers in their agricultural practices. Again rarely there are some tradesmen who come to inform (in fact to sell) about chemical fertilizers, irrigation systems etc. More rarely researchers from the Faculty of Agriculture of one of the universities in Eskişehir organize individual irregular informative meetings.

### 6. Relevant end-users / stakeholder groups

- Provincial Division of the State Water Affairs:** The local branch of the primary executive state agency for elimination of adverse effects of Turkey's surface and groundwater and putting them in public utilization in various ways such as hydropower, irrigation, domestic and industrial use. This institution is passively involved in DESIRE since it previously constructed the Keskin Dam in the hotspot area.





WB3,2<sup>nd</sup> Stakeholder meeting

- **Anatolian Agricultural Research Center:** A governmental organization conducting various research activities including production of drought resistant new species, amelioration of meadows etc.
- **Provincial Special Management:** The older General Directorate of Rural Services, now bound directly to local governor. It is expected normally to distribute infrastructure services such as road and aqueduct building or repair, etc.
- **Provincial Directorate for the Environment and Forestry:** Local state branch responsible for reforestation and environmental rehabilitation and protection.
- **Soil and Water Research Institute, Eskişehir Branch:** Branch of an organization (The Ministry of Agriculture and Rural Service) aiming at the development, conservation or suitable exploitation of the soil and water resources in the Eskişehir region. This institute previously made some research projects in relation to various aspects of land degradation in Eskişehir regions.
- **Eskişehir Osmangazi University, Faculty of Agriculture:** As a state university, this organization realises both education (undergraduate and MSc) and researches on productivity and land degradation issues.
- **TEMA Eskişehir Branch:** A branch of Turkish NGO for combating soil erosion, for restoration and protection of natural habitats.

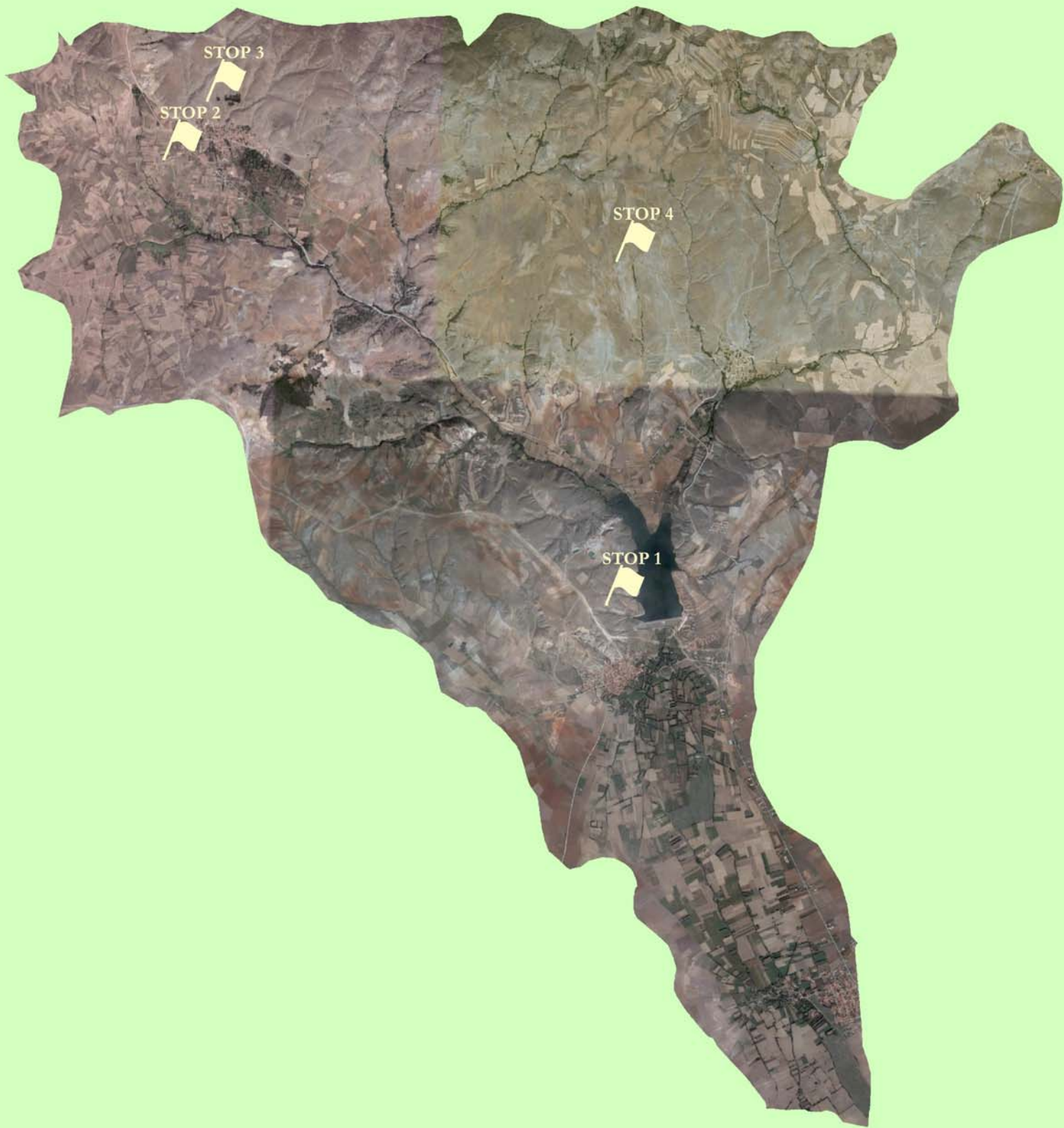
- **Foundation For The Reinforcement of the General Directorate of National Parks and Game-Wild Life :** A Turkish NGO focused on the protection of environment with its wild life.
- **UNCCD National Focal point:** The national connection point against desertification founded under the Research, planning and co-ordination board of the Ministry of Environment and Forestry.
- **Tepebaşı Municipality:** Decision-maker and execution authority within the municipality boundary with respect to land management and related issues. Since the majority of the hotspot included within the municipality with the latest local legislative rearrangements, this organization has ultimate significance.
- **Local Irrigation Unions:** The union of villagers (end-users) for provision of surface and ground waters to their farms.
- **Local Farmer Unions:** The union of villagers for increasing the productivity of soil and and crop quality.

