Combating Desertification with the Sustainable Regional Development Model: The Case of Green Asia in Mongolia

기획재정부 MINISTRY OF STRATEGY AND FINANCE

한국수출입은행 THE EXPORT-IMPORT BANK OF KOREA

World Bank Institute

Cover suggestions

2

3

4

5

Content

Tables

Figures

Abstract

Desertification is a growing problem in the world and its causes vary as does its impact. Desertification through climate change generally is attributed to drought; desertification through human activities is generally attributed to overgrazing, exploitation and mining. The impact of human activities on desertification however is significantly greater than climate changes. Furthermore, policies also impact land degradation and desertification. In the case of Mongolia, desertification has been a growing concern impacted by climate change, overgrazing and the like as well as mining coupled with policy factors and socio-economic issues. This case study examines some of the issues facing Mongolia and the actions taken towards combating the impact of desertification, particularly focusing on a sustainable model proposed by the Green Asia Foundation—an international nonprofit organization—as well as some of the issues that have come up in its attempt to combat desertification in regions of Mongolia. Green Asia's experience in combating desertification provides lessons for future sustainable projects which are duly noted in the conclusion of this case study.

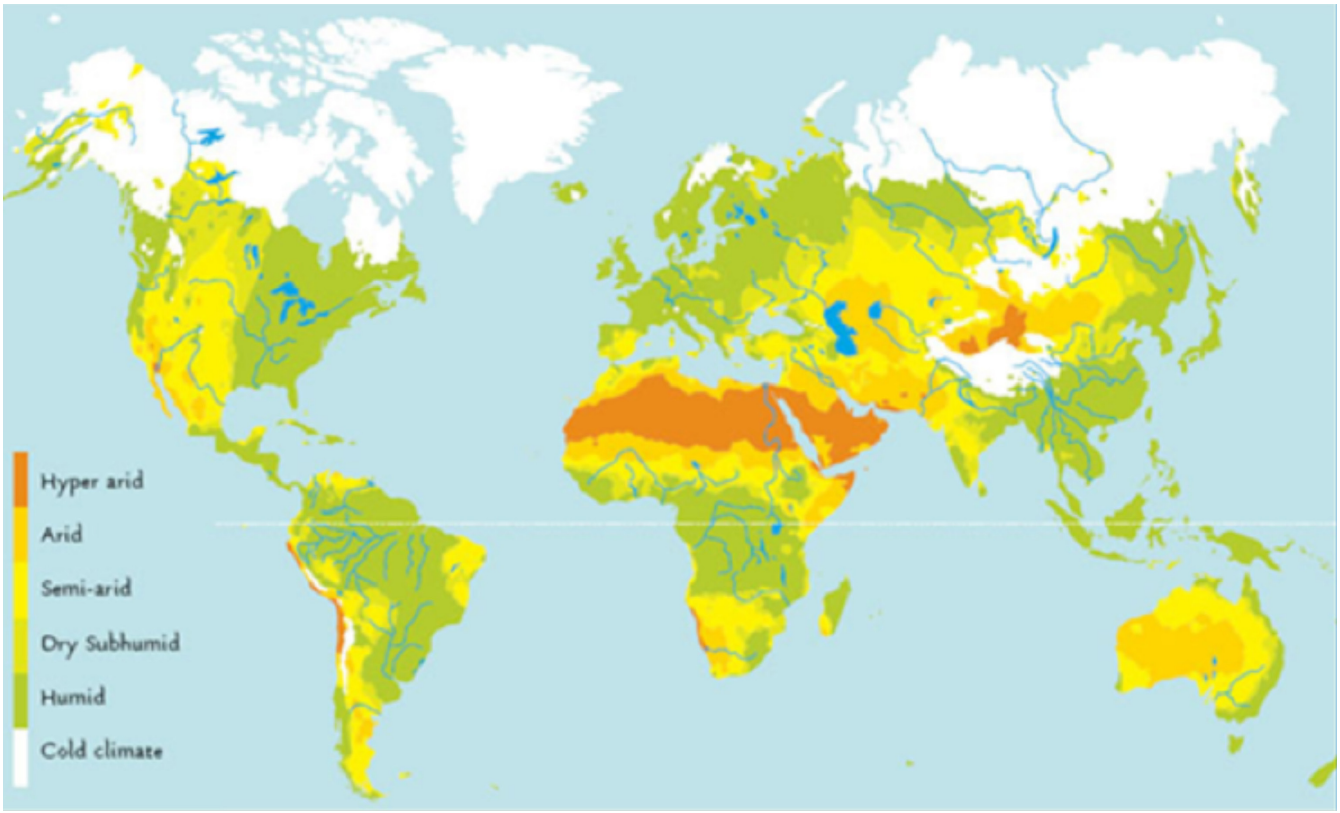
Key Words: Desertification, Sustainable Regional Development Model

1. Background

1.1 Encroaching Desert

Desert is coming. More than 20,000 square miles of land in the world is turned into desert every year.[1] It is also known that some "74% of the land in North America and more than 2.4 million acres of land (73% of its drylands) in Africa" are gorged by desertification (Figure 1).[2] It appears that all the continents on the earth are affected by drought and desertification. The impact from desertification is severe—about "3.6 billion of the world's 5.2 billion hectares of useful dryland for agriculture has suffered erosion and soil degradation" and "1 billion of the over 6 billion of the world's population are affected by drought and desertification."[3]

Figure 1: Aridity Map of the World



Source: United Nations, The (2010a) "Learning to Combat Desertification," http://www.unesco.org/mab/doc/ekocd/intro_learning.htmlUNEP, (Accessed: 16 December 2011) UNESCO (Original Data Source: CRU/UEA, UNEP/DEWA)

1 United Nations (2008) "Youth Statement," at Children and Youth Major Group, Desertification, Wednesday 7 May 2008 at 3-6pm Session, UN Department of Economic and Social Affairs, http://www.un.org/esa/sustdev/csd/csd16/statements/youth_7may_desertification.pdf.
2 Ibid.
3 Ibid.

