



MINISTRY OF ENVIRONMENT,  
GREEN DEVELOPMENT AND TOURISM



*Empowered lives  
Resilient nations*



# VALUATION OF CONTRIBUTION OF ECOSYSTEM SERVICES OF THE ORKHON VALLEY NATIONAL PARK TO SECTORAL ECONOMIC DEVELOPMENT

# 2015



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April 2015

Prepared by:  
Ganzorig Gonchigsunlaa  
Marlon Flores



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## VALUATION OF CONTRIBUTION OF ECOSYSTEM SERVICES OF THE ORKHON VALLEY NATIONAL PARK TO SECTORAL ECONOMIC DEVELOPMENT

### THE STUDY TEAM:

#### **Ganzorig Gonchigsumlaa**

Environmental Economist - National Consultant  
Lecturer, School of Economics and Business  
Mongolian University of Life Sciences  
[ganjaa123@yahoo.com](mailto:ganjaa123@yahoo.com)

#### **Marlon Flores**

Economist - International Consultant  
Senior Advisor, Environmental Economics & Finance  
Ecologic Institute, Washington DC  
[marlon.flores@eius.org](mailto:marlon.flores@eius.org)



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# ACRONYMS

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BAU	Business As Usual
ESS	Ecosystems services
GoM	Government of Mongolia
INC	Investing in Natural Capital
MEGTD	Ministry of Environment, Green Development and Tourism
MoFA	Ministry of Food and Agriculture
MNPAs	Mongolian Network of Protected Areas
NBT	Nature-based tourism
NGO	Non Governmental Organization
NSO	National Statistical Office Mongolia
OVNP	Orkhon Valley National Park
PAAD	Protected Areas Administration Department
TSA	Targeted Scenario Analysis
SPAN	UNDP “Strengthening of the Protected Area Network” Project
UNDP	United Nations Development Programme
GEF	Global Environment Facility
Mt.	Mountain



## EXECUTIVE SUMMARY

The United Nations Development Programme sponsored GEF Project “Strengthening of the Protected Areas Network of Mongolia (SPAN)” (2010-2015) is providing support to the Ministry of Environment, Green Development and Tourism. The objective of the project is to catalyse the management effectiveness and financial sustainability of Mongolia’s protected areas system. The project has three major outcomes that will contribute to achieve its objective: (1) Strengthened national policy, legal and institutional frameworks for sustainable management and financing of the national PA system; (2) Institutional and staff capacity and arrangements are in place to effectively manage and govern the national PA system; and (3) Sustainable financing mechanisms and innovative collaboration approaches demonstrated at demonstration sites, increasing funds and effective strategies for PA management.

In order to achieve the overall project objective, and particularly to mobilize political will to expand financial support to the Mongolian Network of Protected Areas (MNPAs), an economic valuation of the contribution of the MNPAs to the economy has been deemed necessary. This valuation includes a site level report on the Orkhon Valley National Park (OVNP). This report is an integrated part of the above-indicated UNDP’s SPAN Project, and focuses on the OVNP.

The report is organized in 4 sections. Sections 1 and 2 provide an introduction, objective and basic concepts related to ecosystems services.

The objective of this study is to analyse selected productive sectors and determine the gains or losses of undertaking productive activities by comparing “poor” with “sound” protected area’s ecosystem management practices. It is expected that this report will assist government officials and the private sector to incorporate ecosystems’ management policy into PA investment, economic planning, corporate business plans, and investment policies at sectoral level. It is also expected that the input of this report

will provide economic and social arguments to help MEGDT to mobilize political will to increase financial support the MNPAs’ management plans and financial strategies.

The study used a basic Targeted Scenario Analysis (TSA) approach. Using economic impact indicators, TSA assesses current “business as usual (BAU)” ecosystems management practices and its current value; and compares it with a sustainable ecosystems management scenario defined as INC (investing in natural capital) and its potential values. TSA may also assess potential gains (or losses) of shifting from BAU to INC. The BAU approach is characterized by a focus on short-term gains (e.g., < 10 years), externalization of impacts and their costs, and little or no recognition of the economic value of ecosystem services (ESS), which are typically depleted or degraded. Under INC, the focus is on long-term gains (> 10 years); also under INC, the costs of impacts are internalized. In INC, ESS are maintained, thus generating potential for a long-term flow of ecosystem goods and services that can enter into decision-making. INC practices tend to support ecosystem sustainability as a practical and cost-effective way to realize long-run profits.

Section 3 is the core part of the report. It contains the assessment of the contribution of ESS of the OVNP to the economy. Depending on the availability of data, economic indicators are used to assess BAU and INC impact; for example, productivity level and value, and employment. Using the TSA approach, the following sectors were assessed: nature-based tourism (NBT) tourism, irrigated agriculture, livestock, drinkable water, and forestry.

The OVNP is one of the most attractive destinations for tourists in Mongolia. About 20% of foreign tourists that come to Mongolia visit the OVNP to see both natural beauty and historical sites. The UNESCO World Heritage as Cultural Landscape recognized the Orkhon Valley in 2004.

The OVNP is becoming a very popular tour-destination. In 2013, 43,591 tourists visited to OVNP,

of which 17,625 tourists were foreigners, and 25,966 tourists are Mongolian. In recent years, growth of domestic tourists is higher than foreigners, for example about 46% of tourists were Mongolians in 2006, but it is increased to about 60% in 2013. OVNP's Administration (2012) reports indicate that there were 8,560 domestic tourists visited to OVNP in 2006, which is about 3 times less than number in 2013. The value of the contribution of ecosystem services of OVNP to tourism, under BAU, is estimated at 14.9 billion MNT (USD 9.8 million) in 2013. In INC, well managed attractions and planned visitation schedules may lead to an increase in the number of tourists and number of days spent in OVNP. Considering the current level of visitation the baseline for INC, the value of the contribution of ESS of OVNP to the NBT sector may reach 35.1 billion MNT (USD 23 million) in 2033.

There is a direct link between irrigated agriculture and ecosystems services that originate in the OVNP. Although the law prohibits farming in PAs, neighbouring subsistence farming areas benefit through ecosystem services, e.g., water and pollination service, which are generated from and preserved in OVNP.

Irrigated agriculture employs people in both subsistence (household) and commercial farming (companies). In 2012, approximately 2000 people were engaged in irrigated agriculture in six Soums of OVNP. This level of self-employment and formal employment will not be possible without the input of freshwater and pollination ecosystem services that originates in the OVNP.

This report assessed a range of agricultural products, and concluded that the total economic benefit of crops (hay, fodder, wheat, vegetable and fruits), which is sum of net benefit of crops production and income of employing people, has increased in recent years; for example from 1.4 Bln MNT (USD 1.25 Million) in 2002 to 6.0 Bln MNT (USD 4.42 Million) in 2012.

The above-indicated benefits are considered to be under BAU. Therefore, it is not considered sustainable in the long-term. If BAU continues, it is estimated that the net economic loss may reach 35.9 billion MNT (USD 26.4 million) between 2013 and 2033.

The OVNP is rich in natural grassland that provides a direct input to sustain livestock productivity in neighbouring Soums, and to support the livelihoods of thousands of herders. In 2012, there were approximately 1 million livestock in six Soums of the

OVNP. The number of livestock has increased from 581,300 in 2002 to 1,073,800 in 2012.

The values of livestock in and around the OVNP were estimated by the production of different livestock including goat, sheep, cattle, horse, and camel and the values of meat and hides, milk (cow and goat), cashmere and wool. The gross market value of the livestock production is estimated at 57.8 billion MNT (USD 42.6 Million) in 2012. The net benefit is estimated at 34.1 billion MNT (USD 25.1 million). However, due to poor grassland ecosystems management, the current level of growth may not be sustainable. Hence, in order to sustain current productivity and market values, better investment in ecosystem services of PAs is required. This is the case of KharKhorin Soum, because it is the largest beneficiary of ESS from the OVNP. About 23.5% of livestock productivity is located in this Soum.

Income to rural families is highly important in the livestock sector. According to the (National Statistical Office of Mongolia, 2014b), about 10,900 people are engaged in livestock activities in 2012.

In terms of water supply, the Orkhon River is one of the most important rivers in Mongolia. It runs through the OVNP and receives tributaries such as the Tuul River and Tamir River. There are 219 rivers, 36 springs, 7 mineral water points, and 15 lakes that are located or run through the OVNP. In 2012, there were 43 thousand people have benefitted from drinkable water ecosystem services that are linked with OVNP and most of the live in KharKhorin and Uyanga Soum.

The value of drinkable water that originates from or runs through the OVNP in Mongolia increased from 189.1 million MNT (USD 170,300) in 2002 to 421.5 million MNT (USD 276,600) in 2013. The total value for the period from 2002 to 2013 is estimated at 2.8 billion MNT (USD 2.03 million). The Total value increased sharply since 2009, this is the year that Khujirt GEM LLC started producing bottled water for the Ulaanbaatar market. Until 2013, the value of bottled water reached 235.2 million MNT (USD 211.8 thousand), which is 55.8% of total value of drinkable water of OVNP. This significant benefit is based on free freshwater ESS partly provided by the OVNP.

BAU practices will produce short-term benefits up to 2025, which is about 1.62 billion MNT (USD 1.19 million); however, starting in 2026 BAU practices may lead to loss. By 2033 the sum of loss could reach 1.65 billion MNT (USD 1.22 million). Under INC





practices, the total value of the OVNP's drinkable water would be 560.8 million MNT (USD 412.6 thousand) in 2033, which is 1.3 times higher than the value in 2013.

The OVNP is rich in forests resources and therefore forest ecosystems directly contribute to the benefits generated by the forestry sector. Bat-Ulzii Soum is the most important Soum among other five OVNP Soums. About 75% of Bat-Ulzii Soum is under protection. Bat-Ulzii Soum has 12.9 million hectares of forest and 0.63% (81,511 hectares) of the total forests of Mongolia. About 31.4% of the area of Bat-Ulzii Soum is covered with forests, and forest area in OVNP is 22.3%.

The net value of wood from OVNP between 2010 and 2013 is estimated at 219.2 million MNT (USD 161.3 thousand). People benefit from forest by extracting firewood for cooking and heating purposes; and to make materials for building houses, Gers, and construction. The net value of wood production is decreasing in the BAU scenario from 99.5 million MNT (USD 65.3 thousand) in 2013, and to 73.5 million MNT (USD 48.2 thousand) if projected to 2033.

Because of its abundance in the OVNP, larch is used to estimate the value of carbon sequestration. The total area of forest of the OVNP is 151,900 hectares, out of which 135,900 hectares are covered with larch. The value of carbon is assessed for illustrative purposes only; because the value of carbon is considered as supply driven; and currently, there is no active carbon market in Mongolia. Nevertheless, it is estimated at 1.93 billion MNT (USD 1.34 million) in 2013. This value, under BAU, is decreasing due to the loss of tree coverage. This could lead to a potential loss estimated at 11.5 billion MNT (USD 7.6 million) for next twenty years.

The study concluded, in Section 4, that despite challenges of having limited information available to the study, there is substantial evidence that the ESS provided by the OVNP make a large contribution to the regional economy. Nevertheless, as in many other countries in the region, resource degradation under BAU, typically, offers immediate returns in the form of marketable products such as livestock; and the negative impact of ecosystem wear and tear under BAU practices may not be visible in the short term but will eventually damage economic growth. The study concludes that currently, there could be significant losses as a result of BAU practices; and that the shift to INC will increase economic benefits. Detailed sector conclusions are included in section 4.1

Finally, In Section 4.2, a set of recommendations is included; for example:

- Assess the current policy barriers to improve ecosystems management in and around the OVNP; based on the results of the analysis, the OVNP's administration could increase in collaboration with the Soums' government and local herders to mainstream sustainable natural resource management for grassland and water into policies. This may include grass management plans based on an assessment of the adequate carrying capacity of grasslands in the OVNP considering the needs of endemic animal and plant species.
- Soums' governments could develop a sustainable-tourism business strategy in close collaboration with the private sector and the network of PAs of Mongolia. This strategy could include a full revision of the current entry fee policy; and services and infrastructure development such as walking trails, designated camping areas with amenities and entrance gates to facilitate statistical analysis of visitation.
- Visitor information centres should be financed and established in major urban centers and the OVNP;
- Create an OVNP webpage and incorporate financial information and economic impact information, and links to the network of PAs; information should be accessible in Mongolian and English.
- Business development in tourism sector should be encouraged by establishing local government financial incentives, and monitor the compliance of tourism companies with taxation rules.
- Assess drinkable water quality of springs and surface sources used for human consumption, and determine the need and extend of spring water protection policies.
- Establish the forest information systems to monitor the quantity and quality of forest in the OVNP and in collaboration with other regions and PAs.
- For the water and livestock sector, it is indispensable to assess the conditions of the areas of concentration (e.g., next to water sources) and develop livestock access to water policies to ensure sustainable livestock survival and maintaining healthy water sources.
- The above listed recommendations are a sample of what is needed to shift from BAU to INC in the reviewed sectors in this report.

# 1. INTRODUCTION

The United Nations Development Programme sponsored GEF Project “Strengthening of the Protected Areas Network of Mongolia (SPAN)” (2010-2015) is providing support to the Ministry of Environment, Green Development and Tourism. The objective of the project is to catalyse the management effectiveness and financial sustainability of Mongolia’s protected areas system. The project has three major outcomes that will contribute to achieve its objective: (1) Strengthened national policy, legal and institutional frameworks for sustainable management and financing of the national PA system; (2) Institutional and staff capacity and arrangements are in place to effectively manage and govern the national PA system; and (3) Sustainable financing mechanisms and innovative collaboration approaches demonstrated at demonstration sites, increasing funds and effective strategies for PA management.

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Its objective is to analyze selected productive sector and determine the gains or losses of undertaking productive activities by comparing “poor” with “sound” protected area’s ecosystem management practices. It is expected that this report will assist government officials and the private sector to incorporate ecosystems’ management policy into PA investment, economic planning, corporate business plans, and investment policies at sectoral level. It is also expected that the input of this report will provide economic and social arguments to help MEGDT to mobilize political will to increase financial support the MNPAs’ management plans and financial strategies. The OVNP is home of a range of wildlife, plants and animals, ecosystems and cultural monuments.

It provides corridors for wildlife migration from “Ikh Bogd” and “Khangai”; the OVNP also provides shelter to important watersheds from which many rivers originate. There are many touristic attractions such as Khuisiin Naiman Nuur, Orkhon Waterfall, Tuvkhun Monastery and Erdene Zuu Monastery. Developing eco-friendly tourism in the OVNP is the one of objectives of its management plan (2010).

The OVNP includes Turkish stone monuments from VI-VII Century, ruins of Uigar capital-Kharbalgas from VIII-IX Century, Erdenezuu Monastery from XVI century and Tuvkhun Monastery which was founded by Undur Gegeen Zanabazar in Orkhon Valley. In 2004, UNESCO declared the Orkhon Valley a World Heritage Site. The OVNP territory is divided into the following zones:

The pristine zone is only for conservation of the pristine nature, conducting study or survey and rehabilitation activities. Areas around Bayan nuur, Tooroit Mt., Shardov Mt., Khurenbuluu Mt., Kharkhul Mt., Mogoitiin Rashaan, Khangain Tsagaan chuluut, Khangain ovoo, Khamariin davaa, Uvurgeegen, Artsagaan, Sharbuluu Mt., Ulaan davaa, Khyatruunii davaa, Posts 3,4 and 2 and Bayan nuur are included into the territory of the OVNP Pristine Zone.

Tourism Zone. The activities allowed in the pristine zone and zone of limited use can also be conducted in the tourism zone. Areas around Tuvkhun Mt., Bulsh hill, Khuushiin gozgor Mt., Shanaga hill, Khujirtiin khudag, Shagshaa khudag, Khadatin khudag, Jargalantiin khudag, Golinkhanan Mt., Goliin hill, Artsat tolgoi, Undur artsat, Senjit Mt., Tolgoin barilga, Uliin khutul, Orkhon river, Khetsuu tolgoi, Berkh Bag Center, Suuj spring, Bondgor hill, Mukhdagiin khudag, Uurtiin tokhoi, Tsagaan river, Orkhon waterfall, Shakhlaga hill, Yargait hill, Ulaankhad Mt., Khudag Mt. and Tuvkhun Mt. are included into the territory of the OVNP Tourism zone.

Zone of Limited Use. In addition to the activities allowed in the pristine zone and zone of limited use livestock grazing, building holiday houses for tourists and travelers and roads can be conducted in the zone of limited use.



## 2.

## BIODIVERSITY, ECOSYSTEM AND ECOSYSTEM SERVICES

The term biodiversity refers to “the variety of life on Earth at all its levels, from genes to ecosystems, and the ecological and evolutionary processes that sustain it. Biodiversity includes not only species we consider rare, threatened, or endangered, but every living thing - even organisms we still know little about, such as microbes, fungi, and invertebrates. Biodiversity is important everywhere; species and habitats in your area as well as those in distant lands all play a role in maintaining healthy ecosystems. Healthy biodiversity is needed to satisfy basic needs like food, drinking water, fuel, shelter, and medicine. Much of the world’s population still uses plants and animals as a primary source of medicine, and in the United States alone, about 57% of the 150 most prescribed drugs have their origins in biodiversity.

An ecosystem is a natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors; it is a completely independent unit of interdependent organisms, which share the same habitat.

Ecosystem services (ESS) refer to direct and indirect contributions of ecosystems to human wellbeing (UNEP, 2014). The concept “ecosystem goods and services” is synonymous with ecosystem services<sup>1</sup>. There are number of definitions of ecosystem services. According to Schroter et al., (2005), ecosystem services (ESS) are the conversion of natural assets - such as trees, snow cover, and soil fertility - into valuable benefits such as wood products, winter tourism, and arable land. ES can be described as a “services provided by the natural environment that benefit people” (DEFRA, 2007: 10). Ecosystems provide services such as water supply, pollination, seed dispersal, climate regulation, water purification, nutrient cycling, and control of agricultural pests. Many flowering plants depend on animals for pollination, and 30% of human crops depend on the free services of pollinators”<sup>2</sup>.

Ecosystem services are classified as provisioning, regulating, supporting and cultural services (TEEB in Local and Regional Policy and Management, 2012).

Provisioning Services are ecosystem services that describe the material or energy outputs from ecosystems. They include food, water, construction materials and other resources.

Regulating Services are the services that ecosystems provide by acting as regulators eg: regulating the quality of air and soil or by providing flood and disease control.

Supporting services are directly linked to the habitats that support species and they have indirect influence on human wellbeing and other ecosystem services.

Cultural services are the non-material benefits including the recreation and tourism and specifically eco-tourism.

These ESS provide indispensable input to sectoral productivity enabling economic development. Key ESS from the OVNP are included in Table 1 below.

**Table 1:** Key ecosystem Services of the OVNP

Ecosystem service in OVNP	Covered in the study
Freshwater	•
Pollination	•
Forest	•
Grasslands (hay)	•
Fresh water supply (drinkable water)	•
Cultural	•
Nature-based sports: fishing, hunting, skiing, hiking, nature & wildlife viewing	•

The OVNP is rich in flora and fauna; and small rivers and springs feed the Orkhon River in OVNP. Water flow in the Orkhon River has reportedly been decreasing due to adverse climate conditions and poor ecosystem management. In fact, most rivers in the nearby Souns of Uvurkhangaigai have had severe reductions in water flow (estimated at 71.2%) from 1982 to 2007 (OVNP Protected Area Administration, 2014a).

<sup>1</sup> [www.teebweb.org](http://www.teebweb.org)

<sup>2</sup> <http://www.amnh.org/our-research/center-for-biodiversity-conservation/about/what-is-biodiversity>







# 3.

## VALUATION OF THE ECONOMIC CONTRIBUTION OF ECOSYSTEMS SERVICES OF OVNP TO SECTORAL DEVELOPMENT

The OVNP's freshwater, grasslands and forest ecosystems provide significant economic benefits to a range of sectors including: tourism, irrigated agriculture, livestock, drinkable water, and forestry. Approximately 12,010 hectares in Uyanga Soum of Uvurkhangai province is protected area, out of which 11,500 hectares belongs to Navel Eight Lakes (Khuisiin Naiman Nuur) Natural Monument Protected Area, and remaining 510 hectare of land is area of OVNP. The Uyanga Soum includes the Navel Eight Lakes natural monument and it also encompasses part of the OVNP. Therefore, for the purpose of this report, the economic benefits of the OVNP include the Navel Eight Lakes natural monument.

### 3.1 METHODOLOGY

The study used a basic Targeted Scenario Analysis (TSA) approach. Using economic impact indicators, the TSA assesses current "business as usual (BAU)" ecosystems management practices and its current value; and compares it with a sustainable ecosystems management scenario defined as INC (investing in natural capital) and its potential values. TSA may also assess potential gains (or losses) of shifting from BAU to INC. The BAU approach is characterized by a focus on short-term gains (e.g., < 10 years), externalization of impacts and their costs, and little or no recognition of the economic value of ESS, which are typically depleted or degraded. Under INC, the focus is on long-term gains (> 10 years); also under INC, the costs of impacts are internalized. In INC, ESS are maintained, thus generating potential for a long-term flow of ecosystem goods and services that can enter into decision making. INC practices tend to support ecosystem sustainability as a practical and cost-effective way to realize long-run profits.

It is expected that the TSA approach will serve multiple purposes:

Analyze selected economic sectors and determine the potential economic gains or losses of undertaking

productive activities by comparing "poor" with "sound" environmental management practices.

Inform policy makers and businesses about the economic risks and opportunities of undertaking productive activities that impact ecosystem services.

Assist government and the private sector to incorporate ecosystems' management policy into economic planning, corporate business plans, and investment policies at sectoral level.

Provide economic (and social) arguments to mobilize political will to increase financial support to improve ecosystems management.

Depending on the availability of data, economic indicators are used to assess BAU and INC impact. For example, productivity level and value, employment and income, fiscal impacts (taxes to government), and foreign exchange earnings. A more detailed description of the methodology is provided in Annex2.

Using the TSA approach, the following sectors were assessed: nature-based tourism, irrigated agriculture, livestock, drinkable water, and forestry.

### 3.2 NATURE-BASED TOURISM

The OVNP is one of the most attractive destination for tourists that come to Mongolia. About 20% of foreign tourists that come to Mongolia visit the OVNP to see both natural beauty and historical sites, including: Tuvkhun Mt., Bulsh Tolgoi, Khuush gozgor Mt., Shanaga hill, Khadatiink hudag, Jargalant khudag, Goliin Khanan Mt., that is shaped like wall, Goliin hill, Artsat hill, Senjit Mt., Tolgoin Barilga and Uliin Khutul in the eastern side, and along the edge of Orkhon river there are Khetsuu hill, Suuj spring, Bondgor hill, Mukhdagiin khudag, Uurtiin tokhoi, Orkhon waterfall, and Ongots bridge, Shakhlaga hill, Yargait hill, Ulaan khad Mt., Khudag Mt. Orkhon Valley was recognized by the UNESCO World Heritage as Cultural Landscape in 2004.



**Photo:** Navel Eight Lakes. <http://www.sunpath-mongolia.com/pages/eighth-lakes>



**Author:** D.Dojinnyam <http://whc.unesco.org/en/list/1081/gallery/>



#### **Orkhon Valley Cultural Landscape – UNESCO World Heritage**

The 121,967-ha Orkhon Valley Cultural Landscape encompasses an extensive area of pastureland on both banks of the Orkhon River and includes numerous archaeological remains dating back to the 6th century. The site also includes Kharkhorum, the 13th- and 14th-century capital of Chinggis (Genghis) Khan's vast Empire. Collectively the remains in the site reflect the symbiotic links between nomadic, pastoral societies and their administrative and religious centres, and the importance of the Orkhon valley in the history of central Asia. The grassland is still grazed by Mongolian nomadic pastoralists.

There are 20 companies operating tourism business in the OVNP, including 12 in Kharkhorin, 6 in Bat-Ulzii, 1 in Khujirt, and 1 in Khashaat Soum. Nature-based tourism (NBT) is important to sustain economy of the rural communities. Communities are involved in: providing Ger camps, Ger Hotels, small shops, supermarkets, tours, cafeterias, restaurants, selling souvenirs, and horseback riding. For example, the "Trap Stone" community, established in 2012, includes 14 households and provides jobs for 28 people; and it generates an estimated 4-6 million MNT (USD 2,600 to 3,900) of revenue per year per household<sup>3</sup>. The number of tourists visiting OVNP is increasing. Graphic 1 below shows the increasing trend from 2005 to 2013.

The OVNP is becoming a very popular tour-destination. In 2013, 43,591 tourists visited to OVNP, of which 17,625 tourists were foreigners, and 25,966

tourists are Mongolian. In recent years, growth of domestic tourists is higher than foreigners, for example about 46% of tourists were Mongolians in 2006, but it is increased to about 60% in 2013. OVNP's Administration (2012) reports indicate that there were 8,560 domestic tourists visited to OVNP in 2006, which is about 3 times less than number in 2013.

Although increasing the number of visitors to OVNP could be beneficial in economic terms, to date it has been detrimental in environmental terms. Domestic tourists who leave trash in the areas that they visit and poor waste management by the park administration cause the most visible impact. These may eventually cause a decline in foreign visitors. This is a typical BAU scenario. Table 2 below illustrates the characteristics of BAU and INC in NBT.

<sup>3</sup> Interview with Mr Chuluunbat Khenmedekhev, leader of "Trap Stone" community, Bat-Ulzii Soum, in 9th February, 2014.



OVNP Administration Office and Mongolian National Mountaineering Federation have organized "National Championship for Ice Climbing-2015" at Orkhon waterfall zone of OVNP.

During the championship, working group from OVNP Administration Office has organized advocacy

activities about the protection regulations of Orkhon waterfall zone in order to improve knowledge of local people to increase the value of the OVNP, and to expand eco-friendly tourism in OVNP, for three days.

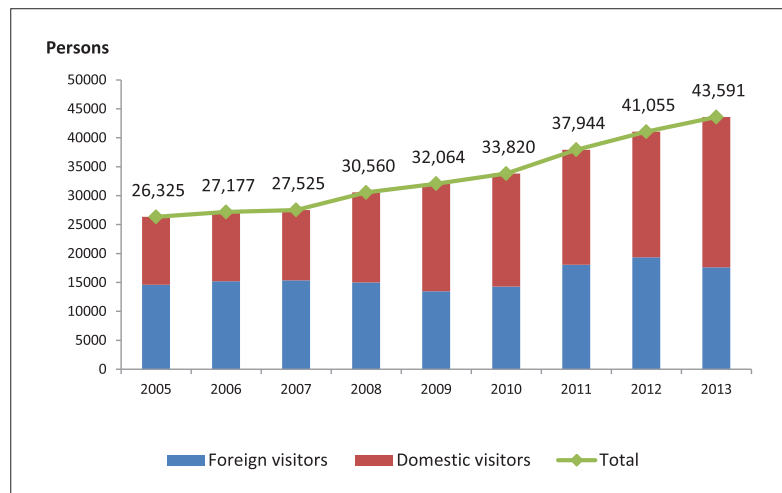


The climbing championship with motto of "RESPECT THE MOUNTAINS" has been successfully organized

among more than 100 people with respect to the PA regulations.



