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Appendixes – Part 9

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5. Conclusions

In the buffer zone of the power line, 29 potential bat habitats were found and surveyed, represented by: car passages under the railway, drainages under the railway, bridges, abandoned buildings, grottes and caves. All ravines with vertical walls were carefully surveyed.

There are definitely no bat hibernation sites on the territory. No traces of bats were found in the entire project area (faeces, food remains). It should be taken into account that in drainage systems, food and faeces may be washed away by water during floods. However, there are no typical traces (urine marks, scuffs) along the slits.

Car passages, drainages, grottos may be a temporary roost during seasonal migrations, possibly summering. Permanent colonies are absent.

Large concrete bridges and crossings have deep slits unsuitable for hibernation (low temperatures), but breeding colonies may be found in them during the summer.

Of the two clay caves found, one is a potential breeding (hibernation?) site, due to the narrow entrance it could not be fully surveyed.

There are numerous settlements in the foothills of the Koytash ridge, along agricultural fields, and along large areas of the planned transmission line, with houses providing refuges for some species such as Common pipistrelle bat, potentially *Vespertilios*. The presence of other species is not excluded, but is rarer.

In order to identify the most complete species composition of bats feeding on the territory it is necessary to organize surveys with the help of a bat detector (walking route surveys), as well as it is desirable to make records of bat echolocation during seasonal migrations (autumn, spring).

It is recommended to conduct mist netting at 5 sites in summer to clarify the presence of breeding colonies and the species list: artificial pound, car passages under the railway (3) and 1 cave.

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1 Introduction

In accordance with the Resolutions of the President of the Republic of Uzbekistan No. PP-207 dated July 4, 2023, "On measures for the implementation of the investment project 'Construction of a 500 MW Solar Photovoltaic Power Station, a 334 MW Electric Energy Storage System, and a Substation to support its operation in the Nurabad District of the Samarkand Region - Sazagan Solar 1'," and No. PP-208 dated July 4, 2023, "On measures for the implementation of the investment project 'Construction of a 500 MW Solar Photovoltaic Power Station, a 334 MW Electric Energy Storage System, and a Substation to support its operation in the Nurabad District of the Samarkand Region - Sazagan Solar 2'," investment agreements were signed on April 19, 2023, between the Ministry of Investments, Industry, and Trade of the Republic of Uzbekistan, the company "ACWA Power Company" (Investor), and the companies "ACWA Power Sazagan Solar 1" and "ACWA Power Sazagan Solar 2" (hereinafter referred to as the "Project Companies").

Under the aforementioned investment agreements, the Project Companies are implementing the projects "Sazagan Solar 1" and "Sazagan Solar 2," within which three solar photovoltaic power stations with a total capacity of 1000 MW and a substation with a capacity of 500/220 kV will be constructed in the Nurabad District of the Samarkand Region. Additionally, two energy storage systems with a capacity of 334 MW will be built - one in the Nurabad District of the Samarkand Region and another in the Karakul District of the Bukhara Region. Furthermore, two parallel overhead power transmission lines with a voltage of 220 kV and a length of 70 km will be constructed to connect the main project facilities. 360 km overhead transmission line will also connect stations located in Samarkand region with the Khalka substation, located in Tashkent region.

UZB-ACWA-Samarkand Solar 1 and Solar2&OHTL ESIA Project consists of the following parts:

1) Nurabad substation and access road 5320 m
2) Nurabad BESS
3) Solar 100 MW PV plant and access road 70 m
4) Solar 400 MW PV plant, pooling station and access road 696 m
5) Solar 500 MW PV plant
6) Karakul BESS and access road
7) Khalka substation and 360 km 550 kV OHTL
8) 70km OHTL (Nurabad SS – Pooling station)
9) OHTL 4.9 km
10) LILO 11 km
11) LILO 19 km

2 Study Area Description

Flora

According to the scheme of phytochoria of Uzbekistan (Tojibaev et al., 2017), the project area belongs to the Nuratau and Aktau phytogeographical regions of Nuratau district and Urgut region of Kuhistan district of Mountain Central Asian province, Chinaz and Mirzachul regions of Middle Syrdarya district and Middle Zeravshan, Lower Zeravschan and Karshi-Karnabchul regions of Bukhara district of Turan province. 360 km OHTL area belongs to the Nuratau and Aktau phytogeographical regions of Nuratau district and Urgut region of Kuhistan district of Mountain Central Asian province, Chinaz and Mirzachul regions of Middle Syrdarya district and Middle Zeravshan region of Bukhara district of Turan province. 500 and 400 MW PV areas belong to Karshi-Karnabchul region of Bukhara district of Turan province, 100 MW PV, BESS and Nurobod substation areas – to Urgut region of Kuhistan district of Mountain Central Asian province. Karakul substation area belongs to Lower Zeravschan region of Bukhara district of Turan province. Khalka substation area belongs to Chinaz region of Middle Syrdarya district of Turan province. Thus, the study area covers a very large region with heterogeneous flora and vegetation.

Geographical description

Tashkent Region is located in the northeastern part of the Republic of Uzbekistan. Its area is about 15.3 thousand km2, the population is almost 3 million people and the average population density is about 200 people / km2. Physiographically, Tashkent Region can be divided into alluvial-proluvial plain situated on the right bank of the middle reaches of the Syrdarya River, and mountain ranges of the Western Tien Shan. The Khalka substation and eastern segment (32 km) of OHTL are situated in Quyi Chirchiq District of the Tashkent Region of Uzbekistan, in the valley of the river Chirchiq (right tributary of Syrdarya River), on the alluvial-proluvial plain occupied mainly with anthropogenic landscapes (irrigated arable lands, gardens, woodland belts, channels and settlements). This area belongs to the ancient Tashkent oasis, a region with the most valuable agricultural lands and with the best and most fertile soils of Uzbekistan. Within this area, the terrain is nearly flat or slightly inclined plain, dissected with irrigation channels. The elevations range from 259–260 m above sea level on the bank of the Syrdarya River up to 323-325 m.s.l. near the SS Khalka.

The Syrdarya Region is located in the central part of Uzbekistan, on the left bank of Syrdarya River. It occupies 4.276 thousand km2, the population is about 896.6 thousand people and the average population density is 209.5 people/km2. Physiographically, all territory of this administrative region is a part of the Hungry Steppe (Mirzachul), an alluvial-proluvial plain on the left bank of the Syrdarya River in its middle reaches. The elevation is 230-395 m a.s.l. In the past, about 120–130 years ago, the Hungry Steppe was an almost waterless desert with ephemeroid vegetation used as a spring pasture for nomadic herding, and fragments of salt marshes; the floodplain of the river Syrdarya was covered by tugay vegetation represented with riparian poplar and willow woodlands and reeds. At present, almost the entire Syrdarya Region is occupied by anthropogenic landscapes (agricultural lands and settlements).

The Dzhizak Region is located in the central part of Uzbekistan. The total area is 21.21 thousand km2, the population is about 1.475 million people and the average population density is 69.6 people/km2. The territory of the Dzhizak Region can be divided into two physiographical parts. The northern plain part includes the desert of south-eastern Kyzylkum, the Aydar-Arnasay lake system, and an alluvial-proluvial plain of the Hungry Steppe. The southern mountainous part includes Turkestan Ridge and its western spurs, Malguzar and Nuratau mountains. The Nuratau Mountains are two parallel medium-altitude ranges separated by Sanzar-Nurata intermountain depression (so-called Nurata valley). The northern branch is the Nuratau Range (about 200 km long, 2,169 m.s.l.), one of the oldest mountain ranges of Central Asia, and the southern branch of the Nuratau Mountains consists of several smaller ranges, Aktau (about 100 km long, 1,993 m.s.l.), Karatau (50 km long, 1,190 m.s.l.), Karachatau (20 km long, 1,101 m.s.l.), and Khobduntau (35 km long, 1,672 m.s.l.). The slopes of the Nuratau Mountains are deeply dissected by numerous valleys of mountain streams and dry riverbeds. The northern slopes are steep, rocky, with strongly rugged terrain, while southern slopes have rather gentle, hilly terrain.

The Samarkand Region is located in the central part of Uzbekistan, in the basin of the Zeravshan River, in its middle reaches. This region has an area of 16.77 thousand km2, the population of about 4.1 million people and the average population density of 245.6 people/km2. Physiographically, its territory also consists of plain and mountainous parts. Plains are represented in the centre of the region (the Zeravshan valley) and its southwest (piedmont plains of Zeravshan Range, including Karnabchul). The Zeravshan valley is bordered by the Nuratau mountains from the north and Zeravshan Range and its western spurs, Zirabulak-Ziadin mountains, from the south. The Samarkand oasis situated in the middle reaches of the Zeravshan River is one of the oldest agricultural oases in the Central Asia with the most valuable agricultural lands and with the best and most fertile soils of Uzbekistan. Currently, almost the entire Zeravshan valley is occupied by an anthropogenic landscape, with small fragments of floodplain ecosystems. The landscape of Karnabchul (western piedmont plain) and northern piedmont plain of Zeravshan Range and northern piedmont plain of Nuratau Mountains is represented with piedmont semidesert, with almost flat or slightly inclined, wavy or gentle hilly terrain, dissected with dry beds of temporary streams.

Thus, the study area includes parts of almost flat to slightly inclined clayey plains of the middle reaches of the rivers Syrdarya and Zeravshan, alluvial valleys and terraces of these rivers, the eastern part of Nuratau Range, the eastern part of intermontain Nurata valley, the eastern and southern piedmonts of Khobduntau Range, almost flat to slightly inclined clayey northern and western piedmont plain of the Zeravshan Range, and a small plot of sandy desert of South-western Kyzylkum. The elevation ranges from 259–260 m.s.l. on the banks of the Syrdarya River up to 840–845 m.s.l. in the piedmonts of Khobduntau. Within the Karakul BESS area, elevation is 210–216 m.s.l.

The **climate** of the study area is continental semi-arid and arid with mild wet winters and hot dry summers. According to the Köppen-Geiger climate classification (Kottek et al., 2006), the study area belongs to the zones of cold semi-arid climate (BSk) and hot-summer Mediterranean climate (Csa). The average temperature of January is about -1–0 °C in the valley of the Syrdarya River and Karnabchul, and about +1°C in the Zeravshan valley. The average temperature of July is from +26–27°C in the valleys of the Syrdarya and Zeravshan to +28–30°C in Karnabchul, the mean annual temperature is 14–15°C in the valleys of the Syrdarya and Zeravshan and 17°C in Karnabchul. The annual precipitation is about 150–200 mm in Karnabchul, 250–300 mm in the Syrdarya valley, 300–400 mm in the Zeravshan valley and eastern part of Nuratau Mountains. Precipitation occurs mainly in the late autumn, winter, spring and early summer, the maximum falls in March-April (Geographical Atlas of Uzbekistan, 2012; Williams, Konovalov, 2008; https://ru.climate -data.org; http://worldweather.wmo.int).

Following **protected areas** are situated in the Tashkent Region: Chatkal State Biosphere Reserve (category Ia of IUCN, 24.7 thousand ha, 96 km to the northeast of SS Khalka), Ugam-Chatkal National Park (category II of IUCN, 506.9 thousand ha, 53–55 km to the east of SS Khalka), the Ugam-Chatkal Biosphere Reserve (42.9 thousand ha, 53–55 km to the east of SS Khalka), natural monument Urungach (category III of IUCN, 43 ha, about 145 km to the north of SS Khalka), Dalverzin hunting farm (category VI of IUCN, 5.3 thousand ha, about 38 km to the southeast of SS Khalka and OTHL). Among them, the nearest to the Project area is the Dalverzin hunting farm, which is situated. The Ugam-Chatkal National Park and Ugam-Chatkal Biosphere Reserve are situated about.

Protected areas of the Syrdarya Region: Saykhun wildlife sanctuary (category IV of IUCN, … ha, 17 km to the south of OTHL) and Kalgansyr hunting farm (category VI of IUCN, … ha, 15 km to the north of OTHL).

Protected areas of the Dzhizak Region: Nuratau Nature Reserve (category Ia of IUCN, 17.752 thousand ha, 73 km to the northwest of OTHL), Zaamin Nature Reserve (category Ia of IUCN, 26.84 thousand ha, 65 km to the southeast of OTHL), Zaamin National Park (category II of IUCN, 24.11 thousand ha, 73 km to the southeast of OTHL), Arnasay wildlife sanctuary (category IV of IUCN, 63.3 thousand ha, 33 km to the north of OTHL).

Protected areas of the Samarkand Region: Zeravshan National Park (category II of IUCN, 2.426 thousand ha, 36 km to the east of OTHL), Amankutan National Park (category II of IUCN, 1.5 thousand ha, 33 km to the south of Samarkand 100 MW PV, BESS and Nurobod substation), Kushrabad wildlife sanctuary (category IV of IUCN, 16.5 thousand ha, 45 km to the northwest of OTHL), Nurobod wildlife sanctuary (category IV of IUCN, 40.0 thousand ha, 20 km to the west of 500 and 400 MW PV).

Protected areas of the Bukhara Region: Kyzylkum Nature Reserve (category Ia of IUCN, 10.311 thousand ha, 185 km to the northwest of Karakul substation), natural monument Paykent (category III of IUCN, 30 ha, about 13 km to the northeast of Karakul substation), Dzheyran wildlife nursery (category IV of IUCN, 16.522 thousand ha, 63 km to the east of Karakul substation), Dengizkul wildlife sanctuary (category IV of IUCN, 50.0 thousand ha, 35 km to the south of Karakul substation), Qumsulton wildlife sanctuary (category IV of IUCN, 4.9 thousand ha, 27 km to the east of Karakul substation), Khadicha wildlife sanctuary (category IV of IUCN, 11.3 thousand ha, 53 km to the east of Karakul substation), Qora-qir wildlife sanctuary (category IV of IUCN, 30.0 thousand ha, 87 km to the north of Karakul substation).

The nearest to the Project area is the Muborak wildlife sanctuary (category IV of IUCN, 264.469 thousand ha, Muborak District of Kashkadarya Region) situated in 750 m to the west of 400 MW PV plant.

Desktop data

Anthropogenic (modified) landscapes predominate in the plain part of the study area, except for a few small plots of more or less disturbed natural ecosystems. In piedmonts and low mountains, there are both, natural and anthropogenic landscapes.

The flora and vegetation of Tashkent, Dzhizak and Samarkand Regions are well studied and described in numerous publications, but the plant diversity of the Syrdarya Region is still insufficiently explored. The history of botanical research in this region has about 180 years. A huge amount of herbarium material collected from the Project area during almost two centuries is kept mainly in the National Herbarium of Uzbekistan in Tashkent (TASH), Herbarium of the Komarov Botanical Institute in St. Petersburg (LE), Herbarium of the Lomonosov Moscow State University (MW), and several other largest and oldest herbaria of the world (B, K, GOET, P, etc.).

The first scientific data on landscapes and plant diversity of the Project region have been obtained in the 19th and early 20th Century by European and Russian naturalists who took part in several research missions (A. Lehmann in 1841–1842, N. Severtzov in 1864–1868, A.P. and O.A. Fedtschenko in 1866–1871, P. Capus and G.

Bonvalot in 1881, A. Regel in 1875–1885, V.I. Lipsky in 1887–1903, D. Glazunov in 1892, O.A. and B.A. Fedtschenko in 1897–1915, A.I. Michelson in 1914, M.D. Spiridonov in 1915, etc.). V.I. Lipsky in the book "Flora of Central Asia, i.e. Russian Turkestan and Bukhara and Khiva Khanates" (1902–1905) described in details the history of botanical research for this initial period (with expedition routes). Herbarium collections made by above mentioned pioneers of the study of Central Asian flora laid the basis for our contemporary knowledge on the plant diversity of the Project area.

The earliest publications with the data on plant diversity and landscapes of study area are "A. Lehmanii reliquiane botanicae sive Enumeratio plantarum in itinere per deserta Asiae mediae ab. A. Lehmann annis 1839—1842 collectarum" (Bunge, 1848), "Contribution to the knowledge of flora native to Russia and the steppes of Central Asia" (Bunge, 1852), "Topographic essay of the Zeravshan valley" (Fedtschenko, 1870), "Traveling around the Turkestan region and exploring the mountainous country of the Tien Shan" (Severtzov, 1873), «Fedtschenko's Reisen in Turkestan, 1868–1870» (Fedtschenko, 1874), 24 issues of "Proceedings of the Turkestan expedition" and "List of plants collected in Turkestan in 1869–1871" (Fedtschenko), "Plantes du Turkestan: Mission Capus" (Franchet, 1883), "Materials for Flora of Central Asia" (Lipsky, 1900) and "Mountainous Bukhara" (Lipsky, 1902–1905).

In 1908–1917, the Migration Department of Russian government organized a number of expeditions for investigation of soils and vegetation of Central Asia within the framework of colonization and agricultural development of this region. In the basins of Syrdarya and Zeravshan rivers, these studies were carried out by soil scientist N. Dimo and botanists M.V. Kultiasow, E.P. Korovin and M.G. Popov. The supervisor of botanical studies of these expeditions was B. Fedtschenko, a head botanist of the Imperial Botanical Garden in Saint Petersburg. As a result of these large-scale researches, a huge amount of herbarium was collected, numerous new taxa and a diversity of plant communities were described for the first time, and the first geobotanical maps were compiled. Main results of these expeditions were published in series of reports (Fedtschenko, 1912–1915), 6 volumes of «Conspectus florae Turkestanicae» (Fedtschenko, 1906–1916), a detailed synopsis of the flora of Central Asia with the information on localities, 13 issues of «Flora of Asiatic Russia» (Fedtschenko, 1913–1918), «List of weedy plants of Turkestan» (Fedtschenko, 1915). These preliminary data of the inventory of Central Asian flora became the basis for further botanical studies of the Soviet period.

In 1918, the Turkestan State University was established in Tashkent (it was given a name of Central Asian State University from 1923 to 1960, Tashkent State University in 1960–2000, and National University of Uzbekistan since 2000). Since early 1920s, botanists of the University performed field surveys covering the entire territory of Central Asia (including Project area) and focused mainly on the inventory of the flora, investigation of the vegetation cover and identification of plant resources. The history of botanical studies performed by Central Asian State University in 1920–1945 was described in detail by R.U. Rakhimbekov in the book «From the history of studying of nature of Central Asia» (1970).