1.2 Major Causes and Impact of Desertification

The underlying cause of desertification can largely be viewed from climatic variations and anthropogenic human activities.[4] As is widely known, climate variations, e.g. drought, are often quoted as a major factor that attributes to desertification. However, human activities are known as the most significant causes to land degradation/desertification. Indeed, "over-cultivation exhausts the soil. Overgrazing removes vegetation that prevents soil erosion. Trees that bind the soil together are cut for lumber or firewood for heating and cooking. Poorly drained irrigation turns cropland salty, desertifying 500,000 hectares annually, about the same amount of soil that is newly irrigated each year."[5] Indeed, according to the United Nations Environment Programme (UNEP), it is estimated that the impact brought forth by climate variations is about 13 per cent while human activities account for 87 per cent.[6]

As such, human activities inflict almost irreversible damages on land. These activities would include overgrazing, deforestation, overexploitation of land by outdated agricultural practices, and the like. Human activities especially in the dryland areas are closely linked to land degradation and desertification. As the developmental pressure and daily activities of the population in these environmentally vulnerable areas further deteriorate soil erosion and land degradation, the land cannot sustain "eco-services" at a certain point. As arable lands, and subsequently their livelihood, disappear, the exodus of emigrants to cities begins. This is what we can term the "climate refugees." This, in turn, causes further environmental disasters in the urban areas. Hence, the vicious downward spiral of environmental catastrophe (Figure 2). Thus, socioeconomic factors, such as population growth, urbanisation, poverty, etc., are closely linked to desertification.

Policy factors also contribute to land degradation and desertification. These are in part related to increased international trade amplified by globalisation.[7] An increase in demand, for example, for Mongolian cashmere products in the developed countries leads to an increased number of pastoral livestock (e.g. goats), which, in turn, results in the degradation of pasture lands. Coupled with climate change, overgrazing caused by the shortfall of carrying capacity of pasture lands further accelerates desertification process.

Needless to say, the consequences of the land taken over by desert are severe. People living in drylands are dependent on the eco-system for their livelihood. Once the eco-system is devastated, the human life will end up in instability, which will further accelerate the deterio-

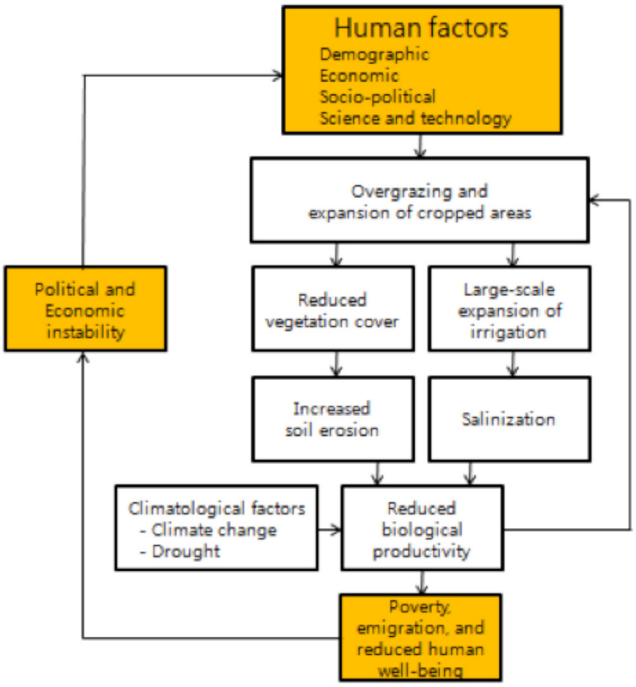
4 The United Nations Convention for Combating Desertification (UNCCD) defines desertification as "land degradation in arid, semi-arid and sry sub-humid areas reaulting from factors such as climatic variations and human activities."

5 United Nations, The (1997) "The United Nations Convention to Combat Desertification: A New Response to an Age-Old Problem," http://www.un.org/ecosocdev/geninfo/sustdev/desert.htm, (Accessed 16 December 2011) Earth Summit +5: Special Session of the General Assembly to Review and Appraise the Implementation of Agenda 21, 23-27 June 1997, New York.

6 Citizens Information Media Center (2008) A Survey on the Occurrence of Dust Sand Storm in Mongolia and a Study on the Promotion of the Countermeasures," (in Korean) Seoul, March 2008, p.63.

7 Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Desertification Synthesis. World Resources Institute, Washington, DC, pp.9-10.

Figure 2: Downward Linkage to Desertification by Human Factors



Source: Excerpted from Millennium Ecosystem Assessment (2005), p.4.