**Graphic 1.** Number of tourists in OVNP



Source: OVNP Protected Area Administration (2012, 2014b)

**Table 2. Characteristics of NBT in OVNP in Mongolia (BAU/INC)**

**BAU**

- Poor tourism visitation management causes ecosystems degradation.
- Landscape pollution: garbage along roadsides, riversides, lakes, and main tourist attractions).
- Reduced visitation due to lack of visitors' safety programs.
- Limited access: limited domestic train and bus routes, poor road infrastructure; and low quality transport service and safety.
- Poor (basic) and limited hotels and sanitation infrastructure.
- Limited and poorly managed family owned accommodation and non-trained staff or poorly trained staff.
- Lack of information centres and information material; and limited web-based information.
- Water and electricity shortages.
- Poor or no investment in OVNP's tourism infrastructure.
- Poor marketing and communications.
- Limited access to health services (hospitals)
- Unplanned infrastructure (e.g. housing) being constructed in areas, which have a potential destination for tourists.
- Lack of sustainable tourism strategy, fragmentation of potential destinations /packages (e.g. natural, adventure, winter, health).
- Unregulated and poorly managed land-use and zoning.
- Lack of OVNP entry fees.
- Poor access within natural attractions (lack trails and information signs).
- Poor inter-institutional collaboration between Central tourism agencies, OVNP authorities and local governments; and local (community) organizations.
- Limited service providers (tour operators).
- Poor quality of services (local hotels, restaurants, family owned accommodation, tour operators)

**INC**

- Sustainable tourism policy including ecosystems management and land use.
- Strict waste management in OVNP.
- Visitation and visitor's safety programs available.
- Improved access and transport to main attractions, and safety.
- Suitable infrastructure for foreign visitors available in key destinations.
- Well-trained and managed family owned accommodation and trained staff.
- Information centres in appropriate locations and information material
- Improved content in web sites (in English and other major languages).
- Institutional coordination to avoid power cuts and water shortages during tourism seasons.
- Basic financial needs of OVNP covered by the state (incl. infrastructure).
- Marketing and communications strategy in coordination with the Tourism Department.
- Improved access to health services (hospitals) in key locations.
- Land use policy within OVNP regulates adequate infrastructure development (e.g. housing).
- Sustainable tourism strategy implemented in full collaboration with the private sector operators.
- Improved OVNP entry passes systems and fees retention by OVNP.
- Improved access within key natural attractions (lack trails and information signs).



The estimation of the economic benefits of ecosystem services of OVNP to the tourism sector is based on the number of tourists multiplied by average expenditure per tourist in OVNP. The average expenditure for

both foreign and domestic tourists was provided by the OVNP Administration (2014b). This is shown in Table 3 below.

**Table 3.** Expenditure of tourists who visit to OVNP

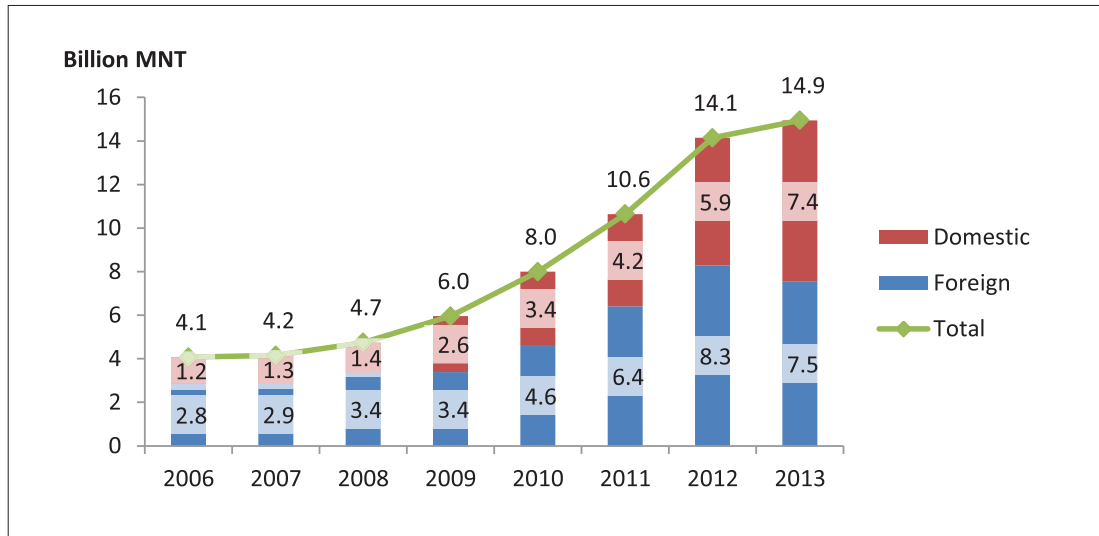
	Row ID	Tourist type	2006	2007	2008	2009	2010	2011	2012	2013
Average cost of hotel/ Ger camp to stay one night per person (000 MNT)	A	Foreign	20.0	20.0	25.0	25.0	30.0	30.0	35.0	35.0
		Domestic	20.0	20.0	20.0	20.0	25.0	25.0	30.0	35.0
Average cost of food per person per day (000 MNT)	B	Foreign	15.0	15.0	15.0	15.0	21.0	21.0	25.0	25.0
		Domestic	15.0	15.0	15.0	15.0	18.0	18.0	25.0	25.0
Average cost of tourist attractions, services, and tourist activities per person per day (000 MNT)	C	Foreign	12.0	12.0	12.0	12.0	20.0	20.0	20.0	20.0
		Domestic	10.0	10.0	1.0	10.0	12.0	12.0	15.0	15.0
Total cost per person per day (000 MNT)	D=A+B+C	Foreign	47.0	47.0	52.0	52.0	71.0	71.0	80.0	80.0
		Domestic	45.0	45.0	36.0	45.0	55.0	55.0	70.0	75.0
Average days spent in OVNP per person	E	Foreign	2	2	3	3	3	3	3	3
		Domestic	3	3	3	4	4	5	5	5
Total cost of OVNP excluding entrance fee and transportation (000 MNT)	F=D x E	Foreign	94.0	94.0	156.0	156.0	213.0	213.0	240.0	240.0
		Domestic	135.0	135.0	108.0	180.0	220.0	275.0	350.0	375.0
Average transportation cost per person two way to/from OVNP (000 MNT)	G	Foreign	215.0	215.0	215.0	260.0	320.0	375.0	470.0	470.0
		Domestic	35.0	40.0	40.0	50.0	70.0	80.0	100.0	100.0
Average cost of entrance fee per person to OVNP (000 MNT)	H	Foreign	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		Domestic	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total cost for visiting to OVNP per person (000 MNT)	I=F+G+H	Foreign	312.0	312.0	374.0	419.0	536.0	591.0	713.0	713.0
		Domestic	170.3	175.3	148.3	230.3	290.3	355.3	450.3	475.3

Source: Authors' Estimation, OVNP Protected Area Administration (2014b)

According to data provided by OVNP Administration (2014b), in 2013, one foreign tourist spends an average of 713 thousand MNT (USD 467.9) in a 3 nights stay at the OVNP. It includes the costs of hotel, food, entrance fee, fee for services, transportation. For domestic tourists, in the same year, the average is 475.3 thousand MNT (USD 311.9) for a 5 nights

stay at the OVNP. Expenditure for domestic tourists is less than foreigners, but their stay at the park is longer. It is assumed that the net benefit is 60% of the total revenue, and remaining 40% is the cost of the operation. The net value between 2006 and 2013 is shown in Graphic 2.

**Graphic 2.** Value of ecosystem services of OVNP for tourism sector (Billion MNT)



Source: Authors' estimation

The gross market value of estimated that number of foreign and domestic tourists who visited to OVNP is multiplied by average cost per foreign and domestic tourist. Then, in order to estimate net value of the ecosystem services of OVNP for tourism sector, total value was multiplied by 0.6 as a share of profit of tourism business. Thus, the value of the contribution of ecosystem services of OVNP to tourism is 14.9 billion MNT (USD 9.8 million) in 2013, which is 3.7 times higher than value in 2006.

The current situation of the park is considered BAU and therefore those values are used as the BAU baseline to compare with INC.

In the BAU scenario, tourism mismanagement will continue in the OVNP. I.e. the number of tourists will continue to increase, especially domestic tourists, the pollution and ecosystems degradation will also increase, and eventually, tourism will start to decline. The average annual growth rate of tourism benefits, between 2006 and 2013, of 21.1% is considered unsustainable, without adequate investment in infrastructure and management. Therefore, it is expected that this average growth rate will decline in the coming years by 2.2% per year assumed. Under BAU, the benefit will continue to increase in the short term, up to 2024 while growth rate is positive still. However, since 2025 the value decreases because

since then the annual growth rate becomes negative and continues to decline more.

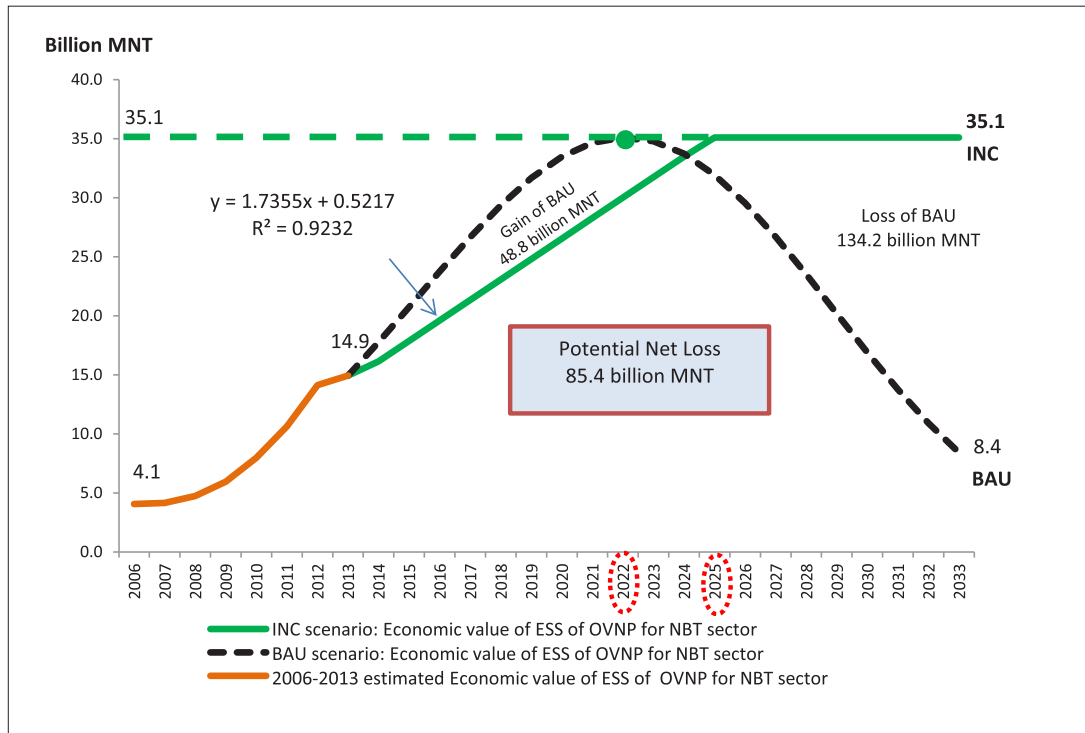
Under BAU, between 2014 and 2024, tourism sector may provide benefits in the order of 48.8 billion MNT (USD 32 million). However, from 2025 onwards, BAU will deteriorate. The estimated total loss under BAU from 2025 to 2033 is 134.2 billion MNT (USD 88 million). The net loss then becomes 85.4 billion MNT (USD 56 million) between 2014 and 2033; as illustrated in Graphic 3.

If the Government of Mongolia and the OVNP's stakeholders invest in ecosystems management and sustainable tourism, benefits will be more sustainable. In INC, well managed attractions and planned visitation schedules may lead to an increase in the number of tourists and number of days spent in OVNP. Considering the current level of visitation the baseline for INC, the value of the contribution of ESS of OVNP to the NBT sector may reach 35.1 billion MNT (USD 23 million) in 2033. It is assumed that the value increases linearly until 2025 and remain constant in following years, which the value is considered as sustainable level of tourism value. It is also assumed that the highest economic value of OVNP under BAU is 35.1 billion MNT (USD 23 million) in 2022; this is considered as maximum capacity or sustainable level of value.





**Graphic 3.** Trend of value of ecosystem services of OVNP for Nature Based Tourism sector



### 3.3 IRRIGATED AGRICULTURE

There is a direct link between irrigated agriculture and ecosystems services that originate in the OVNP. Although the law prohibits farming in PAs, neighbouring subsistence farming areas benefit through ecosystem services that are generated from and preserved in OVNP (Parliament of Mongolia, 1994). Historically, land of OVNP used to be one of the main areas for agricultural production during socialist time. It is also part of Khangai region where the soil was more fertile and the most convenient to plant agricultural products. However, in the last three decades, because of unsuitable agricultural practices, the soil has become lighter and heavily eroded by wind in OVNP.

KharKhorin Soum of Uvurkhangai province is good example in crop farming, comparing to other five Soums overlapped with OVNP, that cultivates, on average, an area of 18.9 thousand hectares every year (Administration Office of Uvurkhangai Province, 2013). In this Soum, 12 companies providing jobs for over 500 local people, and 332 households providing jobs for 700 people in full time run irrigated agriculture in 2013 as stated by Soum Governor<sup>4</sup>.

For example, one of the biggest sea-buckthorn production company in Mongolia called “KharKhorin” LLC cultivated 500 hectares since 2005 (Department of Industry and Agriculture of Uvurkhangai Province, 2014). This company uses water for irrigation that originates in the Orkhon river in the OVNP.

The KharKhorin Soum is the only Soum where cereals are produced out of other five Soums that overlap with OVNP. This Soum produces about one third of vegetable production of the Uvurkhangai province. About 90% of total crop farming equipment, e.g., tractors, soil processing and seedling machineries of Uvurkhangai province are in KharKhorin Soum (Department of Industry and Agriculture of Uvurkhangai Province, 2014).

Three ecosystems services that provide its benefits to irrigated agriculture:

Water supply. Orkhon river is one of the biggest river in Orkhon-Selenge river basin. The flood plain of Orkhon river makes the soil of the land of Orkhon valley more fertile for running irrigated agriculture. Ecosystem service of water supply from OVNP is crucial for irrigated agriculture in KharKhorin, Bat-Ulziit, Uyanga, Khujirt Soums of Uvurkhangai province, and Khashaat, Khotont Soums of Arkhangai province.

<sup>4</sup> Name of Soum governor is Enkhbat Lamzav, interview held in KharKhorin Soum administration office, Uvurkhangai province, on 10th February, 2014

Pollination: Pollinators are important for subsistence farming especially for orchard, horticultural and forage production. In addition the production of seeds for many root and fiber crops (FAO, 2014). Those species, which transfer the pollen resulting in fertilization and seed set, are for example bees, butterflies, hover flies, birds, and bats; furthermore, pollination can be done by wind. OVNP has 95.5 thousand hectares of forest area which is home of flowers and diversified species of plants. This makes the pollination services more available because richness of plants creates convenient environment

for pollinators such as bees and butterflies. Natural hay. Natural grassland are used for grazing and converted to hay when it is harvested. This is indispensable to sustain livestock production. For the purpose of this study, because of unsustainable farming practices and poor investment in fresh water ecosystem management subsistence, the current commercial farming is considered as BAU practice. A sample of BAU characteristics are shown in Table 4 below.

**Table 4. Characteristics of irrigated agriculture under BAU and INC scenarios**

BAU	INC
<ul style="list-style-type: none"> <li>▪ Lack of ecosystems management policy, poor extension services (non-trained or poorly trained extension workers /farmers, lack of information centers and information material, lack of on-site regulation for agro-business investment and development.</li> <li>▪ Poorly funded agricultural policy</li> <li>▪ Poorly planned and maintained irrigation infrastructure.</li> <li>▪ Excessive use of pesticides and chemical fertilizers.</li> <li>▪ Deforestation around river basins, in grasslands, and lack of silvo-pastoral systems.</li> <li>▪ Water pollution</li> <li>▪ Unregulated and poorly managed land-use and zoning; particularly in grasslands.</li> <li>▪ Poor preparation for Dzud years due to reduction of natural hay harvest.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Suitable farming policy and practices, ecosystems management policy, effective extension services (trained extension workers and farmers, information centers and information material available, on-site regulation for agro-business investment and development.</li> <li>▪ Investment supports sustainable agricultural policy, including preparedness for Dzud years.</li> <li>▪ Planned and maintained irrigation infrastructure.</li> <li>▪ Control and incentives to phase out or limit pesticides and chemical fertilizers use.</li> <li>▪ Reforestation strategy.</li> <li>▪ Fiscal incentives (fines) to control/eliminate sources of water pollution.</li> <li>▪ Regulated and well-managed land-use and zoning, including grasslands use planning.</li> </ul>

in order to assess BAU and INC scenarios in irrigated agriculture, and the existing and potential gains or losses, the following indicators have been selected: production levels, market value, labour force, and tax revenue to the governments.

Irrigated agriculture in Mongolia produces a variety of products. For the purpose of this analysis, five categories of products have been selected to estimate the economic contribution of ecosystems in terms of agricultural output: hay, fodder, wheat, vegetables, and sea buckthorn. These analyses are presented in the next sections. The National Statistical Office of Mongolia (2014) provided data for this analysis, for each Soum that overlaps with the OVNP.

### Hay

Hay is important to feed livestock during winter and spring time; an estimated 25,900 tons of hay are harvested every year in the six Soums that overlap

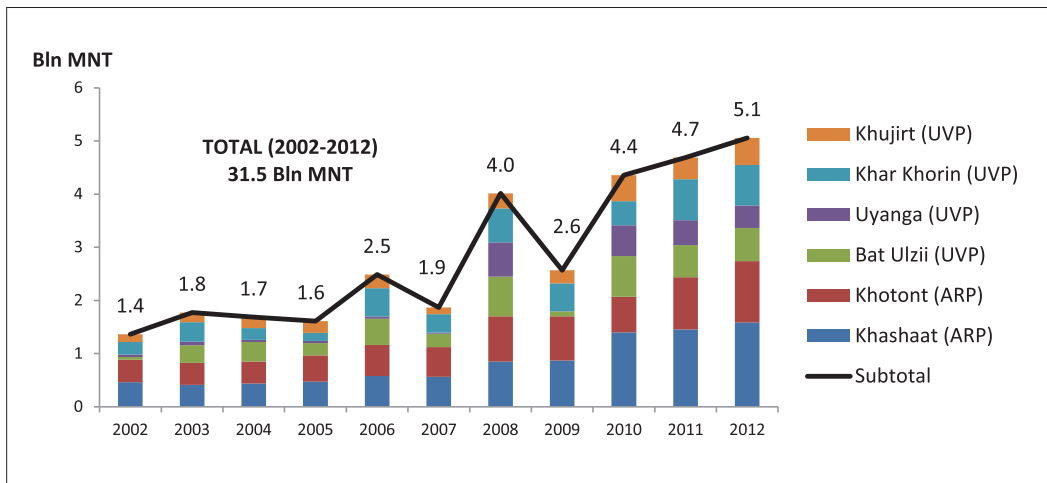
with the OVNP. The cumulated production of hay for 2002-2012 is estimated at 238,700 tons in the six Soums. Hay harvesting has increased in the last decade because of the increasing number of Livestock, however, harvest decline in years with less precipitation.

The hay market price is rapidly increasing since demand is higher than supply. This is an increasing threat to the OVNP natural grass ecosystems reducing regrowth of the grass and leading to grass scarcity. For example, in 2012, 4,560 tons of hay was harvested from the OVNP. In 2012, the average price of hay per ton was 195.5 thousand MNT (USD 143.8) in the Soums overlapping in the OVNP<sup>5</sup>. Since 2007, the price of hay is increased by 100%.

<sup>5</sup> 2012 yearly exchange rate is 1USD=1359.24 MNT on average of 12 months exchange rates reported in [www.mongolbank.mn](http://www.mongolbank.mn).



**Graphic 4.** Total market value of hay production in Soums overlapped with OVNP (Bln MNT)



Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

Graphic 4 shows that the total market value of hay production in 2012 was 5.1 billion MNT (USD 3.72 million) including the production of six Soums that overlap with the OVNP; and the aggregated market value of hay production for 2002-2012 is estimated at 31.5 billion MNT (USD 23.2 million). The availability of this indispensable resource is a significant for the households engaged in livestock in and around the OVNP.

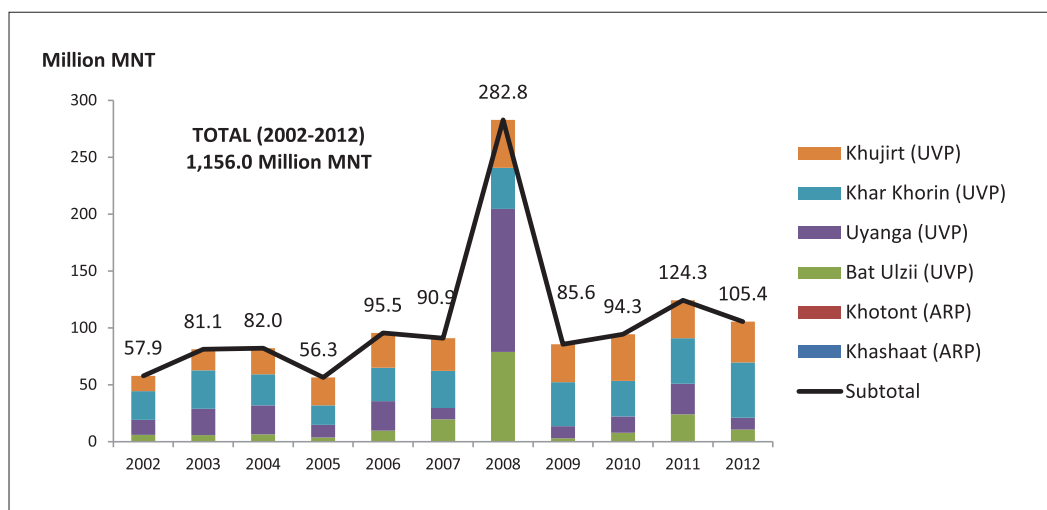
**Fodder**

Fodder is mixture of cereals such as wheat, barley, or fodder plants with minerals like salt, and it is used to feed livestock during winter and springtime.

Approximately 543.2 tons of fodder was harvested in six Soums where the OVNP is located. The aggregated production of fodder for 2002-2012 was 9,300 tons in six Soums. Except from 2008, fodder production has been stable for the last decade. The major increase of fodder production was driven by the increase of fodder production from 80 tons in 2007 to 959.6 tons in 2008 in Uyanga Soum.

As it is the case of hay, the market price of the fodder is increasing. In 2012, the average price of fodder per ton was 134.5 thousand MNT (USD 99) in OVNP overlapped Soums.

**Graphic 5.** Total market value of fodder production in Soums overlapped with OVNP (Million MNT)



Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

Graphic 5 shows that the total market value of fodder production in 2012 is 105.4 million MNT (USD 77.6 thousand) that are harvested from the six Soums that overlap with OVNP; and the aggregated market value of fodder production for 2002-2012 is 1.16 billion MNT (USD 850.5 thousand). This is also a free (cost saving) benefit of free ESS to local communities.

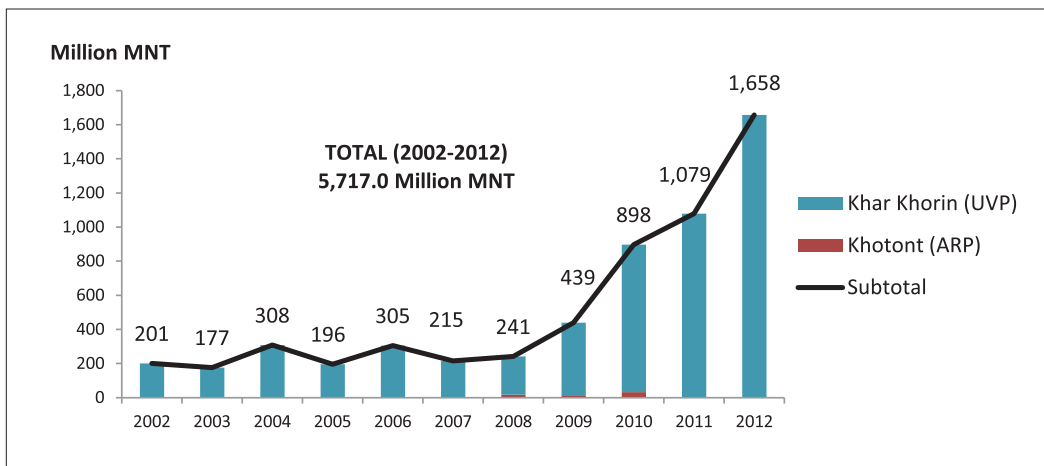
### Wheat

Fresh water ESS that originates in the OVNP is indispensable for the production of wheat around the ONNP. Wheat is produced only in two Soums where OVNP is located: KharKhorin Soum of Uvurkhangaï province and Khotont Soum of Arkhangai province. However, KharKhorin Soum alone produced total of 5.3 thousand tons of wheat while other five Soums have not produced any in 2012. The aggregated production of wheat for 2002-2012 is the two

Soums is estimated at 24,000 tons. Since 2008, amount of wheat production in KharKhorin Soum is increasing rapidly from 857 tons to 5,329 tons in 2012 (6.2 times higher). Water from the Orkhon River used for irrigation has been crucial to sustain this increase in productivity. However, the capacity of the Orkhon River is being compromised. This may affect productivity in the future.

The market price of wheat also has been increasing rapidly in the last decade. The average market price per ton of wheat was 311.1 thousand MNT (USD 228.9) in 2012. This has forced the government to intervene and buy wheat from wheat producing companies to provide subsidized (cheap) wheat to flour milling companies. The GoM subsidy policy to wheat is part of the Third Land Rehabilitation Campaign. The trend of the market value of wheat 2002-2012 is shown in Graphic 6.

**Graphic 6.** Market value of wheat production in Soums overlapped with OVNP (Million MNT)



Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

Based on official data, the total market value of wheat production in 2012 was 1.7 billion MNT (USD 1.2 million) that are harvested from two Soums locate overlapping with OVNP; and the aggregated market value of wheat production for 2002-2012 is 5.7 billion MNT (USD 4.2 million). This production will not be possible without irrigation from the Orkhon River. However, nothing is invested in fresh water ecosystems management to ensure an appropriate management of water resources. This is a typical BAU situation.

### Vegetables

Vegetable production in the six Soums where OVNP is located is increasing rapidly. It has grown from

approximately 460 tons in 2006 to 1,980 tons in 2012; an estimated 67.5% of this production was potatoes. KharKhorin Soum is also dominant in terms of vegetable production because there 72.3% of total vegetable is produced in 2012 (See Annex 2 for more details of the composition of vegetables production).