In 1927, the Uzbek Pedagogical Institute was established in Samarkand. In 1933 it has been reorganized into the Uzbek State University (since 1961 – Samarkand State University). Professors and students of the Samarkand University carried out numerous field expeditions, collected numerous herbarium specimens and contributed to the accumulation of floristic data. Thus, in 1937–1943, famous Uzbek botanist K.Z. Zakirov, a head of the department of botany of Samarkand State University, performed large-scale research within the entire basin of the river Zeravshan (Uzbekistan and Tajikistan). Later, he published the two-volume monograph "Flora and vegetation of the Zeravshan River basin" (Zakirov, 1955, 1961) which contains a checklist of 2588 plant species recorded for this huge area, with reference to herbarium collections. This book remains one of the basic sources on the flora and vegetation of the Samarkand Region.

In 1930, Zonal Experimental Karakul Breeding Station was organized in Samarkand Region (since 1935 – Uzbek Research Institute of Karakul Breeding and Desert Ecology), with several experimental stations, including Karnabchul. Botanical researches of Institute of Karakul Breeding and Desert Ecology were focused on investigation, rehabilitation and improving of rangelands of arid and semi-arid zones of Central Asia, assessment of seasonal yield of different types of rangelands, detailed study of ecology, biology and nutritional value of desert fodder plants, their selection and introduction, as well as development, testing and implementation of measures to combat desertification (Sovetkina, Korovin, 1941; Shamsutdinov, 1975).

In the 1930–1940s, geobotanical studies (first of all, inventarization of flora and survey of pastures) were also carried out in different regions of Uzbekistan by special expeditions of the Committee of Sciences (which in 1940 was reorganized into the Academy of Sciences of Uzbekistan); the results were used for creation of the first

geobotanical map of Uzbekistan and publication of «Flora of Uzbekistan» (1941–1962, in 6 volumes), which reported 4148 plant species (3663 native, 485 – alien, introduced and cultivated). In 1950–1980, the Institute of Botany of the Academy of Sciences of Uzbekistan carried out large-scale expeditions focused mainly on investigation of the vegetation and plant resources. Results of geobotanical studies were published in the book «Vegetation cover of Uzbekistan and the ways of its practical use» (1971–1984, in 4 volumes).

Main publications of the Soviet period containing data on flora and vegetation of Project area are "Essay on the vegetation of the Pistalitau Mountains" (Kultiasow, 1923), "Plant formations of the Nurata Valley" (Korovin, 1923), "An identification guide of plants of surroundings of Tashkent" (Popov, 1923), "Vegetation of the Khobduntau and Karachatau Mountains" (Kudryashev, 1930), "The vegetation of Nuratau Mountains" (Knorring, 1934), "An identification guide of plants of the Tashkent oasis" (Lapin, 1938, 1941), "Vegetation of Central Asia and South Kazakhstan" (Korovin, 1934, 1961, 1962), "Flora and vegetation of the Zeravshan River basin" (Zakirov, 1955, 1961), "Tugay vegetation of Angren River valley and its peculiarities" (Usmanov, 1953), "An identification guide of wild plants of the Hungry Steppe" (Botschantzev et al., 1961), "Vegetation of the South-Western Kyzylkum" (Granitov, 1964, 1967), "Vegetation of the western part of Turkestan Range and its spurs" (Demurina, 1975), "Medicinal plants of Tashkent Region" (Pulatova et al., 1980), etc. The most important publications of the second half of the 20th Century dedicated to the plant diversity of the Nuratau Mountains are the monographs of P.K. Zakirov "The vegetation cover of Nuratau Mountains" (1969) and "The botanical geography of Nuratau Range and low mountains of Kyzylkum" (1971). These books contain detailed descriptions of the vegetation and a checklist of the flora of the Nuratau Range with 679 species of vascular plants. Later, R.V. Kamelin (1973) added 157 new records to this checklist. A huge volume of herbarium material collected by Uzbek and Russian botanists in Project region during the Soviet period currently is stored in the National Herbarium of Uzbekistan (TASH) and the Herbarium of the Komarov Botanical Institute (LE) in St. Petersburg.

The disintegration of USSR caused dramatic reductions in financing of researches, loss of scientific personnel, the collapse of scientific schools and studies in 1990s. Since early 2000s, the botanical studies in Uzbekistan have been revitalized; several new species have been described and dozens of new records were found from the Project area. It is connected with the start of a number of international projects financed by FAO, ICARDA, UNDP, GEF and other international organizations, as well as with increased government funding of science.

The most important results of botanical research of the post-Soviet period were summarized in following books: "Rangelands of the arid and semi-arid zones in Uzbekistan" (Gintzburger et al., 2003), "Botanical geography of Kazakhstan and Middle Asia" (Rachkovskaya et al., 2003), "Flora of the South-Western Tien Shan (within the Republic of Uzbekistan)" (Tojibaev, 2010), «Plants of Syrdarya Valley» (Sulaymonov et al., 2015), "Botanical geography of Uzbekistan" (Tojibaev et al., 2017), "Flora of Bukhara Oasis" (Esanov, 2019), "Inventory of the flora of Uzbekistan: Samarkand Region" (Tojibaev et al., 2018), "Inventory of the flora of Uzbekistan: Bukhara Region" (Tojibaev et al., 2020)", "Flora of the Dzhizak Province, Uzbekistan" (Tojibaev et al., 2020) and "Inventory of the flora of Uzbekistan: Dzhizak Region" (Tojibaev et al., 2021), in dissertations "Wild food plants of the Tashkent Region" (Umarov, 1992), "Vegetation of the Sanzar River basin" (Tirkasheva, 2011), "Analysis of the flora of Bukhara Oasis" (Esanov, 2017), "Vegetation of the Akhangaran river basin" (Azimov, 2018), and "Ecological and phytocoenotic assessment of vegetation transformation of semi-desert pastures of Uzbekistan (on the example of Karnabchul)" (Rajabov, 2022), as well as numerous papers in scientific journals listed in References.

Fundamental taxonomical treatments, as "Flora of the U.S.S.R." (1934–1964, in 30 volumes) and "Conspectus Florae Asiae Mediae" (1963–2015, in 11 volumes), should also be mentioned among the important sources of information on the plant diversity of the project region. Information about endemic and rare plant species is given in the Red Data Book of Uzbekistan (1984, 1998, 2006, 2009, 2019). Modern online resources, including Plantarium (www.plantarium.ru), iNaturalist (www.inaturalist.org), Global Biodiversity Information Facility, GBIF (www.gbif.org), as well as digital herbaria, also are very important in studying the flora of the region.

Since 2016, the Institute of Botany launched a large-scale project devoted to the publication of the 2nd edition of «Flora of Uzbekistan». Recently published first 4 volumes of the new national "Flora" (2016, 2017, 2019, 2022) contain the treatment of 18 families with 92 genera and 507 species performed to date (11.7% of the national flora); for each species, herbarium specimens are cited and distribution maps based on their georeferencing are given.

Since 2013, the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan performed several scientific projects targeted to the step-by-step inventory of flora of the administrative regions of the Republic of Uzbekistan and compilation of the state cadaster of threatened plants. At the present, the inventory of the flora

of Bukhara, Dzhizak, Kashkadarya, Navoi and Samarkand Regions was completed and published (Tojibaev et al., 2018, 2019, 2020, 2021). The following information for each species is provided: life form, habitat, distribution within the phytogeographical regions, conservation status, and economic use.

Since 2020, the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan performs the state scientific project "Cadaster of the flora of Tashkent region". A regularly updated online check-list of the flora of the Tashkent Region (with a photo gallery) was created on the Plantarium Internet portal. To date, it contains 2260 species of 664 genera and 118 families, including 49 national endemics, 71 nationally and 5 globally red-listed species. Most of endemic and threatened species occur in the mountainous part of Tashkent Region.

According to series of books "Inventory of the flora of Uzbekistan", the flora of Bukhara Region includes 764 species of vascular plants, 25 species are included in the Red Data Book of Uzbekistan. Among them, 546 species are recorded for Lower Zeravshan phytogeographical region (Bukhara Oasis). The check-list of the flora of Samarkand Region includes 1687 species (53 red-listed), among them, 1182 species are reported for Urgut phytogeographical region, 816 species – for Aktau phytogeographical region, 790 species – for Middle Zeravshan region, and 348 species are reported for Karnabchul. The check-list of the flora of Dzhizak Region includes 1991 species (50 red-listed), among them, 1139 species are reported for Nuratau phytogeographical region, 563 – for Aktau phytogeographical region, and 625 – for Mirzachul.

Check-list of the flora of Syrdarya region published by N.O. Sulaymonov, K.K. Kushiev et Kh.F. Shomurodov (Sulaymonov et al., 2015) includes 347 species from 56 families, 4 species of them are listed in the Red Data Book of Uzbekistan.

As for assessments of areas with high biodiversity conservation significance, they have been performed in Uzbekistan within the framework of UNDP-GEF project "Strengthening Sustainability of the National Protected Area System by Focusing on Strictly Protected Areas" and CEPF project "Mountains of Central Asia Biodiversity Hotspot". According to results of the first project published in the "Recommendations for protected areas system development in Uzbekistan" (Ismatov, 2013), 17 sites important for plant diversity were identified within Uzbekistan and recommended for protected areas. The second project has been focused on the assessment of Key Biodiversity Areas within Mountains of Central Asia Global Biodiversity Hotspot using the KBA standards; 36 KBA were identified for Uzbekistan (Mountains of Central Asia Biodiversity Hotspot, 2017).

General conclusion: the study area covers a very large region with heterogeneous flora and vegetation.

3 Materials and methods

The field research on the project area was conducted using the traditional methods of botanical survey commonly used for sampling and mapping of vegetation, recognition of floristic composition and spatial patterns of plant communities (Field geobotany, 1959–1976; Granitov, 1980; Kent, 2011). The field surveys were carried out March 16-17, and April 6-7, and April 20-21, 2024.

Vegetation structure and species composition were described from 50x50 m square geobotanical sample plots (SP) chosen in an area with homogeneous vegetation, representative for the project site and situated away from roads and boundaries between different vegetation communities (coordinates of these boundaries observed during the survey were recorded separately). 21 sample plots were described in total, among them, 5 sample plots were described along the 70 km OHTL, 8 sample plots were described within three solar PV plants, and 1 sample plot was described within Nurobod BESS, Nurobod substation, OHTL 4.9 km, two acess roads each, and 3 sample plots on LILO 11km. The arable lands (and 360 OHTL line) were excluded from the survey as they were described during Autumn 2023.

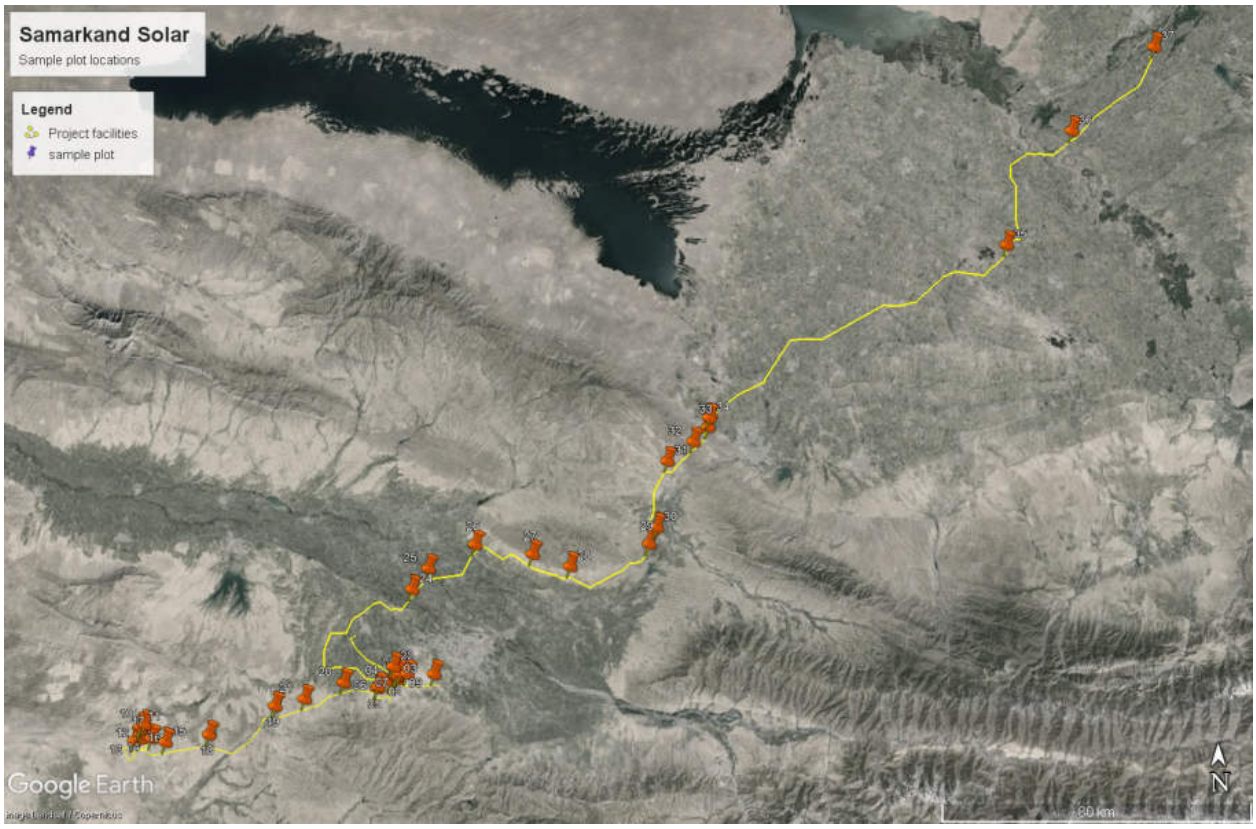


Figure 1: Survey map

For each sample plot, photographs of the landscape and vegetation were taken using a digital camera, and following data were recorded: location and physical environment (including GPS coordinates, elevation, topography, and soil), state of vegetation and disturbance factors (grazing, etc.), plant association, canopy cover (%), canopy height, all plant species present at the plot, their cover and abundance, phenological stage and height. Microcomplexes (e.g. along dry riverbeds) were described separately. Coordinates of populations of endemic, red listed or alien species, number of individuals and area occupied by population also were recorded.

According to the International Code of Phytosociological Nomenclature (2019), plant associations were identified on the basis of composition of dominant species. The vegetation types and formations were classified in accordance with four-volume "Vegetation cover of Uzbekistan" (1971–1984).

Species cover and abundance were determined using the Braun-Blanquet scale (1965) and the DACFOR scale widely used in geobotanical and ecological studies as a rapid visual assessment technique.

Following 6 gradations are distinguished in classical Braun-Blanquet cover-abundance scale:

+ – low number of individuals, coverage less than 1%;

1 – high number of individuals, coverage 1-5%;

2 – number of individuals is high, coverage 5-25%;

3 – any number of individuals, coverage 25-50%;

4 – any number of individuals, 50-75% coverage;

5 – any number of individuals, coverage exceeds 75%.

The DACFOR scale also has 6 gradations of abundance of plants: D – Dominant; A – Abundant, C – Common, F – Frequent, O – Occasional, R – Rare.

Plants recorded during the field survey were identified using special literature (Conspectus Florae Asiae Mediae, 1968-2016; Flora of Uzbekistan, 1941-1963, 2016, 2017, 2019, 2022) and the herbarium collections of the National Herbarium of Uzbekistan (TASH). The accepted scientific names of plant species are given according to the global

taxonomic databases International Plant Names Index (www.ipni.org), Global Biodiversity Information Facility (www.gbif.org) and Plants of the World Online (www.powo.science.kew.org).

Various scientific publications and online databases (Nikitin, 1983; IUCN/ISSG, 2014; CABI, 2017; Sennikov et al., 2018) were used for identification of alien species, while the Red Data Book of Uzbekistan (1984, 1998, 2006, 2009, 2019) and the IUCN Red List (www.iucnredlist.org) were used for identification of threatened species.

It should be noted that currently only 289 taxa of more than 4380 species recorded for the flora of Uzbekistan were assessed by IUCN (6.6% of the flora), 27 species of them were included in the IUCN Red List as threatened (7 – CR, 10 – EN, 10 – VU), 17 of them are redlisted at the national level. 12 plant species were assessed as Near Threatened (NT), 227 – Least Concern (LC), and 23 species belong to the category DD (Data Deficient). The majority of species of the flora of Uzbekistan has not yet been assessed by IUCN and belongs to the category NE (Not Evaluated).

To date, 5 editions of the Red Data Book of Uzbekistan have been published. The first (1984) included 163 plant species, the second (1998) – 301, the third (2006) – 302, the fourth (2009) – 321, and an actual, fifth edition (2019), includes 314 plant species. National categories of threatened plants are follows: 0 (probably extinct species) – corresponds to EX or EW categories of the IUCN Red List (www.iucnredlist.org), 1 (endangered, disappearing species) – meets CR category of IUCN, 2 (rare species) – meets EN category of IUCN and 3 (vulnerable, declining species) – corresponds to VU or NT category of IUCN.

For the purposes of implementation of IFC Performance Standard 6, habitats are divided into modified, natural, and critical. Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Critical habitats are a subset of modified or natural habitats.

As defined by the International Finance Corporation (IFC) Performance Standard 6 (PS6) and EBRD Performance Requirement 6 (PR6), critical habitats are areas with high biodiversity value which meet at least one following criteria:

Criterion 1. Habitat of significant importance to Critically Endangered and/or Endangered species;

Criterion 2. Habitat of significant importance to endemic and/or restricted-range species;

Criterion 3. Habitat supporting globally significant concentrations of migratory species and/or congregatory species;

Criterion 4. Highly threatened and/or unique ecosystems;

Criterion 5. Areas associated with key evolutionary processes.

Numerical thresholds have been defined for the first four critical habitat criteria, based on these published by IUCN in "A Global Standard for the Identification of Key Biodiversity Areas" (2016) and "IUCN Red List Categories and Criteria" (2012). Assessment parameters are: i) number of mature individuals, ii) area of occupancy, iii) extent of suitable habitat, iv) range, v) number of localities, vi) distinct genetic diversity.