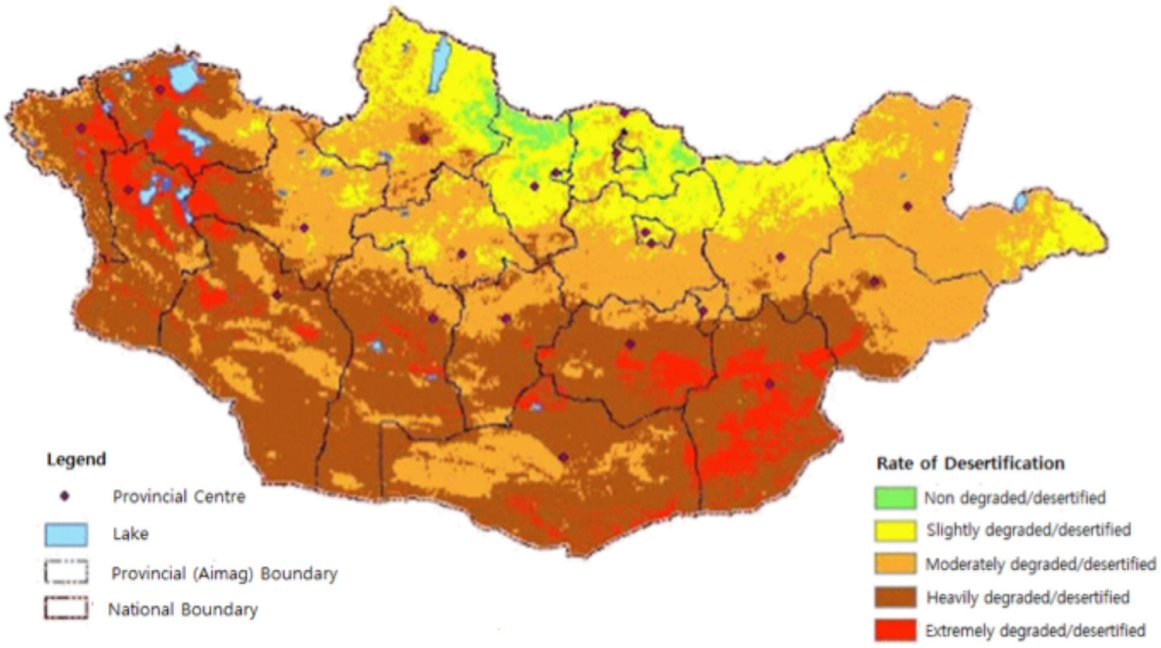
ration process by exploiting marginal resources left in the devastated lands—"squeezing a dry towel" for a last drop of water. Eventually, the spiral reaches its end of the cycle when the lands are completely abandoned (Figure 2).

1.3 Mongolia in the Frontline of Desertification

Mongolia, along with the Sahel area in the African continent, is on the frontline in combating desertification. Based on the definition put forth by the United Nations Convention for Combating Desertification (UNCCD), scientists and researchers conclude that "almost 90% of Mongolia's pastureland is vulnerable to land degradation and desertification."[8] As was assessed in a recent survey, "almost all grasslands are under threat of desertification and roughly 72% of the total territory is degraded to some extent."[9] As depicted in Figure 3, the rate of land degradation/desertification in Mongolia is astonishing. And it is an on-going process that seems to be accelerating. In the 20-year period from 1985 to 2005, as seen in Figure 4, the areas with the Normalised Difference Vegetation Index (NDVI) of less than 0.07 have increased by 21 per cent, meaning that the area of "thin" vegetation cover is expanding.

8 The Government of Mongolia (2010) p.2. For the definition of desertification, please refer to Footnote 4 in Page 2.
9 Ibid.

Figure 3: The Map of Land Degradation/Desertification in Mongolia



Source: Excerpted from Mongolian Academy of Science (2008) "Dynamics of desertification in Mongolia and its trend," Desertification Study Centre of Geoecological Institute.

Figure 4: Desertification Process in Mongolia

Note: The areas in blue represents the areas with NDVI <0.07 while other areas >0.07; Source: Natsagdorj, L. (2008) "Climate Change and Desertification in Mongolia," Presentation File, Green Asia.

1.4 Major Causes of Land Degradation and Desertification in Mongolia

Then, what are the major causes of this astonishing rate of land degradation/desertification in Mongolia? Many agree that three major causes, among others, are attributable to land degradation/desertification in Mongolia.[10] They are,

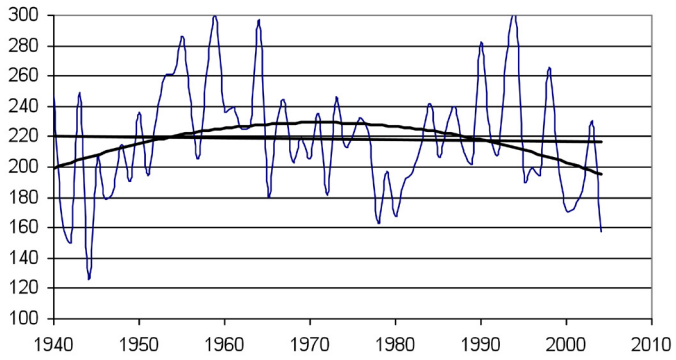
- Climate change;
- Overgrazing; and
- Mining activities.

1.4.1 Climate changes

The climate in Mongolia is characterised by highly extreme variations. It is in general cold and dry and has a long cold winter and a short summer. In this continental weather region, the amount of precipitation tends to be low with a range of 200-300 mm annually, which falls in the short summer season (Figure 5).