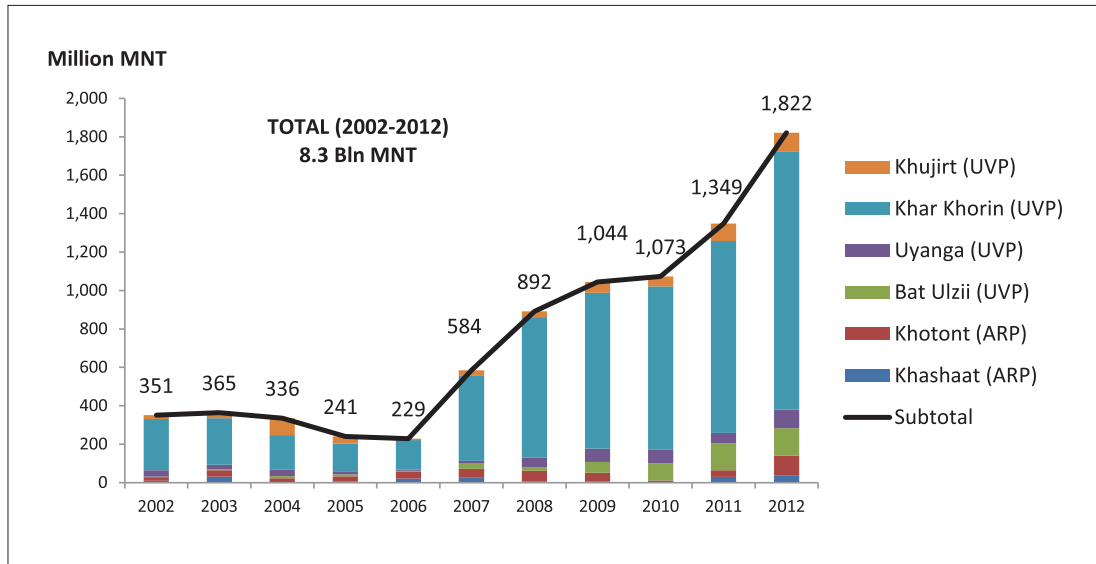
Since collective farming collapsed late 1980s, vegetable production also declined due to the economic downturn in Mongolia; i.e., the transition from the socialist to the democracy systems. In recent years, with government support, irrigation schemes have increased and this has resulted in increased vegetable production; this is evident in the six Soums



that overlap with the OVNP. In addition, increases in market prices of vegetables have motivated small farmers to expand irrigated vegetable farming. In 2012, the average market price per KG of

vegetables, except cucumber, was 1,253 MNT (USD 0.92) and 2,786 MNT (USD 2.04) for cucumber. Graphic 7 below shows the trend in market values for vegetables from 2002 to 2012.

**Graphic 7.** Market value trends of vegetable production in Soums overlapped with OVNP (Million MNT)



Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

The total market value of vegetable production in 2012 is 1.8 billion MNT (USD 1.34 million). This was harvested from the two Soums that overlap with OVNP, in 2012. The aggregated market value of vegetable production from 2002 to 2012 was 8.3 billion MNT (USD 6.1 million). KharKhorin Soum is the most productive among the other five Soums, i.e., 73.8% of total economic value was generated in KharKhorin Soum. Again, this benefit derived from free water from irrigation is considered BAU because it neglects freshwater ecosystems management.

### Fruit

Tomatoes and sea buckthorn are considered the most important fruits in the OVNP region; KharKhorin Soum is the most important producer.

The largest sea buckthorn production company KharKhorin LLC in KharKhorin Soum cultivated 500 hectares of sea buckthorn in 2007. The initial production was 8.5 tons in 2010. The company is equipped with drip irrigation system using water from Orkhon river. The company is supported by a government's soft loan for expansion and investment under the GoM's "Sea buckthorn

national programme" and "Green Wall programme". The company also received 800 million MNT (USD 556.7 thousand) from state budget for the project of sea buckthorn farming<sup>6</sup>. Currently, project of KharKhorin LLC is selected one of the 1151 projects eligible to obtain a soft (cheap) loan from the Chingis Bond Investment under "Production Support National Programme" from Government<sup>7</sup>. However, little or nothing is invested in fresh water resources Management in the Orkhon River. This is typical BAU scenario. Clearly, KharKhorin LLC plans could expand its production using financial support from the GoM. However, such expansion of productivity and investments are at risk if BAU continues.

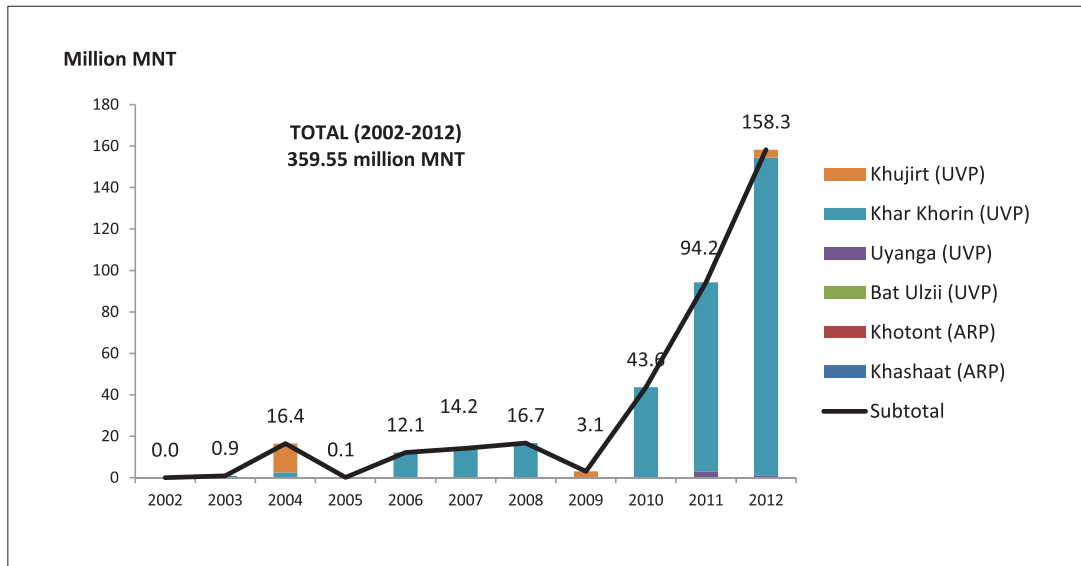
The price of the sea buckthorn in the OVNP overlapped Soums is increasing faster than the price of tomato. The average 2012 market price per KG of sea buckthorn was 4,881 MNT (USD 3.6) and tomato 2,920 MNT (USD 2.15). Graphic 8 below shows the 2002 - 2012 trend in market value under BAU.

<sup>6</sup> Source: National association of Bags and Soums of Mongolia (2012): <http://bagsum.mn/index.php/news?start=2>

<sup>7</sup> Source: New Government for Changes, Mongolia (22.01.2014) <http://zasag.mn/news/view/4293>



**Graphic 8.** Market value trend 2002-2012 of fruit production in Sums in the OVNP (Million MNT)

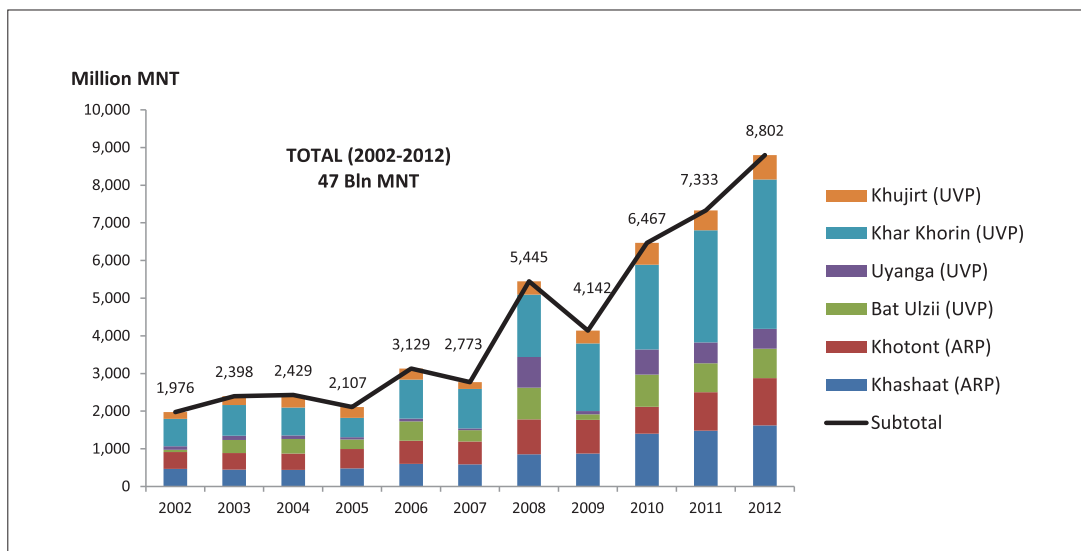


Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

The market value of fruit (tomato and sea buckthorn) production in 2012 was estimated at 158.3 million MNT (USD 116.5 thousand). The aggregated market value of fruit production from 2002 to 2012 was 359.55 million MNT (USD 264.5 thousand).

The total gross benefit of crop production is estimated by aggregating market values of hay, fodder, wheat, vegetable and fruits. Thus, the market value of the 2012 crop production is 8.8 billion MNT (USD 6.5 million).

**Graphic 9.** Market value of irrigated agriculture in Sums overlapped with OVNP (Million MNT)



Source: National Statistical Office of Mongolia (2014); Authors' Estimation



The aggregated market value of agricultural production for 2002-2012 is 47 billion MNT (USD 34.6 million); this is shown in Graphic 9 above. The KharKhorin Soum is the most important producer

among the Soums that overlap with OVNP, i.e., 45.1% of total economic value of crop production was generated in KharKhorin Soum in 2012.

In order to find the net value, excluding the total cost of production, the percentage share of cost is used.

Table 5. Profit Share of Crop Sector											
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Profit share (%)	61.5	61.5	61.5	61.5	61.5	53.3*	45.1*	36.9*	28.8	28.8	28.8

Source: National Statistical Office of Mongolia (2012); \*Estimated by authors under assumption<sup>8</sup>

<sup>8</sup> It is assumed that given percentages between 2002-2005 are the same as 2006, and percentages in 2011-2012 are the same as 2010 because there is only percentage of 2006 and 2010 are reported in National Statistical Office of Mongolia (2012).

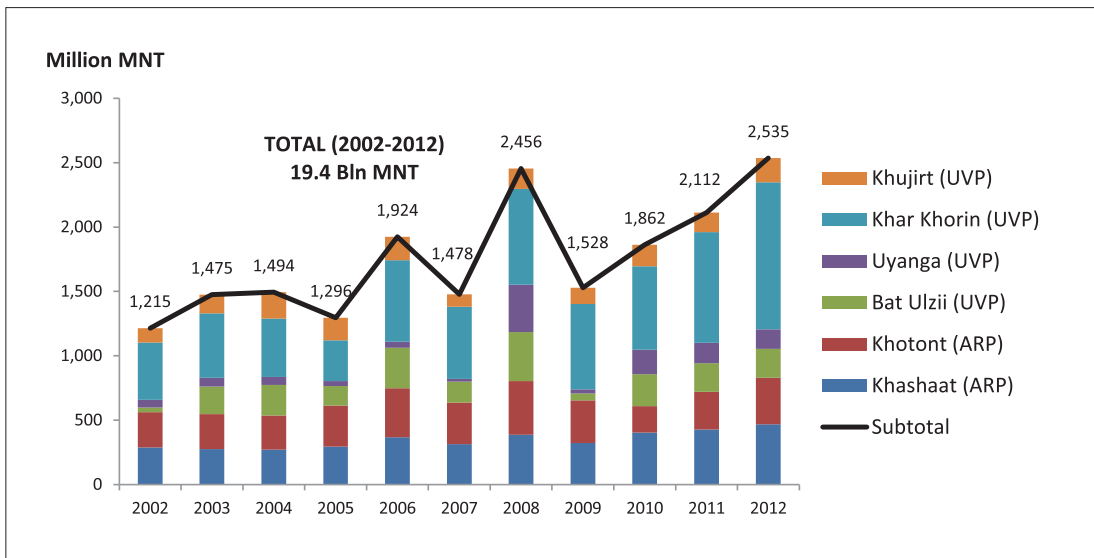
Table 5 shows profits as percentage of gross revenue. For example, in 2010, the profit of crop production is estimated at 28.8% of total revenue. Graphic 10 below shows the trends in net market value 2002 – 2012.

increased in recent years; for example from 1.2 Bln MNT (USD 1.09 Million) in 2002 to 2.5 Bln MNT (USD 1.86 Million) in 2012.

The net value of irrigated agricultural production has

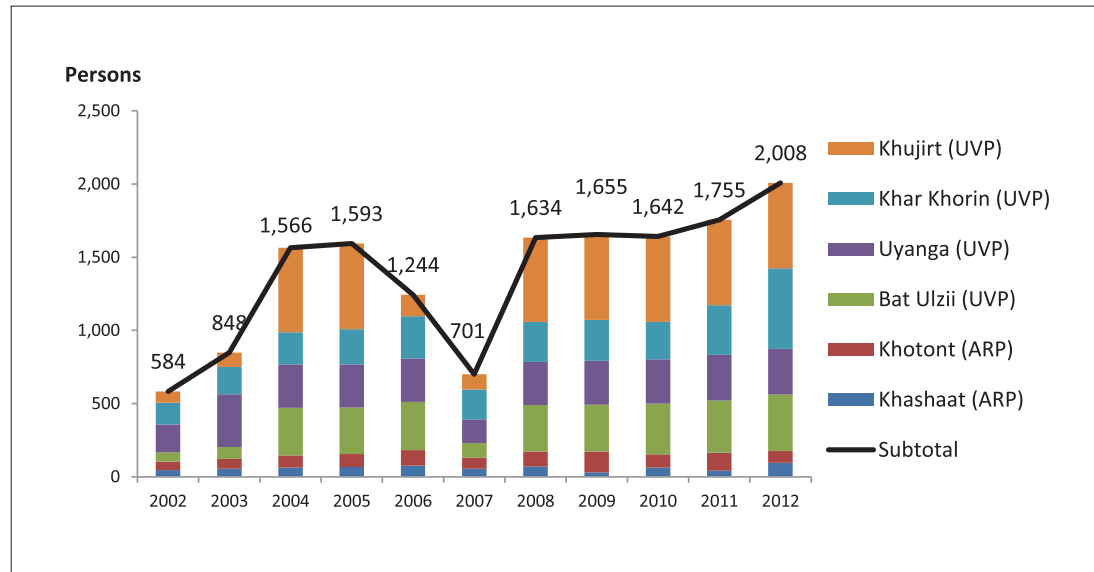
KharKhorin Soum is benefitting more from irrigated agriculture that takes ecosystem service originated from OVNP.

**Graphic 10.** Net market value irrigated agriculture in Soums overlapped with OVNP (Million MNT)



Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

**Graphic 11.** Total number of people employed in irrigated agriculture in OVNP Soums.



Source: Authors' Estimation; National Statistical Office of Mongolia (2014)

Irrigated agriculture in Soums where OVNP is overlapped employs people in both subsistence (household) and commercial farming (companies). For example, in 2012, there were an estimated 1,178 households, and 55 companies operating in the six Soums that overlap with OVNP, based on data provided by National Statistical Office of Mongolia (2014). According to First State Census of Agriculture in 2011 (National Statistical Office of Mongolia, 2012), on average, about 4.4 persons are employed per agricultural company and 1.5 persons per crop farming household. Using this average numbers, the total number of people employed full time in agriculture in the six Soums was estimated (see Graphic 11).

In 2012, about 2 thousand people were employed in irrigated agriculture in six Soums of OVNP. This level of employment will not be possible without the input of freshwater ecosystems that originates in

the OVNP. It is assumed that people work for seven months in a year in irrigated agriculture activities.

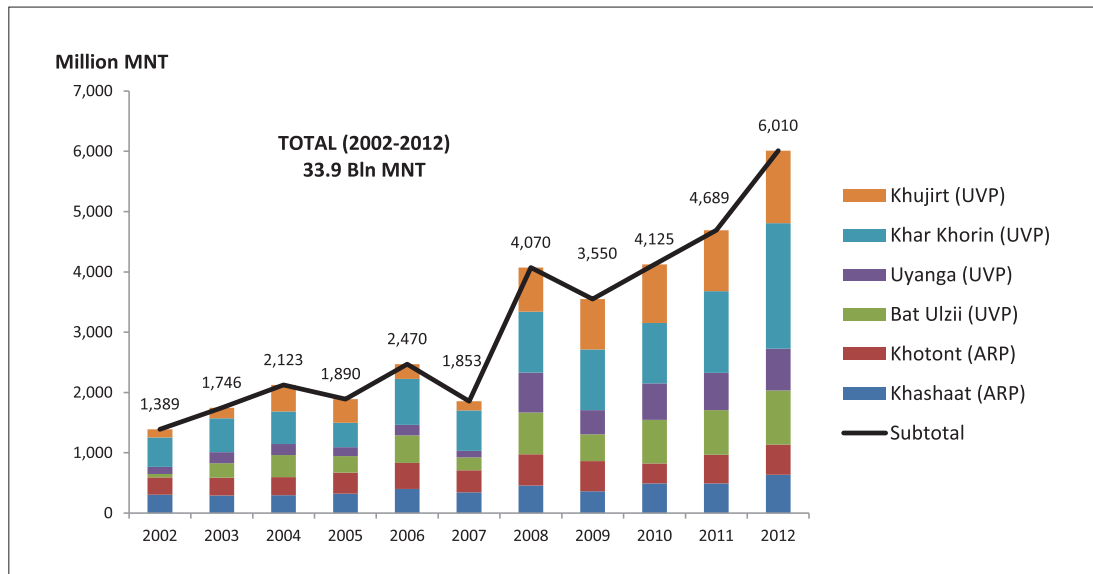
After multiplying the monthly income reported by National Statistical Office of Mongolia (2012), the total income of people engaged in the crop sector is illustrated in next figure. The NSO reported income is average for people who work in crop sector; it excludes income tax and social security contributions. In 2012, the income of people in crop sector reached to 3.5 billion MNT (USD 2.6 thousand) and the cumulative income over between 2002 and 2012 is 14.5 billion MNT (USD 10.7 million) in the six Soums overlapping the OVNP.

#### Total economic value

The total economic value of Orkhon Valley National Park for irrigated agriculture is summation of benefit of net value of crop production, employment benefit, and government tax revenue. This is shown in Graphic 12.



**Graphic 12.** Total economic value of irrigated agriculture for OVNP Soums

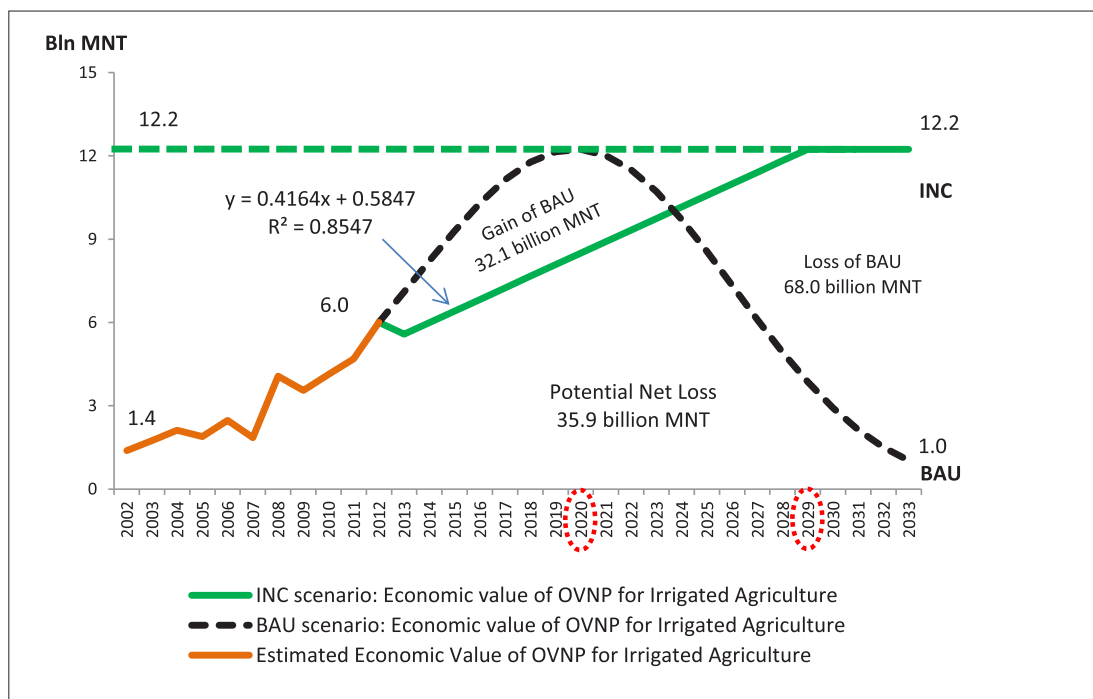


Source: Authors' Estimation, National Statistical Office of Mongolia (2014)

Total economic benefit of irrigated agriculture supported by ESS of the OVNP is 6.0 billion MNT (USD 4.42 million) in 2012 which is 4.3 times higher than the value in 2002. The total economic value of irrigated agriculture between 2002 and 2012 is 33.9 billion MNT (USD 24.9 million).

The above-indicated benefits are considered to be under BAU. Therefore, it is not considered sustainable in the long term. Benefits will start to decrease if no action to improve freshwater ecosystems management is taken. BAU and INC scenarios are illustrated in Figure 13 below.

**Graphic 13.** Trend of value of ecosystem services of OVNP for irrigated agriculture sector under BAU and INC (Bln MNT)



Source: Authors' estimation

The annual average growth rate of 20.7% was considered to create the BAU scenario. Under BAU, it is also assumed that this annual average growth rate will decrease by 2.5% annually from 2013. This is because of unsustainable farming management and practice, poorly funded agricultural policy, poorly planned irrigation infrastructure, and excessive use of pesticides and chemical fertilizers, water pollution etc. Based on these assumptions, total value of OVNP for crop sector would be 1.0 billion MNT (USD 757.4 thousand) in 2033. This means that, under BAU, the 2012 value will be decreased by 6 times<sup>9</sup>.

Although an estimated short term gain of 32.1 billion MNT (USD 23.6 million) may happen under BAU up to 2023. From this point onwards the growth rate becomes negative, thus the value decreases. However, BAU may result in a total loss of 68.0 billion MNT (USD 50.1 million) between 2024 and 2033. So, the net loss (total gain - total loss) of running business as usual as would be 35.9 billion MNT (USD 26.4 million) for 2013-2033.

<sup>9</sup> 2012 exchange rate was used.

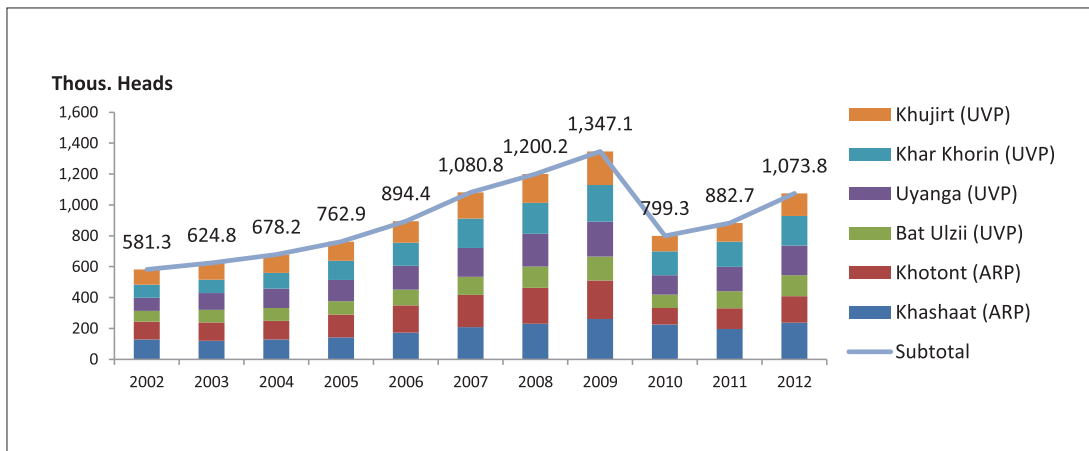
On the other hand, under INC, the value may increase until its sustainable level, and it will continue to be stable. This will be the result of introducing adequate farming policy and practices, funding to support ecosystems management. In the INC scenario, it is assumed that the sustainable level of value would be equal to maximum level BAU, which is 12.2 billion MNT (USD 9 million) in 2029. This benefit will be constant since 2029 under INC.

### 3.4 LIVESTOCK SECTOR

The OVNP is rich in natural grassland that provides a direct input to sustain livestock productivity in neighbouring Soums, and to support the livelihoods of thousands of herders. According to data provided by National Statistical Office of Mongolia (2014d), in 2012 there was 1 million of livestock in six Soums of OVNP. The number of livestock has increased from 581,300 in 2002 to 1,073,800 in 2012. This is shown in Graphic14 below.

The main problem of livestock sector in OVNP is grassland degradation because the number of

**Graphic 14.** Total number of livestock in OVNP overlapped Soums (Thousand Heads)



Source: National Statistical Office of Mongolia (2014d), authors' estimation

livestock is exceeding carrying capacity of grassland. The OVNP management plan, 2010-2014, indicates that in 2011, 33% of the grassland area is strongly degraded, 55% has moderate degradation and only 12% is not degraded. The indicated management plan also indicates that the carrying capacity was exceeded 0.75-1.0 times in Zuruuleg sub-Soum of Bat-Ulzii Soum; Uujim sub-Soum of Khujirt Soum; Khuuvur and Burgaltai sub-Soums of Khotont Soum; Jalbaa, Nariin Khur, Ongotson Ukhaa sub-Soums of

KharKhorin Soum; Tsaidam, Bayan, Nomgon sub-Soums of Khashaat Soum(Sited in Management Plan of OVNP, 2013).

Consequently, the current grassland management in livestock sector in OVNP is considered as Business As Usual (BAU) scenario. Table 5 below indicates the characteristics on BAU and INC in the livestock sector.

The livestock sector benefits from several ecosystem services that are originated from protected areas



**Table 6.Characteristics of Livestock management practices in OVNP: BAU and INC scenarios**

BAU	INC
<p><b>BAU</b></p> <ul style="list-style-type: none"> <li>▪ Lack of sustainable grassland management policy;</li> <li>▪ Increasing number of rodents that destroy the grassland in OVNP;</li> <li>▪ Current grazing management (grazing) causes severe and moderate degradation to certain areas near water sources, around villages);</li> <li>▪ Lack of monitoring and reporting system of grassland conditions;</li> <li>▪ Limited resources to gather reliable information to manage the grasslands;</li> <li>▪ Existing grazing policies may not reflect the complexity of current pressures on grassland;</li> <li>▪ Ongoing animal husbandry practices often leads to overgrazing, and there is a lack of incentives for adopting sustainable grazing strategies.</li> </ul>	<p><b>INC</b></p> <ul style="list-style-type: none"> <li>▪ Adequate grassland management policy addresses sustainable use of grasslands and livestock management;</li> <li>▪ Decreasing number of rodents that destroy the grassland in OVNP;</li> <li>▪ Extension services are available to improve nomadic husbandry practices and decrease degradation in water sources and villages;</li> <li>▪ An effective system of monitoring and reporting grassland conditions is available;</li> <li>▪ Provide adequate funding to agencies responsible for grass land management and protected areas to gather reliable information to manage the grasslands;</li> <li>▪ Better enforcement and control of grazing policies;</li> <li>▪ Ineffective grazing policies are phased out;</li> <li>▪ New grazing strategy avoids overgrazing, and there are financial incentives for adopting grazing strategies, which promote multiple-use benefits.</li> </ul>

in Mongolia: grassland and fresh water. Livestock is permitted in protected areas, except in “special protected areas” and “natural reserves”. PAs provide seasonal pastures and water supply to livestock; these are indispensable and free ecosystems services that support livestock productivity and the economy of rural households.

The values of livestock production in and around the OVNP were estimated by assessed the production of different livestock products such as meat and hides, milk (cow and goat), cashmere and wool of five types of livestock including goat, sheep, cattle, horse, and camel.

**Meat production**

The most important source of food and protein in Mongolia is meat. In 2013, 249.7 thousand tons of meat was produced in Mongolia, it accounts for the 89.4 KG/person annual consumption in 2013 (National Statistical Office of Mongolia, 2014a).