According to the IFC Guidance Note 6, quantitative thresholds of critical habitat are following:

Criterion 1. CR/EN species: a) habitat required to sustain at least 10% of global population of CR or EN species, where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species; (b) habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species; (c) habitat supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally important concentrations of a red-listed EN species where that habitat could be considered a discrete management unit for that species/subspecies; (d) habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species; (e) as appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.

Criterion 2. Endemic / restricted range species: (a) habitat known to sustain ≥95% of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that

species (e.g. a single-site endemic); (b) habitat known to sustain ≥1% but <95 % of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgment.

Criterion 3 (migratory species) is inapplicable for plants. As for Criterion 4, unfortunately, the officially approved national list of highly threatened and/or unique ecosystems and habitats does not exist in Uzbekistan. For Criterion 5, there are no numerical thresholds.

QGIS 3.18 free software was used for mapping of habitats and vegetation. The vegetation map was compiled in QGIS by visual interpretation of the satellite image using the field data and a topographical map (1:100.000) of the region.

Since Uzbekistan has not developed the national system of classification of habitats, IUCN Habitats Classification Scheme, ver. 3.1 (https://www.iucnredlist.org/resources/habitat-classification-scheme) was used for the classification of habitats of project area. As far it was applicable to the local conditions, we also followed the pan-European system, EUNIS habitat classification scheme.

Table 1: Sample plots description

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
1	50x50 m^2	500 MW BESS	Nurobod District of Samarkand Region, 2.5 km to the north of the village Sazagan	16/03/2024	39.573505	66.740345	719	modified	modified (Fallow lands)	ephemeroid	grazing, ground roads	40-50	14	0	0
2	50x50 m^2	Nurobod SS	Nurobod District of Samarkand Region, 2.5 km to the north of the village Sazagan	16/03/2024	39.575733	66.745086	720	modified	modified (Fallow lands)	ephemeroid	grazing, ground roads	40-50	18	0	0
3	50x50 m^2	220 kV Overhead Transmission Line	Nurobod District of Samarkand Region, to the south of Nurobod substation	16/03/2024	39.567669	66.743024		modified	modified (Fallow lands)	camel thorn-ephemeroid	grazing, ground roads	40-50	19	0	0
4	50x50 m^2	Access Road	Nurobod District of Samarkand Region, 1.5 km to the northwest of the village Sazagan	16/03/2024	39.563586	66.723789		natural	natural (Dry grassland)	camel thorn-ephemeroid	grazing, pollution with garbage	40-50	20	0	0
5	50x50 m^2	100 MW PV	Nurobod District of Samarkand Region, 2.5 km to the west of the village Sazagan	16/03/2024	39.547369	66.6845	756	modified	modified (Fallow lands)	grass-forb-camel thorn	grazing, ground roads	0-10	36	0	0

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
6	50x50 m^2	100 MW PV	Nurobod District of Samarkand Region, 2.3 km to the west of the village Sazagan, Ettitepa Archeologic Heritage site	16/03/2024	39.550955	66.688282	693	semi-natural	semi-natural (Dry grassland)	forb-ephemeroid	grazing, pollution with garbage, archaeological excavations	60-70	41	0	0
7	50x50 m^2	OTHL Nurobod substation – Sogdiana	Nurobod District of Samarkand Region	16/03/2024	39.580849	66.754212	709	modified	modified (young fruit garden)	camel thorn-ephemeroid + young apple plantation	agriculture	0-10	19	0	0
8	50x50 m^2	OTHL Nurobod substation – Sogdiana	Nurobod District of Samarkand Region, a quarry in the dry bed of the river Tepakulsay	16/03/2024	39.580547	66.77518		modified	modified (quarry)	camel thorn-ephemeroid	gravel and clay extraction, garbage dump	60-70	27	0	0
9	50x50 m^2	OTHL Nurobod substation – Sogdiana	Samarkand District of Samarkand Region, 1.5 km to the north of the village Mehrobod	16/03/2024	39.57993	66.85574		modified	modified (Fruit garden; Boundary-strips, roadsides)	grass-forb-camel thorn + apple plantation	agriculture	60-70	29	0	0
10	50x50 m^2	400 MW PV	Nurobod District of Samarkand Region, 1 km to the west of the village Koshkuduk	16/03/2024	39.459027	65.97769	375	modified	modified (Fallow lands)	camel thorn-ephemeroid	grazing, ground roads	30-40	16	0	0

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
11	50x50 m^2	400 MW PV	Nurobod District of Samarkand Region, 2.7 km to the west of the village Koshkuduk	16/03/2024	39.453977	65.965366	346	natural	natural (Dry grassland)	camel thorn-ephemeroid	grazing, ground roads	30-40	20	0	0
12	50x50 m^2	500 MW PV	Nurobod District of Samarkand Region, 2.5 km to the west of the village Koshkuduk	16/03/2024	39.43708	65.966615	357	modified	modified (Fallow lands)	ephemeroid	grazing, ground roads	20-30	19	0	0
13	50x50 m^2	500 MW PV	Nurobod District of Samarkand Region, 4.6 km to the southwest of the village Koshkuduk	16/03/2024	39.420041	65.94642	366	natural	natural (Dry grassland)	camel thorn-ephemeroid	grazing, ground roads	30-40	20	0	0
14	50x50 m^2	Acces Road to 400 MW PV	Nurobod District of Samarkand Region, 0.3 km to the west of the village Koshkuduk	16/03/2024	39.42679	65.99937	372	modified	modified (Fallow lands)	camel thorn-ephemeroid	grazing, ground roads	0-10	17	0	0
15	50x50 m^2	70 km OTHL	Nurobod District of Samarkand Region, 2.5 km to the south of the village Koshkuduk	16/03/2024	39.418412	66.041455	366	modified	modified (Arable lands with non-irrigated agricultural crops)	ephemeroid-forb-camel thorn	agriculture, ground roads	40-50	20	0	0
16	50x50 m^2	400 MW PV	Nurobod District of Samarkand Region, 2.7 km to the west of the village Koshkuduk	06/04/2024	39.447806	65.966744	345	natural	natural (Dry grassland)	harmel-ephemeroid	grazing, ground roads	50-60	22	0	0

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
17	50x50 m^2	500 MW PV	Nurobod District of Samarkand Region, 3 km to the west of the village Koshkuduk	06/04/2024	39.42562	65.96582	346	natural	natural (Dry grassland)	camel thorn-ephemeroid	grazing, ground roads	60-70	23	0	0
18	50x50 m^2	70 km OTHL	Nurobod District of Samarkand Region, 3 km to the south of the village Urtabuz	06/04/2024	39.56149	66.174337	482	natural +modified	natural (Dry grassland) + modified (Arable lands with non-irrigated agricultural crops)	camel thorn-ephemeroid	grazing, ground roads, agriculture	50-60	30	0	0
19	50x50 m^2	70 km OTHL	Nurobod District of Samarkand Region, bank of the canal Eski Anhor	06/04/2024	39.507245	66.40238	660	natural +modified	natural (Dry grassland) + modified (Canal)	camel thorn-ephemeroid	grazing, ground roads, canal	70-80	39	0	0
20	50x50 m^2	70 km OTHL	Pastdargom District of Samarkand Region, 2 km to the south of village Khancharvak	06/04/2024	39.560228	66.5832	707	modified	modified (Fruit garden; Boundary-strips, roadsides)	grass-forb-camel thorn + apple plantation	horticulture, grazing, road	40-50	29	0	0
21	50x50 m^2	70 km OTHL	Nurobod District of Samarkand Region, 2.5 km to the northwest of the village Sarikul	06/04/2024	39.52184	66.464766	682	modified	modified (Arable lands with non-irrigated agricultural crops; Boundary-strips, roadsides)	wheat fields+weedy community	agriculture	50-60	32	0	0
22	50x50 m^2	360 km OTHL	Past Dargom District of Samarkand Region, canal Eski Anhor	20/04/2024	39.597503	66.733704		modified	modified (Arable lands with irrigated agricultural crops; Boundary-strips, roadsides; Canals and	reeds and camel thorn-forb-grass community	grazing, ground roads, agriculture	40-50	39	0	0

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
									drainage channels)						
23	50x50 m^2	360 km OTHL	Pastdargom District of Samarkand Region, 5 km to the north of the village Sazagan	20/04/2024	39.57993	66.85574	718	modified	modified (Boundary-strips, roadsides)	apple garden and camel thorn-grass community on boundary-strips	grazing, ground roads, agriculture	30-40	32	0	0
24	50x50 m^2	360 km OTHL	Akdarya District of Samarkand Region, 1.5 km to the southwest of the village Khadzhi, right bank of the river Karadarya (left branch of the river Zeravshan)	20/04/2024	39.77646	66.79124	604	natural	natural (Riparian scrub)	Riparian scrub	grazing, gravel mining	80-90	70	0	0
25	50x50 m^2	360 km OTHL	Akdarya District of Samarkand Region, irrigated arable lands, boundary-strips and woodland belts near the village Kumushkent	20/04/2024	39.824868	66.84101	635	modified	modified Arable lands with irrigated agricultural crops; Woodland belts; Boundary-strips, roadsides; Canals and drainage channels)	camel thorn-grass community on boundary-strips	grazing, ground roads, agriculture	70-80	38	0	0
26	50x50 m^2	360 km OTHL	Dzhambay District of Samarkand Region, small irrigated arable lands and woodland belts,	20/04/2024	39.87971	66.98251	645	modified	modified (Arable lands with irrigated agricultural crops; Woodland	camel thorn-grass community on	grazing, ground roads, agriculture	80-90	56	0	0

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
			between the village Dauchar and canal Payaryk						belts; Boundary-strips, roadsides; Canals and drainage channels)	boundary-strips					
27	50x50 m^2	360 km OTHL	Dzhambay District of Samarkand Region, southern piedmonts of Khobduntau Range, 3.5 km to the northeast of the village Qongirot	20/04/2024	39.85665	67.15567	775	modified	modified (dry ravine among apple gardens, rainfed arable lands and fallow lands)	camel thorn-grass community on boundary-strips	grazing, ground roads	15-20	36	0	0
28	50x50 m^2	360 km OTHL	Bulungur District of Samarkand Region, southern piedmonts of Khobduntau Range, 3 km to the north of the village Gatcha	21/04/2024	39.82803	67.26876	800	modified	modified (rainfed arable lands and fallow lands)	camel thorn-grass community + cultural crops	grazing, agricultu re	20-30	51	0	0
29	50x50 m^2	360 km OTHL	Bakhmal District of Dzhizak Region, western piedmonts of Turkestan Range, surroundings of the village Khonimkorgon	21/04/2024	39.877729	67.507534	830	modified	modified (Apple garden, road belts; Boundary-strips, roadsides)	camel thorn-grass community + cultural crops	grazing, agricultu re	40-50	44	0	0
30	50x50 m^2	360 km OTHL	Bakhmal District of Dzhizak Region, western piedmonts of Turkestan Range, surroundings of the village Gallakor	21/04/2024	39.915786	67.530745	630	modified	modified (rainfed arable lands)	cultural crops	agricultu re	30-40	30	0	0
31	50x50 m^2	360 km OTHL	Gallaral District of Dzhizak Region, between town Gallaaral and village Karakchi	21/04/2024	40.06872	67.56588	600	modified	modified (woodland belt and rainfed arable lands)	camel thorn-grass community + cultural crops	grazing, agricultu re	40-50	52	0	0

SP No.	Shape and size	Project site	Location	Date	Latitude, N	Longitude, E	Elevation, m.s.l.	habitat type	Habitat	Vegetation	Impact factors	Canopy cover, %	Number of species	IUCN	Uzb Red list
32	50x50 m^2	360 km OTHL	Gallaral District of Dzhizak Region, southern slope of Nuratau Range	21/04/2024	40.112765	67.64559	590	natural	natural (intensively grazed foothills)	native camel thorn-ephemeroid vegetation	grazing	80-90	30	0	0
33	50x50 m^2	360 km OTHL	Sharaf Rashidov District of Dzhizak Region, 3 km to the south of the village Kuyovboshi, northern slope of Nuratau Range	21/04/2024	40.1459	67.69066	773	natural	natural (Xerophytic shrubland)	sagebrush-forb-grass-spiny almond community	grazing	80-90	41	0	0
34	50x50 m^2	360 km OTHL	Sharaf Rashidov District of Dzhizak Region, 1.5 km to the west of the village Kuyovboshi	21/04/2024	40.16754	67.694	705	natural	natural (Dry grassland)	caper-ephemeroid-sagebrush community	grazing	20-30	36	0	0
35	50x50 m^2	360 km OTHL	Mirzaabad District of Syrdarya Region, drainage channel	21/04/2024	40.5548	68.61285	280	modified	modified (Boundary-strips, roadsides; Canals and drainage channels)	camel thorn-reed-liquorice community, between irrigated arable lands and highway	grazing, agriculture, road	80-90	58	0	0
36	50x50 m^2	360 km OTHL	Syrdarya District of Syrdarya Region, left bank of Syrdarya River	21/04/2024	40.81739	68.82465	261	natural	natural (Riparian scrub)	Riparian scrub	grazing, agriculture	60-70	65	0	0
37	50x50 m^2	360 km OTHL	Quyi Chirchiq District of Tashkent Region, 3 km to the south of SS Khalka	21/04/2024	41.00937	69.089368	320	modified	modified (banks of canal, woodland belts, roadsides and boundary-strips between irrigated arable lands)	camel thorn-grass community + cultural crops	grazing, agriculture	80-90	62	0	0

4 Habitat Assessment

According to IUCN Habitats Classification Scheme and EUNIS habitat classification, following habitats can be identified in the project area.

4.1 100 MW PV plant and access road 70 m

Two types of modified habitats are represented within 100 MW PV plant area (Figure 2):

Arable lands with agricultural crops. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, and represented with a subtype V1 Arable land and market gardens (V11 Intensive unmixed crops). Wihin 100 MW PV plant area and its surroundings, this habitat is represented with rainfed arable lands used under wheat (*Triticum aestivum*), barley (*Hordeum vulgare*) and safflower (*Carthamus tinctorius*).

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned irrigated or rainfed arable lands are occupied with communities of grasses (*Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Hordeum spontaneum*, *Cynodon dactylon, Elymus repens, Poa bulbosa*), annual and perennial weeds (*Artemisia annua, A. scoparia*, *Atriplex micrantha, Capsella bursa-pastoris, Descurainia sophia*, *Centaurea iberica*, *C. solstitialis*, *Cirsium vulgare*, *Carthamus oxyacanthus*, *Echinophora sibthorpiana*, *Lepidium latifolium*, *Xanthium spinosum, X. strumarium*, etc.), saltworts (*Caroxylon dendroides, Suaeda altissima*), caper (*Capparis spinosa*) and camel thorn (*Alhagi pseudalhagi*). The species composition and abundance, and density of canopy cover very much varies on different areas depending of soil type, level of salinization, humidity and other local conditions.

Two types of modified habitats are represented within access road: Fallow lands and woodland belts, boundary-strips, roadsides (Figure 2).

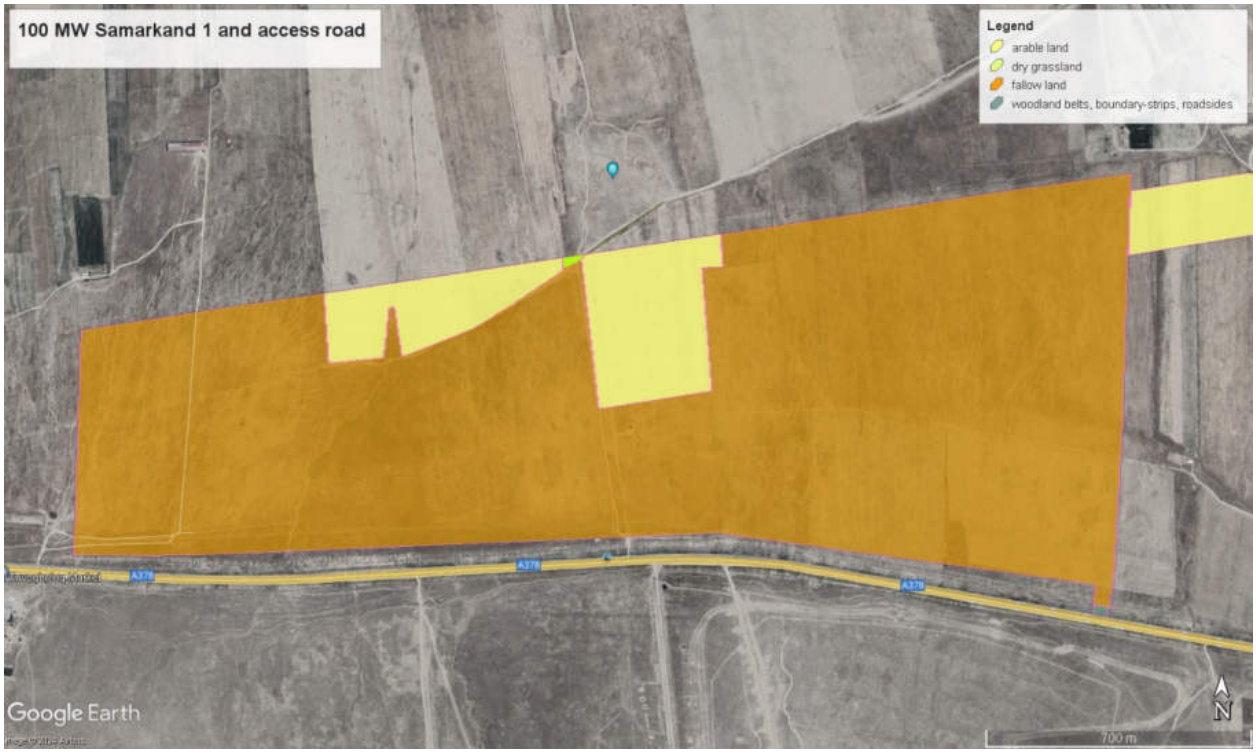


Figure 2: Habitat types 100 MW Samarkand 1 and access road

4.2 500/220KV Nurabad substation

One type of modified habitats is represented within Nurabad substation – Fallow land (Figure 3).

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-camel thorn community (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary harmel (*Peganum harmala*) and *Cousinia resinosa*. Plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-20%). Both plots currently are used by local people as pasture.