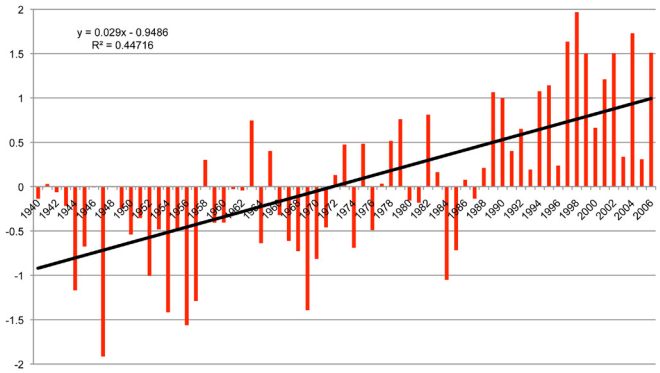
The annual mean temperature in Mongolia in the period 1940-2004 has increased about 1.9°C (Figure 6). This change is significant as it is higher than the previously observed increase—1.56°C.[11] Unlike the change in temperature, the change in the annual mean of precipitation in the last 65 years, a decrease of about two per cent only, does not appear to be significant.[12] However, an increasing rate of annual mean of nation-wide evapo-transpi-

Figure 5: Change in Precipitation in Mongolia, 1940-2006



Source: Natsagdorj (2008)

Figure 6: Changes in Annual Mean Temperature in Mongolia, 1940-2006



Source: Natsagdorj (2008)

10 Other causes often referred to as the major causes for desertification in Mongolia include wild fire, the lack of sustainable land management, abandoned farmland, etc.
11 Citizens Information Media Centre (2008), p.66.
12 Ibid.

ration, about 2-3 mm, is the subject to concern. Indeed, it has increased to approximately 100 mm in the last 46 years.[13]

Frequent appearances of extreme climate in recent years, prolonged harsh winters and hot summers, leave devastating scars on all facets of life in Mongolia. As noted in Table 1 below, the number of livestock plummeted significantly in 2010. This was caused by a dzud, or zud,[14] that hit Mongolia in the 2009/2010 winter, in which more than 7.8 million livestock, or some 17 per cent of total livestock, were lost.[15] The consequences of this unprecedented natural disaster were far too severe. Not only the loss of animals but also a falling rate of livestock birth resulted in almost irrevocable damages on the livelihood of herders and rural communities. In fact, the livestock sector provides "livelihoods for 30% of Mongolia's population and represents 16% of the country's gross domestic product."[16] As a result of the dzud, almost "9,000 households (45,000 people) have been left without animals and faced a grim future."[17]

Table 1: Number of Private Livestock in Mongolia

	Unit: '000			
	2007	*2008*	*2009*	*2010*
Horse	2,215.7	2,164.1	2,198.2	1,901.7
Cattle	2,398.0	2,473.2	2,565.8	2,151.0
Camel	257.1	263.2	274.0	267.1
Sheep	16,681.0	18,052.6	18,954.6	14,273.9
Goat	18,200.2	19,818.9	19,503.9	13,798.5
Transmission apparatus for radio-telephony, radio-broadcasting	39,752.0	42,772.0	43,496.5	32,392.2

Source: The Government of Mongolia (2011) Mongolian Statistical Yearbook 2010, National Statistical Office of Mongolia, Ulaanbaatar.

1.4.2 Overgrazing

The Government of Mongolia determines overgrazing as the major cause of land degradation and desertification in Mongolia and assesses that it is the "result of inappropriate access regulations to pasture land."[18] It also estimates that the pasture carrying capacity has already exceeded by 32.5 per cent.[19] While the size of pasture land has been decreasing, the number of livestock has dramatically increased, soaring since 1990 when private owner-

13 Green Asia (2009) "Towards the Green Asia," Presentation file, October 2009.
14 The Mongolian term for a "complex, long-lasting natural disaster in which a summer drought is followed by heavy snowfalls and unusually low temperatures in winter, and then by a dangerous spring thaw." The United Nations (2010b) "Mongolia: Dzud Appeal," www.undp.org/cpr/documents/recovery/mongolia_appeal.pdf. (Accessed: 16 December 2011), The UN Country Team Consolidated Appeal, May 2010, p.5.
15 Ibid.
16 Ibid.
17 Ibid.
18 The Government of Mongolia (2010), p.4.
19 Ibid.

ship of livestock was permitted and even encouraged.[20] As a result, the livestock head has increased every year. In 1918, the total number of livestock was 9,645,600; by 2005, the number increased by three-fold to 30,398,800.[21] And by 2007 it reached nearly 40 million and exceeded 40 million in 2008, as shown in Table 1.

The change in the number of goats is especially palpable—it increased by 121 times to 18,067,500 in 2005 from 1,489,000 in 1918.[22] Of major concern, goats, often referred to as "eating machines," typically sample everything in their path, having a plant diet that is extremely varied. This leads to the destruction of the undergrowth and vegetation, and in addition, trees that are denuded of leaves and left with gnawed bark. Impacts of vegetation removal can cause shifts in the plant community structure and the removal of plant growth or bio-mass, and thus, regeneration capacity of the land.

Figure 7: Goat (Capra Hircus)

Source: Photo taken at near Bayaannur Soum, Mongolia (December 2011)

1.4.3 Mining activities

Mineral exploration and mining operations are the most important industrial sector in Mongolia. In 2009, the mining sector provided about 21.8 per cent of GDP.[23] In 2007, the sector export accounted for about 78.4 per cent of the country's total exports

20 Prior to the privatisation of livestock took place, mostly state-run co-operatives owned and controlled the livestock industry; private ownership of livestock was limited to a small scale. But after the privatisation, livestock herding was heavily subsidised by the state in order to encourage pastoral livestock sector. See Frederick Nixson and Bernard Walters (2004) "Privatisation, Income Distribution and Poverty: the Mongolian Experience," Report submitted to UNDP (Mongolia), January 2004, pp.22-23.