According to the same source, the total meat production in 2012 was 7.0 thousand tons in OVNP overlapped Soums in Mongolia. However, meat production decreased 2010 because of the severe Dzud (natural disaster) in the 2009 winter.

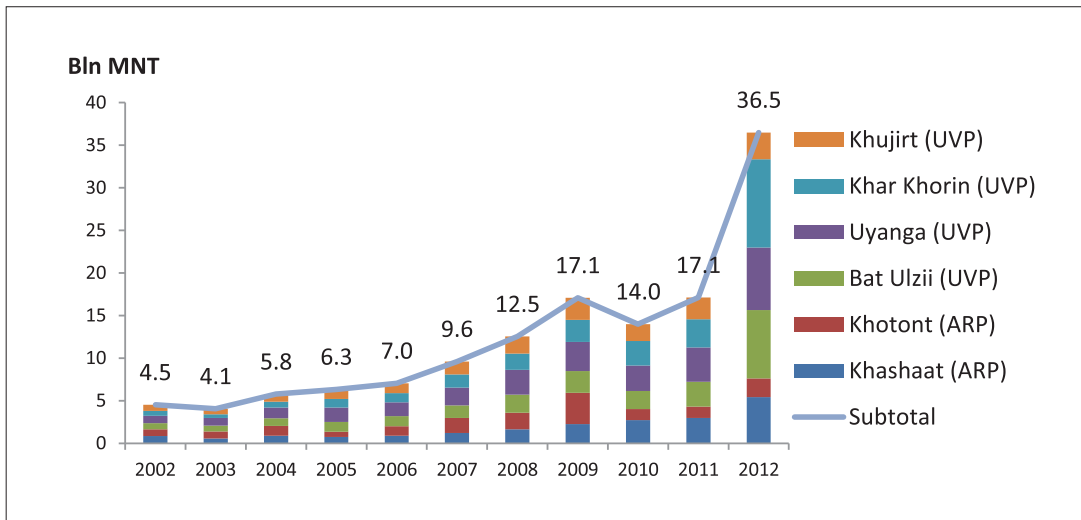
In these Soums, the average price of a KG of beef in 2012 was 6.04 thousand MNT (USD 4.4) and 5.45 thousand MNT (USD 4.01) for a Kg of mutton. However, prices were cheap before the 2009-Dzud, for example price beef per KG in 2009 was 2.46 thousand MNT (USD 1.8); that is 2.5 times cheaper than in 2012.

The market value of meat production in the Soums of OVNP is estimated by multiplying that total amount produced (including slaughtered meat consumed within family for own consumption) by the average price in each Soum.

Graphic 15 above shows that value has been increasing between 2002 and 2012 because the price



**Graphic 15.** Market value of meat production in OVNP Soums (Bln MNT)



Source: Authors' estimation National Statistical Office of Mongolia (2014d)

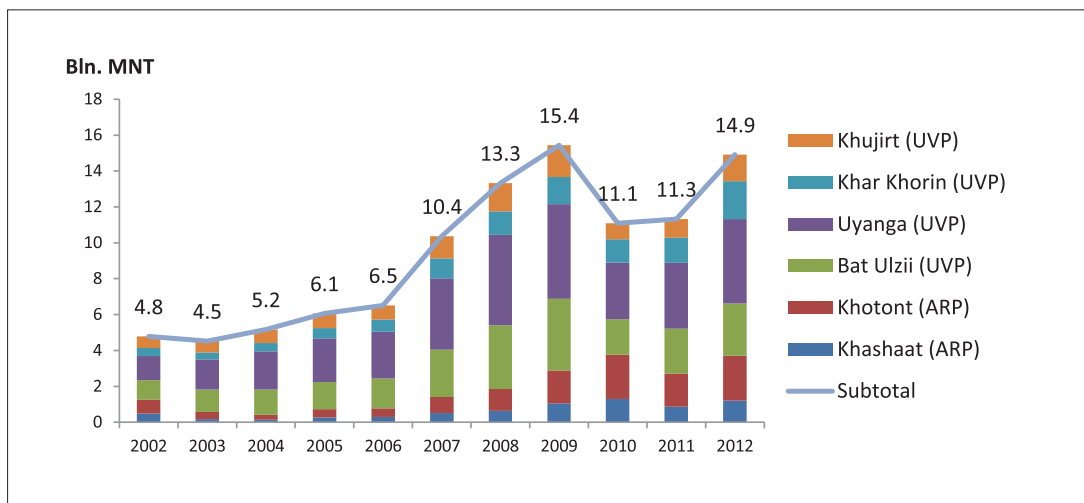
is increasing, but the actual production volume of meat has not grown much; it is due to increasing demand and supply shortages. The 2012 market value of meat production in PAs overlapped Soums is estimated at 36.5 billion MNT (USD 26.9 million); and the aggregated value 2002-2012 is 134.5 billion MNT (USD 99 million).

### Milk production

In order to estimate the value of milk production, goat and cow milk are included in. The number of cows in four Soums of Uvurkhangaï province is multiplied by the average milk output to estimate the total milk production.

Total milk produced in OVNP Soums is 11.4 thousand tons in 2012. The price of milk is growing also very fast, and price of one litter milk was 1.3 thousand MNT (USD 0.96) in 2012. Total amount of produced milk in OVNP overlapped Soums is multiplied by yearly average in each of Soum.

**Graphic 16.** Economic Value of Milk Production in OVNP Soutms (Bln. MNT)



Source: Authors' estimation National Statistical Office of Mongolia (2014d)

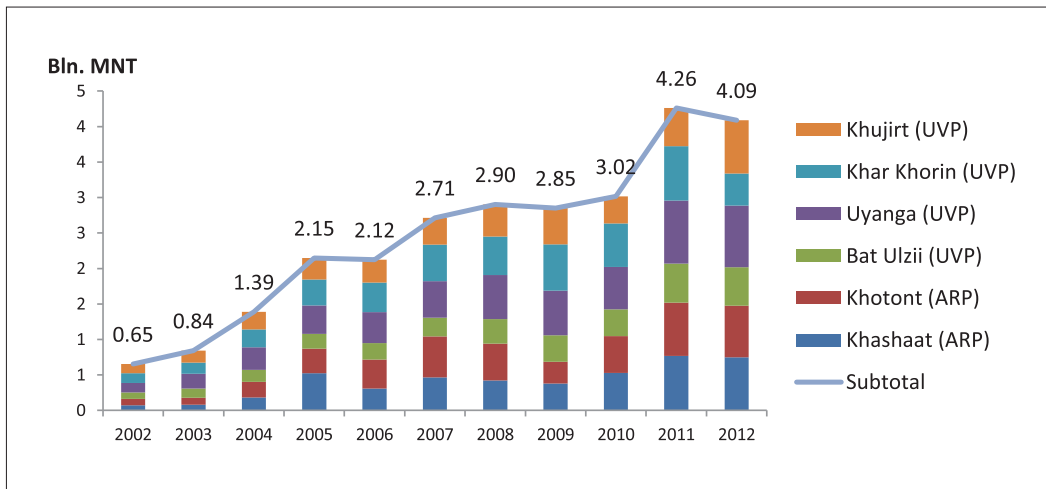


As shown in Figure 16 above, the market value of milk production in 2012 is 14.9 billion MNT (USD 11 million). This will not be possible without the ecosystems services such as grassland and water from OVNP. Uyanga and Bat-Ulzii Soums are the more important for milk production because those have the highest number of livestock. For eleven years of production, the grand total economic value of milk production between 2002 and 2012 is 103.5 billion MNT (USD 76.5million).

### Cashmere production

The most valuable livestock product in Mongolia is goat cashmere. In 2012, total cashmere production in OVNP overlapped Soums is 92.6 tons. In 2012, according to National Statistical Office of Mongolia (2014d), the average price of cashmere per KG was 42.6 thousand MNT or USD 31.4 (Graphic 17).

**Graphic17.** Market value of cashmere production in OVNP Soums (Bln MNT)



Source: Authors' estimation, National Statistical Office of Mongolia (2014d)

The total market value of cashmere production, in 2012, is 4.09 billion MNT (USD 3 million); and the total aggregated market value, 2002-2012, is 27 billion MNT or USD 19.9 million. This significant economic benefit is the result of free grasslands and fresh water ecosystems services.

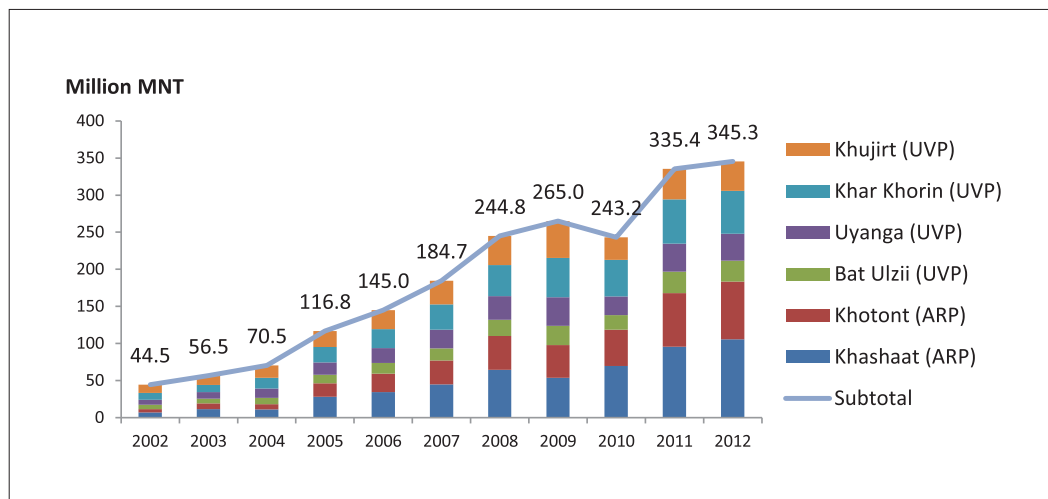
### Wool production

Wool production in Mongolia is traditional and nomadic; pastoralist people use sheep wool to make felt products for example, the thick cover layers of the Gers for insulation material to protect from

cold in winter and hot sun in summer, and boots, sleeping mattress etc.

Approximately 568.9 tons of sheep (99.4%) and camel (0.6%) wool was produced in OVNP in 2012. The price of KG sheep wool was 614 MNT (USD 0.45), for camel wool it was 5.3 thousand MNT (USD 3.87) in 2012, this prices are the averages of 189 Soums and 4 districts that their territory is overlapped with PAs in Mongolia (See network level report).

**Graphic 18.** Market value of wool production in OVNP Soums (Million MNT)



Source: Authors' estimation, National Statistical Office of Mongolia (2014d)

The estimated market value of wool production, in 2012, is 345.3 million MNT (USD 254 thousand); and the aggregated market value (2002-2012) of wool production is 2.05 billion MNT or USD 1.5 million. This is shown in Graphic 18 above.

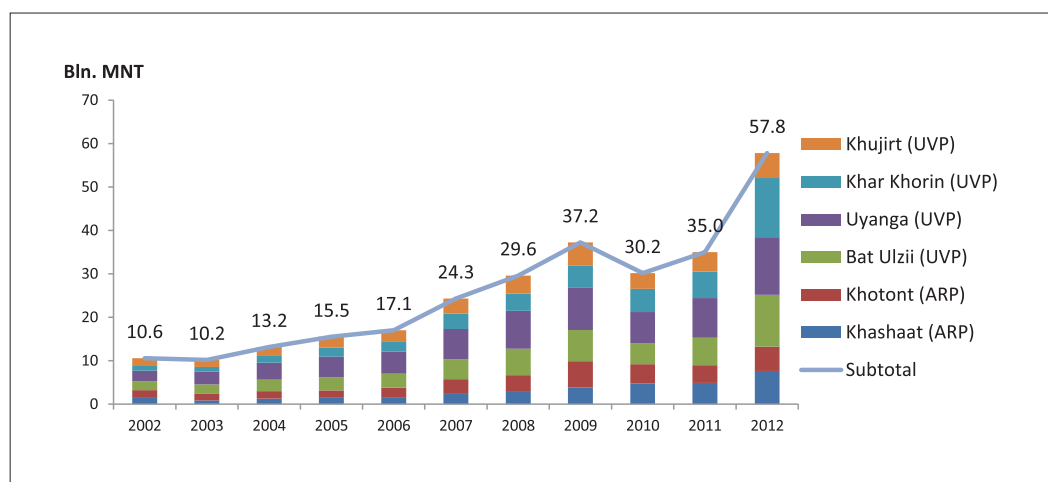
(from five types of livestock) is equal to the total number of slaughtered livestock. The total number of hides produced in OVNP Soums is 114,600 units; and the average market prices in 2012 for each unit are:

### Hides production

Hides are another important product from the livestock sector. Due to limited capacity of hide processing in Mongolia, most of the hides are sold to China. It is estimated that the number of hides

- Goat skin: 14,000 MNT (USD 10.3)
- Sheep skin: 9,300 MNT (USD 6.8)
- Cattle hide: 24,600 MNT (USD 18.1)
- Horse hide: 30,600 MNT (USD 22.5)
- Camel hide: 10,900 MNT (USD 8.0).

**Graphic 19.** Market value of hide production in OVNP Soums (Million MNT)



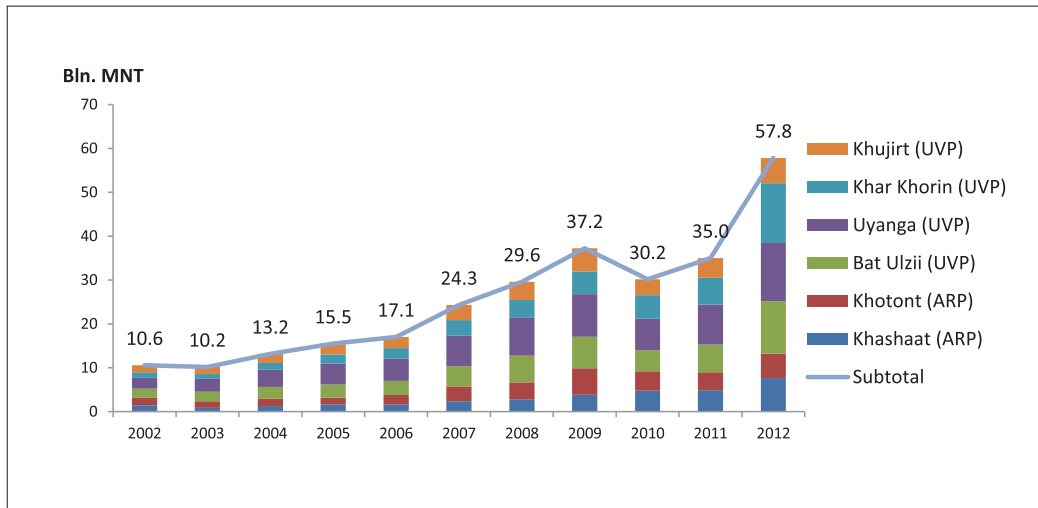
Source: Authors' estimation, National Statistical Office of Mongolia (2014d)



As it is shown in Graphic 19, in 2012, the market value of hide production in OVNP Soums is 2 billion MNT (USD 1.5 million). The total market value of hide production between 2002 and 2012 is 13.7 billion MNT or USD 10.1 million.

It is safe to say that the estimated total market value (actual earned) from producing meat, milk, cashmere, wool, and hides are taken as outputs from livestock sector is highly dependent of ESS from OVNP. This value is shown in Graphic 20 below.

**Graphic 20.** Total market value of livestock production in OVNP Soums (Bln MNT)



Source: Authors' estimation, National Statistical Office of Mongolia (2014d)

The gross market value of the livestock production, that uses ESS from OVNP, is estimated at 57.8 billion MNT (USD 42.6 million) in 2012; and the total livestock production is constantly increasing. The net benefit is estimated at 34.1 billion MNT (USD 25.1 million) in 2012 after deducting the cost share<sup>10</sup>. However, due to poor grassland ecosystems management, the current level of growth may not be sustainable. Hence, in order to sustain current productivity and market values, better investment in ecosystem services of PAs is required. This is the case of KharKhorin Soum, because it is the largest beneficiary of ESS from the OVNP. About 23.5% of livestock productivity is located in this Soum.

Employment is also important in the livestock sector. According to the National Statistical Office of Mongolia (2014b), the average number of people

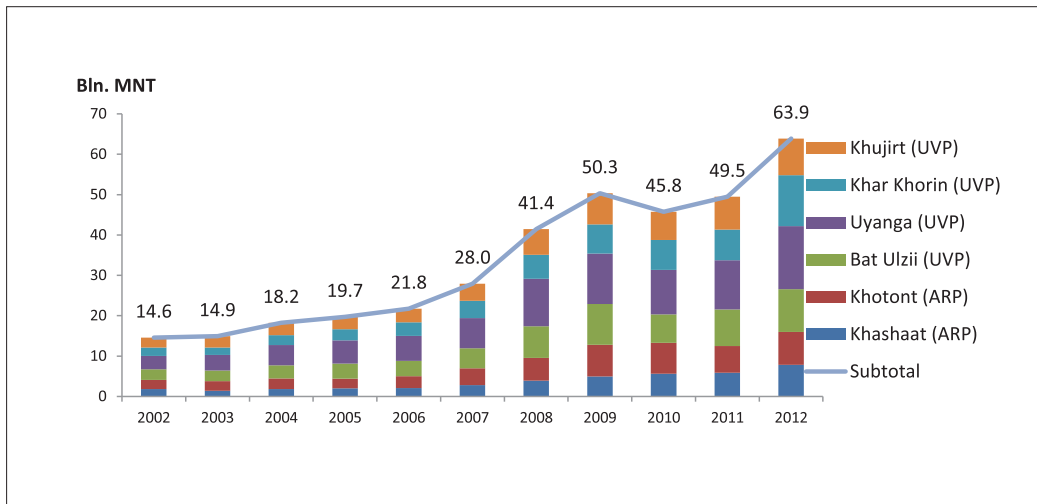
per herder household engaged in livestock is two. Thus, it is estimated that 10,900 people are engaged in livestock activities in 2012 (See Annex 3) in OVNP overlapped Soums. Income of employing people in livestock sector in 2012 is 29.8 billion MNT (USD 21.9 million) in Soums which benefits from OVNP<sup>11</sup>.

The total economic value is estimated that sum of net benefit of livestock production and income of employing people. The estimated total benefit of OVNP for livestock sector is 63.9 billion MNT (USD 47.0 million) in 2012. The total benefit for eleven years between 2002 and 2012 is 368.1 billion MNT or USD 270.8 million. This benefit will not be possible without the direct input from grassland ecosystems services that are reserved or better protected in OVNP. This is shown in Graphic 21 below.

<sup>10</sup> See the annex table of cost share of livestock production, reported by National Statistical Office of Mongolia (2012).

<sup>11</sup> Total number of employed people are multiplied by average salary, that deducts all types of taxes and insurances reported by NSO. In fact, very few herders pay tax and social and health insurances from their incomes generated by selling livestock products.

**Graphic 21.** Total Economic Value of Ecosystem Services of OVNP for Livestock Sector (Bln MNT)

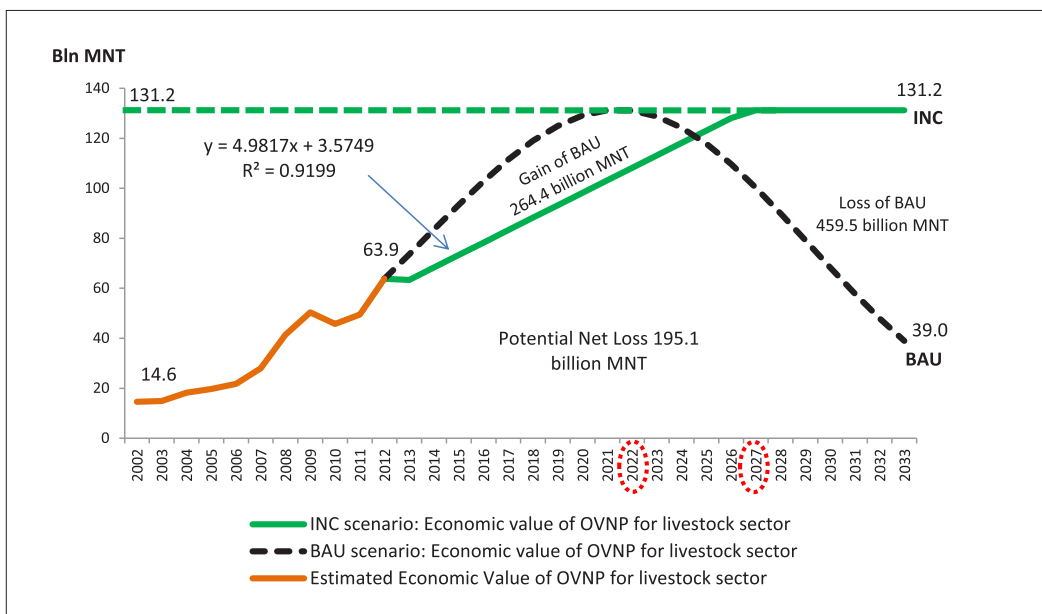


Source: Authors' estimation, National Statistical Office of Mongolia (2014d)

Based on the information in this section, BAU and INC scenarios were constructed. In the BAU scenario, the annual average growth rate of the livestock sector's production in OVNP is 16.9% between 2002 and 2012. It is assumed that this average growth rate will be decreased by 1.7% every coming year. In 2023, the average growth rate becomes negative, hence the total value starts to decline since 2023 after reaching the top value in 2022. Although

livestock, under BAU, livestock sector gains some benefits from ESS estimated at 264.4 billion MNT (USD 194.5 million) during 2013-2024. However, the total loss from 2025 until 2033 is estimated at 459.5 billion MNT (USD 338.0 million). Then the net loss of BAU scenario comparing INC for society who benefit from OVNP is 195.1 billion MNT (USD 143.5 million). This is shown in Graphic 22.

**Graphic 22.** Trend of value of ecosystem services of OVNP for livestock sector: BAU and INC (Bln MNT)



Source: Authors' estimation





Under INC, the total economic (market) value could increase linearly until it reaches to the sustainable level in 2027, which is determined by maximum level of value under BAU in 2021. Then it stays stable in every coming year since 2027.

The INC scenario assumes that there would be grassland resource management policy that addresses the improvement of grassland, provision of extension services for herders, effective system of reporting and analysing grassland condition, adequate funding to manage grasslands in the long-term. Under INC scenario, the total economic value of the OVNP for livestock sector would be 131.2 billion MNT (USD 96.5 million) in 2033, which is about 2 times higher than the value in 2012.

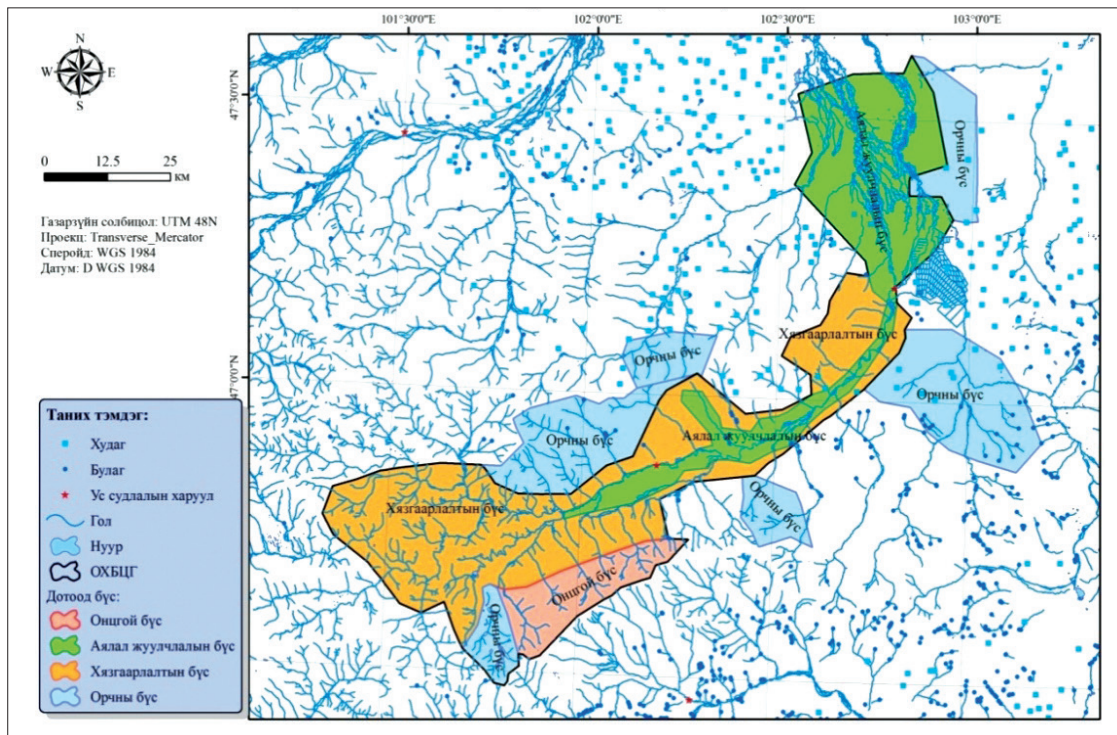
### 3.5 DRINKABLE WATER

One of the most important rivers in Mongolia, the Orkhon River, runs through the OVNP. The Orkhon River originates in the Khangai Mountains in the

Tsenkher sum of Arkhangai province at the foot of the Suvraga Khairkhan mountain. From there it crosses the border into Uvurkhangai province and follows the upper Orkhon valley in eastern direction until it reaches Kharkhorin. On this stretch, the river reach to the Orkhon waterfall (Ulaan tsutgalan), ten meters wide and twenty meters high.

From KharKhorin it flows northwards until it reaches Bulgan province, and then north-east to join the Selenge River next to Sukhbaatar city in the Selenge province, close to the Russian border. With 1,124 km (698 mi), the Orkhon is longer than the Selenge, making it the longest river in Mongolia. The major tributaries of the Orkhon river are the Tuul River and Tamir River. There are 219 rivers, 36 springs, 7 mineral water points, and 15 lakes that are located or run through the OVNP. Map 2 provides an overview of the surface water network in and around the OVNP and Map 3 indicates the location of the Orkhon River.

**Map 2:** Surface water network around OVNP



Source: OVNP Protected Area Administration (2014)

**Map 3:** Location of the Orkhon River



Source: OVNP Protected Area Administration (2014)

Illegal logging and deforestation also threaten the rivers in and around the OVNP; this reduces the capacity of forests to retain water that feeds aquifers. It also increased the risks of flash flooding and erosion. Because of poor investment in protecting water sources, drinkable water is considered BAU.

Table 7 below illustrates the characteristics of the BAU and INC scenarios in the drinkable water sector.

The Orkhon is an important source of surface water and it depends on the precipitation level of the year. Small rivers and springs that feed Orkhon river in OVNP have been drying. About 71.2% of the total number of rivers in the Uvurkhangai province have reduced its flow(OVNP Protected Area Administration, 2014a). Although this situation has improved in recent 4-5 years due to higher precipitation, the rivers are still at risk.