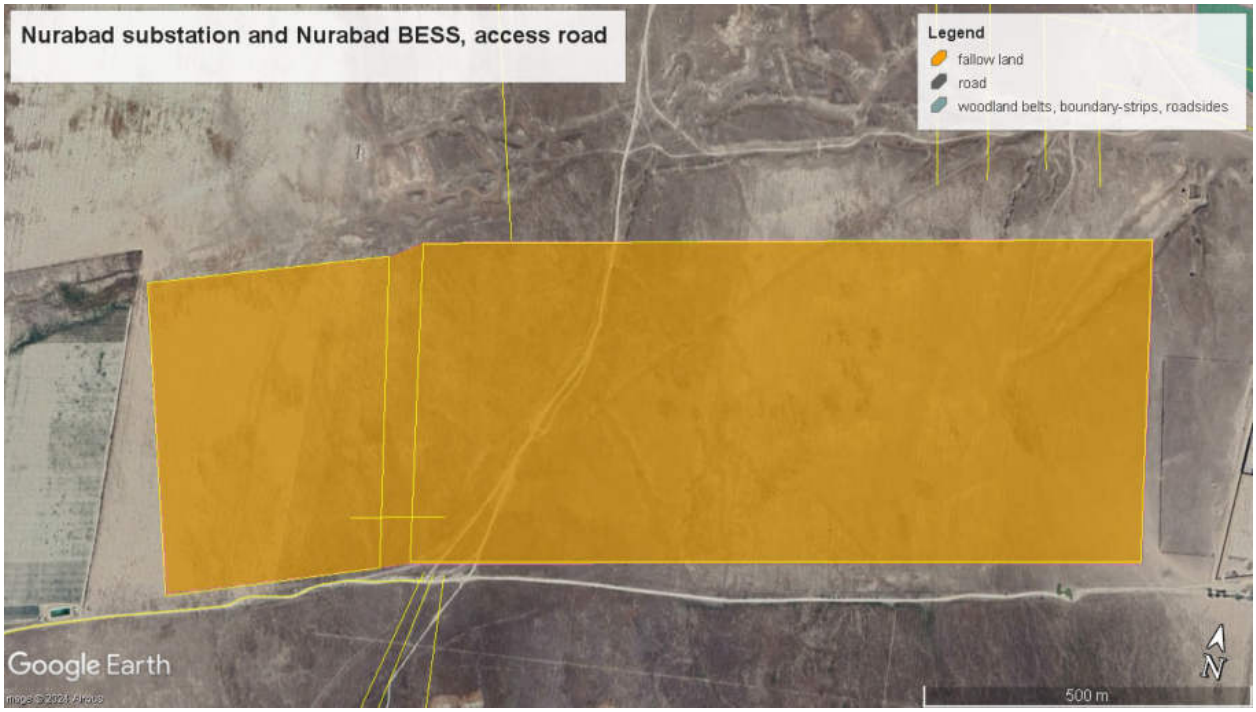


Figure 3: Habitat types — Nurabad BESS (left polygon) and Nurabad Substation (right polygon), and interconnection cable

4.3 Nurabad 500 MW BESS

One type of modified habitats is represented within Nurabad BESS – Fallow land (Figure 3).

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-camel thorn community (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary harmel (*Peganum harmala*) and *Cousinia resinosa*. Plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-20%). Both plots currently are used by local people as pasture.

12) Solar 400 MW PV plant, pooling station and access road 696 m

4.4 Solar 400 MW PV plant, pooling station and access road 696 m

One type of modified habitats and one type of natural habitats are represented within 400 MW PV plant (Figure 4). The site currently is used by local people as pasture.

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-harmel-camel thorn (*Alhagi pseudalhagi subsp. kirghisorum, Peganum harmala, Poa bulbosa*) and bluegrass-camel thorn communities (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary *Cousinia resinosa*.

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat occurs between the abandoned fields and occupies unploughed areas with rugged terrain along dry beds of temporary streams. The vegetation the same as mentioned above, bluegrass-harmel-camel thorn (*Alhagi pseudalhagi subsp. kirghisorum, Peganum harmala, Poa bulbosa*) and bluegrass-camel thorn communities (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary *Cousinia resinosa*.

Whithin fallow lands and on unploughed areas both, plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-30%). These two types of habitats practically do not differ from each other in the character of the landscape and vegetation, except for the weakly visible contours of fields and furrows on the fallow lands.

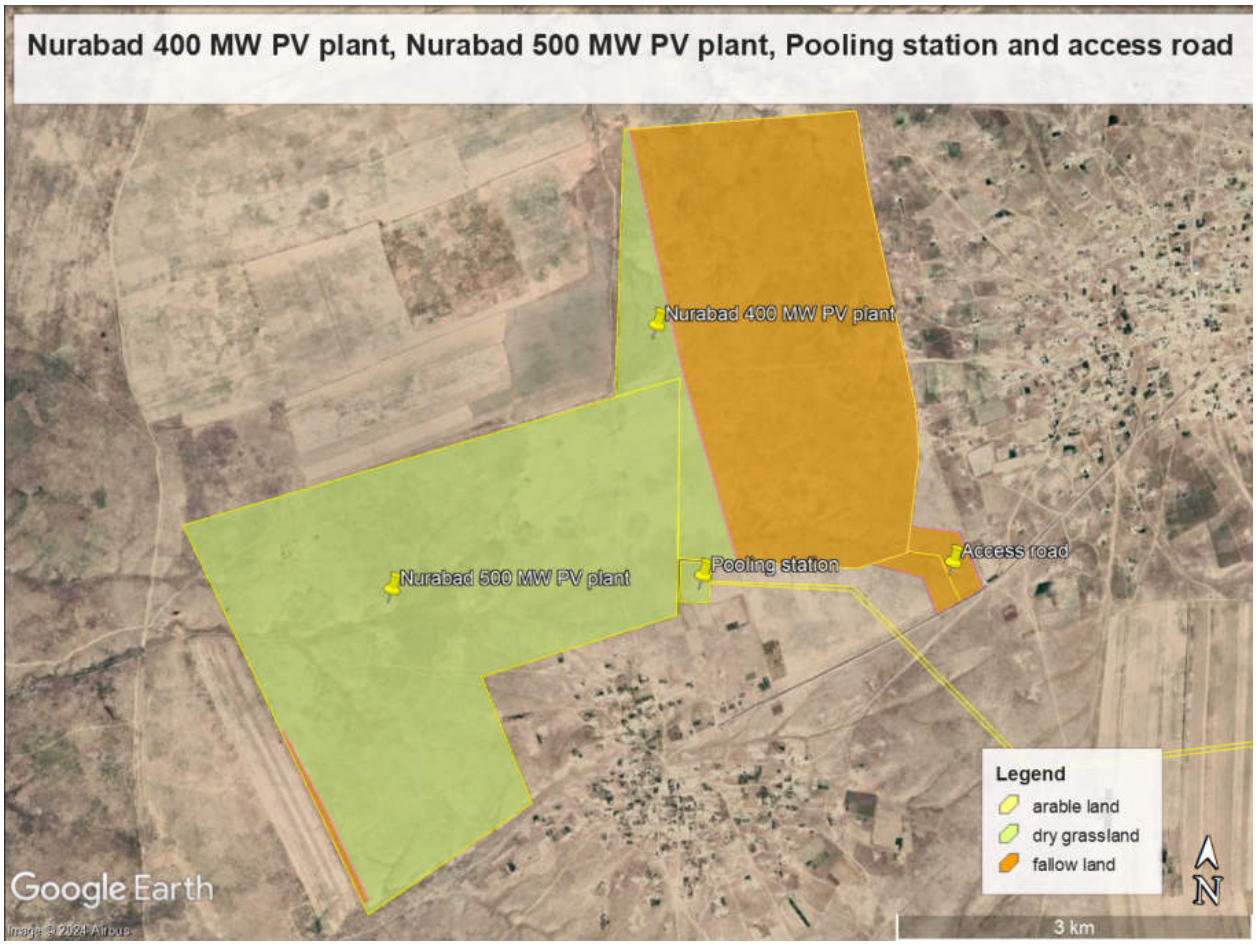


Figure 4: Habitat types — 400 MW PV, 500 MW PV, pooling station, access road 696 m

One type of natural habitats is represented within pooling station m (Figure 4).

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat occurs between the abandoned fields and occupies unploughed areas with rugged terrain along dry beds of temporary streams. The vegetation the same as mentioned above, bluegrass-harmel-camel thorn (*Alhagi pseudalhagi subsp. kirghisorum, Peganum harmala, Poa bulbosa*) and bluegrass-camel thorn communities (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary *Cousinia resinosa*.

One type of modified habitats is represented within access road 696 m (Figure 4).

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-harmel-camel thorn (*Alhagi pseudalhagi subsp. kirghisorum, Peganum harmala, Poa bulbosa*) and bluegrass-camel thorn communities (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary *Cousinia resinosa*.

4.5 Solar 500 MW PV plant

One type of modified habitats and one type of natural habitats are represented within 500 MW PV plant (Figure 4). The site currently is used by local people as pasture.

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-harmel-camel thorn (*Alhagi pseudalhagi subsp. kirghisorum, Peganum harmala, Poa bulbosa*) and bluegrass-camel thorn communities (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary *Cousinia resinosa*.

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat occurs between the abandoned fields and occupies unploughed areas with rugged terrain along dry beds of temporary streams. The vegetation the same as mentioned above, bluegrass-harmel-camel thorn (*Alhagi pseudalhagi subsp. kirghisorum, Peganum harmala, Poa bulbosa*) and bluegrass-camel thorn communities (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary *Cousinia resinosa*.

Whithin fallow lands and on unploughed areas both, plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-30%). These two types of habitats practically do not differ from each other in the character of the landscape and vegetation, except for the weakly visible contours of fields and furrows on the fallow lands.

4.6 Karakul BESS

One type of habitats is represented within the BESS site (Figure 5):

Sandy desert with psammophilous scrub. The BESS site is located at the edge of natural habitat of South-western Kyzylkum with white saxaul growth (*Haloxylon persicum*) on shallow wavy fixed sands, and modified habitats of Bukhara Oasis (garbage dump and construction site). It can be classified as IUCN habitat type 8 Desert and subtype 8.2 Temperate Desert. According to EUNIS habitat classification, this habitat more or less corresponds to type S Heathland, scrub and tundra and subtype S68 Semi-desert sand dune with sparse scrub. The level of degradation is high, construction machinery is actively working on this site, and the natural ecosystem has already been destroyed on about half of the territory.

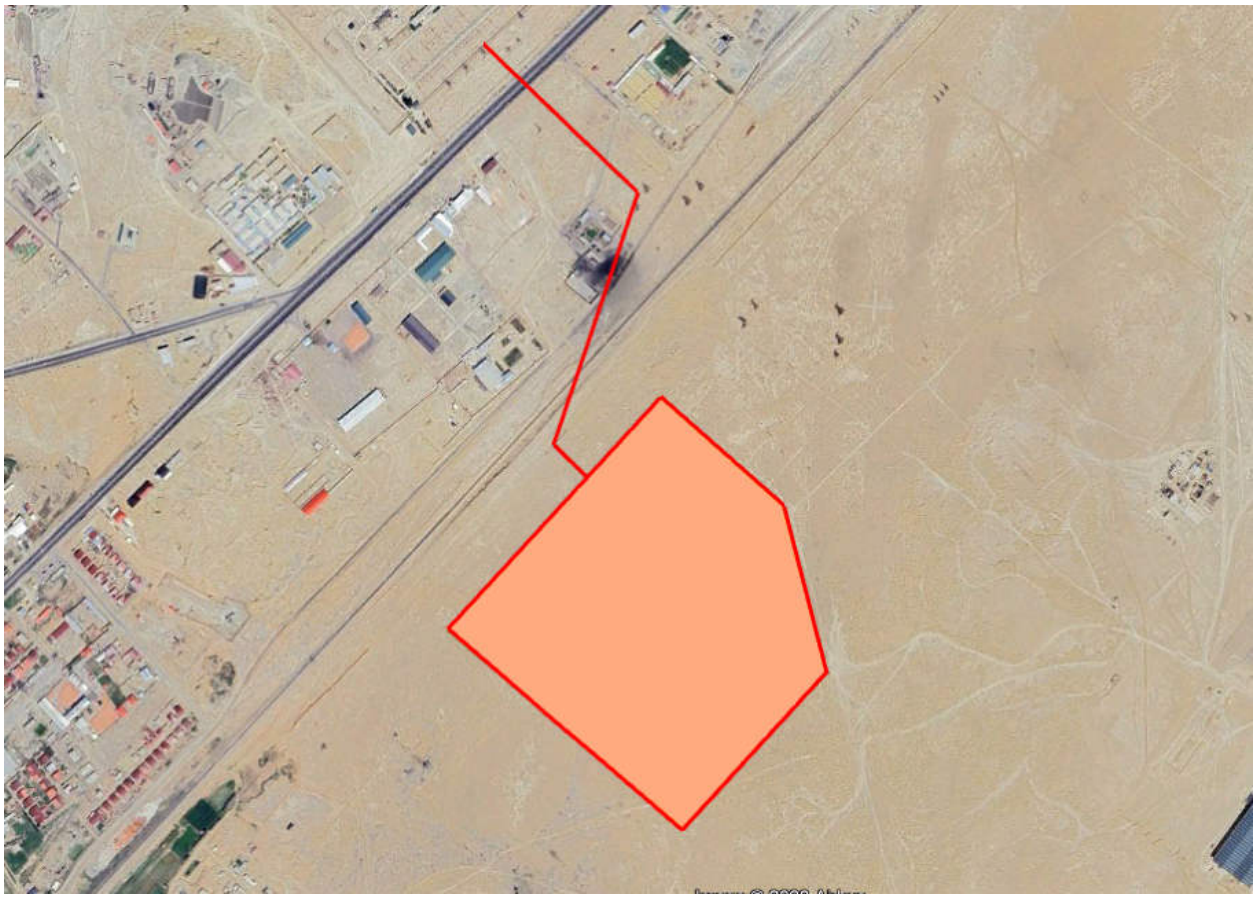


Figure 5: Habitat types- Karakul BESS (1 habitat - Sandy desert with psammophilous scrub)

4.7 Khalka substation and 360 km OHTL (Figure 6)

Khalka substation

Arable lands with agricultural crops. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and represented with a subtype V1 Arable land and market gardens (V11 Intensive unmixed crops). At the present, irrigated arable lands within the SS Khalka area are used under cotton (*Gossypium hirsutum*). This habitat type occupies almost all territory of the SS Khalka (about 29 of 32.6 ha).

Woodland belts, boundary-strips, roadsides, canals and drainage channels. This habitat type occupies a narrow stips (10–20 m in width) between the fields. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and represented with a complex of subtypes V64 Lines of planted trees, V39 Mesic perennial anthropogenic herbaceous vegetation and R31 Mediterranean tall humid inland grassland. Woodland belts are composed of mulberry (*Morus alba*), poplar (*Populus alba, P. afghanica*), elm (*Ulmus sp.*), oleaster (*Elaeagnus angustifolia*), apple (*Malus domestica*), apricot (*Prunus armeniaca*), and other native and non-native trees. Banks of irrigation and drainage canals are occupied with oleaster (*Elaeagnus angustifolia*), reed (*Phragmites australis*), cattail (*Typha sp.*), liquorice (*Glycyrrhiza glabra*), camel thorn (*Alhagi pseudalhagi*), other mesophytic and hydrophytic plants typical for natural wetlands (*Clematis orientalis, Cynanchum sibiricum, Equisetum arvense, Mentha longifolia var. asiatica, Epilobium hirsutum*, etc.), as well as with weeds (*Artemisia annua, A. tournefortiana, Cichorium intybus, Cynodon dactylon, Paspalum distichum, Rhaponticum repens, Imperata cylindrica, Xanthium strumarium, etc.*). Between the fields, there are boundary-strips with ruderal vegetation represented by communities of annual and perennial grasses (*Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Hordeum spontaneum*, *Cynodon dactylon, Elymus repens,*

Poa bulbosa), weeds (*Atriplex micrantha*, *Centaurea iberica*, *Cirsium vulgare*, *Lepidium latifolium*, *Xanthium spinosum, X. strumarium,* etc.), and camel thorn (*Alhagi pseudalhagi*).

Both types are modified habitats. Threatened plants included in the global or national Red lists were not found during the field survey.

360 km OHTL

Modified habitats are represented with 4 types:

Arable lands with agricultural crops. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and represented with a subtype V1 Arable land and market gardens (V11 Intensive unmixed crops, on some areas with V14 Inundated or inundatable croplands, including rice fields). This habitat type can be divided into 2 subtypes – Irrigated arable lands, and Non-irrigated (rainfed) arable lands. At the present, irrigated arable lands along the OTHL are used under cotton (*Gossypium hirsutum*), wheat (*Triticum aestivum*), alfalfa (*Medicago sativa*), corn (*Zea mays*), rice (*Oryza sativa*), potatoes (*Solanum tuberosum*) and other vegetables. This habitat type prevail along the OTHL line within Tashkent and Syrdarya Regions, Dustlik and Pakhtakor Districts of Dzhizak Region, and Jomboy, Payariq, Akdarya, Pastdargom and Nurabad Districts of Samarkand Region. Rice fields are situated on some areas in Syrdarya Region. Rainfed (non-irrigated) arable lands along the OTHL are used under wheat (*Triticum aestivum*), barley (*Hordeum vulgare*), and safflower (*Carthamus tinctorius*). Rainfed croplands are situated along the OTHL line on some areas of Gallaaral District of Dzhizak Region and Bulungur District of Samarkand Region.

Fruit gardens and vineyards. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.3 Plantations and 14.4 Rural Gardens. According EUNIS classification, it belongs to habitat type V – Vegetated man-made habitats and subtypes V5 Shrub plantations (V54 Vineyards) and V6 Tree dominated man-made habitats (V61 Broadleaved fruit and nut tree orchards). This habitat is represented with plantations of fruit trees, including apple (*Malus domestica*), apricot (*Prunus armeniaca*), cherry (*Prunus avium, Prunus cerasus*), peach (*Prunus persica*), and grapevine (*Vitis vinifera*). Alfalfa (*Medicago sativa*) and different vegetables (*Solanum tuberosum, Lycopersicon esculentum, Allium cepa*, etc.) usually are planted between the rows of fruit trees; wild grasses and weeds grow along the ditches and margins of the gardens and vineyards. Along the OTHL this habitat type is represented mainly with fruit gardens, while vineyards are situated on some areas in Samarkand Region.