21 Citizens Information Media Centre (2008), p.99.

22 Ibid.

23 The U.S. Government (2011) "Background Brief: Mongolia," Diplomacy in Action, http://www.state.gov/r/pa/ei/bgn/2779.htm (Accessed: 16 December 2011), U.S. Department of State.

and grew by 2.3 per cent to 80.7 per cent in 2008. As shown in Table 2, three major export commodities in 2007 were copper ores and concentrates, gold, and zinc ores and concentrates. The sector is also the key industry on which most of foreign direct investment (FDI) inflows are concentrated, as seen in the more than seven-billion dollar Oyu Tolgoi project. Although the contribution of the sector to the national economy is substantial, the potential for the environmental hazards is actually high. Indeed, it is estimated that approximately 30 per cent of the degraded land is attributable to mining activities.[24]

However, a weak institutional capacity, e.g. the paucity of strong and determined legal enforcement on the companies that are accountable for the wrecking of the environment, is ultimately attributable to land degradation. Some companies do not even have the land rehabilitation plans during and after the closure of mines; others do not properly deal with the tailings and effluents yielded by their operations.

Threats to the environment are especially multiplied by artisanal (informal) miners. The use of extremely toxic and poisonous substances such as mercury, sodium cyanide and others is strictly limited in Mongolia. However, it is widely known that the use of

Table 2: Top 10 Export Commodities of Mongolia, 2005-2007

	Unit in US$ million		
Description of Commodities	*2005*	*2006*	*2007*
All commodities	1,064.4	1,542.3	1,886.6
Copper ores and concentrates	326.2	635.4	811.4
Gold (including gold plated with platinum)	331.4	270.1	234.9
Zinc ores and concentrates	10.2	91.1	175.5
Wool and fine or coarse animal hair, carded or combed	62.2	83.0	115.4
Coal; briquettes, ovoids and similar solid fuels manufactured from coal	26.6	45.1	115.8
Molybdenum ores and concentrates	46.7	47.8	75.9
Fine or coarse animal hair, not carded or combed	17.4	66.8	67.3
Felspar; leucite and nepheline syenite	25.4	35.1	45.0
Petroleum oils, crude	9.3	19.8	53.3
Tanned or crust skins of sheep or lambs, without wool on	16.4	24.5	25.0

Source: The United Nations (2011) "World Statistics Pocketbook: Mongolia," http://data.un.org/CountryProfile.aspx?crname=Mongolia (Accessed: 16 December 2011), UN Statistical Division.

24 Khaulenbek, A. (2008) "Desertification in Mongolia," Presentation file, Green Asia. Desertification Research Center the Institute of Geoecology, MAS.

the substances in illegal processing of gold ore among artisanal miners is rampant with no regards for safety.[25]

A case in point is a disastrous accident that occurred on the 23rd of April 2007 in Khongor Soum, approximately 200 km north of Ulaanbaatar. The mercury and sodium cyanide waste water used in an informal operation to process gold ore poured directly into the waste treatment plant, which overflowed into the village's water system and contaminated the water supply system and land, resulting in the intoxication of the population and livestock in the village.[26]

As such, a soaring number of informal private mining activities since 1997 have been a major concern. Furthermore, it was estimated that there were about 30,000 informal gold miners in 2005, but the actual number could be at least 100,000.[27] About 1,100 artisanal and small-scale operations were active in coal mining in the winter.[28] These numbers continue to grow because of, in large part, socio-economic distress such as poverty, income inequality, unemployment, and the like.[29]

1.5 A Complex Nexus of Desertification

As discussed, the land degradation/desertification process is greatly affected by a complex interplay of nature and human activities. However, it is apparent that more attention should be given to human factors in order to effectively account for this natural calamity. In particular, the socio-economic aspect of human factors must be fully addressed. For example, poverty may foster the condition whereby people go into illegal activities such as illegal mining and logging without any regards for environmental consideration (See also Table 3).[30] This infers that there is a close relationship between such socio-economic factors as poverty, income inequality, unemployment, inflation, and the like and desertification.

---

25 Joint UNEP/OCHA Environment Unit (2007) "Fact-finding mission: Sodium cyanide and mercury pollution and mining related environmental emergencies in Mongolia," http://ochanet.unocha.org/p/Documents/2007_July_SodiumCyanide-mercurypollution_miningrelatedEEinMongolia.pdf. (Accessed: 16 December 2011) The United Nations, July 2007, p.1. The report describes potential hazards of the use of the toxic and poisonous substances in the gold ore processing as follows: "gold ore is crushed with mercury first and in result of amalgamation about 30 percent of the gold ore is extracted. The remaining 70 percent of gold ore is taken out from the waste by a solution of cyanide… Therefore they pose a serious threat to human and animal populations, the wildlife and the environment (p.1)."

26 Ibid.

27 IBRD/The World Bank (2006) "Mongolia: A Review of Environmental and Social Impacts in the Mining," Discussion Paper, http://siteresources.worldbank.org/INTMONGOLIA/Resources/Mongolia-Mining.pdf. (Access date: 16 December 2011), Environment and Social Development Department, East Asia and Pacific Region, p.8.