**Photo:** Orkhon waterfall



Source: <http://visitamongolia.blogspot.com>

**Table 7. Characteristics of BAU and INC in the Drinking Water Sector**

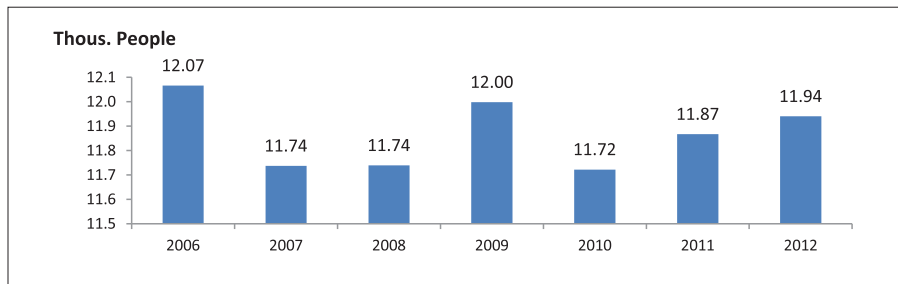
BAU	INC
<ul style="list-style-type: none"> <li>▪ Unsustainable use of water sources</li> <li>▪ Water pollution, poor treatment facilities, e.g., due to tourists and tour operators and local people</li> <li>▪ Increasing water born diseases due to poor sanitation</li> <li>▪ No water resources information system: water quantity and quality, discharges, wells, water pollution, and assessment of mineral waters</li> <li>▪ Poor protection of upper river basin</li> <li>▪ Lack of water metering system; water is under priced or subsidized.</li> <li>▪ Excessive water waste.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sustainable management of water sources and responsible waste water management</li> <li>▪ Functional water treatment facilities</li> <li>▪ Decreased water born diseases due to good waste water management and sanitation</li> <li>▪ Functional water information system</li> <li>▪ Protected upper basins and aquifers</li> <li>▪ Water metering systems and tariffs for different users: domestic, commercial, industrial, and irrigation.</li> <li>▪ Reduced wasted water</li> </ul>



In Mongolia, the price per litre of water is below its ecological and economic values; and the GoM heavily subsidizes it. This allows the water consumers to waste “cheap” water. For example, according to an estimate by the Water Supply and Sewerage Authority (USUG) in 2012, the total water sold to people who live in the Ger District (without pipeline) was 681.8 thousand cubic meters and it was expected to be sold at price of 5,294.8 MNT (3.9 USD) per cubic meter, which makes the operation feasible. However,

the actual price charged was only 911.6 MNT (0.671 USD) per cubic meter. This is typical BAU practice. Rural areas have very low population density, especially herder households who live within protected areas. They are nomadic; and they move seasonally seeking for fresh pastureland for their livestock. There are about 12 thousand people living in OVNP. Graphic 23 shows the population trend in the OVNP 2006-2012.

**Graphic 23.** People living in the OVNP 2006-2012

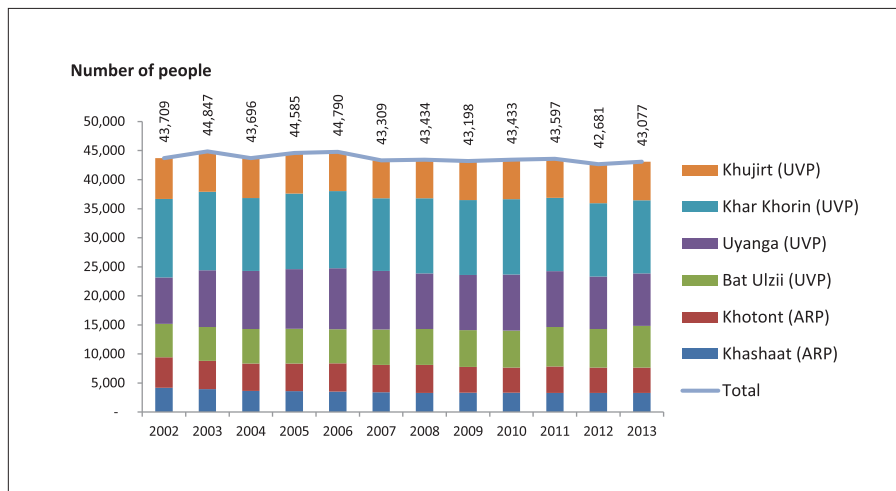


Source: Protected Area Administration of Orkhon Valley National Park (2014)

Although population is low in the OVNP, many people living outside of the OVNP benefit from water that originates of is protected by the OVNP. In fact, the Orkhon river provides water to overlapping provinces. Further, there are three drinkable water-bottling companies that use water from the OVNP. The largest is “Khujirt Gem” LLC located in Khujirt Soum of Uvurkhangai province, one of the OVNP overlapping Soums. This company produced about

2.1 million bottled water which is about 1.6 thousand tons of water was used in 2013<sup>12</sup>. The consumers of this bottled water are actually the people who live in Ulaanbaatar city. The total value of drinkable water is estimated, firstly, for the total population who lives in the six Soums overlapping with OVNP (Graphic 24); secondly for water bottling production amount of “Khujirt Gem” LLC.

**Graphic 24.** Total population in OVNP Soums



Source: Authors’ estimation, National Statistical Office of Mongolia (2014d)

<sup>12</sup> Interview with Mr Ganbold Galsannyam, the general manager of “Khujirt GEM” LLC, in Khujirt Soum, Uvurkhangai Province, on 10th February 2014.

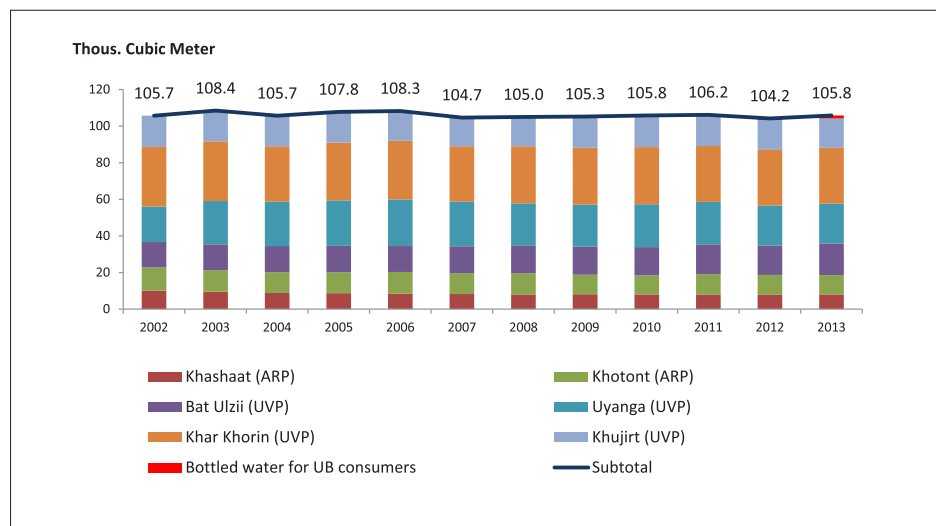
In 2012, there were 43 thousand people have benefitted from drinkable water ecosystem services that are linked with OVNP and most of the live in KharKhorin and Uyanga Soum. Growth rate of population is stable, however due to migration from rural a little small decrease is shown on the figure since 2006.

In order to estimate the economic value of drinkable water provided by OVNP, an average rate of water consumption per person per day from several studies was used. On average, one person who lives in Ger districts or places that are not connected to central water supply system consumes 6.6 litres water per day; and 239.05 litres per day, per person who lives in apartments or places that are connected with central water supply system.

In the six OVNP Soums, water consumption is estimated at 6.63 litres per person per day, for whole year it is 2.42 cubic meter, assuming that these Soums do not have central water supply system. However, the Ministry of Urban Development and Construction (MUDC), by 2016, may be connecting three of the six OVNP Soums to a central water distribution centre, and therefore, water consumption will increase in these Soums (KharKhorin, Uyanga, and Khujirt). Because it is a plan and not implemented, water consumption estimates are using the current actual situation (no implementation of central water supply system).

The total drinkable water consumption includes people who live in the OVNP Soums, and also people who drink bottled water produced by Khujirt GEM LLC.

**Graphic 25.** Total water consumption for people of OVNP Soums and Khujirt GEM LLC (000 cubic Meter)



Source: Authors' estimation

In 2012, people who live in OVNP overlapped Soums and Khujirt bottled water consumers in Ulaanbaatar City consumed 105.8 thousand cubic meter of water. In addition, people who live in KharKhorin Soum consumed about one third of the total water consumption (Graphic 25)

The average prices of water were determined using different sources. For example, Emerton et al., (2009) used willingness-to-pay approach for drinkable water in Ulaanbaatar city to value Upper Tuul Ecosystem and reported that people's willingness-to-pay for one litres drinkable water is 1.36 MNT (0.001 USD). The ecological and economic value of water studied

by Odontsetseg et al., (2010) proposes different values for surface and ground water: surface water is valued in range between 0.35 and 1.62 MNT (0.00026 and 0.0012 USD) per litres; and ground water value ranges between 0.6 and 13.06 MNT (0.00044 and 0.0096 USD) per litres for all 29 water basins in Mongolia<sup>13</sup>.

From a regulatory perspective, there is a legal framework that sets up the ecological and economic value of all water sources in Mongolia. GoM (2011) approved the resolution on ecological and economic value of water in Mongolia. In its first appendix, the ground water price per litres of Tuul River is 0.944

<sup>13</sup> Conversion of MNT to USD is estimated using currency exchange rate of 2012.





MNT (0.0007 USD), for surface water it is 1.06 MNT (0.0008 USD)<sup>14</sup>.

In order to estimate the total economic value of drinkable water (see Graphic 26), the following was considered:

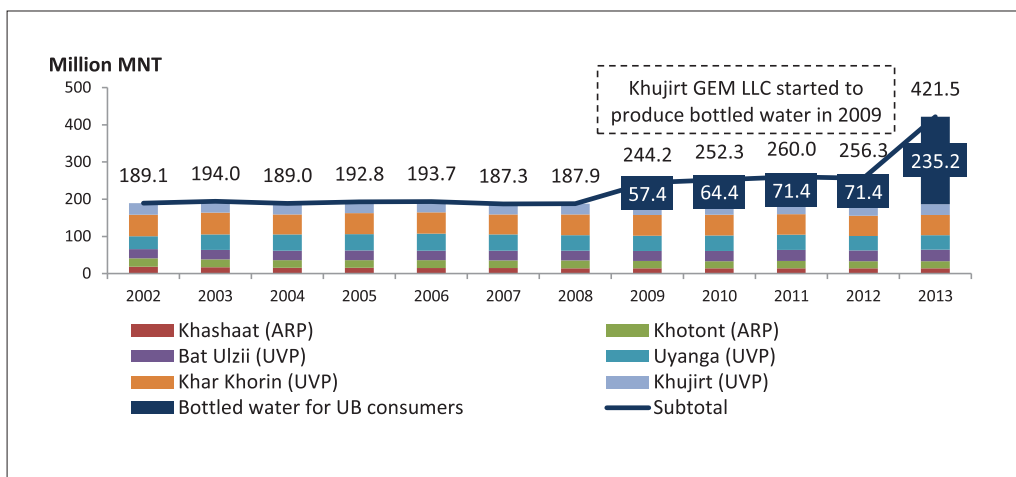
- A weighted average of water value, as stated in Water Value Government Resolution, was applied. I.e., 1,789 MNT or USD 1.32 per cubic meter water (See network level report for more details)

- Price of Khujir GEM LLC’s bottled water 2009-2013. It is estimated that 20% of price is equal to net benefit of the company using water from Khujirt Soum<sup>15</sup>. Thus, the price per cubic meter water is 146.3 thousand MNT (USD 131.8).
- Aggregated number of cubic meters consumed in OVNP Soums
- Aggregated number of cubic meter of Khujirt bottled water consumed in Ulaanbaatar

<sup>14</sup> In Annex 1 of the resolution of Government of Mongolia (2011), surface water value per cubic meter was 2,651 MNT (1.95 USD), and it is multiplied by 0.4 as a water equivalent for use of population drinking stated in Annex 2 of the same government resolution that is renewed in 2013. Then price per cubic meter was converted to per litres. The same approach was used for ground water value estimation, but water equivalent is 0.1 and water value per cubic meter was 9,440 MNT or 6.95 USD (Government of Mongolia 2011).

<sup>15</sup> Assuming 80% of the price is cost of the company to produce bottled water production.

**Graphic 26.** Total economic value of drinkable water of OVNP (Million MNT)



Source: Authors’ estimation

Using the above-listed parameters, total value of drinkable water that originates from or runs through the OVNP in Mongolia grew from 189.1 million MNT (USD 170.3 thousand) in 2002 to 421.5 million MNT (USD 276.6 thousand) in 2013. The total value for the period from 2002 to 2013 is estimated at 2.8 billion MNT (USD 2.03 million). Total value increases sharply since 2009, a year Khujirt GEM LLC started operation of producing bottled water on market of Ulaanbaatar. Until 2013, the company had one line of production although in 2013 they enhanced the capacity three times higher with three lines so that the net profit of the company reaches to 235.2 million MNT (USD 211.8 thousand), which is 55.8%

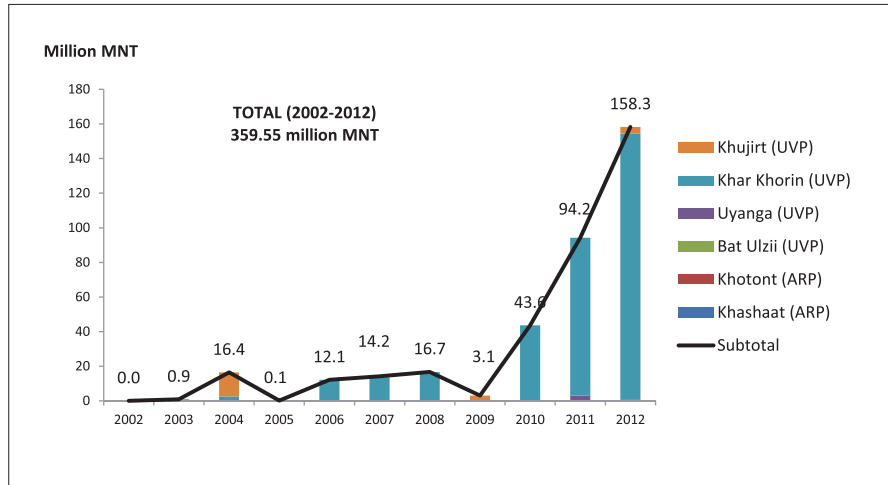
of total value of drinkable water of OVNP. This significant benefit is partly based on the freshwater ESS secured by the OVNP.

Economic value of drinkable water is increasing. However, the situation is unsustainable since there is no funding and action taken to improve freshwater ecosystems management. The current situation of drinkable water is considered BAU.

In BAU, the average annual growth rate of the total value between 2002 and 2013 is 9%. It is assumed that total this annual growth rate will be decreased by 1.2% annually until 2033 because of unsustainable BAU practices.



**Graphic 27.** Trend of value of drinkable water ecosystem services of OVNP under BAU and INC (Bln MNT)



Source: Authors' estimation

BAU practices will produce short term benefits up to 2025, which is about 1,628 million MNT (USD 1.19 million), because the BAU value is higher than INC value; however, starting in 2026 there may be a loss until 2033 under BAU scenario. This loss could reach 1,653 million MNT (USD 1.22 million). The difference between the short-term gain and long-term loss is net loss, equals to 25.1 million MNT (USD 18.5 thousand), under BAU scenario.

Under INC practices, the total value of the OVNP's drinkable water would be 560.8 million MNT (USD 412.6 thousand) in 2033, which is 1.3 times higher than the value in 2013 (Graphic 27).

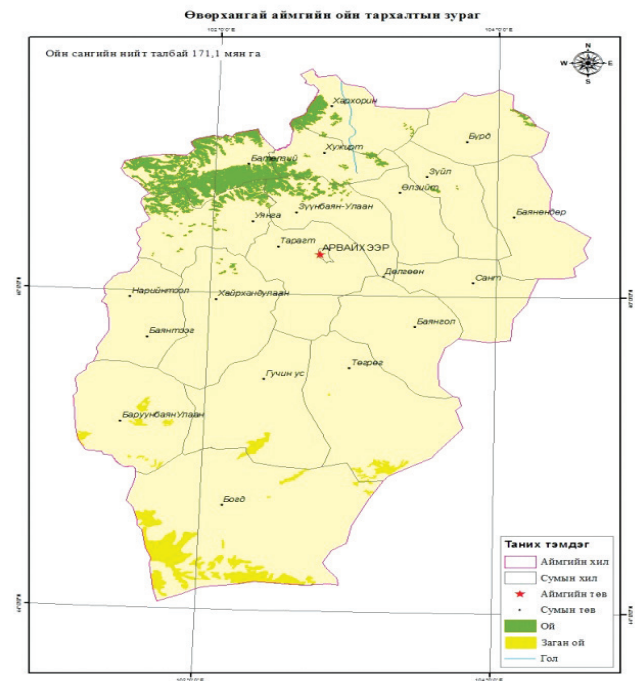
### 3.6 FORESTRY AND CARBON SEQUESTRATION

OVNP is rich in forests resources. Bat-Ulzii Soum is the most important Soum among other five OVNP Soums. About 75% of Bat-Ulzii Soum is under protection. Bat-Ulzii Soum has 12.9 million hectares of forest and 0.63% (81,511 hectares) of the total forests of Mongolia. About 31.4% of the area of Bat-Ulzii Soum is covered with forests, and it is 22.3% of the OVNP.

In this section, two ecosystem services are discussed and valued: wood taken from OVNP, and carbon sequestered by larch trees in OVNP.

Forests have environmental and economic importance. Environmentally, it is the key of watershed, climate control, habitat and ecosystems and so on. Economically, forest products are used

**Map 4:** Forest area coverage of Uvurkhangai province



Source: OVNP Protected Area Administration (2014a). Management Plan of Orkhon Valley National Park: 2014-2018.

in our daily lives in so many ways. There are four types of wood products that come from OVNP: firewood, plank, flitch, and balk (OVNP Protected Area Administration, 2014b).



According to management plan approved by Ministry of Environment and Green Development (MEGD former name of MEGDT), in 2012, it was permitted to extract wood products (25,000-33,300 cubic meters) from the area of Uvurkhangai province. The Decree No.6 of Citizens Representatives' Khural of the Province has states that maximum total usage of forests in 2013 from the area of Uvurkhangai

province has to be 33,200 cubic meters. In 2013, 23,000 cubic meters of wood is prepared from the area of Bat-Ulzii Soum, of which 20,000 cubic meters for firewood and 3,000 cubic meters for other uses.

In 2013, there were 24 forest communities that included 18-36 people each in this Soum. They

**Table 8. Forestry in Bat-Ulzii Soum: characteristics of BAU and INC scenarios**

Table 8. Forestry in Bat-Ulzii Soum: characteristics of BAU and INC scenarios	
<p><b>BAU</b></p> <ul style="list-style-type: none"> <li>▪ Insufficient funding and investment for forest protection (lack of sustainable forest management policy).</li> <li>▪ Increased number of forest fires and illegal logging, and related costs.</li> <li>▪ Poor land use policy results in deforestation</li> <li>▪ The impact of climate change and degradation increases</li> <li>▪ Carbon sequestration is reduced due to decreasing forest area</li> </ul>	<p><b>INC</b></p> <ul style="list-style-type: none"> <li>▪ Sufficient investment in sustainable forest management policy and enforcement.</li> <li>▪ A sustainable forest management strategy is used to reduce the number of forest fires and illegal logging.</li> <li>▪ Sustainable land use policy and enforcement reduces conflicts and deforestation.</li> <li>▪ Measures are implemented to mitigate the effect of climate change</li> <li>▪ Carbon sequestration is increased due to increasing forest area and policy incentives.</li> </ul>

protect about 1,500 hectares of forest. In addition, there are several organizations operating to improve forest managements in the area. However, illegal logging is the main cause of deforestation. Table 8 provides an overview of the characteristics of BAU and SEM in the forestry sector.

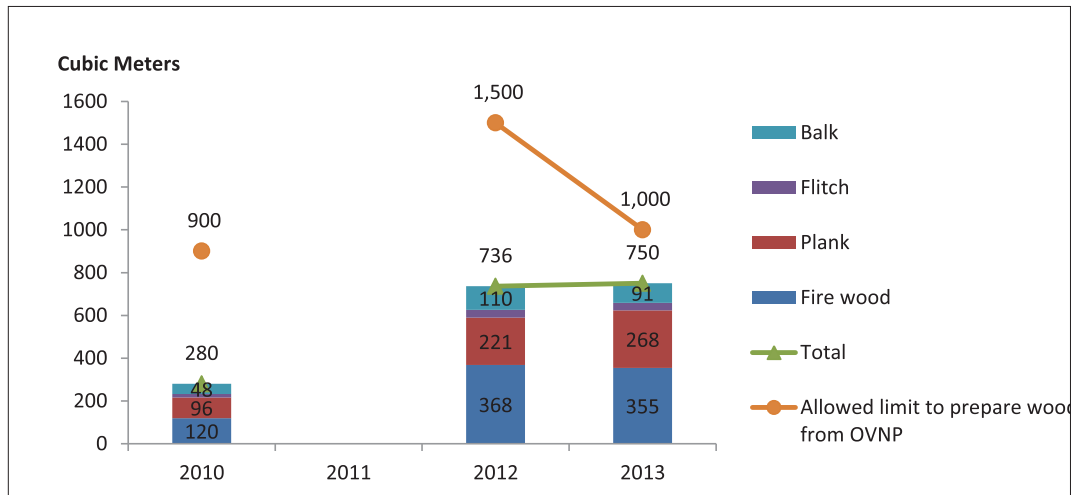
Forests in the OVNP provide a range of ecosystem services that contribute to local and national development. These include:

- **Soil erosion and watershed protection.** Healthy forest helps to prevent soil erosion because trees stabilize soil and reduce sedimentation; and therefore increase water quality and soil quality.
- **Carbon Storage.** Boreal forests of the OVNP store carbon dioxide and help to reduce global warming.

- **Non-timber forest products.** OVNP is rich with non-timber forest product (NTFP). The most common NTFP are cedar nuts, wild mushroom, strawberry and other fruits/berries, and medicinal plants.
- **Storing water.** Permafrost under the forest feeds many small rivers, spring waters, wells, and aquifers. These are key for drinking water supply.

The OVNP Administration (2014b) provided data of total wood extraction in the OVNP (unpublished data). This is shown in Graphic 28 below.

**Figure 28.** Total wood extracted from OVNP (2010-2013)



Source: Orkhon Valley National Park Protected Area Administration (2014b).

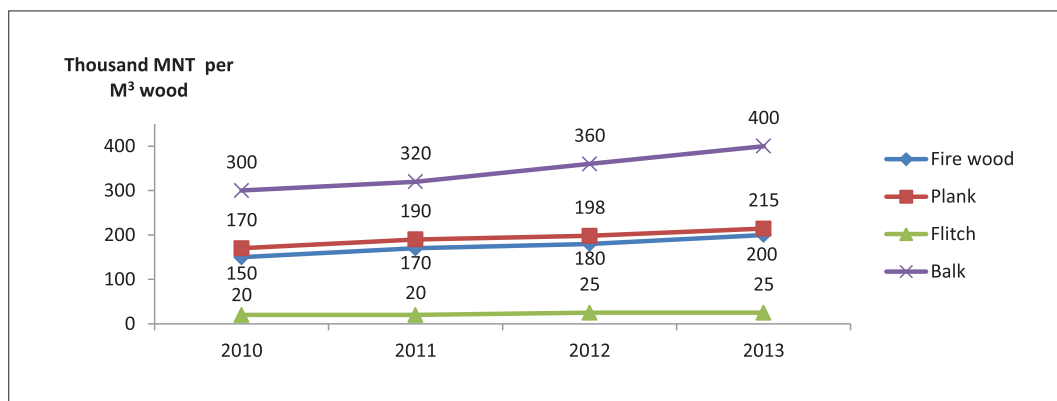
Note: There was no allowance of wood preparation in OVNP by Ministry of Nature, Environment and Tourism in 2011.

Cutting trees from forest in protected areas is forbidden by the Law of Protected Areas (Parliament of Mongolia, 1994). However, it is possible to clean and maintain the forest area by removing fell down trees, and branches of trees, and removing stumps etc. Within scope of cleaning and maintaining procedure it is approved to take 900 cubic meters in 2010 (Minister of Nature, Environment and Tourism, 2010), 1500 cubic meters in 2012 (Minister of Nature, Environment and Tourism, 2012), 1000 cubic meters in 2013 (Minister of Environment and

Green Development, 2012) from OVNP under decree of minister of environment<sup>16</sup>.

Prepared wood from ONVP is increasing over time and it is always below the approved limit for wood preparation; most of the prepared wood was used for firewood and planks. The market value of wood taken from OVNP is estimated by multiplying the total cubic meters amount of prepared wood by the average market value for each type of wood. This is illustrated in Graphic 29.

**Graphic 29.** Market price of different woods in Bat-Ulzii Soum



Source: Orkhon Valley National Park Protected Area Administration (2014b)

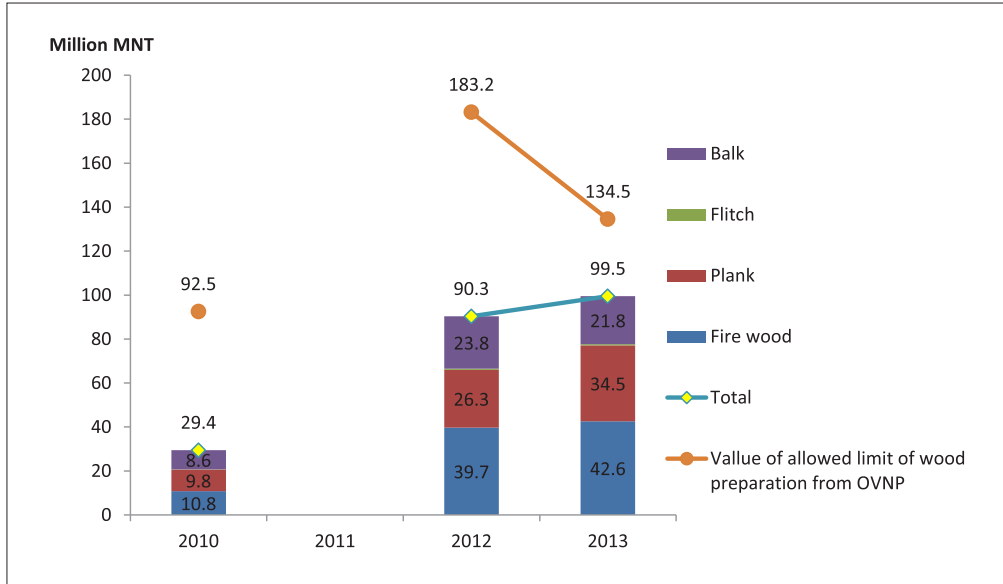
<sup>16</sup> In case of Mongolia, it is arguable if the wood preparation from protected areas is for cleaning and maintenance purposes. By the order of ministry, local community or professional company must undertake the operation of the wood preparation, however under the approval there could be illegal logging and amount of wood taken from protected areas is may be unregistered or registered less than actual amount. It was evident from interview with Mrs Yanjindulam Buyantogtokh, environmental state inspector of Bat-Ulzii Soum, that about 243 cubic meters of wood taken from Bat-Ulzii Soum illegally, and it is caught up which amounts 31.7 million MNT (USD 20.8 thousand) in 2013 (Interview was taken in Bat-Ulzii Soum, Uvurkhangai Province on 9<sup>th</sup> of February, 2014). She also added that the only way to cut the trees from forest is under name of cleaning and maintenance of the forest.



It is assumed that 40% of the total value represents the cost of wood preparation and 60% is the net profit, which the profit share is used for estimating

the value of wood of OVNP. Graphic 30 shows economic value of wood preparation from OVNP 2010-2013.