**Eskişehir Agricultural Credit Cooperation:** An NGO that provides various agricultural credits to farmers.

## 7. Past and ongoing projects

There are few specialized project on the subject of land degradation and desertification in the Eskişehir area and most of them were realized either by ESOGU Faculty of Agriculture or by other local state organizations. They are thematic and rather local case studies. Among them effect of some agricultural practices on the soil erosion by water, inquiry on the wind erosion in the region and probable solutions and recurrence probability of the drought period in Eskişehir region can especially be cited. Another work undertaken by a local state institution and an NGO (TEMA Foundation) is named “Eskişehir Province Seyitgazi District Arslanbeyi Village Rural Development and Erosion Control Project”. There is no previous agricultural works within the hotspot boundary. The surveys realized by Provincial Division of the State Water Affairs in relation to construction of Keskin dam in the hotspot comprises some hydrological studies as well as some irrigation plans.





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## GUIDE for THE FIELD TRIP to KESKIN HOTSPOT

### Stop 1

Southern part of the hotspot, 500 m to the north of the Keskin Village

- Have a glance at some problems of the hotspot.

a) Heavy urbanization of the productive soils of the Asagısogut and Keskin villages from the Eskisehir city, mainly as solitary villas, sítés (many double flat houses within protected boundaries), factories and private schools.

Connected disadvantages:

- Very high selling prices for the unit land: 15.000 YTL/decare (8 €/m<sup>2</sup>), while irrigated farming in this part of the hotspot can provide (for sugar beet) a yearly income of 300 YTL/decare (150 €/dekar) at maximum.
- New neighbors do not want neither machine noises, bad smellings due to husbandry nor straw particles and soil dusts. This arises conflict between the people.



Urbanisation pressure: note the Eskisehir City at the background.

b) Heavy grazing in already poor pasture lands (stop is on pastureland) due to proximity to Keskin Village; without any grazing control.