28 Ibid.

29 Ibid.

30 The World Bank estimates that between 36 and 80 per cent of the total logging is illegal. The World Bank (2011) "Mongolia Environment," http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTEAPREGTOPENVIRONMENT/0,,contentMDK:20266325~menuPK:537827~pagePK:34004173~piPK:34003707~theSitePK:502886,00.html#NRM (Accessed: 16 December 2011)

In fact, the linkages between poverty and land degradation, and thus desertification, have thus far been conceptualised by numerous researchers.[31] Although the direction of causality cannot be determined, it appears that poverty and land degradation are closely interrelated.[32] This leads to an important policy implication: Strategies to address socio-economic malaise must be embedded, or even be emphasised, in any plans or programmes for ameliorating the desertification process.

Table 3: Some Social and Economic Indicators of Mongolia

Indicator	*2010*
GDP, PPP (current international $ million)	11,122,9
GDP per capita, World Bank Atlas Method (US$)*	1,133.0
GNI per capita, 2005 constant price (US$)*	1,028.0
Agriculture, forestry and fishing, value added (% of GDP)*	15.9
Mining and quarrying, value added (% of GDP)*	22.7
Manufacturing, value added (% of GDP)*	8.5
Wholesale and retail; Motor-vehicle and motor-cycle repair, value added (%)*	15.3
Transportation and storage, value added (%)*	8.3
Foreign direct investment, net inflows (% of GDP)	23.5
Poverty headcount ratio at $2 a day (PPP, % of population, Y2005)	49.05
Poverty headcount ratio at national poverty line (% of population, Y2008)	35.2
GINI index (Y2005)	33.0
Unemployment, total*	9.9
Population, total (million)	2.8
Rural population (% of total population)	42.5
Population density (people per sq. km of land area)	1.8

Note: 2010 data unless noted otherwise; * Data excerpted from Mongolian Statistical yearbook 2010, NSOM; Source: World Bank (2011) World Development Indicators (On-line), http://data.worldbank.org/ (Accessed: 16 December 2011), National Statistical Office of Mongolia (2011).

1.6 A Comprehensive Government Policy: National Action Programme for Combating Desertification 2010-2020 (NAP CD)

Recognising the need to muster a national capacity at the maximum level of efficiency and effectiveness, the Government of Mongolia (GoM) has formulated comprehensive strategic principles for combating desertification—the National Action Program for Combating Desertification, 2010-2020 (NAP CD).

31 Consultative Group on International Agricultural Research (1999) "Rural Poverty and Land Degradation: A Reality Check for the CGIAR," in CGIAR Research Priorities for Marginal Lands, Discussion paper http://www.fao.org/Wairdocs/TAC/X5784E/x5784e00.htm#Contents, The World Bank, September 1999.

32 In 2010, the unemployment rate in the Western, Khangai, Central, and Eastern Regions were estimated 10.1, 11.9, 9.3 and 10.5 per cent respectively, while the capital Ulaanbaatar remained at 8.7 per cent. National Statistical Office of Mongolia (2011).

In fact, the GoM joined the UNCCD in 1996 and adopted the first action programme and adopted the first NAP CD in the following year. The National Committee for Combating Desertification (NCCD) was created to implement the NAP CD. It was updated in 2003 by an action programme known as the NAP CD 2. However, the plans were criticised as not being effective enough to address the underlying causes of desertification and hence the NAP CD 2010-2020 was developed.

The new NAP CD differs from the previous plans in two aspects: Firstly, it calls for the NAP CD to be in sync with the MDG-based national development plan; and secondly, it recognises desertification as a matter of national security. In its rationale for the NAP CD 2010-2020, the GoM states:

> 4.3 There is a need to formulate NAP align with MDG-based National Development Strategy and the National Program for Regional Development. In May 2009, the National Security Council called for a meeting in order to discuss state, extent, and trends of desertification and actual measure against desertification and future goal and the National Security Council decided to revise the NAP CD in line with the National Development Strategy.[33]

The new NAP seems highly plausible because it identifies poverty as one of major causes of land degradation and desertification in Mongolia. Given that more than 40 per cent of the population in Mongolia is in the rural area of the country, and the majority of them are herders, it is critical that they benefit from the measures to address desertification. To this, some researchers have suggested that the benefits to the local households and communities from managing natural resources should be raised.[34] By doing so, the participation of the local communities in the preservation of the natural resources would be enhanced, as they see that their utilities are embedded in the preserving of the natural resources. And for the people living in rural areas, it is important to create alternative sources of income generation.[35] The poor tends to be dependent on natural resources as their primary income. Hence, having alternative sources of income generating activities will reduce their dependency and their need to fall back on natural resources.

---

33 The Government of Mongolia (2010), p.4.

34 Tsedendamba, L., T. Banzragch, S.Enkhbold, and S. Davaanyam (2010) "Mongolia's New Policy for Combating Desertification and alignment with Millennium Development Goals-based Comprehensive National Development Strategy of Mongolia," Conference Paper presented at 2nd International Conference: Climate, Sustainability and Development in Semi-arid Regions, August 16-20, 2010, Fortaleza-Ceará, Brazil, http://www.icid18.org/files/articles/599/1279508799.pdf (Accessed: 20 December 2011)

35 Ibid.

Figure 8: Dust and Sand Storm near Bayannuur Soum, Mongolia

Source: Photo Taken by Green Asia in May 2010.