**Graphic 30.** Net value of wood taken from OVNP (Million MNT)



Source: Orkhon Valley National Park Protected Area Administration (2014b); Authors' Estimation

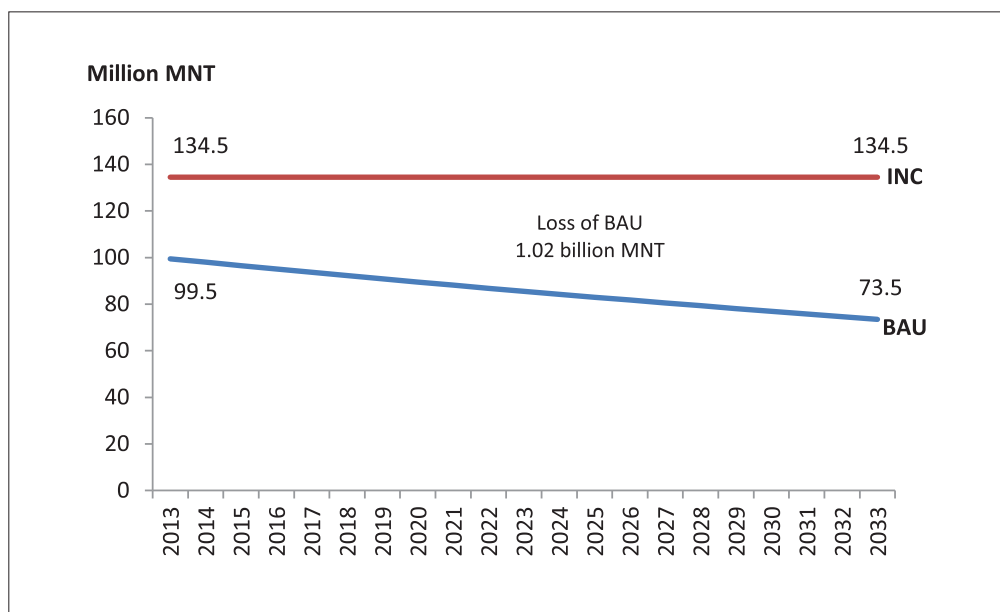
The net value of wood prepared from OVNP, in 2013, is 99.5 million MNT (USD 65.3 thousand) while the allowed limit of wood preparation in monetary value is 134.5 million MNT (USD 88.3 thousand)<sup>17</sup>. The total net value of wood taken from OVNP between 2010 and 2013 is 219.2 million MNT (USD 161.3 thousand). People benefit from forest by extracting firewood for cooking and heating purposes; and also to make materials for building houses, Gers, and construction. Under BAU, the preparation of wood is lower than the permitted level; and therefore BAU in this case

is not a bad scenario, assuming that the permitted levels for wood extraction are sustainable. However, under BAU there is a net loss of 35 million MNT (USD 23 thousand), which is difference between potential value is 134.5 million MNT (USD 88.3 thousand) under INC scenario, actual value is 99.5 million MNT (USD 65.3 thousand) under BAU scenario, in 2012. This is possibly caused by lack of monitoring and reporting. This loss could significantly increase if BAU is maintained.

<sup>17</sup> Because the allowed limit is not given by types of wood like plank, flitch, balk or firewood, authors' disaggregate the total amount of allowed wood to be prepared by average percentage share of each type of wood in 2010, 2012, 2013 ( See annex Figure): Firewood 48%, Plank 33%, Flitch 5% and Balk 14%. After that, each type of allowed wood is multiplied by its market prices, and then 40% of cost is deducted, to estimate net value of wood production which is 92.5 million (USD 68.6 thousand) MNT in 2010, 183.2 million MNT (USD 134.8 thousand) in 2012, and 134.5 million MNT (USD 88.3 thousand) in 2013.



**Graphic 31.** Trend of Value of Forest of OVNP under BAU and INC (million MNT)



Source: Author's estimation

Graphic 31 shows that net value of wood production is decreasing in the BAU scenario from 99.5 million MNT (USD 65.3 thousand) in 2013 to 73.5 million MNT (USD 48.2 thousand) in 2033 after 20 years<sup>18</sup>. It is assumed that under INC the annual sustainable amount of wood to be prepared from 2013 to 2033 is 1,000 cubic meters which is allowed by order (Minister of Environment and Green Development, 2012), its value is 134.5 million MNT (USD 88.3 thousand). Thus, the total loss will be 1.02 billion MNT (USD 670.2 thousand) by 2033.

### CARBON SEQUESTRATION

Because of its abundance in the OVNP, larch is used to estimate the value of carbon sequestration. The total area of forest in OVNP is 151.9 thousand hectares, out of which 135.9 thousand hectares is covered with larch. The value in this section is only for illustrative purposes only; because the value of carbon is considered supply driven. Currently, there is no active carbon market in Mongolia. Table 8 below includes the estimated values.

**Table 8.** Value of carbon sequestration by larch in OVNP

	2009	2010	2011	2012	2013
Average Value of Carbon sequestration by larch per year (USD/metric ton of carbon sequestered)	6.6	6.6	6.6	6.6	6.6
Total land area of larch in OVNP (Thous.Ha)	155.68	135.68	135.68	135.68	135.68
Total Carbon sequestration by larch in OVNP (thous. Metric ton)	1027.5	895.5	895.5	895.5	895.5
Current market value of CO <sub>2</sub> (USD/metric ton)	1.5	1.5	1.5	1.5	1.5
Total value of CO <sub>2</sub> sequestration by larch in OVNP (Million USD)	1.54	1.34	1.34	1.34	1.34
<b>TOTAL VALUE (2009-2013, MILLION USD)</b>	<b>6.91</b>				

Source: Authors' Estimation, OVNP Protected Area Administration (2014b)

Note: See Network Level Report for detailed references of carbon sequestration capacity and price.

<sup>18</sup> Exchange rate of 2013 is used for conversion from MNT to USD, which is 1 USD=1523.93 MNT

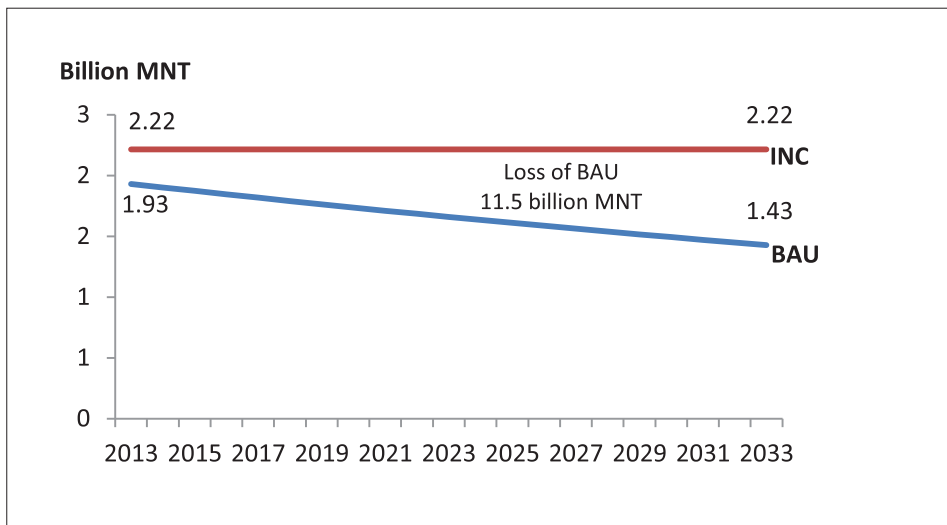


It is estimated that total value of carbon sequestration by larch in OVNP is 1.93 billion MNT (USD 1.34 million) in 2013, and cumulated value between 2009 and 2013 is 9.94 billion MNT (USD 6.91 million).

The total value of carbon sequestration by larch in OVNP is 1.93 billion MNT (USD 1.34 million) in 2013, but it was 2.22 billion MNT (USD 1.54 million) in 2009. This is caused by the reduction of larch trees. This is considered to be BAU. It is assumed that under INC

scenario, the environment continually provides the ecosystem service of carbon sequestration by larch in OVNP it stays constant for following years until 2032. However, under BAU scenario, current value of carbon sequestration decreases by 1.5% annually until 2032. Graphic 32 below illustrates the BAU and INC scenario for carbon sequestration in the OVNP.

**Graphic 32.** Trend of Value of Carbon Sequestration by larch in OVNP (Billion MNT): BAU and INC



Source: Authors' Estimation

The potential total loss due to BAU (mismanagement of forest, deforestation, illegal logging) is estimated

to be 11.5 billion MNT (USD 7.6 million) for next twenty years.

## 4.

# CONCLUSIONS AND RECOMMENDATIONS

### 4.1 CONCLUSIONS

Despite the challenges of having limited information available to the study, there is substantial evidence that the ESS provided by the OVNP make a large contribution to the regional economy. Nevertheless, as in many other countries in the region, resource degradation under BAU, typically, offers immediate returns in the form of marketable products such as livestock; and the negative impact of ecosystem wear and tear under BAU practices may not be visible in the short term but will eventually damage economic growth.

The study concludes that currently, there could be significant losses as a result of BAU practices; and that the shift to INC will increase economic benefits. Nature-based tourism (NBT) is highly important in the economics of OVNP Soums. In 2013, 43,591 tourists visited to OVNP, of which 17,625 tourists were foreigners, and 25,966 tourists are Mongolian. According to data provided by OVNP Administration (2014b), in 2013, one foreign tourist spends an average of 713 thousand MNT (USD 467.9) in a 3 nights stay at the OVNP. It includes the costs of hotel, food, entrance fee, fee for services, transportation. For domestic tourists, in the same year, the average is 475.3 thousand MNT (USD 311.9) for a 5 nights stay at the OVNP. Expenditure for domestic tourists is less than foreigners, but their stay at the park is longer. It is assumed that the net benefit is 60% of the total revenue, and remaining 40% is the cost of the operation. The value of the contribution of ecosystem services of OVNP to tourism, in 2013, under BAU, is estimated at 14.9 billion MNT (USD 9.8 million). Considering the current level of visitation the baseline for INC, the value of the contribution of ESS of OVNP to the NBT sector may reach 35.1 billion MNT (USD 23 million) in 2033.

Grasslands and fresh water ecosystems are indispensable to sustain livestock production in and around OVNP. The OVNP is an crucial area where grass is "storage" for the harsh winter periods, and this is key to the survival of livestock. The study

assessed a range of agricultural products, and concluded that the total economic benefit of crops (hay, fodder, wheat, vegetable and fruits), which is sum of net benefit of crops production and income of employing people, has increased in recent years; for example from 1.4 Bln MNT (USD 1.25 Million) in 2002 to 6.0 Bln MNT (USD 4.42 Million) in 2012.

The above-indicated benefits are considered to be under BAU. Therefore, it is not considered sustainable in the long-term. If BAU continues, it is estimated that the net economic loss may reach 35.9 billion MNT (USD 26.4 million) between 2013 and 2033. Irrigated agriculture employs people in both subsistence (household) and commercial farming (companies). In 2012, about 2,000 people were engaged in irrigated agriculture in six Soums of OVNP.

Livestock is central to support rural livelihoods. The economic benefits from livestock production, e.g. goat cashmere, do not come without ecological damage, as is the case of overgrazing in the concentration areas of OVNP. However, further research is needed to determine an accurate level of degradations and its costs to the economy. In 2012, there were approximately 1 million livestock in six Soums of OVNP.

The gross market value of the livestock production, that uses ESS from OVNP, is estimated at 57.8 billion MNT (USD 42.6 Million) in 2012. The net benefit is estimated at 34.1 billion MNT (USD 25.1 million). However, due to poor grassland ecosystems management, the current level of growth may not be sustainable. Hence, in order to sustain current productivity and market values, better investment in ecosystem services of PAs is required. It is estimated that 10,900 people are engaged in livestock activities in 2012.

In 2012, there were 43 thousand people have benefitted from drinkable water ecosystem services that are linked with OVNP and most of the live in KharKhorin and Uyanga Soum.



The total value of drinkable water that originates from or runs through the OVNP in Mongolia increased from 189.1 million MNT (USD 170.3 thousand) in 2002 to 421.5 million MNT (USD 276.6 thousand) in 2013. The total value for the period from 2002 to 2013 is estimated at 2.8 billion MNT (USD 2.03 million). In addition, since 2009, Khujirt GEM LLC started producing bottled water on market of Ulaanbaatar. In 2013 the company's productivity reached 235.2 million MNT (USD 211.8 thousand), which is 55.8% of total value of drinkable water of OVNP. This significant benefit is partly based on the freshwater ESS secured by the OVNP.

BAU practices will be generating short-term benefits up to 2025. However, starting in 2026 BAU may start lead to loss, and the sum of loss could reach 1.65 billion MNT (USD 1.22 million) up to 2033.

The OVNP is rich in forests resources and therefore, forest ecosystems directly contribute to the benefits generated by the forestry sector. The net value of wood from OVNP between 2010 and 2013 is estimated at 219.2 million MNT (USD 161.3 thousand). People benefit from forest by extracting firewood for cooking and heating purposes; and also to make materials for building houses, Gers, and construction. The net value of wood production is decreasing in the BAU scenario from 99.5 million MNT (USD 65.3 thousand) in 2013 to 73.5 million MNT (USD 48.2 thousand) in 2033.

In TSA analysis, the value estimated represent, for example, value of sectoral output, in which an ecosystems service, such as fresh water or grasslands, is one indispensable input. Nevertheless, it is safe to say, that in the OVNP, INC is indispensable to sustain the current annual economic benefits such as those indicated above.

The benefit estimations of this report could significantly increase once a more detailed and comprehensive research is carried out, including the production of reliable data and establishment of sectoral baselines. It is also important to note, that this study is not a total economic valuation (TEV); it is a basic targeted scenario analysis (TSA). The goal of the TSA study is to provide sectoral decision makers from the government and private sector with initial information to facilitate the incorporation of ecosystem services into economic planning, investment policies (e.g. additional financial support to enable the MNPAs to meet the cost of the basic conservation level, corporate business plans, and investment policies at sectoral level).

## 4.2 RECOMMENDATIONS

Based on the above listed conclusions, the following is recommended:

- Assess the current policy barriers to improve ecosystems management in and around the OVNP; based on the results of the analysis, the OVNP's administration could increase in collaboration with the Soums' government and local herders to mainstream sustainable natural resource management for grassland and water into policies. This may include grass management plans based on an assessment of the adequate carrying capacity of grasslands in the OVNP considering the needs of endemic animal and plant species.
- Soums governments could develop a sustainable-tourism business strategy in close collaboration with the private sector and the network of PAs of Mongolia. This strategy could include a full revision of the current entry fee policy; and services and infrastructure development such as walking trails, designated camping areas with amenities and entrance gates to facilitate statistical analysis of visitation.
- Visitor information centres should be established in major urban centers and the OVNP;
- Create an OVNP webpage and incorporate financial information and economic impact information, and links to the network of PAs; information should be accessible in Mongolian and English.
- Business development in tourism sector should be encouraged by establishing local government financial incentives, and monitor the compliance of tourism companies with taxation rules.
- Assess drinkable water quality of springs and surface sources used for human consumption and determine the need and extend of spring water protection policies.
- Establish and forest information systems to monitor the quantity and quality of forest in the OVNP and in collaboration with other regions and PAs.
- For the water and livestock sector, it is indispensable to assess the conditions of the areas of concentration (e.g., next to water sources) and develop livestock access to water policies to ensure sustainable livestock survival and maintaining healthy water sources.
- The above listed recommendations are a sample of what is needed to shift from BAU to INC in the reviewed sectors in this report.

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## ANNEX 2. TARGETED SCENARIO ANALYSIS – TSA (METHODOLOGY)

This study used a basic “Targeted Scenario Analysis” (TSA). It is not a traditional ecosystem-centered valuation approach. TSA is sector-centered and it builds on the approach used by UNDP for the valuation of ecosystems services in the Latin American and Caribbean Region, more recent PA/ Ecosystem valuations studies in Central and Eastern Europe, and in the UNDP draft guideline to Targeted Scenario Analysis to be available in early 2014. TSA is a sector-oriented approach, which is relevant to policy makers responsible for sector development and investment policies.

TSA explores the economic relations between production practices, ES, other inputs, and their respective sectoral outputs (values). The approach addresses for example: a) how ecosystem degradation lowers outputs and discusses the associated costs; and, b) ecosystem-friendly management practices that avoid damages and its economic benefits are highlighted. These two different approaches, “Business as Usual” (BAU) and “Investing in natural capital” (INC), are used to facilitate the analysis and demonstrate the value of ES to productivity. A sample of typical characteristics of BAU and INC in the hydropower sector is included in the Table below.

Characteristics of BAU ecosystems management that may affect Hydropower Plants Dams development	
<ul style="list-style-type: none"> <li>▪ Poor water ecosystems management;</li> <li>▪ Lack of sustainable agricultural strategy, including watershed management plans (currently being developed);</li> <li>▪ Deforestation and erosion in deforested areas and riverbeds;</li> <li>▪ Unregulated use of pesticides and fertilizers;</li> <li>▪ Overgrazing;</li> <li>▪ Surface water pollution;</li> <li>▪ Erosion (high content of sediments);</li> <li>▪ Outdated agricultural techniques and practice;</li> <li>▪ Lack of adequate zoning and land use policies and enforcement.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Deteriorated or obsolete infrastructure (reservoirs, intake points and water canal network, pumping stations, silting control);</li> <li>▪ Lack of metering and water fees for irrigation;</li> <li>▪ Poor investment in maintenance and renovation;</li> <li>▪ Illegal construction in agricultural land;</li> <li>▪ Small farm size and fragmented production and processing; and,</li> <li>▪ Limited institutional capacity.</li> </ul>

Source: Adapted from Flores M., 2011

### STEPS AND INFORMATION FLOW

Depending on the availability of information, the following steps are recommended to apply the TSA valuation approach:

1. Definition of the scope of the analysis: OVNP.
2. Definition of BAU baseline and potential INC intervention based on available information and first hand research.
3. Selecting indicators (based on available information and agreement with stakeholders).

4. Constructing BAU and INC scenarios and values.
5. Formulation of informed policy and management recommendations.

### INDICATORS

Depending on the availability of data, selected indicators are used to assess BAU and INC impact. Sample indicators are shown in the Table below. Not all indicators are suitable for all the selected sectors or subsectors. Therefore, indicators are used when applicable.

### Sector Indicators used to construct BAU/INC scenarios

Employment increase (# of jobs) by sub-sector (direct, indirect and induced)

Income, average annual increase by sub-sector

Fiscal impacts (annual tax revenues to governments)

Annual revenue from green taxes

Foreign exchange earnings (annual, from exports)

Sector investment (government)

Sector investment (private sector)

Damage costs (as a result from BAU practices)

Avoided damages costs (as a result from INC practices)

Production trend (volume and value)

Sector production trend (as percentage of GDP)

Changes in natural capital (e.g. # Ha under protection or INC practices)

### CONSTRUCTING BAU AND INC SCENARIOS

Traditional data on the value of ecosystems to the selected sectors is organized based on this BAU/INC framework. The values of biodiversity and ecosystems are not seen as static (time-bound) data points, but, rather, as variables that respond to degradation, sustainable management, and other interventions.

The term BAU refers not to all current activities but those activities that damage or depletes ecosystem services. The BAU approach is characterized by a focus on short-term gains (e.g., < 10 years), externalization of impacts and their costs, and little or no recognition of the economic value of ES, which are typically depleted or degraded. Under INC, the focus is on long-term gains (> 10 years); also under INC, the costs of impacts are internalized. Ecosystem services are maintained, thus generating potential for a long-term flow of ecosystem goods and services that can enter into decision making. Activities labelled as INC practices tend to support ecosystem sustainability, not for ideological reasons, but, rather, as a practical, cost-effective way to realize long-run profits. Common INC practices include watershed management, agro-forestry and silvo-pastoral production methods, low-impact logging and mining, nature-based income diversification, and organic farming (adapted from Bovarnick et al, 2010).

Formulation of informed policy and management recommendations

Once the relationship between the policy interventions (BAU or INC) and outcomes and the magnitude of the outcomes that may result from each of the policy interventions has been estimated, the information could be presented to decision makers in order to assist them at choosing among different the policy options; the choice between BAU and INC.

Some decision makers may want to know the analyst's opinion or seek a direct recommendation as to which policy intervention to choose on the basis of the TSA. Decision makers may promote debate before supporting one policy intervention over another. Others may prefer a more "factual approach" in order to come to their own conclusions as to the choice among policy interventions.

In both cases, the analysis should present the results of all indicators, for all affected stakeholders, in a way that enables the decision maker to compare and contrast the pros and cons of the different interventions in terms of different criteria and the consequences on different groups. The main trade-offs between indicators and stakeholders should be highlighted, without presenting a dominant intervention or single number that indicates which intervention "should" be chosen (UNDP TSA)<sup>19</sup>.

<sup>19</sup> UNDP Targeted Scenario Analysis (2013)



## LIMITATIONS

The sector-level approach and the BAU and INC analysis have some limitations for instance:

- The analyses draw on technically economic and ecological data from the published material available. Such data is still scarce in OVNP/Mongolia, just a handful of studies are available.
- The sectoral approach disaggregates the economic value of each type of ES and fragments system-wide values to show specific sectoral inputs.
- Lack of national and sector-level data has limited the applicability of the selected range of indicators used to assess the impact of BAU and INC practices.
- When available data is mostly out-dated, few current data from recent years is likely to be available.

## ANNEX 3. SECTOR DATA TABLES

**Annex 3.1** Total population of OVNP overlapped Soums

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Arkhangai	Khashaat	4,187	3,932	3,652	3,594	3,509	3,395	3,305	3,344	3,325	3,304	3,301	3,294
	Khotont	5,228	4,865	4,692	4,763	4,874	4,725	4,809	4,440	4,324	4,559	4,443	4,371
Uvurkhangai	Bat-Ulzii	5,755	5,851	5,932	5,955	5,878	6,077	6,189	6,318	6,381	6,794	6,615	7,176
	Uyanga	8,010	9,764	10,003	10,273	10,510	10,083	9,581	9,498	9,659	9,593	9,050	9,006
	KharKhorin	13,482	13,496	12,546	13,015	13,270	12,533	12,901	12,882	12,933	12,613	12,601	12,617
	Khujirt	7,047	6,939	6,871	6,985	6,749	6,496	6,649	6,716	6,811	6,734	6,750	6,613
Total		43,709	44,847	43,696	44,585	44,790	43,309	43,434	43,198	43,433	43,597	42,681	43,077

**Annex 3.2** Population and household living in OVNP in 2013

Provinces	Soums	Population	Number of households	Population in OVNP		Households in OVNP	
				Number	Percentage	Number	Percentage
Arkhangai	Khashaat	3,294	967	781	23.7%	215	22.2%
	Khotont	4,371	1,330	988	22.6%	294	22.1%
Өвөрхангай	Бат-Өлзий	7,176	2,312	1,323	18.4%	415	17.9%
	Уянга	9,006	2,668	250	2.8%	56	2.1%
	Хархорин	12,617	3,628	1615	12.8%	474	13.1%
	Хужирт	6,613	1,920	2189	33.1%	649	33.8%
<b>TOTAL</b>		<b>43,077</b>	<b>12,825</b>	<b>7,146</b>	<b>16.7%</b>	<b>2,103</b>	<b>16.4%</b>

Source: OVNP Protected Area Administration (2014);

### Annex 3.3 Area of OVNP and its share in total area of overlapping Soums

Province	Soum	Total area of the Soums (KM2)	Total area of the Orkhon Valley National Park overlap with Soums	
			Area (KM2)	Area share (%)
Arkhangai	Khashaat	2,587.0	310.0	12.0%
	Khotont	2,346.9	318.4	13.6%
Uvurkhangai	Bat-Ulzii	2,592.4	1,952.1	75.3%
	Uyanga	3,046.5	120.1*	3.9%
	KharKhorin	2,305.3	837.8	36.3%
	Khujirt	1,664.1	107.0	6.4%
<b>TOTAL</b>		<b>14,542.2</b>	<b>3,645.38</b>	<b>25.1%</b>

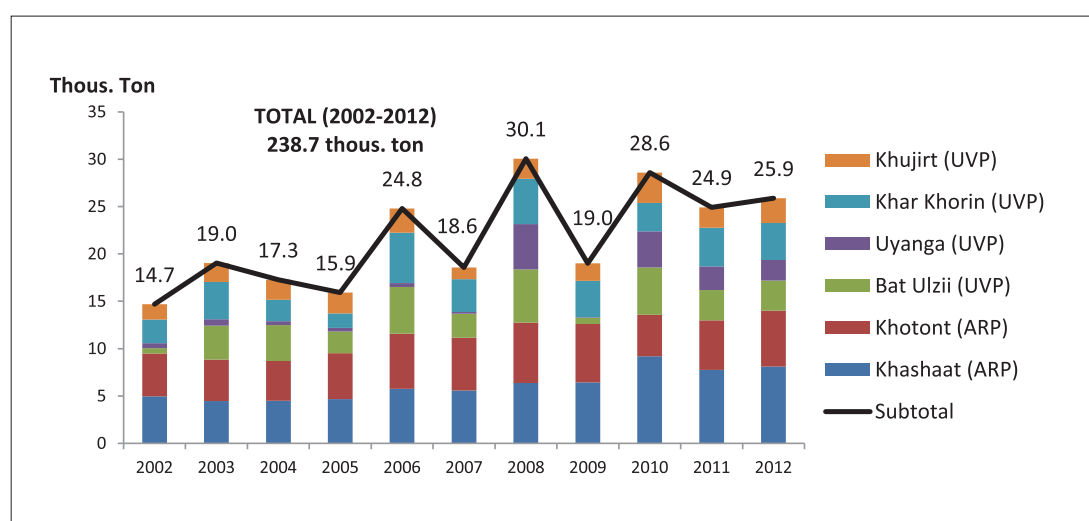
Source: OVNP Protected Area Administration (2014);

In Uyanga Soum, 115square KM of land is area of Navel Eight Lake Natural Monument PA, and remaining 5.1 square KM of land is area of OVNP. It means that total area of OVNP includes area of Navel Eight Lake Natural Monument. Actual area of OVNP, excluding Eight Lake, is 3,530.38 square KM.