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned irrigated or rainfed arable lands are occupied with secondary communities with domination of grasses (*Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Hordeum spontaneum*, *Cynodon dactylon, Elymus repens, Poa bulbosa*), annual and perennial weeds (*Artemisia annua, A. scoparia*, *Atriplex micrantha, Capsella bursa-pastoris, Descurainia sophia*, *Centaurea belangeriana, C. iberica*, *C. solstitialis*, *Cirsium vulgare*, *Carthamus oxyacanthus*, *Echinophora sibthorpiana*, *Eryngium caeruleum*, *Lepidium latifolium*, *Xanthium spinosum, X. strumarium*, etc.), ephemeral dicots (*Papaver pavoninum, Roemeria refracta*, annual species of *Astragalus*, etc.), saltworts (*Suaeda altissima, Climacoptera sp., Halocharis hispida, Ceratocarpus arenarius*), caper (*Capparis spinosa*), camel thorn (*Alhagi pseudalhagi*) and other forbs. Secondary ephemeral and forb-ephemeral plant communities developing on abandoned fields represent different stages of succession. The species composition and abundance, and density of canopy cover very much varies on different areas depending of fallow land “age”, soil type, level of salinization, humidity and other local conditions. These parameters also vary greatly in different years depending on meteorological conditions.

On satellite images, fallow lands are easily identified by the regular contours of the former fields, lined with former channels and parallel furrows. These these signs of former plowing are usually clearly during the field survey, although the vegetation communities on old fallow landss almost does not differ from the native vegetation. Currently, these lands are used by local people mainly as a pasture.

Woodland belts, boundary-strips, roadsides, canals and drainage channels. This habitat type occupies a narrow stips (10–20 m in width) between the fields. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and represented with a complex of 3 subtypes V64 Lines of planted trees (Woodland belts along the roads, railway and between the fields), V38 Dry perennial anthropogenic herbaceous vegetation (Boundary-strips and roadsides) and V39 Mesic perennial anthropogenic herbaceous vegetation (banks of canals and drainage channels). These subtypes are often difficult to distinguish on a map as a separate polygons because of their mosaic and small scale.

Woodland belts are composed of mulberry (*Morus alba*), poplar (*Populus alba, P. afghanica*), elm (*Ulmus sp.*), oriental plane-tree (Platanus orientalis), redcedar (*Juniperus virginiana*), China-sumac (*Ailanthus altissima*), oleaster (*Elaeagnus angustifolia*), apple (*Malus domestica*), apricot (*Prunus armeniaca*), and other native and non-native trees. Banks of irrigation canals and drainage canals are occupied with oleaster (*Elaeagnus angustifolia*), tamarisk (*Tamarix sp.*), reed (*Phragmites australis*), cattail (*Typha sp.*), liquorice (*Glycyrrhiza glabra*), camel thorn (*Alhagi pseudalhagi*), other mesophytic, and hydrophytic plants typical for natural wetlands (*Clematis orientalis, Cynanchum sibiricum, Equisetum arvense, Mentha longifolia var. asiatica, Epilobium hirsutum*, etc.), as well as with mesophytic weeds (*Artemisia annua, A. tournefortiana, Paspalum distichum, Rhaponticum repens, Imperata cylindrica, Xanthium strumarium, etc.*). Dry boundary-strips and roadsides are occupied by communities meso-xerophytic and xerophytic annual and perennial grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Hordeum spontaneum*, *Cynodon dactylon, Poa bulbosa),* weeds (*Centaurea iberica*, *C. solstitialis*, *Xanthium spinosum,* etc.), caper (*Capparis spinosa*), camel thorn (*Alhagi pseudalhagi*), saltworts and annuals (*Papaver pavoninum, Roemeria refracta*, *Astragalus filicaulis, Trigonella geminiflora*, etc.). The species composition and abundance, and density of canopy cover very much varies on different areas depending of soil type, level of salinization, humidity and other local conditions. Within the Syrdarya Region where the soils are more or less saline, annual and perennial saltworts (*Suaeda altissima, Climacoptera sp., Halocharis hispida, Halostachys caspica*) and other halophytic and halomesophytic plants (*Aeluropus littoralis, Limonium otolepis, Cressa cretica*, etc.) are common for this habitat type.

Natural and semi-natural habitats are represented with 4 types:

Xerophytic shrublands. IUCN habitat type 3 Shrubland, subtype 3.8 Mediterranean-type shrubby vegetation. According to EUNIS habitat classification, this habitat more or less corresponds to type S Heathland, scrub and tundra, and subtype S35 Temperate and submediterranean thorn scrub. Along the OTHL, this habitat is represented only on the steep stony slopes of Nuratau Ridge and occupies a small area (about 5–6 hectares in total). The vegetation is represented with sparse communities of spiny almond (*Prunus (Amygdalus) spinosissima*), a thorny shrub 1–1.5 m tall. The herbage is dominated by sagebrush (*Artemisia sogdiana*), ephemeroids (*Poa bulbosa, Carex pachystylis*), wheatgrass (*Thinopyrum intermedium*), annual grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus tectorum*, *Taeniatherum caput-medusae*), forbs and ephemers. Canopy cover is 20-40%. The formation of spiny almond belongs to the type of xerophytic open woodlands and shrubs (Xerodendra, or so-called “shibljak”) widely spread in foothills and lower montane zone of Central Asia and composed of deciduous, small-leaved, drought-resistant shrubs and small trees, mostly species of genera Prunus, Crataegus, Acer, Pistacia and Rosa. As noted in literature (Zakirov, 1969, 1971; Vegetation cover of Uzbekistan, 1971–1984), on the Nuratau Ridge, communities of xerophytic shrubs are distributed from 500-600 to 1800-1900 m s.l. In the foothills, spiny almond has environment-forming role, and serve as a habitat to many species of animals. Xerophytic shrublands are sensitive for cutting and overgrazing. Due to long-term anthropogenic press, shrublands currently are mostly confined to steep stony slopes. As a result of the extermination of shrubs, sagebrush and other and subshrubs, this type of vegetation is replaced by secondary ephemeral communities, which can lead to erosion of steep slopes, deflation, mudflows, droughts and further desertification.

One endemic species included in the Red Data Book of Uzbekistan with the status 3 was recorded during the field survey – *Phlomis thapsoides*. It is narrow endemic to Nuratau Mountains and national endemic of Uzbekistan.

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat is represented in piedmonts and foothills of Nuratau and

Khobduntau ridges and occupies rather small area. The vegetation is represented with ephemeroid-sagebrush, Phlomis-ephemeroid and forb-grass communities with domination of sagebrush (*Artemisia sogdiana*), ephemeroids (*Poa bulbosa, Carex pachystylis*), annual grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus tectorum*, *Hordeum murinum* subsp. *leporinum*, *Taeniatherum caput-medusae*), camel thorn (*Alhagi pseudalhagi* subsp. *kirghisorum*), caper (*Capparis spinosa*), and other xerophytic forbs (*Phlomis thapsoides, Cousinia resinosa, Cullen drupaceum*), which belong to the types of xerophytic subshrubs (Xerohemithamna) and ephemeral-ephemeroid vegetation (*Agrillophyta, or Ephemerophyta*), widely spread on light, typical and dark serozem soils (Calcic xerosols) on piedmont plains and foothills of Uzbekistan. This is moderately to strongly degraded natural habitat, used mainly as pasture. The abundance of spiny forbs (*Alhagi pseudalhagi* subsp. *kirghisorum, Capparis spinosa, Cousinia resinosa,* species of *Carthamus* and *Centaurea, Eryngium caeruleum*), harmel (*Peganum harmala*) and *Cullen drupaceum* indicates that the level of degradation of this habitat is rather high, which is connected with overgrazing. Canopy cover on most areas is sparse (10–30%). Threatened plants included in the global or national Red lists were not found during the field survey.

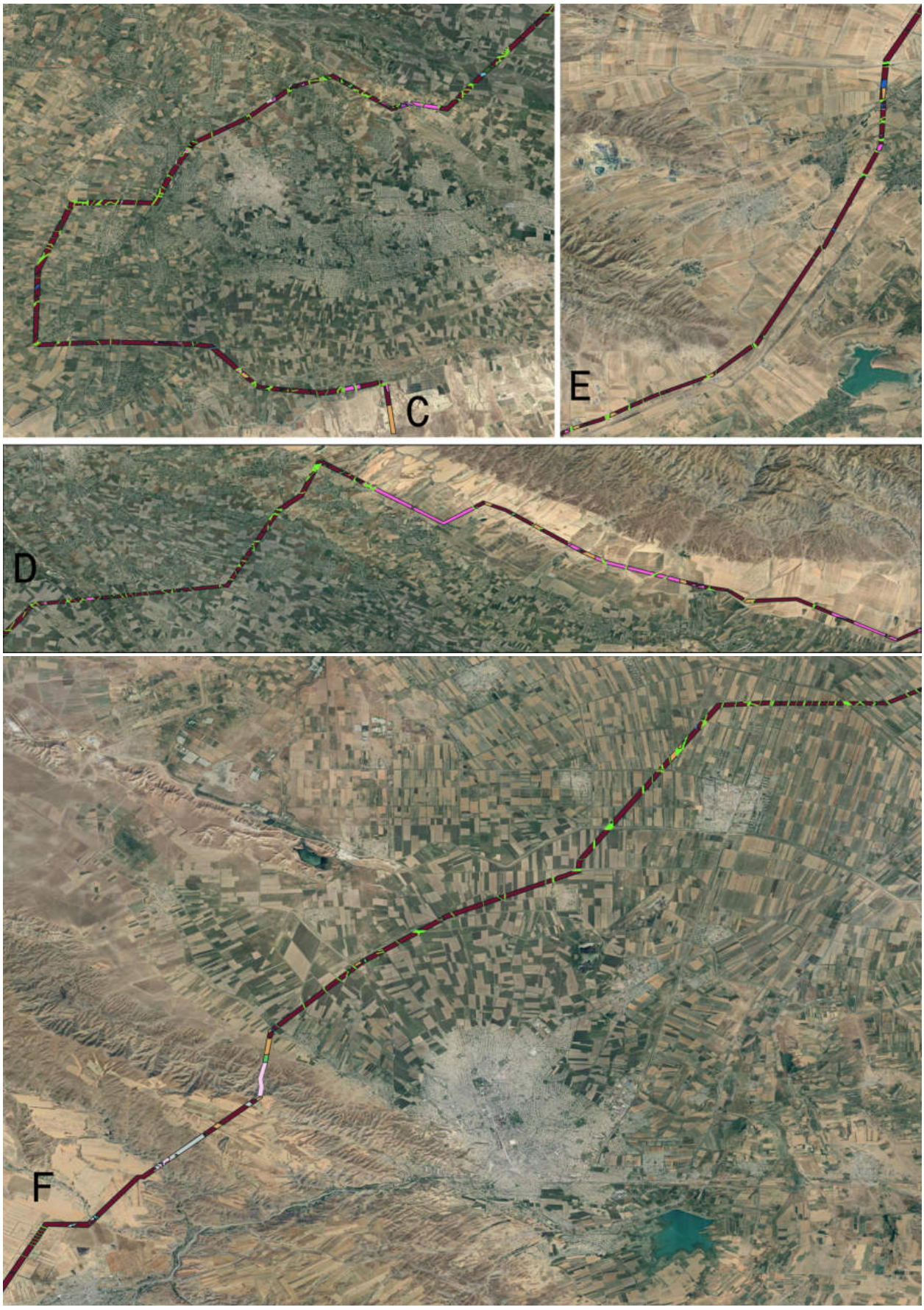
Wet grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R3 Seasonally wet and wet grasslands. This habitat is represented on very small areas along valleys of temporary streams and near springs. The vegetation is represented with intensively grazed dense green swards formed by Cynodon dactylon, Trifolium fragiferum, T. repens, Plantago major, P. lanceolata, Paspalum distichum, Juncus sp., etc., and ruderal weeds (Centaurea iberica, Xanthium spinosum).

Riparian scrub. IUCN habitat type 5 Wetlands (inland), subtype 5.3 Shrub dominated wetlands. Corresponds with EUNIS habitat type S Heathland, scrub and tundra and subtype S9 Riverine and fen scrubs (S9314 Irano-Turanian tamarisk thickets). In accordance with the classification of the vegetation of Uzbekistan, riparian scrub also belong to the type Potamophyta (tugay vegetation). This habitat occupies a strip up to 200-300 m in width along the banks of the rivers Syrdarya and Zeravshan, and narrow strips along some large canals. There are rather dense stands of tamarisk (*Tamarix arceuthoides, T.hispida, T.hohenackeri, T.ramosissima*), other halomesophytic shrubs, as wolfberry (*Lycium dasystemum)* and salt tree (*Caragana (Halimodendron) halodendron*), and solitary trees of poplars (*Populus euphratica, P. pruinosa*) and oleaster or Russian olive (*Elaeagnus angustifolia*). The density of tamarisk stands is up to 70-80%. The herbage is composed of reeds (*Phragmites australis*), camel thorn (*Alhagi pseudalhagi*), liquorice (*Glycyrrhiza glabra*) and other mesophytic, halophytic and hydrophytic plants typical for this vegetation type (*Aeluropus littoralis, Clematis orientalis, Cynanchum acutum ssp. sibiricum*, *Karelinia caspia, Limonium otolepis*). Canopy cover of herbage varies from 10-20 up to 80-100%. The level of anthropogenic degradation is high due to sand mining, land development, overgrazing, garbage dumps and cutting of trees and shrubs.

Although threatened plants included in the global or national Red Lists were not found during the field survey, the riparian ecosystems in Central Asia are relict and one of the most threatened and sensitive habitats (especially, tugay woodlands and scrub). In the past, the riparian woodlands were widespread over the territory of Central Asia. The catastrophic decline of the area of the natural floodplain ecosystems as a result of human activities was observed throughout their distribution range. In Central Asia, these ecosystems currently occupy less than 10% of their territory 50-60 years ago (Treshkin, 2011). Riparian habitats (tugay woodlands, scrub and reeds) play a crucial role in maintaining the hydrological regime of rivers and biological water treatment, conserving water resources and preventing mudflows.

Wetlands. IUCN habitat type 5 Wetlands (inland), subtype 5.8 Seasonal/intermittent freshwater marshes/pools (under 8 ha). According to EUNIS habitat classification, this is a complex of subtypes R31 Mediterranean tall humid inland grassland and subtype V39 Mesic perennial anthropogenic herbaceous vegetation. This habitat can be classified as semi-natural. Landscape is modified, because there are artificial former ponds, rectangular in shape, but vegetation communities are almost the same that in natural riparian habitats, mostly with herbaceous vegetation composed of reeds (*Phragmites australis, Typha angustifolia, T. latifolia, T.laxmannii, T. minima*), liquorice (*Glycyrrhiza glabra*) and other mesophytic and hydrophytic plants typical for natural wetlands (*Aeluropus littoralis, Clematis orientalis, Cynanchum acutum ssp. sibiricum, Limonium otolepis, Mentha longifolia var. asiatica, Persicaria minor*, etc.), on some areas with local abundance of weeds (*Artemisia vulgaris, Cynodon dactylon, Imperata*