Figure 9: Dust Storm Blowing across a Street in Seoul, Korea

Source: Green Asia (2010)

2. An Integrated Regional Development Model for Combating Desertification: The Case of Green Asia Foundation

2.1 Green Asia: An Environmental NGO

Established in 1998, Green Asia Foundation is a Korea-based non-profit, non-governmental organization (NGO) with an environmental focus accredited by such institutions as the Ministry of Foreign Affairs and Trade of the Republic of Korea, the UNCCD, the United Nations Framework Convention on Climate Change (UNFCCC), and the United Nations Development Programme-Global Environment Facility (UNDP-GEF).

Green Asia envisions the restoring of environments and biodiversity in Asia. To achieve this vision, the organization established goals to develop and disseminate viable and sustainable models for the preservation and restoration of the environment—global common goods—especially on the Asian continent. As environmental problems are in general transnational, Green Asia also works closely together with NGOs and public- and private-sector institutions from other Asian countries.

Alarmed by the magnitude of the impact of dust and sand storms (DDS, also known as yellow dust, yellow sand, Asian dust, etc.) affecting the Asian region, especially in Korea, China, and Japan, Green Asia has devoted its focus on the root cause of these natural catastrophes: desertification.

DDS, a seasonal meteorological phenomenon, consists not only of soil particle aerosol but also pollutants, such as mercury, carbon monoxide, etc., which originate mainly from the Gobi and Taklamakan Deserts in Central Asia. It affects not only the places of occurrence, Central Asia, North-western China, and Mongolia, but also blankets over

East Asia—the Korean Peninsula, Japan, and the Russian Far-east. It usually occurs in the spring months; however it is now appearing in autumn and even winter seasons.

Dust not only reduces visibility, but also causes chronic health issues for the population living in the affected areas. The DDS occurrence in March 2002 in Korea resulted in significant economic losses which were estimated at US$20 billion.[36]

As the frequency and magnitude of DDS intensified, Green Asia in 2000 chose Mongolia as the place where they should work to achieve their ambitious goals—to reclaim degraded lands via the process of re-forestation, thereby creating a condition for the ultimate regeneration of an eco-system.

2.2 The Failure Factors for Combating Desertification

Since their arrival in Mongolia in 2000, Green Asia has planted approximately 350,000 trees in four pilot-programme areas. And yet, it is still too early to arrive at conclusions of the effectiveness of these pilot initiatives. Indeed, planting trees is one thing; but establishing them, so that they could protect the soil, is another.

Green Asia initially had repeated the failure of others in numerous instances. It appears that survival rate of planted trees is in general very low. For example, in the "Tree Planting Initiative" project undertaken in Mongolia in 2004, a joint project of a couple of international institutions and the Government of Mongolia, the highest survival rate of seed-

Figure 10: A Failed Case of Tree Planting in Mongolia

Source: Green Asia (2010)

Figure 11: A Failed Case of Tree Planting in Mongolia

Source: Green Asia (2010)

36 Soon-Ung Park (2011) "WMO Sand and Dust Storm Warning Advisory and Assessment System: Achievements and Implementation plan in 2011-2015," Presentation file, 4th JSC/WWRP, Geneva, Switzerland (21-24 Feb. 2011).

ling was only eight per cent. In some pilot sites, no trees survived beyond the first year.[37] Although numerous causes could be attributable to the failure of the planting initiative, it was determined that there were two major issues—livestock and irrigation.[38]

In one case, the entire planting project failed when a herd of livestock browsed across the area where new planting took place; in another location, an irrigation motor malfunction, albeit for a few days, destroyed entire project in another instance.[39]

2.3 The Model for Combating Desertification

From lessons learnt, Green Asia was able to ascertain that anti-desertification programmes are prone to failure if programmes are not supported by active community participation. Furthermore, the most effective method in earning community support and involvement is to address the socio-economic distress of the community. In other words, plans to improve the living condition of the community have to be embedded in any anti-desertification plans.

Figure 12: Schematic Diagramme of Green Asia's Approach to Afforestation Programme

Source: Je Jin-su (2010) ""Combating Desertification Project in Mongolia: For Our Common Future," Presentation file, Green Asia

37 IBRD/The World Bank (2006) Mongolia: Lessons from Tree Planting InitiativIBRD/The World Bank (2006) Mongolia: Lessons from Tree Planting Initiatives, http://siteresources.worldbank.org/INTEAPREGTOPENVIRONMENT/Resources/final_tree_planting.pdf, (Accessed: 20 December 2011) September 2011, p.24.
38 Ibid.
39 Ibid.

As such, the logic is clear. As the underlying causes of the failure in tree planting programmes in general are closely related to herding (the trespassing of livestock), and as most of population in rural areas in Mongolia, mostly living below the national poverty line, are engaged in this practice for their livelihood, it is essential that herders understand trespassing into newly planted sites would destroy their future. Indeed, erecting fences to protect the sites is not enough; it is imperative that people need to understand that their utilities are vested in the plantation.

Approximately "one-third of the population of Mongolia is engaged in herding cashmere goats, as one part of their income stream."[40] Aside from the truth that it was a traditional practice descended from the past, small-scale herders seem to still rear goats as a buffer to their income. If there were other alternative sources available to supplement their income, herders would have no incentive to increase the number of goats, as the herding sector was already in trouble partly due to the declining availability of pasturelands.[41] In addition, most profits from selling fibers appear to go to middlemen, as herders often lack direct access to markets.[42]

As conceptualised by the Millennium Ecosystem Assessment, as in Figure 2, and echoed by the new NAP CD, Green Asia also has concluded that the probability of success for their anti-desertification programmes would be substantially augmented when socio-economic dimensions, specifically designed to address the socio-economic problems of the proposed areas, are fully accounted for and are integrated into each programme. This led to the introduction of Green Asia's conceptual model, the "Sustainable Regional Development Model (Figure 12)."[43] And Green Asia decided to apply their model to the US$1.5 million lake and water resource restoration project implemented in Bayannuur Soum, about 190km west of the capital Ulaanbaatar.