### Hay production in Soums overlapped with OVNP (Tons)

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arkhangai	Khashaat	4,955.8	4,452.3	4,497.5	4,675.5	5,753.7	5,582.7	6,365.6	6,432.5	9,191.9	7,741.1	8,114.1
	Khotont	4,542.9	4,379.5	4,205.3	4,848.3	5,823.8	5,577.4	6,382.6	6,174.6	4,387.1	5,235.2	5,891.1
Uvur-khangai	Bat-Ulzii	542.0	3,600.0	3,774.0	2,300.0	4,948.2	2,520.0	5,600.0	655.0	5,000.0	3,200.0	3,195.0
	Uyanga	524.3	673.0	418.7	382.0	411.4	200.0	4,798.1	41.2	3,800.0	2,500.0	2,162.3
	KharKhorin	2,510.0	3,930.0	2,267.0	1,500.0	5,300.0	3,450.0	4,800.0	3,850.0	3,000.0	4,100.0	3,895.4
	Khujirt	1,600.0	1,992.0	2,112.0	2,210.0	2,550.0	1,243.0	2,110.0	1,850.0	3,200.0	2,150.0	2,617.1
Subtotal		14,675.0	19,026.8	17,274.4	15,915.7	24,787.1	18,573.2	30,056.3	19,003.3	28,579.0	24,926.4	25,874.9
<b>TOTAL (2002-2012)</b>		<b>238,692.1</b>										

### Hay production in Soums overlapped with OVNP (thousand tons)



Source: National Statistical Office of Mongolia (2014)



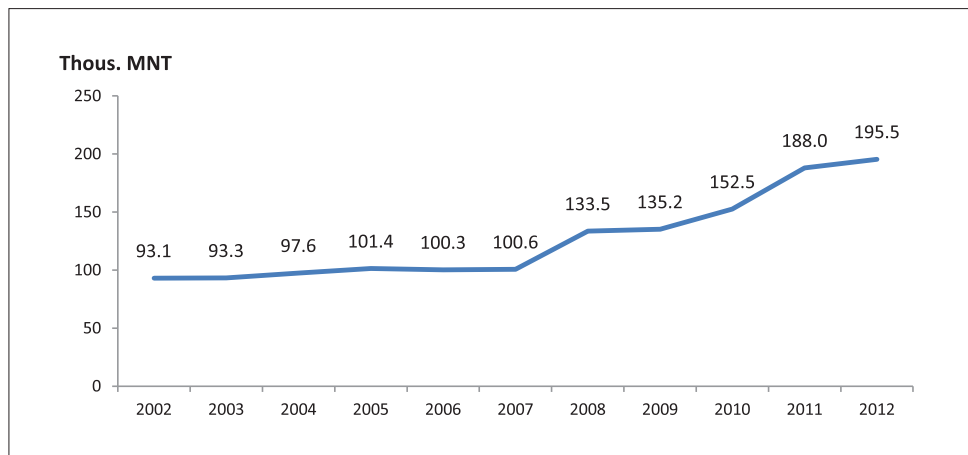
### Total hay harvested from OVNP (Ton)

	2006	2007	2008	2009	2010	2011	2012
Hay harvest (Tons)	2900	2800	3000	3100	4000	4220	4560

### Total market value of hay production in Soums overlapped with OVNP (million MNT)

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arkhangai	Khashaat	461.4	415.3	438.9	474.0	577.3	561.8	850.0	869.8	1,401.8	1,455.5	1,586.4
	Khotont	423.0	408.5	410.4	491.5	584.3	561.2	852.2	834.9	669.0	984.3	1,151.8
Uvurkhangai	Bat-Ulzii	50.5	335.8	368.3	233.2	496.5	253.6	747.7	88.6	762.5	601.7	624.7
	Uyanga	48.8	62.8	40.9	38.7	41.3	20.1	640.7	5.6	579.5	470.0	422.8
	KharKhorin	233.7	366.6	221.2	152.1	531.8	347.2	640.9	520.6	457.5	770.9	761.6
	Khujirt	149.0	185.8	206.1	224.0	255.9	125.1	281.7	250.1	488.0	404.2	511.7
TOTAL		1,366.3	1,774.7	1,685.7	1,613.5	2,487.0	1,868.9	4,013.3	2,569.5	4,358.3	4,686.6	5,059.0
<b>TOTAL (2002-2012)</b>		<b>31,482.8</b>										

### Price of the hay per ton (000 MNT)



Source: National Statistical Office of Mongolia (2014);

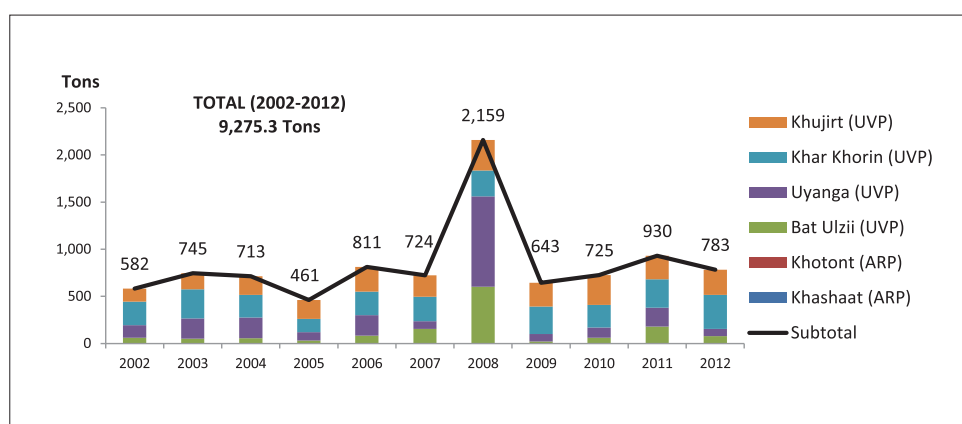
Note: Average price for all PAs overlapped Soums in Mongolia, estimated by Authors

### Fodder production in Soums overlapped with OVNP (Tons)

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arkhangai	Khashaat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Khotont	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uvurkhangai	Bat-Ulzii	59.5	51.5	56.0	30.0	81.8	155.7	601.9	21.5	60.0	180.0	78.8
	Uyanga	133.4	213.8	220.5	90.0	219.1	80.0	959.6	79.7	110.0	200.0	76.4
	KharKhorin	252.0	310.0	238.9	140.0	250.0	260.0	275.0	291.7	240.0	300.0	361.3
	Khujirt	137.0	169.2	198.0	201.0	260.0	228.0	322.0	250.0	315.0	250.0	267
Subtotal		581.9	744.5	713.4	461.0	810.9	723.7	2,158.5	642.9	725.0	930.0	783.5
<b>TOTAL (2002-2012)</b>		<b>9,275.3</b>										



### Fodder production in Soums overlapped with OVNP (Tons)

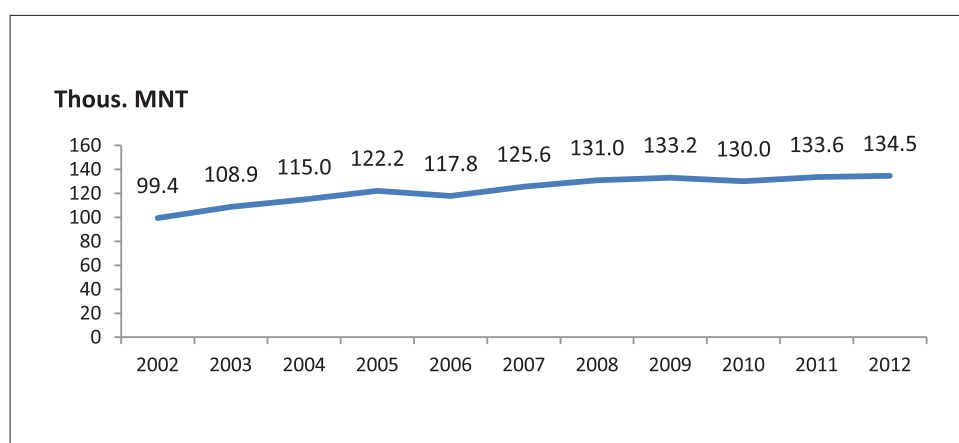


Source: National Statistical Office of Mongolia (2014)

### Total market value of fodder production in Souds overlapped with OVNP (million MNT)

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arkhangai	Khashaat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Khotont	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uvurkhangai	Bat-Ulzii	5.92	5.61	6.44	3.67	9.63	19.55	78.85	2.86	7.80	24.05	10.60
	Uyanga	13.27	23.28	25.36	11.00	25.81	10.04	125.71	10.61	14.30	26.73	10.28
	KharKhorin	25.06	33.76	27.47	17.11	29.44	32.64	36.03	38.85	31.20	40.09	48.61
	Khujirt	13.62	18.42	22.77	24.57	30.62	28.63	42.18	33.30	40.95	33.41	35.92
Total		57.87	81.07	82.04	56.34	95.51	90.86	282.76	85.62	94.25	124.28	105.41
<b>TOTAL (2002-2012)</b>		<b>1,156.0</b>										

### Price of the fodder per ton (000 MNT)

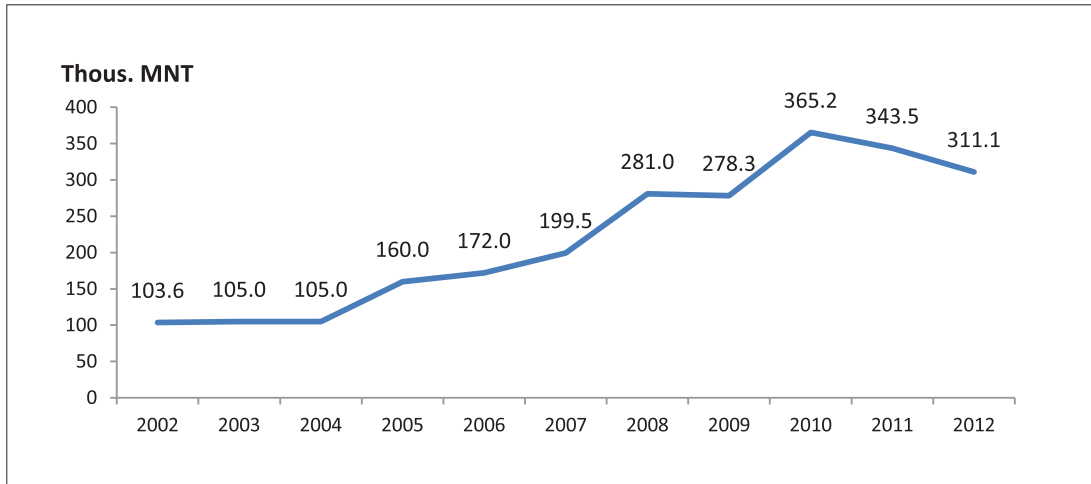


Source: National Statistical Office of Mongolia (2014);

Note: Average price for all PAs overlapped Souds in Mongolia, estimated by Authors



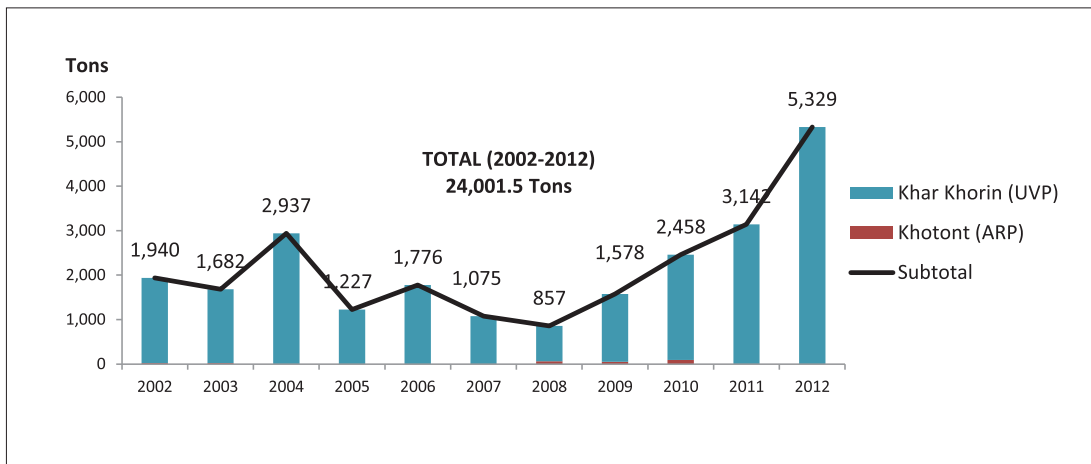
### Price of the wheat per ton (000 MNT)



Source: National Statistical Office of Mongolia (2014);

Note: Average price for all PAs overlapped Sums in Mongolia, estimated by Authors

### Wheat production in Sums overlapped with OVNP (Tons)



Source: National Statistical Office of Mongolia (2014)

### Wheat production in Sums overlapped with OVNP (Tons)

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arkhangai	Khashaat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Khotont	20.0	20.0	0.0	0.0	0.0	0.0	60.0	50.0	90.0	0.0	0.0
Uvurkhangaï	Bat-Ulzii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Uyanga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	KharKhorin	1,919.9	1,661.9	2,937.4	1,227.2	1,776.1	1,075.4	797.3	1,528.1	2,367.6	3,141.8	5,328.7
	Khujirt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal		1,939.9	1,681.9	2,937.4	1,227.2	1,776.1	1,075.4	857.3	1,578.1	2,457.6	3,141.8	5,328.7
<b>TOTAL (2002-2012)</b>		<b>24,001.5</b>										

### Total market value of wheat production in Soums overlapped with OVNP (million MNT)

Provinces	Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Arkhangai	Khashaat	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Khotont	2.1	2.1	0.0	0.0	0.0	0.0	16.9	13.9	32.9	0.0	0.0
Uvurkhangai	Bat-Ulzii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Uyanga	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	KharKhorin	198.9	174.5	308.4	196.4	305.5	214.6	224.0	425.3	864.7	1,079.4	1,657.6
	Khujirt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal		201.0	176.6	308.4	196.4	305.5	214.6	240.9	439.2	897.6	1,079.4	1,657.6
<b>TOTAL (2002-2012)</b>		<b>5,717.0</b>										

### Vegetable production in Soums overlapped with OVNP (Tons)

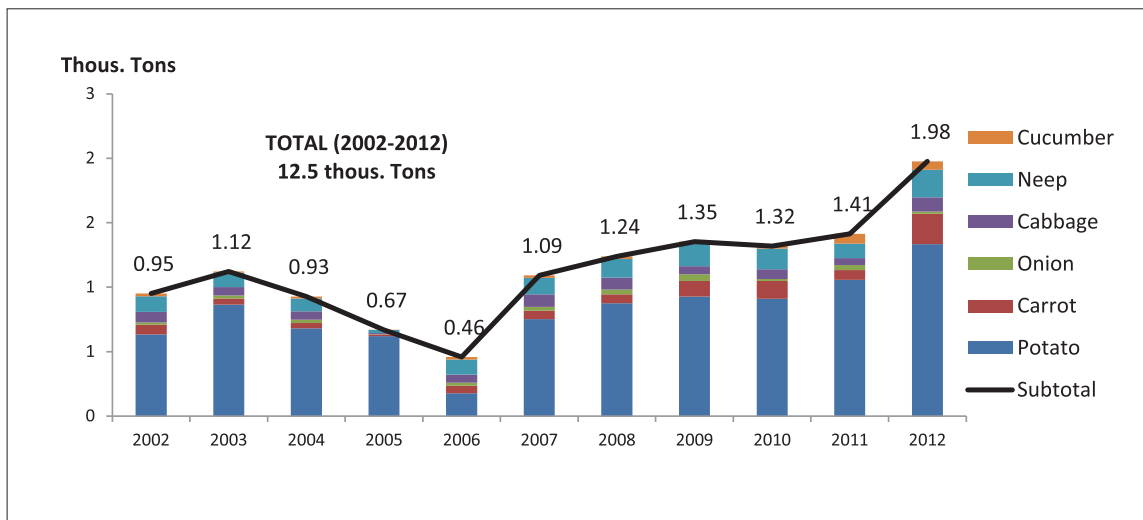
Vegetable	Soums*	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Potato	Khashaat (ARP)	20.1	93.5	1.5	5.9	50.9	35.0	5.6	7.0	2.5	35.7	40.0
	Khotont (ARP)	33.0	102.0	75.0	54.5	55.5	81.0	70.0	55.0	8.0	14.5	70.0
	Bat-Ulzii (UVP)	5.3	10.0	31.5	20.4	8.5	42.4	18.0	50.4	90.0	130.0	131.0
	Uyanga (UVP)	90.4	66.0	92.0	22.0	5.6	8.4	46.0	66.4	66.6	60.0	90.0
	KharKhorin(UVP)	466.0	520.0	338.0	407.0	51.0	540.0	715.0	700.0	697.5	727.0	926.6
	Khujirt (UVP)	19.1	73.8	142.8	110.0	6.5	46.0	21.3	47.4	45.0	90.0	76.0
	Subtotal	633.9	865.3	680.8	619.8	178.0	752.8	875.9	926.2	909.6	1,057.3	1,333.6
TOTAL (2002-2012)		8,833.1										
Carrot	Khashaat (ARP)	2.3	5.5	0.7	2.3	-	10.0	0.6	0.5	0.5	-	5.0
	Khotont (ARP)	8.0	4.0	1.4	7.0	9.0	5.0	6.0	1.5	1.0	8.0	15.0
	Bat-Ulzii (UVP)	1.4	1.3	1.0	1.5	1.2	1.1	2.0	1.6	3.4	3.4	4.9
	Uyanga (UVP)	-	4.0	1.7	-	3.8	2.9	2.9	9.0	3.9	-	7.0
	KharKhorin(UVP)	45.0	32.0	33.0	2.2	40.9	45.0	55.0	101.0	125.0	59.5	190.5
	Khujirt (UVP)	18.0	0.2	4.0	-	2.6	0.9	1.8	9.0	4.8	3.7	14.0
	Subtotal	74.7	47.0	41.8	13.0	57.5	64.9	68.3	122.6	138.6	74.6	236.4
TOTAL (2002-2012)		939.4										
Onion	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	2.0	3.0	-	-	3.0	4.0	-	-	-	5.0	6.0
	Bat-Ulzii (UVP)	0.2	-	-	1.0	-	0.9	1.5	5.0	5.5	3.9	4.9
	Uyanga (UVP)	-	-	0.7	-	1.8	1.9	7.5	2.0	2.6	-	3.5
	KharKhorin(UVP)	14.9	17.0	11.0	0.9	18.0	22.0	23.0	42.0	5.4	28.0	0.6
	Khujirt (UVP)	0.2	2.7	13.0	-	0.6	0.7	5.0	2.5	1.7	2.5	0.8
	Subtotal	17.3	22.7	24.7	1.9	23.4	29.5	37.0	51.5	15.2	39.4	15.8
TOTAL (2002-2012)		278.4										
Cabbage	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	4.0	2.0	1.0	3.0	4.0	4.0	2.0	1.0	-	6.0	7.0
	Bat-Ulzii (UVP)	-	-	-	0.8	0.8	4.1	2.5	4.2	4.3	4.2	5.1
	Uyanga (UVP)	3.2	-	1.9	4.9	-	2.9	4.0	12.0	14.0	-	1.1
	KharKhorin(UVP)	74.0	61.0	45.0	0.6	54.0	87.0	79.0	41.0	55.0	41.0	93.6
	Khujirt (UVP)	0.2	2.9	18.0	-	3.8	-	4.8	4.9	2.9	2.5	4.0
	Subtotal	81.4	65.9	65.9	9.3	62.6	98.0	92.3	63.1	76.2	53.7	110.8
TOTAL (2002-2012)		779.2										



Neep	Khashaat(ARP)	2.3	5.0	0.7	3.0	-	11.0	0.9	0.8	0.5	-	4.0
	Khotont(ARP)	6.0	5.0	1.0	11.0	12.0	1.0	3.0	4.0	2.5	5.0	27.0
	Bat-Ulzii(UVP)	2.0	1.1	2.5	3.2	0.6	6.7	2.7	3.7	1.2	1.3	5.2
	Uyanga(UVP)	0.7	7.0	3.1	3.9	2.1	4.5	4.5	1.2	1.4	-	7.5
	KharKhorin(UVP)	92.0	85.0	61.0	3.1	100.0	101.0	129.0	162.0	151.0	102.0	160.4
	Khujirt(UVP)	19.5	8.9	29.8	-	2.5	2.0	6.4	3.1	2.8	5.4	10.2
	Subtotal	122.5	112.0	98.1	24.2	117.2	126.2	146.5	174.8	159.4	113.7	214.3
TOTAL (2002-2012)		1,408.9										
Cucumber	Khashaat(ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont(ARP)	-	-	-	-	-	-	-	-	-	-	-
	Bat-Ulzii(UVP)	-	-	-	0.1	-	1.2	-	3.1	3.5	6.1	6.5
	Uyanga(UVP)	-	-	-	-	-	-	0.7	-	-	1.5	0.3
	KharKhorin(UVP)	21.0	7.9	4.5	-	18.5	18.0	18.0	9.0	13.0	67.0	56.6
	Khujirt(UVP)	0.5	1.3	12.0	-	-	0.5	-	2.0	2.9	-	1.4
	Subtotal	21.5	9.2	16.5	0.1	18.5	19.7	18.7	14.1	19.4	74.6	64.8
TOTAL (2002-2012)		277.1										
TotalVegetable		951.33	1,122.06	927.81	668.25	457.13	1,091.10	1,238.70	1,352.30	1,318.40	1,413.26	1,975.74
<b>TOTALVegetable (2002-2012)</b>		<b>12,516.08</b>										

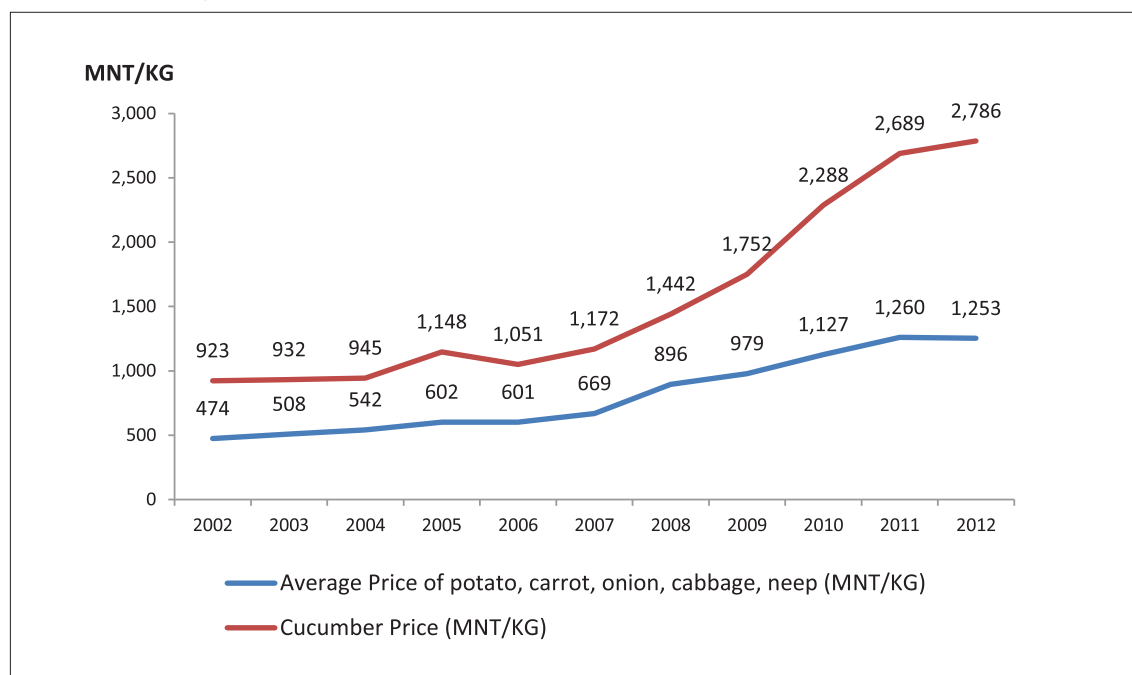
\*ARP: Arkhangai province, UVP: Uvurkhangai province

### Vegetable production in Soums overlapped with OVNP (Tons)



Source: National Statistical Office of Mongolia (2014)

### Price of the vegetable per KG (MNT)



Source: National Statistical Office of Mongolia (2014);

Note: Average price for six Soums overlapping with OVNP, Authors' Estimation

### Total market value of vegetable production in Soums overlapped with OVNP (million MNT)

Vegetable	Soums*	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Potato	Khashaat (ARP)	6.8	27.1	0.4	1.9	20.9	16.5	3.9	5.2	1.7	29.3	29.6	
	Khotont (ARP)	10.6	27.5	20.3	16.4	21.6	36.5	46.9	39.6	5.2	11.6	50.4	
	Bat-Ulzii (UVP)	1.9	3.2	10.1	7.1	3.7	21.2	12.6	37.8	67.5	110.5	104.8	
	Uyanga (UVP)	31.6	19.8	29.4	7.7	2.5	4.2	32.2	49.8	50.0	51.0	76.5	
	KharKhorin (UVP)	163.1	145.6	101.4	142.5	19.4	270.0	464.8	490.0	523.1	581.6	741.3	
	Khujirt (UVP)	6.7	22.1	42.8	38.5	2.6	23.0	14.9	35.6	33.8	76.5	64.6	
	Subtotal		220.7	245.4	204.4	214.0	70.7	371.3	575.2	657.9	681.2	860.5	1,067.2
	TOTAL (2002-2012)		5,168.6										
Carrot	Khashaat (ARP)	1.2	2.4	0.3	1.1	-	5.3	0.5	0.4	0.4	-	4.9	
	Khotont (ARP)	4.0	1.7	0.6	3.2	4.3	2.6	4.7	1.3	0.7	8.4	14.3	
	Bat-Ulzii (UVP)	0.5	0.6	0.5	0.8	0.7	0.7	1.6	1.4	2.7	3.7	4.9	
	Uyanga (UVP)	-	2.0	0.9	-	2.1	1.7	2.3	8.1	3.3	-	7.0	
	KharKhorin (UVP)	15.8	16.0	16.5	1.1	22.5	27.0	44.0	90.9	100.0	65.5	190.5	
	Khujirt (UVP)	6.3	0.1	2.0	-	1.4	0.5	1.4	8.1	4.1	4.1	14.0	
	Subtotal		27.7	22.8	20.8	6.1	31.0	37.8	54.5	110.3	111.2	81.7	235.5
	TOTAL (2002-2012)		739.4										