cylindrica, Paspalum distichum, etc.) and with solitary shrubs of tamarisk and oleaster (*Elaeagnus angustifolia, Tamarix sp*.). Taking into account arid conditions and climate change (especially, desertification), both natural, semi-natural and modified wetlands in Central Asia are sensitive habitats. Although threatened plants included in the global or national Red lists were not found during the field survey, as other riparian habitats, these wetlands are important in maintaining the hydrological regime of rivers and biological water treatment, conserving water resources and preventing mudflows.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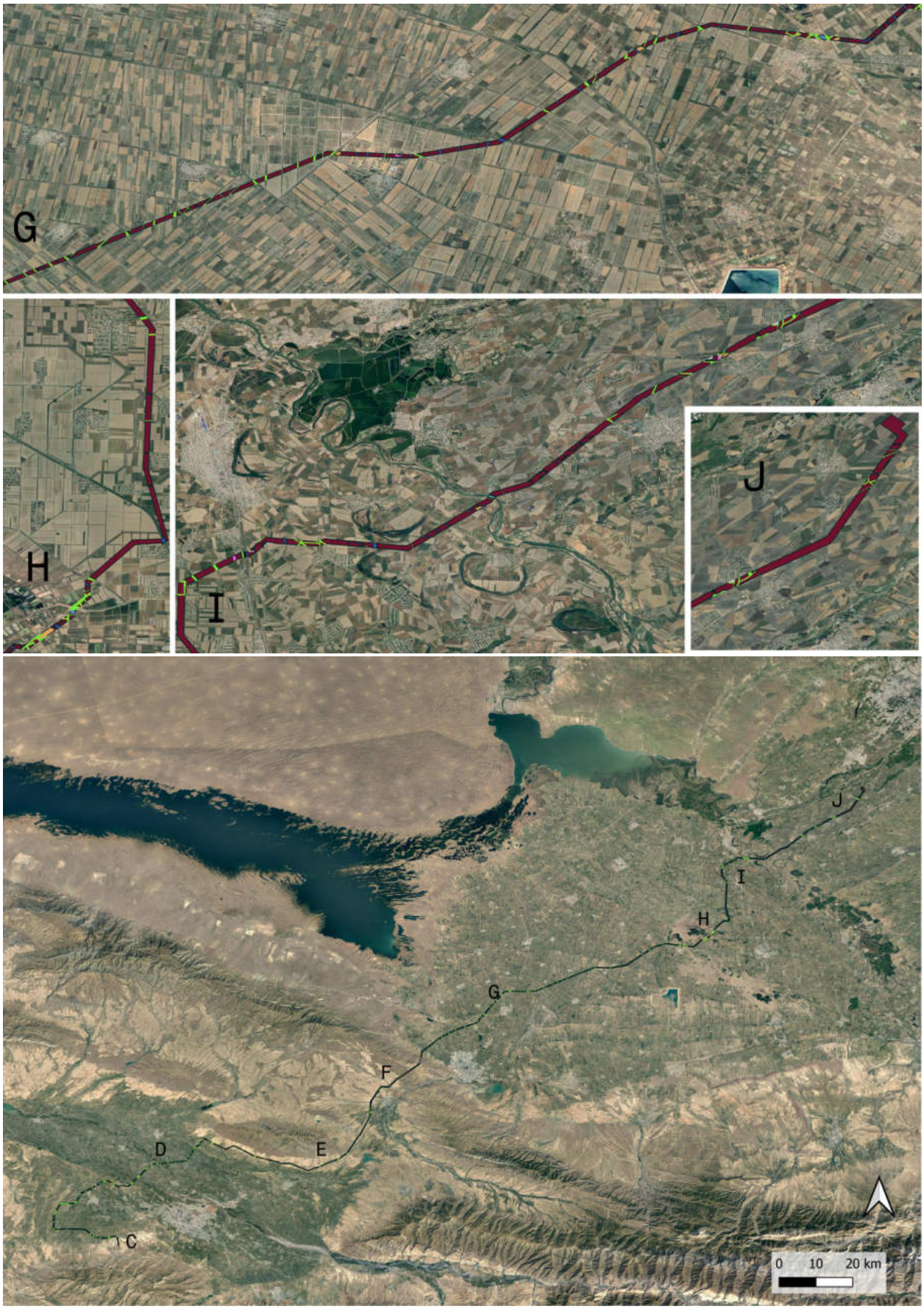
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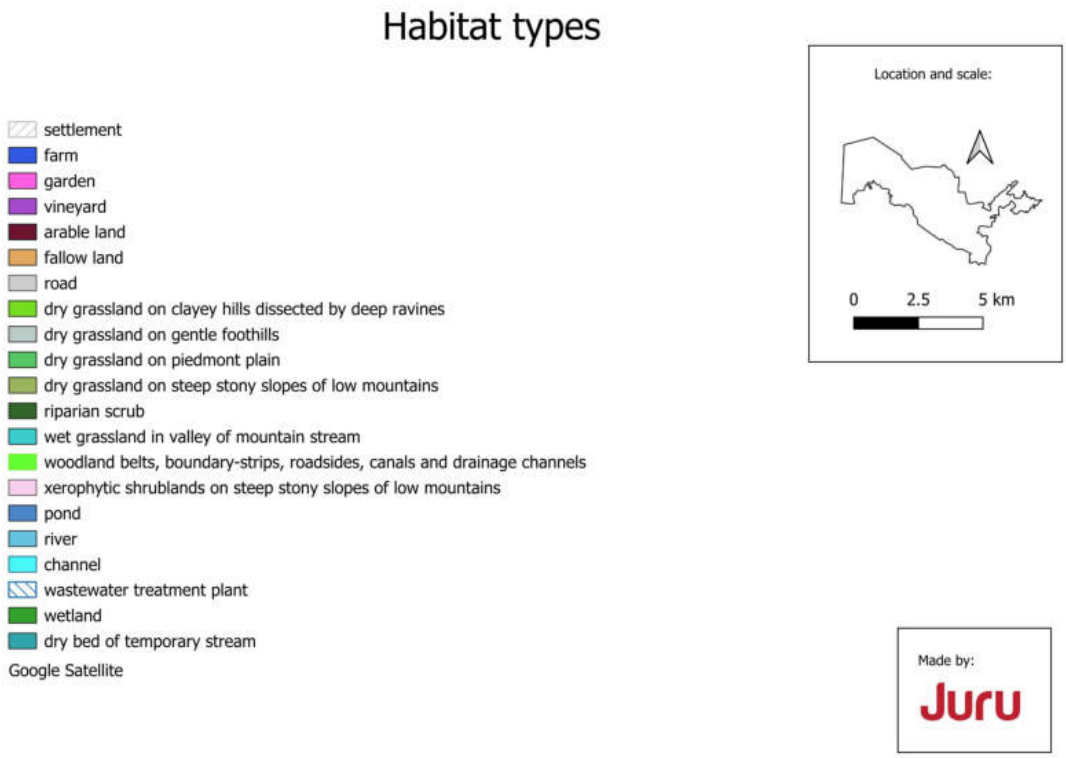

Figure 6: Habitat types – 360 km OHTL and Khalka SS

4.8 OHTL 70 km

Four types of modified habitats and two types of natural habitats are represented within OHTL 70 km (Figure 7).

Modified habitats are represented with 4 types:

Arable lands with agricultural crops. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and represented with a subtype V1 Arable land and market gardens (V11 Intensive unmixed crops, on some areas with V14 Inundated or inundatable croplands, including rice fields). This habitat type can be divided into 2 subtypes – Irrigated arable lands, and Non-irrigated (rainfed) arable lands. At the present, irrigated arable lands along the 70 km OTHL are used under mainly cotton (*Gossypium hirsutum*), wheat (*Triticum aestivum*) and peanut *(Arachis hypogaea*). This habitat type covers rather small areas in eastern part of the 70 km OTHL line, in surroundings of villages Khancharvak and Kyzylkarvan. Non-irrigated arable lands used under wheat (*Triticum aestivum*) and barley (*Hordeum vulgare*) is the main type of modified habitats along the 70 km OTHL.

Fruit gardens and vineyards. This habitat type covers rather small areas in eastern part of the 70 km OTHL line, in surroundings of villages Khancharvak and Kyzylkarvan, and it can be divided into 2 subtypes – Fruit gardens, and Vineyards. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.3 Plantations and 14.4 Rural Gardens. According EUNIS classification, it belongs to habitat type V – Vegetated man-made habitats and 2 subtypes, V5 Shrub plantations (V54 Vineyards) and V6 Tree dominated man-made habitats (V61 Broadleaved fruit and nut tree orchards). Fruit gardens are represented with plantations of fruit trees, mainly apple (*Malus domestica*) and apricot. (*Prunus armeniaca*), and grapevine (*Vitis vinifera*). Wild grasses and weeds grow along the ditches and margins of Vineyards are the plantations of grapevine (*Vitis vinifera*). Wild grasses and weeds grow along the ditches and margins of the gardens and vineyards, as well as between the rows of trees and grapevine.

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market

gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned irrigated or rainfed arable lands are occupied with communities of grasses (*Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Hordeum spontaneum*, *Cynodon dactylon, Poa bulbosa*), annual and perennial weeds (*Centaurea iberica*, *C. solstitialis*, *Cirsium vulgare*, *Carthamus oxyacanthus*, *Echinophora sibthorpiana*, *Xanthium spinosum,* etc.), caper (*Capparis spinosa*) and camel thorn (*Alhagi pseudalhagi*). The species composition and abundance, and density of canopy cover very much varies on different areas depending of soil type, humidity, the age of fallow land, and other local conditions.

Boundary-strips, roadsides, canals and drainage channels. This habitat type occupies a narrow stips between the fields, along the roads and irrigation systems. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and 2 subtypes, V38 Dry perennial anthropogenic herbaceous vegetation and V39 Mesic perennial anthropogenic herbaceous vegetation. This habitat is occupied with communities of camel thorn (*Alhagi pseudalhagi*), Persian rose (Rosa persica), annual and perennial grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Cynodon dactylon, Poa bulbosa),* weeds (*Centaurea iberica*, *C. solstitialis*, *Sophora alopecuroides, Sophora pachycarpa, Xanthium spinosum,* etc.). Banks of irrigation and drainage canals are occupied with oleaster (*Elaeagnus angustifolia*), tamarisk (*Tamarix sp.*), reed (*Phragmites australis*), camel thorn (*Alhagi pseudalhagi*), other mesophytic plants (*Mentha longifolia var. asiatica, Epilobium hirsutum*, etc.), as well as with mesophytic weeds. The species composition and abundance, and density of canopy cover very much varies on different areas depending of local conditions.

Natural and semi-natural habitats are represented with 2 types:

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat occupies unplowed areas with more or less rugged terrain along dry beds of temporary streams and on the hills. The vegetation is represented with forb-grass communities with domination of ephemeroids (*Poa bulbosa, Carex pachystylis*), annual grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus tectorum*, *Hordeum murinum* subsp. *leporinum*, *Taeniatherum caput-medusae*), camel thorn (*Alhagi pseudalhagi* subsp. *kirghisorum*), caper (*Capparis spinosa*), and other xerophytic forbs (*Phlomis thapsoides, Cousinia resinosa*), which belong to the type of ephemeral-ephemeroid vegetation (Agrillophyta, or Ephemerophyta), widely spread on serozem soils (Calcic xerosols) on piedmont plains and foothills of Uzbekistan. This natural habitat is used by local people as pasture. The abundance of spiny forbs (*Alhagi pseudalhagi* subsp. *kirghisorum, Capparis spinosa, Cousinia resinosa,* species of *Carthamus* and *Centaurea*) indicates that the level of degradation of this habitat is rather high, which is connected with overgrazing. Canopy cover is 20–30% or less. Threatened plants included in the global or national Red lists were not found during the field survey.

Dry beds of temporary streams. This habitat covers narrow strips along dry beds of several rather large temporary streams in eastern part of the 70 km OTHL line, and corresponds with EUNIS habitat type H – Inland unvegetated or sparsely vegetated habitats. The vegetation is very sparse and represented with solitary specimens of tamarisk, camel thorn and other annual and perennial plants. This habitat is moderately to strongly degraded due to gravel extraction.

Figure 7: Habitat types - OHTL 70 km

4.9 OHTL 4.9 km and access road

Two types of modified habitats and two types of natural habitats are represented within OHTL 4.9 km (Figure 8).

Natural habitat

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat occupies boundary-strips between the fields and unplowed areas with rugged terrain along dry beds of temporary streams and on the hills. The vegetation is represented with forb-grass communities with domination of ephemeroids (*Poa bulbosa, Carex pachystylis*), annual grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus tectorum*, *Hordeum murinum* subsp. *leporinum*, *Taeniatherum caput-medusae*), camel thorn (*Alhagi pseudalhagi* subsp. *kirghisorum*), caper (*Capparis spinosa*), and other xerophytic forbs (*Phlomis thapsoides, Cousinia resinosa*), which belong to the type of ephemeral-ephemeroid vegetation (Agrillophyta, or Ephemerophyta), widely spread on serozem soils (*Calcic xerosols*) on piedmont plains and foothills of Uzbekistan. This natural habitat is used by local people as pasture. The abundance of spiny forbs (*Alhagi pseudalhagi* subsp. *kirghisorum, Capparis spinosa, Cousinia resinosa,* species of *Carthamus* and *Centaurea*) and poisonous species *Peganum harmals*, *Sophora pachycarpa* and *Diarthron vesiculosum* indicates that the level of degradation of this habitat is rather high, which is connected with overgrazing.

Dry beds of temporary streams. This habitat covers narrow strips along dry beds of several rather large temporary streams, and corresponds with EUNIS habitat type H – Inland unvegetated or sparsely vegetated habitats. The vegetation is very sparse and represented with solitary specimens of tamarisk, camel thorn and other annual and perennial plants. This habitat is moderately to strongly degraded due to gravel extraction.

Modified habitat

Arable lands with agricultural crops. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, and represented with a subtype V1 Arable land and market gardens (V11 Intensive unmixed crops). Wihin 100 MW PV plant area and its surroundings, this habitat is represented with rainfed arable lands used under wheat (*Triticum aestivum*), barley (*Hordeum vulgare*) and safflower (*Carthamus tinctorius*).

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-camel thorn community (*Alhagi pseudalhagi subsp. kirghisorum, Poa*

bulbosa), with solitary harmel (*Peganum harmala*) and *Cousinia resinosa*. Plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-20%). Both plots currently are used by local people as pasture.

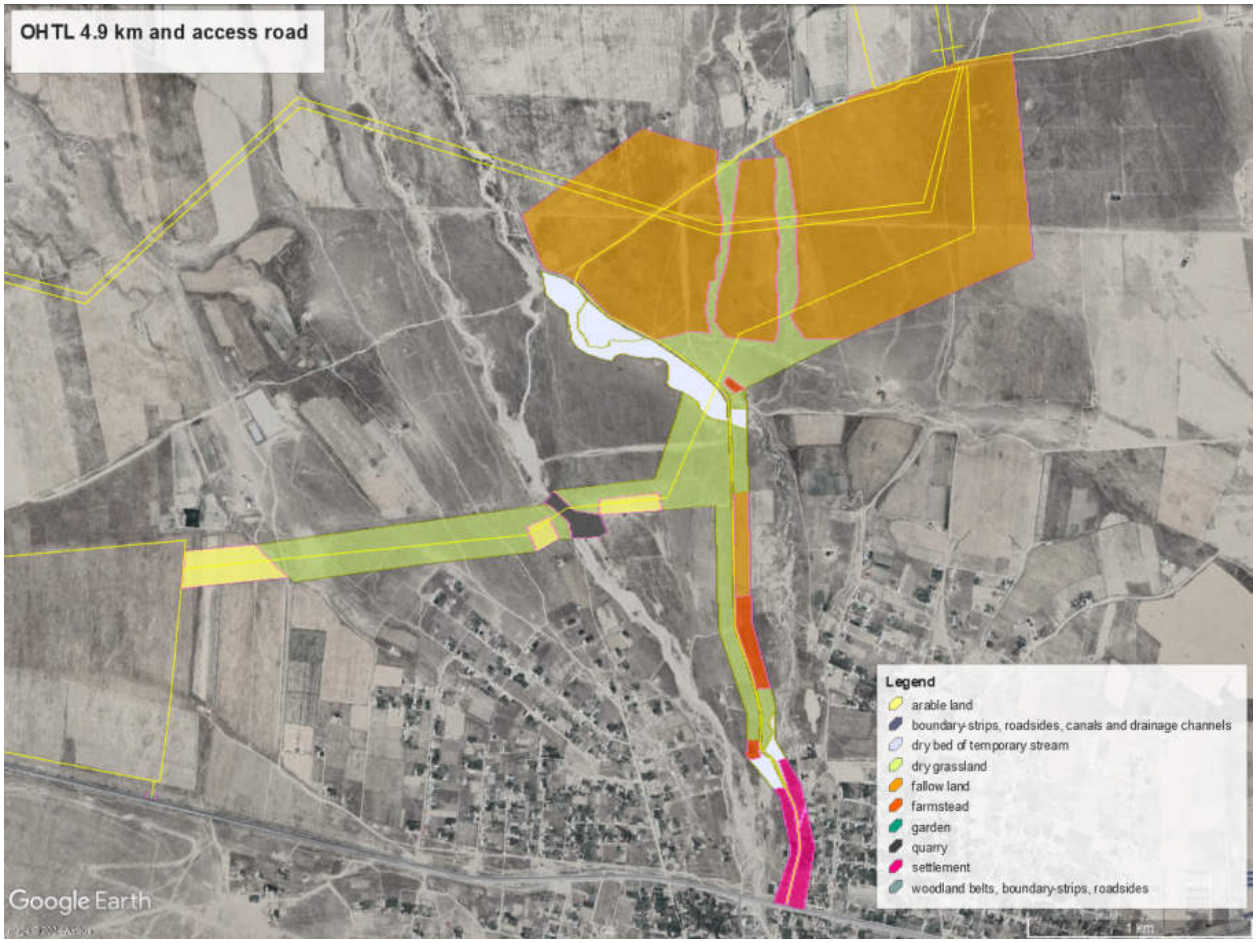

Figure 8: Habitat types - OHTL 4.9 km and access road

4.10 OHTL LILO 11 km

Two types of modified habitats and two types of natural habitats are represented within OHTL 11 km (Figure 9).

Natural habitats:

Dry grasslands. IUCN habitat type 4 Native grassland, subtype 4.4 Temperate grassland. According to EUNIS habitat classification, this habitat corresponds to type R Grasslands and lands dominated by forbs, mosses or lichens, and subtype R1 Dry grasslands. This habitat occupies boundary-strips between the fields and unplowed areas with rugged terrain along dry beds of temporary streams and on the hills. The vegetation is represented with forb-grass communities with domination of ephemeroids (*Poa bulbosa, Carex pachystylis*), annual grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus tectorum*, *Hordeum murinum* subsp. *leporinum*, *Taeniatherum caput-medusae*), camel thorn (*Alhagi pseudalhagi* subsp. *kirghisorum*), caper (*Capparis spinosa*), and other xerophytic forbs (*Phlomis thapsoides, Cousinia resinosa*), which belong to the type of ephemeral-ephemeroid vegetation (Agrillophyta, or Ephemerophyta), widely spread on serozem soils (*Calcic xerosols*) on piedmont plains and foothills of Uzbekistan. This natural habitat is used by local people as pasture. The abundance of spiny forbs (*Alhagi pseudalhagi* subsp. *kirghisorum, Capparis spinosa, Cousinia resinosa,* species of *Carthamus* and *Centaurea*) and poisonous species *Peganum harmals*, *Sophora pachycarpa* and *Diarthron vesiculosum* indicates that the level of degradation of this habitat is rather high, which is connected with overgrazing. Canopy cover is 20–30 to 50–60%. Threatened plants included in the global or national Red lists were not found during the field survey.

Dry beds of temporary streams. This habitat covers narrow strips along dry beds of several rather large temporary streams, and corresponds with EUNIS habitat type H – Inland unvegetated or sparsely vegetated habitats. The vegetation is very sparse and represented with solitary specimens of tamarisk, camel thorn and other annual and perennial plants. This habitat is moderately to strongly degraded due to gravel extraction.

Modified habitat:

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-camel thorn community (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary harmel (*Peganum harmala*) and *Cousinia resinosa*. Plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-20%).

Fruit gardens and vineyards. This habitat type covers main part pf the 11 km OTHL line, and it can be divided into 2 subtypes – Fruit gardens, and Vineyards. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.3 Plantations and 14.4 Rural Gardens. According EUNIS classification, it belongs to habitat type V – Vegetated man-made habitats and 2 subtypes, V5 Shrub plantations (V54 Vineyards) and V6 Tree dominated man-made habitats (V61 Broadleaved fruit and nut tree orchards). Fruit gardens are represented with plantations of fruit trees, mainly apple (*Malus domestica*) and apricot. (*Prunus armeniaca*), and grapevine (*Vitis vinifera*). Wild grasses and weeds grow along the ditches and margins of Vineyards are the plantations of grapevine (*Vitis vinifera*). Wild grasses and weeds grow along the ditches and margins of the gardens and vineyards, as well as between the rows of trees and grapevine.