- Very poor plant species with respect to quality and quantity: (*Astragalus pseudocaspicus*, *Astragalus microcephalus*, *Hohenackenia exscapa*, *Astragalus vulneraria*, *Cousinia iconica*, *Globularia trichosantha*, *Convolvulus galatrun*, etc.) cover ratio is generally below %45.

But husbandry, particularly sheep production is very rapidly decreasing due to market pressure (low meat prices versus high input costs).

c) Siltation at the bottom of Keskin Dam reached 15-20 cm only in 20 years which reveals significant water erosion from the upstream dry-farming areas and pasturelands. Furthermore there is conflict on the use of Keskin dam waters. Municipality authorities want it for city's demand while agricultural state authorities insist on its agricultural uses. No solution has been obtained occurs yet.

d) Generally steep/relatively steep dry farming (mainly cereals) areas. Groundwater is scarce to absent. This issue will be discussed in the stop 4.

e) Mining (marble & gravel production) activity significantly destroys the landscape in some places. No rehabilitation action is undertaken by mine holders. Dust dispersal and noise (from machines and blasting) were regarded important problems by villagers.



Destroyed landscape due to mining activity close to Stop 1

A view from Stop1 towards east. Note newly built villas and poor tree coverage





## Stop 2

300 m SW of the Uludere Village, NW part of the hotspot.

- *Unsolved problem of soil mining:*

Significant areas of older, well-developed Lithic Leptosols have been mined by a brick company, since some farmers tend to sell their fields instead of agricultural activity due to very low income rates. Villagers have repeatedly talked to local authorities for prevention of this activity but they did not get any positive result since exploitation seems legal.



Hanged croplands due to soil excavation at Stop2

- Results:
  - Drop of water content in the neighboring fields.
  - Difficulty in accessing the field and in agricultural practices, higher risk of accidents during agricultural activities such as ploughing.
  - Conflict between the farmers.



Well developed lithic leptosols have been mined by a brick company

## Stop 3

300 m to the north of The Uludere Village.



View towards stop3. Note older tree planting and widespread step pasturelands in the background.

Intensive gully formation in the highly degraded pasturelands.

- Walking through the village one can observe that villagers are poor and many houses were abandoned. Half of the hotspot families have a yearly income less than 10.000 YTL (5.000 Euro).



View from Uludere Village.

- Thin lithosols, high slope gradients, high slope length.



Gully erosion

- Semi-arid climatic setting, catastrophic nature of rainfalls and low organic matter

and clay contents of soils collectively encourage the water erosion.

- Poor plant species represented by the community *Astragalus angustifolius*, *Genista sessilifolia*, *Tanacetum armenum*, *Verbascum lasianthum*.
- Sporadic successful tree plantation in the past and present. Main problem with the tree planting is maintenance within the first several years (esp. watering)
- Deep (in some cases several meters deep) active gullies: no physical soil prevention measure taken.
- From time to time flooding occurs and destroys houses, agricultural machines as well as farming areas.



View from gully erosion

## Stop 4

1500 m WNW of the Egrioz Village, at the centre of the hotspot. This field was also nominated as the SIP spot to monitor the water erosion of dry-farming areas in the Eskisehir hotspot.

- Extensive soil erosion by water in relatively steep dry farming areas.
  - Highly fragmented fields (a half of the families have more than 10 parcel; with average farm size of 10-20 ha).
  - Still wrong agricultural practices (eg. parallel to slope tillage).
  - High slopes and slope lengths > 20°, and several kilometres respectively).
  - Generally thin (<15-20 cm) lithosol on metamorphic rocks.
  - Coarse texture, high rock fragment rates of the ground, very low organic matter content (see table below).



Parallel to slope tillage. Note high stoniness due to water erosion.

Representative soil properties in vicinity of SIP field.

Sample Name	Organic Matter(%)	Soil Depth(cm)	Gravel(%)	Sand(%)	Silt(%)	Clay(%)
K-36	1,51	45	24	45	16	15
K-59	0,58	45	6	40	19	35
K-60	1,10	135	2	44	15	39
K-61	1,67	30	18	52	14	16



## NOTES

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