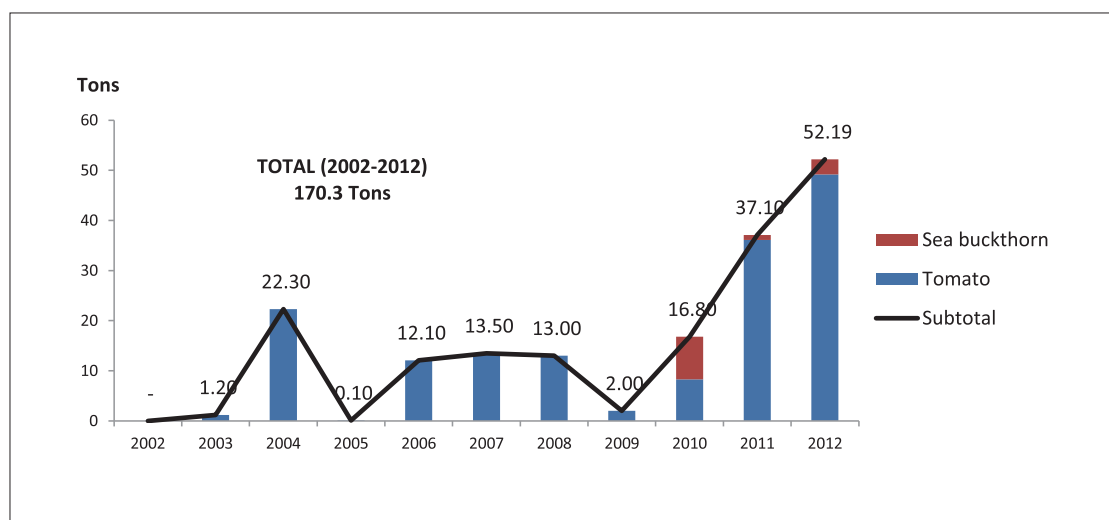




Onion	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	0.8	1.3	-	-	1.4	2.3	-	-	-	4.7	5.7
	Bat-Ulzii (UVP)	0.1	-	-	0.5	-	0.6	1.2	4.3	6.1	3.9	4.9
	Uyanga (UVP)	-	-	0.4	-	1.0	1.2	6.0	1.7	2.9	-	3.5
	KharKhorin (UVP)	6.0	7.7	5.5	0.5	9.9	14.3	18.4	35.7	5.9	28.0	0.6
	Khujirt (UVP)	0.1	1.4	7.2	-	0.3	0.5	4.0	2.1	1.9	2.5	0.8
	Subtotal	6.9	10.3	13.0	1.0	12.6	18.9	29.6	43.8	16.7	39.1	15.5
	TOTAL (2002-2012)	207.5										
Cabbage	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	1.7	0.9	0.5	1.4	2.0	2.1	1.5	0.8	-	5.7	6.4
	Bat-Ulzii (UVP)	-	-	-	0.4	0.5	2.5	2.0	3.4	4.3	4.2	5.1
	Uyanga (UVP)	1.3	-	1.0	2.5	-	1.7	3.2	9.6	14.0	-	1.1
	KharKhorin (UVP)	29.6	30.5	24.8	0.3	31.3	52.2	63.2	32.8	55.0	41.0	93.6
	Khujirt (UVP)	0.1	1.5	9.9	-	2.2	-	3.8	3.9	2.9	2.5	4.0
	Subtotal	32.7	32.8	36.2	4.5	36.0	58.5	73.8	50.4	76.2	53.4	110.3
	TOTAL (2002-2012)	564.7										
Neep	Khashaat (ARP)	0.9	2.0	0.3	1.9	-	5.9	0.8	0.7	0.4	-	3.9
	Khotont (ARP)	2.2	1.9	0.4	6.6	6.0	0.5	2.5	3.4	2.1	4.7	25.7
	Bat-Ulzii (UVP)	0.7	0.5	1.3	2.1	0.3	4.0	2.4	3.3	1.1	1.3	5.2
	Uyanga (UVP)	0.2	2.8	1.6	2.5	1.2	2.7	4.1	1.1	1.3	-	7.5
	KharKhorin (UVP)	32.2	34.0	27.5	1.9	50.0	60.6	116.1	145.8	135.9	102.0	160.4
	Khujirt (UVP)	6.8	3.6	14.9	-	1.4	1.2	5.8	2.8	2.5	5.4	10.2
	Subtotal	43.1	44.6	45.9	14.9	58.9	75.0	131.6	157.1	143.3	113.4	212.8
	TOTAL (2002-2012)	1,040.5										
Cucumber	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Bat-Ulzii (UVP)	-	-	-	0.1	-	1.4	-	5.4	8.0	16.4	18.1
	Uyanga (UVP)	-	-	-	-	-	-	1.0	-	-	4.0	0.8
	KharKhorin (UVP)	19.4	7.4	4.3	-	19.4	21.1	25.9	15.8	29.7	180.2	157.7
	Khujirt (UVP)	0.5	1.2	11.3	-	-	0.6	-	3.5	6.6	-	3.9
	Subtotal	19.9	8.6	15.6	0.1	19.4	23.1	27.0	24.7	44.4	200.6	180.5
	TOTAL	563.8										
Total Vegetable		(2002-2012)	364.51	335.92	240.68	228.67	584.48	891.62	1,044.18	1,073.03	1,348.70	1,821.82
<b>TOTAL Vegetable (2002-2012)</b>		<b>8,284.54</b>										

Fruit	Soums*	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Potato	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Bat-Ulzii (UVP)	-	-	-	0.1	-	-	-	-	-	-	-
	Uyanga (UVP)	-	-	-	-	-	-	-	-	-	1.2	0.3
	KharKhorin (UVP)	-	1.2	3.4	-	12.1	12.9	13.0	-	8.3	34.9	47.6
	Khujirt (UVP)	-	-	18.9	-	-	0.6	-	2.0	-	-	1.3
	Subtotal	-	1.2	22.3	0.1	12.1	13.5	13.0	2.0	8.3	36.1	49.2
	TOTAL (2002-2012)	157.8										
Carrot	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Bat-Ulzii (UVP)	-	-	-	-	-	-	-	-	-	-	-
	Uyanga (UVP)	-	-	-	-	-	-	-	-	-	-	-
	KharKhorin (UVP)	-	-	-	-	-	-	-	-	8.5	1.0	3.0
	Khujirt (UVP)	-	-	-	-	-	-	-	-	-	-	-
	Subtotal	-	-	-	-	-	-	-	-	8.5	1.0	3.0
	TOTAL (2002-2012)	12.5										
Total Fruit	-	1.20	22.30	0.10	12.10	13.50	13.00	2.00	16.80	37.10	52.19	
TOTAL Fruit (2002-2012)	170.29											

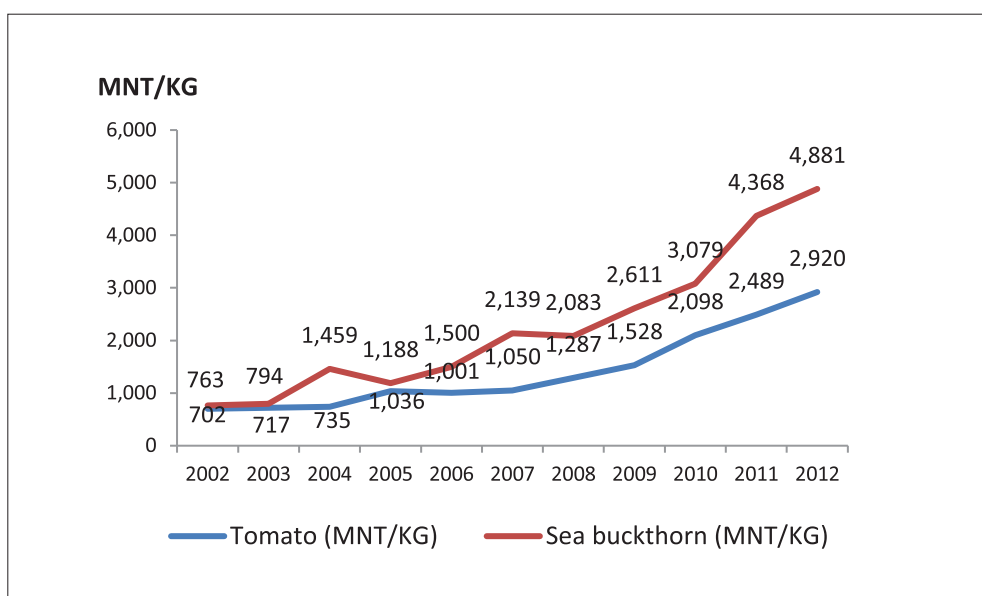
### Fruit production in Soums overlapped with OVNP (Tons)



Source: National Statistical Office of Mongolia (2014)



### Price of the fruit per KG (MNT)



Source: National Statistical Office of Mongolia (2014);

Note: Average price for six Soums overlapping with OVNP, Authors' Estimation

### Total market value of fruit production in Soums overlapped with OVNP (million MNT)

Vegetable	Soums*	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Tomato	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Bat-Ulzii (UVP)	-	-	-	0.1	-	-	-	-	-	-	-
	Uyanga (UVP)	-	-	-	-	-	-	-	-	-	3.0	0.8
	KharKhorin (UVP)	-	0.9	2.5	-	12.1	13.6	16.7	-	17.4	86.9	139.0
	Khujirt (UVP)	-	-	13.9	-	-	0.6	-	3.1	-	-	3.8
	Subtotal	-	0.9	16.4	0.1	12.1	14.2	16.7	3.1	17.4	89.9	143.6
	TOTAL (2002-2012)	314.4										
Sea buckthorn	Khashaat (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Khotont (ARP)	-	-	-	-	-	-	-	-	-	-	-
	Bat-Ulzii (UVP)	-	-	-	-	-	-	-	-	-	-	-
	Uyanga (UVP)	-	-	-	-	-	-	-	-	-	-	-
	KharKhorin (UVP)	-	-	-	-	-	-	-	-	26.2	4.4	14.6
	Khujirt (UVP)	-	-	-	-	-	-	-	-	-	-	-
	Subtotal	-	-	-	-	-	-	-	-	26.2	4.4	14.6
	TOTAL (2002-2012)	45.2										
Total Vegetable		-	0.86	16.40	0.10	12.12	14.18	16.73	3.06	43.59	94.23	158.29
<b>TOTAL Vegetable (2002-2012)</b>		<b>359.55</b>										

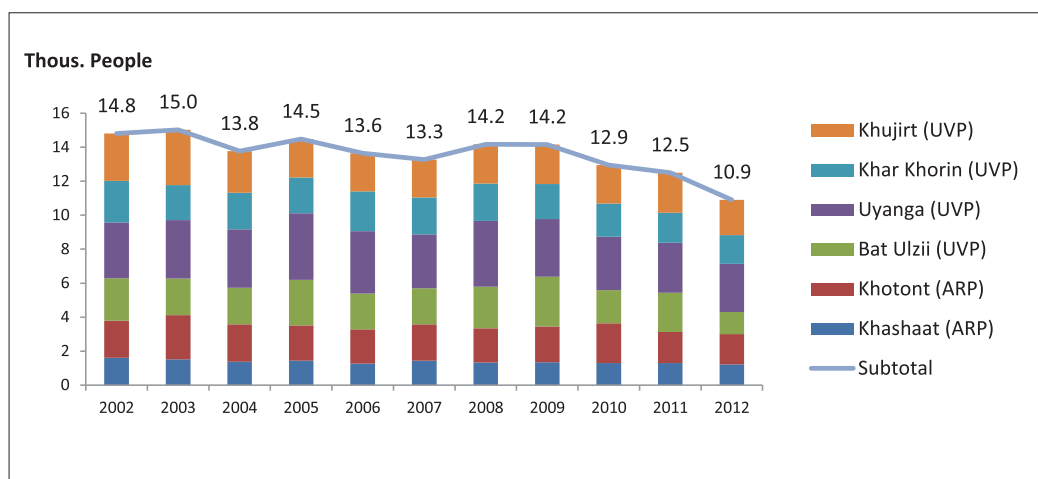
### Income of person who work in agricultural sector

MNT or USD	Salary type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
000 MNT	Average Yearly income	466.8	501.6	631.2	585.6	688.8	840.0	1550.4	1917.6	2163.6	2305.2	2732.4
	Average 7 months income	272.3	292.6	368.2	341.6	401.8	490.0	904.4	1118.6	1262.1	1344.7	1593.9
	Average Monthly income	38.9	41.8	52.6	48.8	57.4	70.0	129.2	159.8	180.3	192.1	227.7
USD	Average Yearly income	420.4	437.5	532.5	485.9	583.9	717.4	1329.9	1334.2	1606.0	1821.5	2010.2
	Average 7 months income	245.2	255.2	310.6	283.4	340.6	418.5	775.8	778.3	936.9	1062.6	1172.6
	Average Monthly income	35.0	36.5	44.4	40.5	48.7	59.8	110.8	111.2	133.8	151.8	167.5
Exchange Rate	1 USD=... MNT	1110.3	1146.5	1185.3	1205.3	1179.7	1171.0	1165.8	1437.2	1347.2	1265.5	1359.2

### Total water consumption of people who live in OVNP overlapped Soums (000 cubic Meter)

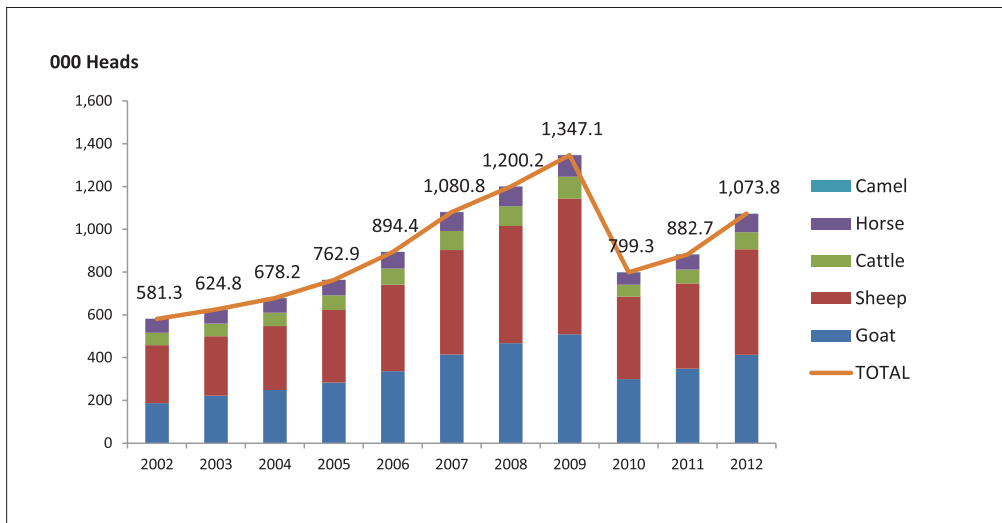
Soums	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Khashaat (ARP)	10.1	9.5	8.8	8.7	8.5	8.2	8.0	8.1	8.0	8.0	8.0	8.0
Khotont (ARP)	12.6	11.8	11.3	11.5	11.8	11.4	11.6	10.7	10.5	11.0	10.7	10.6
Bat-Ulzii (UVP)	13.9	14.1	14.3	14.4	14.2	14.7	15.0	15.3	15.4	16.4	16.0	17.4
Uyanga (UVP)	19.4	23.6	24.2	24.8	25.4	24.4	23.2	23.0	23.4	23.2	21.9	21.8
KharKhorin (UVP)	32.6	32.6	30.3	31.5	32.1	30.3	31.2	31.2	31.3	30.5	30.5	30.5
Khujirt (UVP)	17.0	16.8	16.6	16.9	16.3	15.7	16.1	16.2	16.5	16.3	16.3	16.0
Bottled water	0	0	0	0	0	0	0	0.8	0.8	0.8	0.8	1.6
Subtotal	105.7	108.4	105.7	107.8	108.3	104.7	105.0	105.3	105.8	106.2	104.2	105.8
<b>Total (2002-2012)</b>	<b>1,273.0</b>											

### Total Number of Working Force for livestock Sector in OVNP overlapped Soums

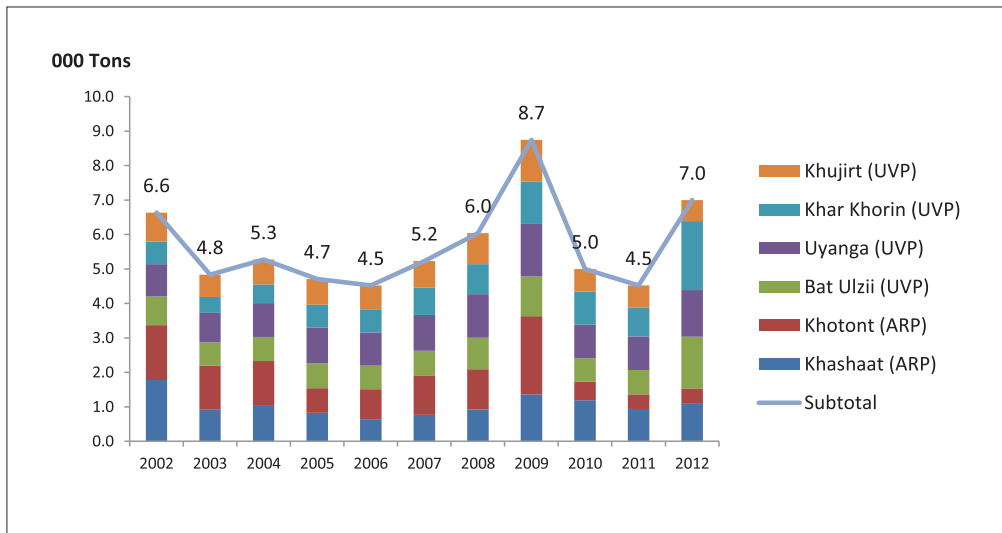




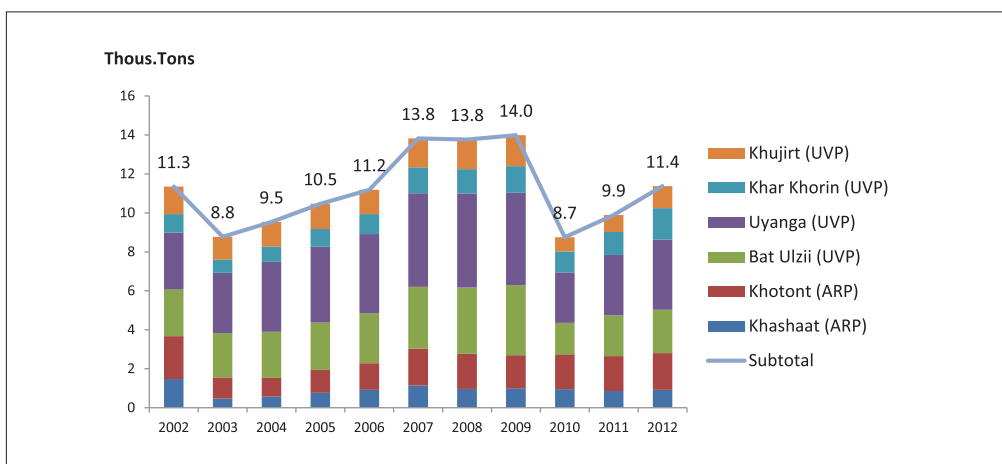
### Total number of livestock in PAs overlapped Soums (000 Heads)



### Total amount of meat production in OVNP overlapped Soums (000 Tons)

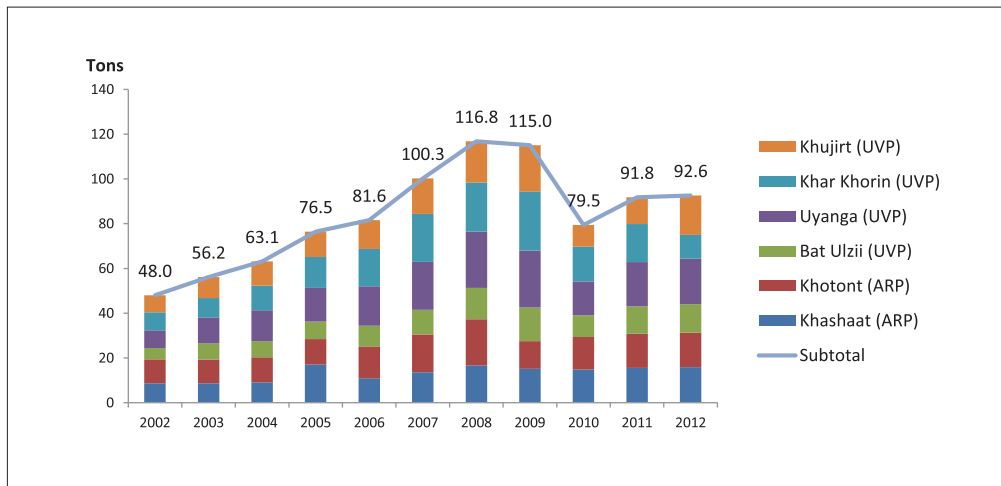


### Total milk production in OVNP overlapped Soums (000 Tons)

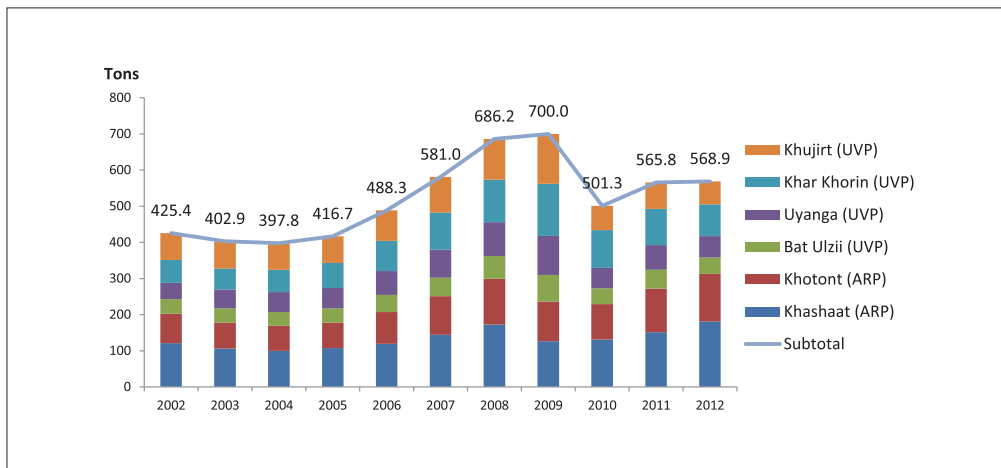




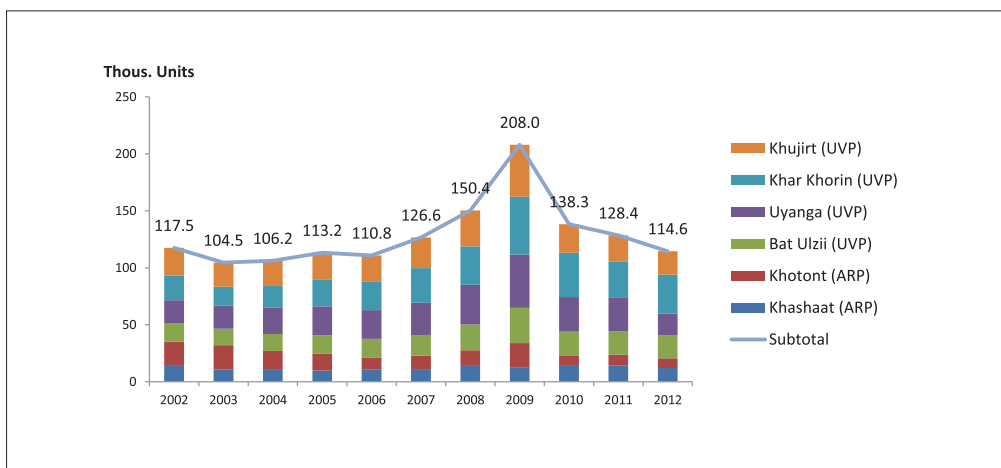
### Total production of cashmere in OVNP overlapped Soums



### Total wool production in OVNP overlapped Soums

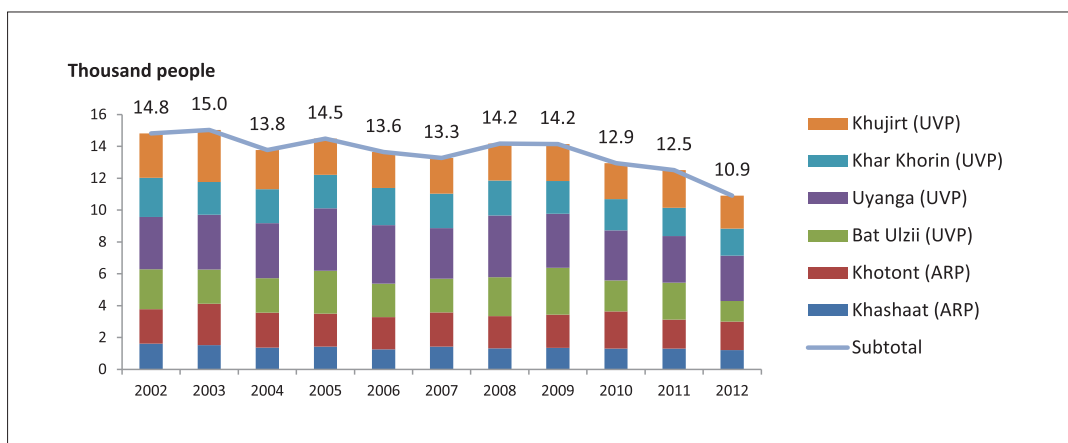


### Total number of skins and hides produced in OVNP overlapped Soums (Thous. Units)

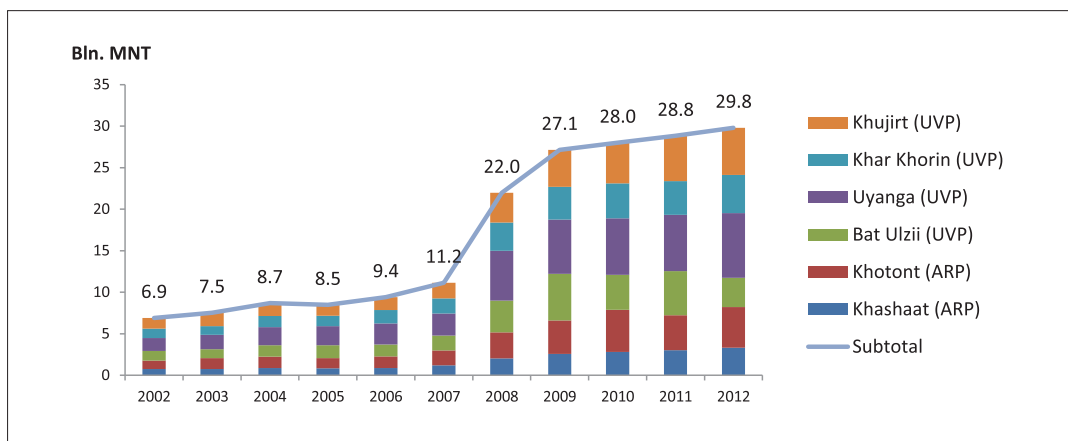




### Total number of people employed in livestock sector in Sums overlapped with OVNP



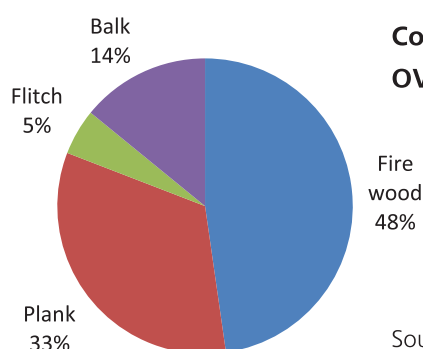
### Total income generated by employing people in livestock sector in OVNP overlapped Sums (Bln MNT)



### Forestry annex

Net value of wood taken from OVNP (Million MNT)

	2010	2011	2012	2013
Fire wood	10.8	0	39.7	42.6
Plank	9.8	0	26.3	34.5
Flitch	0.2	0	0.6	0.5
Balk	8.6	0	23.8	21.8
Subtotal	29.4	0	90.3	99.5
TOTAL (2010-2013)	219.2			



**Composition of wood preparation from OVNP by types 2010-2013**

Source: Source: OVNP Protected Area Administration (2014b); Authors' Estimation

### Allowed wood preparation by types, estimated (cubic meters)

	2010	2011	2012	2013
Fire wood	429.6	0	716.0	477.3
Plank	298.1	0	496.9	331.3
Flitch	45.4	0	75.6	50.4
Balk	126.9	0	211.5	141.0
Total	900	0	1,500	1000

Source: Source: OVNP Protected Area Administration (2014b); Authors' Estimation

### Net value of allowed limit of wood preparation from OVNP (Million M)

	2010	2011	2012	2013
Fire wood	38.7	0	77.3	57.3
Plank	30.4	0	59.0	42.6
Flitch	0.5	0	1.1	0.8
Balk	22.8	0	45.7	33.8
Total	92.5	0	183.2	134.5

### Allowed wood preparation by types, estimated (cubic meters)

	2010	2011	2012	2013
estimated (cubic meters)	429.6	-	716.0	477.3
	2010	2011	2012	2013
Fire wood	429.6	0	716.0	477.3
Plank	298.1	0	496.9	331.3
Flitch	45.4	0	75.6	50.4
Balk	126.9	0	211.5	141.0
Total	900	0	1,500	1000

### Net value of allowed limit of wood preparation from OVNP (Million MNT)

	2010	2011	2012	2013
Fire wood	38.7	0	77.3	57.3
Plank	30.4	0	59.0	42.6
Flitch	0.5	0	1.1	0.8
Balk	22.8	0	45.7	33.8
Total	92.5	0	183.2	134.5

Source: Source: OVNP Protected Area Administration (2014b); Authors' Estimation