Boundary-strips, roadsides, canals and drainage channels. This habitat type occupies a narrow stips between the fields, along the roads and irrigation systems. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and 2 subtypes, V38 Dry perennial anthropogenic herbaceous vegetation and V39 Mesic perennial anthropogenic herbaceous vegetation. This habitat is occupied with communities of camel thorn (*Alhagi pseudalhagi*), Persian rose (Rosa persica), annual and perennial grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Cynodon dactylon, Poa bulbosa),* weeds (*Centaurea iberica*, *C. solstitialis*, *Sophora alopecuroides, Sophora pachycarpa, Xanthium spinosum,* etc.). Banks of irrigation and drainage canals are occupied with oleaster (*Elaeagnus angustifolia*), tamarisk (*Tamarix sp.*), reed (*Phragmites australis*), camel thorn (*Alhagi pseudalhagi*), other mesophytic plants (*Mentha longifolia var. asiatica, Epilobium hirsutum*, etc.), as well as with mesophytic weeds. The species composition and abundance, and density of canopy cover very much varies on different areas depending of local conditions.

Figure 9: Habitat types - OHTL LILO 11 km

4.11 OHTL LILO 19 km

Four types of modified habitats and one type of natural habitats are represented within OHTL LILO 11 km (Figure 10).

Natural habitats:

Dry beds of temporary streams. This habitat covers narrow strips along dry beds of several rather large temporary streams, and corresponds with EUNIS habitat type H – Inland unvegetated or sparsely vegetated habitats. The vegetation is very sparse and represented with solitary specimens of tamarisk, camel thorn and other annual and perennial plants. This habitat is moderately to strongly degraded due to gravel extraction.

Modified habitat:

Arable lands with agricultural crops. IUCN habitat type 14 Artificial – Terrestrial, subtype 14.1 Arable Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and represented with a subtype V1 Arable land and market gardens (V11 Intensive unmixed crops).

Fallow lands. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V Vegetated man-made habitats, subtype V1 Arable land and market gardens (V15 Bare tilled, fallow or recently abandoned arable land). Abandoned non-irrigated arable lands with sandy-clayey soil and bluegrass-camel thorn community (*Alhagi pseudalhagi subsp. kirghisorum, Poa bulbosa*), with solitary harmel (*Peganum harmala*) and *Cousinia resinosa*. Plants are scattered or occur in patches, species composition is poor, and the canopy cover is sparse (from nearly 0 to 10-20%).

Boundary-strips, roadsides, canals and drainage channels. This habitat type occupies a narrow stips between the fields, along the roads and irrigation systems. IUCN habitat type 14 Artificial – Terrestrial, subtypes 14.1 Arable Land and 14.2 Pasture Land. This IUCN habitat type corresponds with EUNIS habitat type V – Vegetated man-made habitats, and 2 subtypes, V38 Dry perennial anthropogenic herbaceous vegetation and V39 Mesic perennial anthropogenic herbaceous vegetation. This habitat is occupied with communities of camel thorn (*Alhagi pseudalhagi*), Persian rose (Rosa persica), annual and perennial grasses (*Aegilops cylindrica, Ae. triuncialis*, *Bromus scoparius*, *B.tectorum*, *Hordeum murinum* ssp. *leporinum*, *Cynodon dactylon, Poa bulbosa),* weeds (*Centaurea iberica*, *C. solstitialis*, *Sophora alopecuroides, Sophora pachycarpa, Xanthium spinosum,* etc.). Banks of irrigation and drainage canals are occupied with oleaster (*Elaeagnus angustifolia*), tamarisk (*Tamarix sp.*), reed (*Phragmites australis*), camel thorn (*Alhagi pseudalhagi*), other mesophytic plants (*Mentha longifolia var. asiatica, Epilobium hirsutum*, etc.), as well as with mesophytic weeds. The species composition and abundance, and density of canopy cover very much varies on different areas depending of local conditions.

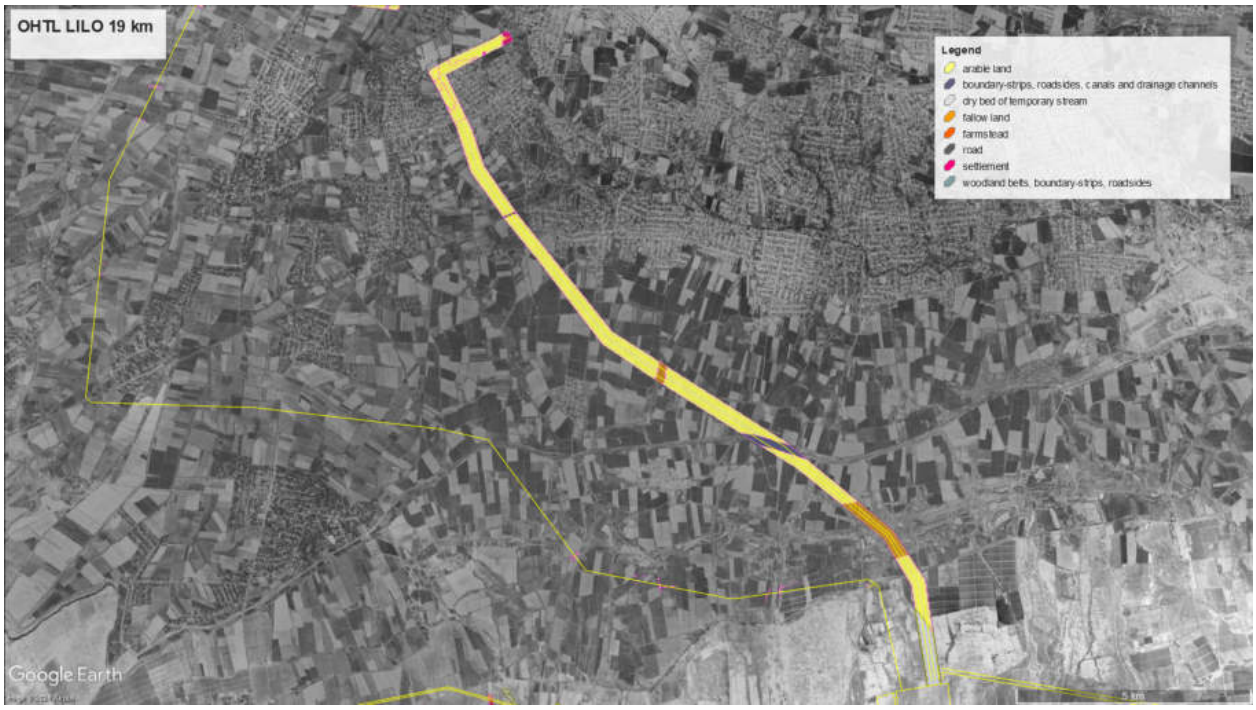

Figure 10: Habitat types - OHTL LILO 19 km

5 Flora Assessment

5.1 100 MW PV plant

In total, 48 plant species were recorded within 100 MW PV plant area, none of them are nationally or globally red-listed, 13 species are alien and 2 are agricultural crops (wheat - Triticum aestivum and barley - Hordeum vulgare). Annuals are 25 species, 3 are biennials, 35 – perennials and 2 subshrub. All recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan. Predominance of therophytes (annuals and biennials) is a feature of secondary ephemeral-grass and ephemeral-forb-grass communities on fallow lands in Uzbekistan. The number of plant species recorded per sample plot varies from 35 to 44.

5.2 500/220KV Nurabad substation

In total, 14 plant species were recorded within neighbouring areas of Nurabad substation, none of them are nationally or globally red-listed. Annuals are 8 species, 6– perennials. All recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan occupied with rainfed crops and fallow lands

5.3 500 MW BESS

In total, 18 plant species were recorded within neighbouring areas of Nurabad 500 MW BESS, none of them are nationally or globally red-listed. Annuals are 10 species, 8 – perennials. All recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan occupied with rainfed crops and fallow lands.

5.4 400 MW PV plant, pooling station and access road

In total, 26 plant species were recorded within neighbouring areas of 400 MW PV plants, none of them are nationally or globally red-listed, or alien. Annuals are 14 species, and 11 are perennials, and 1 - subsrub. All

recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan. The number of plant species recorded per sample plot varies from 16 to 22.

5.5 500 MW PV plant

In total, 25 plant species were recorded within neighbouring areas of 500 MW PV plants, none of them are nationally or globally red-listed, or alien. Annuals are 14 species, and 11 are perennials. All recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan. The number of plant species recorded per sample plot varies from 19 to 23.

5.6 Karakul BESS

In total, 19 plant species were recorded, none of them are nationally or globally red-listed, or alien. 9 species are annuals, 6 – perennials, 2 – subshrubs, and 2 – shrubs. All recorded species are typical and more or less common for south-western part of Kyzylkum Desert. The territory of planned BESS currently is used mainly for sand mining and garbage dump, the level of anthropogenic disturbance is high.

5.7 Khalka substation and 360 km OHTLError! Reference source not found.

Khalka substation

In total, 41 plant species were recorded, none of them are nationally or globally red-listed, 8 species are alien, 1 species is an agricultural crop, 1 species of planted trees is introduced. Annuals, biennials – 15, perennials – 27, trees – 1 (**Error! Reference source not found.**).

360 km OHTL

In total, 247 plant species of 52 families (197 native, 39 alien and 11 agricultural crops or introduced fruit or ornamental trees) were recorded during the field surveys along 360 km OTHL. One threatened restricted-range endemic species included in the Red Data Book of Uzbekistan (*Phlomis nubilans*, UzbRDB category 3) was found on the north stony slope of the Nuratau Range. Along the OTHL line, this rare species occurs only between 40.14441° N 67.69072° E and 40.14761° N 67.69127° E (about 700 m). 78 specimens of *Phlomis nubilans* were count in 100x10 m transect in the upper part of the slope. Solitary specimens of two not red-listed endemic species, *Dianthus helenae* (endemic to the Nuratau Mountains, endemic of Uzbekistan) and *Nanophyton saxatile* (endemic to northwestern spurs of Pamir-Alay mountain system, including Nuratau and Zirabulak-Ziadin mountains, and Malguzar Range, endemic of Uzbekistan) also were recorded on this territory together with *Phlomis nubilans.* Species assessed in the IUCN Red List as CR, EN or VU were not recorded among wild growing plants. Among ornamental trees, planted in woodland belts, one introduced species, *Gleditsia caspica*, is included in the IUCN Red List as Endangered (EN A2ac+4ac), and one native species *Prunus bucharica (Amygdalus bucharica*) is included in the IUCN Red List as Vulnerable (VU). Another native species, planted in the woodland belts, is nationally red-listed *Platanus orientalis* (category 3). Generally, the flora of the project area is composed with plant species more or less widely spread and typical for river valleys, deserts, foothills and anthropogenic landscapes of Uzbekistan. The number of plant species recorded per sample plot varies from 20-22 to 86.

5.8 70 km OHTL

In total, 65 plant species were recorded along 70 km OTHL, none of them are nationally or globally red-listed, 12 species are alien weeds and 1 are agricultural crops (wheat - Triticum aestivum, cotton - *Gossypium hirsutum*, peanut - *(Arachis hypogaea,* alfalfa – *Medicago sativa*), 2 species are cultivated fruit or ornamental trees ans shrubs (apple – *Malus domestica*, grapevine – *Vitis vinifera*, etc.). Annuals are 29 species, 5 are biennials, 26 – perennials, 1 subshrub, and 3 trees. All recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan. The number of plant species recorded per sample plot varies from 20 to 42, where natural and secondary communities on xeric natural and modified habitats have rather poor and uniform species composition, and secondary communities on mesic modified habitats have a more diverse and reach species composition, which is associated with the presence of numerous native and alien weeds.

5.9 4.9 km OHTL and access road

In total, 19 plant species were recorded within neighbouring areas of Nurabad substation and 500 MW BESS, none of them are nationally or globally red-listed, or alien. Annuals are 10 species, 9 – perennials. All recorded species are typical and more or less common for piedmont plains and foothills of Uzbekistan occupied with rainfed crops and fallow lands.

5.10 OHTL LILO 11 km

In total, 49 plant species were recorded within OHTL LILO 11 km none of them are nationally or globally red-listed, and 11 - aliens. Annuals are 37 species, 6 -biannuals, 30 – perennials, 1 subshrub and 1 tree. All recorded species are typical and more or less common for piedmont plains of Uzbekistan occupied with arable lands and gardens. The number of plant species recorded per sample plot varies from 19 to 29.

6 Impact Assessment

1) 100 MW PV plant

The analysis of satellite imagery and results of the field survey showed that the habitats within the 100 MW plant site are modified. There are rainfed arable lands and fallow lands with secondary vegetation typical for such disturbed areas in clayey piedmont plains of Uzbekistan. Threatened or endemic species, trees and shrubs are absent. The loss of vegetation during construction of the solar power plant can have some negative impacts on flora and vegetation, affect habitat conditions of wildlife, and potentially reducing biodiversity in the area. The negative impact also may be related to the deflation and dust storms after the destroying of vegetation on these areas. Taking into account the current state of these modified habitats and secondary vegetation, the negative impact can be assessed as insignificant.

2) 500/220KV Nurabad substation and 500 MW BESS

The analysis of satellite imagery and results of the field survey showed that the habitats within the 500 MW BESS and Nurabad substation site are modified. It is a fallow land with poor, sparse and uniform vegetation typical for such disturbed areas and intensively grazed rangelands in clayey piedmont plains of Uzbekistan. Threatened or endemic species, trees and shrubs are absent. The loss of vegetation during construction of the substation and BESS can have some negative impacts on flora and vegetation, affect habitat conditions of wildlife, and potentially reducing biodiversity in the area. The negative impact also may be related to the deflation and dust storms after the destroying of vegetation on these areas. Taking into account the current state of these modified habitats and poor secondary vegetation, the negative impact can be assessed as insignificant.

3) 400 MW PV plant and 500 MW PV plant

The analysis of satellite imagery and results of the field survey showed that the habitats within the 400 and 500 MW PV plant site are both natural and modified, occupied with poor, sparse and uniform vegetation typical for such disturbed areas and intensively grazed rangelands in clayey piedmont plains of Uzbekistan. Threatened or endemic species, trees and shrubs are absent. The loss of vegetation during construction of the solar power plants can have some negative impacts on flora and vegetation, affect habitat conditions of wildlife, and potentially reducing biodiversity in the area. The installation of solar panels can lead to changes in local microclimate and affect some plant species that are sensitive to changes in insolation, temperature, humidity, and wind conditions. The negative impact also may be related to the deflation and dust storms after the destroying of vegetation on large areas. Taking into account the current state of these habitats and poor vegetation, the negative impact can be assessed as insignificant.

4) Karakul BESS

The habitats within the Karakul BESS site are both natural and modified. The natural habitat of the sandy desert has already been destroyed on about half of the territory, and strongly degraded on the another half. Threatened or endemic species are absent. The main negative impact may be related to the deflation and dust storms after the destroying of vegetation on this area. Taking into account the current state of these habitats and strongly degraded vegetation, the negative impact can be assessed as insignificant. But special measures should be taken for fixation of sands and combat deflation (phytomelioration, fences, mechanical dune stabilization, etc.) in the project site of Karakul BESS and its surroundings.

5) Khalka substation and 360 km OHTL

Khalka substation

The habitats within the Khalka substation site are modified. There are irrigated arable lands used under cotton, woodland belts, boundary-strips, roadsides, banks of canals and drainage channels with mesophytic and hydrophytic plants typical for such agricultural landscapes (including native and alien weeds). Endemics or nationally or globally red-listed plant species are absent. The loss of this anthropogenic vegetation as a result of construction and operation of the substation will not damage the native flora and vegetation. But the construction of the substation will lead to the loss of 32 hectares of the most valuable and highly productive agricultural lands with the best and most fertile soils of Uzbekistan. With this in mind, it is not recommended to build a substation on this valuable land intensively used in agriculture. It is more rational to use some wasteland for the construction of a substation.

360 km OHTL

The analysis of satellite imagery and results of the field survey showed that the habitats along the OTHL are both natural and modified, and the diversity of flora and vegetation is rather significant. Some natural habitats are sensitive and/or threatened, as riparian habitats of valleys of the Syrdarya and Zeravshan rivers and xerophytic shrublands on the north slope of the Nuratau Range. Endemic and threatened plants were found on the north slope of the Nuratau Range. But in general, OTHL crosses mainly modified habitats of agricultural lands. The loss of vegetation during construction of OTHL towers can have some negative impacts on flora and vegetation on small areas. Within the modified habitats, the negative impact can be assessed as insignificant. As for natural habitats, the location of OHTL towers should be identified in such a way as to minimize potential negative impacts on flora and vegetation, especially endemic, threatened and sensitive species on the north slope of the Nuratau Range and riparian habitats of the Syrdarya and Zeravshan valleys

6) 70 km OHTL

The analysis of satellite imagery and results of the field survey showed that the habitats along the 70 km OTHL are both natural and modified. Natural habitats cover rather small areas along the OTHL line, they are occupied with poor, sparse and uniform vegetation typical for intensively grazed rangelands in clayey piedmont plains and foothills of Uzbekistan. The 70 km OTHL crosses mainly modified habitats of non-irrigated and irrigated agricultural lands, gardens and vineyards. For these modified habitats, mainly weedy plants were recorded (including aliens). The loss of vegetation during construction of OTHL towers can have some negative impacts on flora and vegetation on small areas, but in general, the negative impact can be assessed as insignificant. Threatened or endemic species are absent.

7 Conclusion

The habitats within the **100 MW PV plant** site are modified. There are rainfed arable lands and fallow lands with secondary vegetation typical for such disturbed areas in clayey piedmont plains of Uzbekistan. In total, 70 plant species were recorded in summer 2023 and 48 plant species – in spring 2024, none of them are nationally or globally red-listed, 13 species are alien and 2 are agricultural crops, trees and shrubs are absent. The loss of vegetation during construction of the solar power plant can have some negative impacts on flora and vegetation, affect habitat conditions of wildlife, and potentially reducing biodiversity in the area. The negative impact also may be related to the deflation and dust storms after the destroying of vegetation on these areas. Taking into account the current state of these modified habitats and secondary vegetation, the negative impact can be assessed as insignificant.

The habitats within the **Nurabad 500 MW BESS and Nurabad substation** site are modified. It is a fallow land with poor, sparse and uniform vegetation typical for such disturbed areas and intensively grazed rangelands in clayey piedmont plains of Uzbekistan. In total, 25 plant species were recorded in summer 2023 and 19 – in spring 2024, none of them are nationally or globally red-listed, 3 species are alien, trees and shrubs are absent. The loss of vegetation during construction of the substation and BESS can have some negative impacts on flora and vegetation, affect habitat conditions of wildlife, and potentially reducing biodiversity in the area. The negative impact also may be related to the deflation and dust storms after the destroying of vegetation on these areas. Taking into account the current state of these modified habitats and poor secondary vegetation, the negative impact can be assessed as insignificant.

The habitats within the **400 and 500 MW PV plant, pooling station and access road** site are both natural and modified, occupied with poor, sparse and uniform vegetation typical for such disturbed areas and intensively grazed rangelands in clayey piedmont plains of Uzbekistan. In total, 14 plant species were recorded in summer 2023 and 25 in spring 2024, none of them are nationally or globally red-listed, or alien, trees and shrubs are absent. The loss of vegetation during construction of the solar power plants can have some negative impacts on flora and vegetation, affect habitat conditions of wildlife, and potentially reducing biodiversity in the area. The installation of solar panels can lead to changes in local microclimate and affect some plant species that are sensitive to changes in insolation, temperature, humidity, and wind conditions. The negative impact also may be related to the deflation and dust storms after the destroying of vegetation on large areas. Taking into account the current state of these habitats and poor vegetation, the negative impact can be assessed as insignificant.

The habitats along the **OHTL 350 km** are both natural and modified, and the diversity of flora and vegetation is rather significant. In total, 8 habitat types were identified (4 types of modified and 4 types of natural habitats). Some natural habitats are sensitive and/or threatened, as riparian habitats of valleys of the Syrdarya and Zeravshan rivers and xerophytic shrublands on the north slope of the Nuratau Range. Endemic and threatened plants were found on the north slope of the Nuratau Range. But in general, OHTL crosses mainly modified habitats of agricultural lands. In total, 247 plant species of 52 families (197 native, 39 alien and 11 agricultural crops or introduced fruit or ornamental trees) were recorded during the field surveys along 360 km OTHL. One threatened restricted-range endemic species included in the Red Data Book of Uzbekistan (*Phlomis nubilans*, UzbRDB category 3) and 2 non redlisted endemics (*Dianthus helenae* and *Nanophyton saxatile)* were found on the north stony slope of the Nuratau Range in the natural habitat of xerophytic shrublands. Among ornamental trees, planted in woodland belts, one introduced species, *Gleditsia caspica*, is included in the IUCN Red List as Endangered, and one native species *Prunus bucharica (Amygdalus bucharica*) is included in the IUCN Red List as Vulnerable. One native species planted in the woodland belts, *Platanus orientalis,* is nationally red-listed (category 3). Generally, the flora of the OTHL area is composed with plant species more or less widely spread and typical for river valleys, foothills and anthropogenic landscapes of Uzbekistan. The habitats within the Khalka substation site are modified. There are irrigated arable lands used under cotton, woodland belts, boundary-strips, roadsides, banks of canals and drainage channels with mesophytic and hydrophytic plants typical for such agricultural landscapes (including native and alien weeds). 41 plant species were recorded, none of them are nationally or globally red-listed, 8 species are alien, 1 species is an agricultural crop, 1 species of planted trees is introduced. The loss of this anthropogenic vegetation as a result of construction and operation of the substation will not damage the native flora and vegetation. But the construction of the substation will lead to the loss of 32 hectares of the most valuable and highly productive agricultural lands with the best and most fertile soils of Uzbekistan. In this connection, it more rational to use some wasteland for the construction of a substation.

The habitats along the **70 km OTHL** are both natural and modified, and the diversity of flora and vegetation is rather low. In total, 6 habitat types were identified (4 types of modified and 2 types of natural habitats). Endemic and/or threatened plants were not found. In general, the 70 km OTHL crosses mainly modified habitats of of non-irrigated and irrigated agricultural lands, gardens and vineyards. In total, 76 plant species of 28 families (53 native, 15 alien and 8 agricultural crops or introduced fruit or ornamental trees) were recorded during the field surveys along 70 km OTHL in summer 2023 and 65 plant species 12 species are alien weeds and 1 are agricultural crops in spring 2024. Among ornamental trees, planted in woodland belts, one introduced species, *Gleditsia caspica*, is included in the IUCN Red List as Endangered. Generally, the flora of the 70 km OTHL area is composed with plant species more or less widely spread and typical for dry foothills and anthropogenic landscapes of Uzbekistan.

The habitats within the **Karakul BESS** site are both natural and modified. The natural habitat of the sandy desert has already been destroyed on about half of the territory, and strongly degraded on the another half. In total, 19 plant species were recorded, none of them are nationally or globally red-listed, or alien. The main negative impact

may be related to the deflation and dust storms after the destroying of vegetation on this area. Taking into account the current state of these habitats and strongly degraded vegetation, the negative impact can be assessed as insignificant.

The habitats within the **4.9 km OHTL and access road** are modified. It is a fallow land with poor, sparse and uniform vegetation typical for such disturbed areas and intensively grazed rangelands in clayey piedmont plains of Uzbekistan. In total, 25 plant species were recorded in summer 2023 and 19 species in spring 2024, none of them are nationally or globally red-listed, 3 species are alien, trees and shrubs are absent. Taking into account the current state of these modified habitats and poor secondary vegetation, the negative impact can be assessed as insignificant.

The habitats within the **OHTL LILO 11 km** mainly are modified. It is a arable lands, gardens and vineyards. The dry riverbed and dry grasslands fragmentary distributed along the site. In total, 49 plant species were recorded in spring 2024 , none of them are nationally or globally red-listed, 11 species are alien, 1 trees and 1 shrub were recorded. Taking into account the current state of these modified habitats and poor secondary vegetation, the negative impact can be assessed as insignificant.

Following habitat types were identified within the Project area: 6 types of natural habitats (Dry grasslands, Wet grasslands, Wetlands, Xerophytic shrublands, Riparian scrub and Sandy desert); 4 types of modified habitats (Arable lands, Fruit gardens and vineyards, Fallow lands and Woodland belts, boundary-strips, roadsides, canals and drainage channels). The flora of the Project area counts 266 species of 53 families, among them, 39 are alien and 12 are agricultural crops or introduced fruit or ornamental trees. 2 species (one of them is planted tree) are listed in the Red Data Book of Uzbekistan as vulnerable and decreasing (status 3). 2 species are not red-listed endemics. 2 species of planted trees (1 native and 1 introduced) are included in the IUCN Red List.

Resuming above mentioned habitat and flora assessment results, following measures can be recommended to prevent and minimize these negative impacts, and restore habitats and biodiversity of the Project area:

- The location of OHTL towers should be identified in such a way as to minimize potential negative impacts on flora and habitats, especially endemic, threatened and sensitive species on the north slope of the Nuratau Range and riparian habitats of the Syrdarya and Zeravshan valleys.

- Habitat restoration measures and regular monitoring should be carried out in surroundings of solar power plants, BESS and substations. Native plant species should be reintroduced, weeds and alien plants should be controlled.

- It is not recommended to build a Khakla substation on the valuable land intensively used in agriculture; it is more rational to use some wasteland for this purpose.

- Special measures should be taken for fixation of sands and combat deflation (phytomelioration, fences, mechanical dune stabilization, etc.) in the project site of Karakul BESS and its surroundings.

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Annex A: Photo materials on habitats

Figure 11: Sample plot 01-2024 (39.573505° N, 66.740345° E), 500 MW BESS, Nurobod District of Samarkand Region, 2.5 km to the north of the village Sazagan, fallow land.

Figure 12: Sample plot 02-2024 (39.575733° N, 66.745086° E), Nurobod substation, Nurobod District of Samarkand Region, 2.5 km to the north of the village Sazagan, fallow land.

Figure 13: Sample plot 03-2024 (39.567669° N, 66.743024° E), 4.6 Km (220 kV) Overhead Transmission Line, area to the south of Nurobod substation, Nurobod District of Samarkand Region, fallow land.

Figure 14: Sample plot 04-2024 (39.563586° N, 66.723789° E), Access Road, Nurobod District of Samarkand Region, 1.5 km to the northwest of the village Sazagan, strongly degraded dry grassland

Figure 15: Sample plot 05-2024 (39.547369° N, 66.6845° E), Sazagan 100 MW PV site, Nurobod District of Samarkand Region, 2.5 km to the west of the village Sazagan, fallow land.

Figure 16: Sample plot 06-2024 (39.550955° N, 66.688282° E), Nurobod District of Samarkand Region, Ettitepa Archeologic Heritage site, dry grassland

Figure 17: Sample plot 06-2024 (39.550955° N, 66.688282° E), Nurobod District of Samarkand Region, Ettitepa Archeologic Heritage site, archaeological excavations

Figure 18: Sample plot 08-2024 (39.580547° N, 66.77518° E), OTHL Nurobod substation – Sogdiana, Nurobod District of Samarkand Region, a quarry in the dry bed of the river Tepakulsay

Figure 19: Sample plot 08-2024 (39.580547° N, 66.77518° E), OTHL Nurobod substation – Sogdiana, Nurobod District of Samarkand Region, strongly degraded dry grassland to the west of the river Tepakulsay

Figure 20: Sample plot 09-2024 (39.57993° N, 66.85574° E), OTHL Nurobod substation – Sogdiana, Samarkand District of Samarkand Region, 1.5 km to the north of the village Mehrobod, apple garden

Figure 21: Sample plot 19 (39.50505° N, 66.3752° E), 70 km OTHL, Nurobod District of Samarkand Region, canal Eski Anhor

Figure 22: Surroundings of sample plot 21 (39.52184° N, 66.464766° E), 70 km OTHL, Nurobod District of Samarkand Region, 2.5 km to the northwest of the village Sarikul, rainfed arable lands (wheat field)

Figure 23 Sample plot 22-2024 (39.597503° N, 66.733704° E), 360 km OTHL, Past Dargom District of Samarkand Region, canal Eski Anhor, reeds and camel thorn-forb-grass community

Figure 24 Sample plot 23-2024 (39.57993° N, 66.85574° E), 360 km OTHL, Pastdargom District of Samarkand Region, 5 km to the north of the village Sazagan, apple garden and camel thorn-grass community on boundary-strips

Figure 25 Sample plot 24-2024 (39.77646° N, 66.79124° E), 360 km OTHL, Akdarya District of Samarkand Region, native riparian vegetation on the floodplain on the right bank of the river Karadarya (left branch of the river Zeravshan)

Figure 26 Sample plot 25-2024 (39.824868° N, 66.84101° E), 360 km OTHL, Akdarya District of Samarkand Region, irrigated arable lands and woodland belts near the village Kumushkent. Modified habitat

Figure 27 Sample plot 26-2024 (39.87971° N, 66.98251° E), 360 km OTHL, Dzhambay District of Samarkand Region, small irrigated arable lands and woodland belts, between the village Dauchar and canal Payaryk

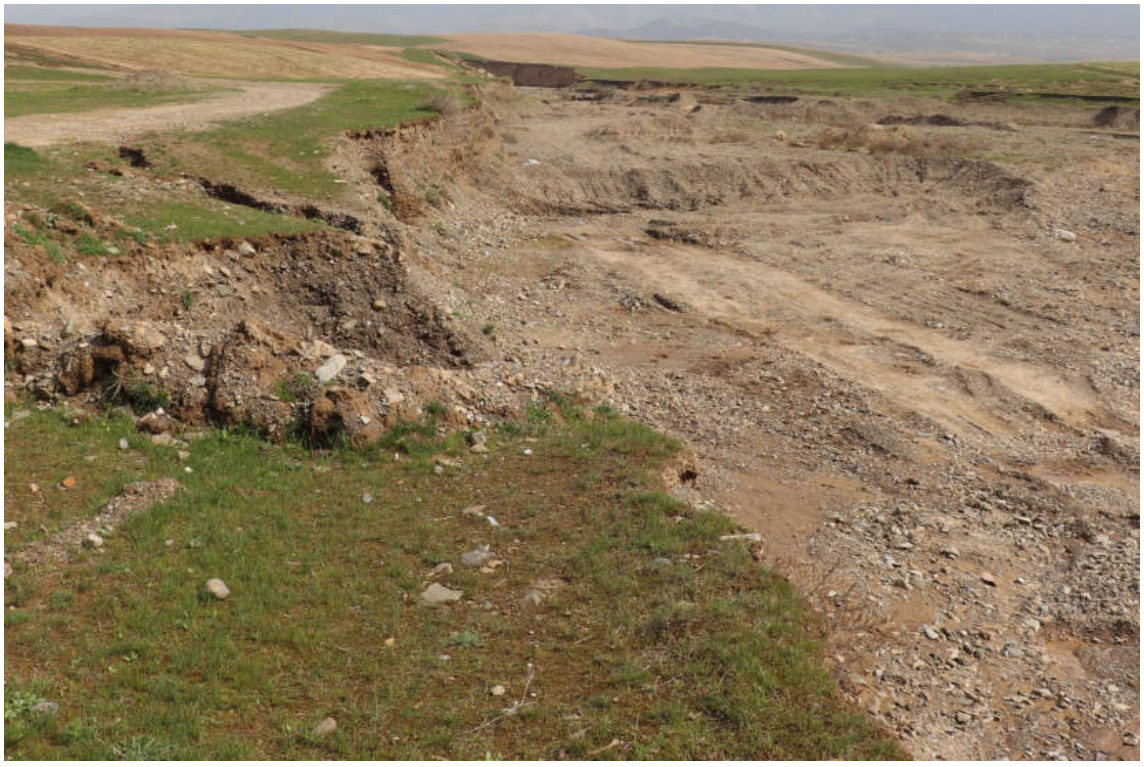

Figure 28 Sample plot 27-2024 (39.85665° N, 67.15567° E), 360 km OTHL, Dzhambay District of Samarkand Region, southern piedmonts of Khobduntau Range, 3.5 km to the northeast of the village Qongirot, dry ravine among apple gardens, rainfed arable lands and fallow lands

Figure 29 Sample plot 28-2024, (39.82803° N, 67.26876° E), 360 km OTHL, Bulungur District of Samarkand Region, southern piedmonts of Khobduntau Range, 3 km to the north of the village Gatcha, rainfed arable land, modified habitat

Figure 30 Sample plot 29-2024 (39.877729° N, 67.507534° E), 360 km OTHL, Bakhmal District of Dzhizak Region, western piedmonts of Turkestan Range, surroundings of the village Khonimkorgon, apple garden among rainfed arable lands, modified habitat

Figure 31 Sample plot 30-2024 (39.915786° N, 67.530745° E), 360 km OTHL, Bakhmal District of Dzhizak Region, western piedmonts of Turkestan Range, surroundings of the village Gallakor, rainfed arable lands, modified habitat

Figure 32 Sample plot 31-2024 (40.06872° N, 67.56588° E), 360 km OTHL, Gallaral District of Dzhizak Region, between town Gallaaral and village Karakchi, woodland belt and rainfed arable lands, modified habitat

Figure 33 Sample plot 32-2024 (40.112765° N, 67.64559° E), 360 km OTHL, Gallaral District of Dzhizak Region, southern slope of Nuratau Range, intensively grazed foothills, natural habitat

Figure 34 Sample plot 33-2024 (40.1459° N, 67.69066° E), 360 km OTHL, Sharaf Rashidov District of Dzhizak Region, northern slope of Nuratau Range with dry grasslands and sparse spiny almond shrublands, natural habitat

Figure 35 Sample plot 33-2024 (40.1459° N, 67.69066° E), 360 km OTHL, Sharaf Rashidov District of Dzhizak Region, northern slope of Nuratau Range, sparse spiny almond shrublands, natural habitat

Figure 36 Sample plot 34-2024 (39.580547° N, 66.77518° E), 360 km OTHL, Sharaf Rashidov District of Dzhizak Region, northern piedmonts of Nuratau Range, caper-ephemeroid-sagebrush community. Natural habitat

Figure 37 Sample plot 35-2024 (40.5548° N, 68.61285° E), 360 km OTHL, Mirzaabad District of Syrdarya Region, drainage channel with camel thorn-reed-liquorice community, between irrigated arable lands and highway

Figure 38 Sample plot 36-2024 (40.81739° N, 68.82465° E), 360 km OTHL, Syrdarya District of Syrdarya Region, a group of poplar trees (Populus pruinosa) among sparse riparian tamarisk scrub on the left bank of Syrdarya River

Figure 39 Sample plot 35-2024 (40.5548° N, 68.61285° E), 360 km OTHL, Mirzaabad District of Syrdarya Region, drainage channel with camel thorn-reed-liquorice community, between irrigated arable lands and highway

Figure 40 Sample plot 36-2024 (40.81739° N, 68.82465° E), 360 km OTHL, Syrdarya District of Syrdarya Region, a group of poplar trees (Populus pruinosa) among sparse riparian tamarisk scrub on the left bank of Syrdarya River

Figure 41 Sample plot 36-2024 (40.81739° N, 68.82465° E), 360 km OTHL, Syrdarya District of Syrdarya Region, left bank of the river Syrdarya, tamarisk scrub

Figure 42 Sample plot 37-2024 (40.98328° N, 69.07634° E), 360 km OTHL, Quyi Chirchiq District of Tashkent Region, 3 km to the south of SS Khalka. An irrigation canal between arable lands. Modified habitat

Annex B: Photo materials on species

Figure 43: Phlomis nubilans, endemic to Nuratau Mountains included in the Red Data Book of Uzbekistan (category 3)

Figure 44: Phlomis thapsoides, a common species of ephemeral-ephemeroid vegetation (Ephemerophyta), typical for piedmont plains and foothills of Uzbekistan

Figure 45: Spiny almond (Prunus (Amygdalus spinosissima), dominant of xerophytic shrublands widely spread in foothills and low mountains of Uzbekistan

Figure 46: Camel thorn (Alhagi pseudalhagi subsp. kirghisorum), a common species of ephemeral-ephemeroid vegetation (Ephemerophyta), typical for piedmont plains and foothills of Uzbekistan

Figure 47: Cousinia resinosa, a common species of ephemeral-ephemeroid vegetation (Ephemerophyta), typical for piedmont plains and foothills of Uzbekistan

Figure 48: Harmel or African rue (Peganum hagmala), poisonous plant and indicator of overgrazing