2.4 Green Asia's Bayannuur Lake and Water Resource Restoration Project

2.4.1 Overview of the project

Funded by the Korea International Co-operation Agency (KOICA), the three-year Lake and Water Resource Restoration project commenced in 2010. Bayannuur is the semi-arid steppe area at an approximate altitude of 850m. Thirty years ago, it was a farming area

40 Lecraw, Donald J., Philip Eddleston, and Alene McMahon (2005) A Value Chain Analysis of the Mongolian Cashmere Industry, Economic Policy Reform and Competitiveness Project (EPRC)/ Chemonics International Inc., Ulaanbaatar, May 2005, USAID, p.9.

41 Ibid.

42 The Government of Mongolia (2010b) "Mongolia Proposal for Global Agriculture and Food Security Programme: Integrated Livestock-based Livelihoods Support Programme, http://www.gafspfund.org/gafsp/sites/gafspfund.org/files/Documents/Mongolia%204%20of%209%20GAFSP%20Proposal.pdf. (Accessed: 18 December 2011), 21 September 2010, p.12.

43 Je Jin-su, Personal interview, Deputy Secretary General, Green Asia, 26 December 2011.

Figure 13: Abating Level of Lakes in Bayannuur Soum

Source: Je Jin-su (2010)

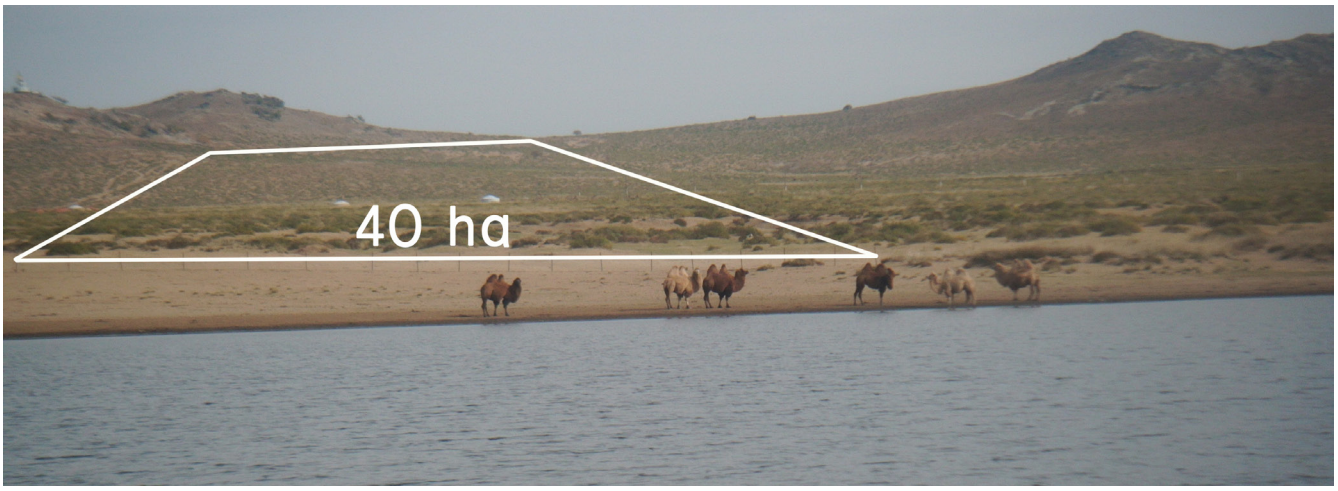
Figure 14: Bayannuur Soum Today

Source: Je Jin-su (2010)

where orchards flourished. However, droughts in recent years have devoured lakes and water resources. Of the four lakes that once existed in the village, two were completely dried up and the water level of the other two is rapidly abating. As a result, bio-diversity in the region disappeared; an increasing number of indicator plants of desertification led to a rapid increase of the salination level of the soil, thus contributing to the declining level of farm products. Farming lands were abandoned, thus accelerating the degradation process of the lands.

The lake recovery was designed to restore forests around the lake to retain moisture and protect the soil. The 40 hectare (ha) pilot site is surrounded by windbreaks, consisting of 30,000 elms in six rows, 10,000 willows in two rows, and 40,000 poplar trees in four

Figure 15: Location of the Pilot Site of the Lake Recovery Project



Source: Je Jin-su (2010)

rows (Figure 15). Inside this shelterbelt, about 10,000 sea-bugthorns (locally known as ChaChargan or vitamin tree) are planted. This is Green Asia's general model of community development, emphasising the enhancement of the community's self-support capacity, which serves as the incentive for the community to actively partake the recovery of eco-system.

Sea-bugthorns are a cash-crop, the berries of which are used to make syrup, juice, health supplement, etc. (Figure 16 and Figure 17). The trees will begin to yield about five kilogrammes (kg) of berries after about five to six years. As the berries can be sold at about US$3.00 per kg (the 2009 price), the trees have the potential to generate approximately US$375,000 of revenue.[44] The revenue from sales of the berries will go up as a six year-old tree generally yields about seven kilogrammes of berries.[45]

One of Green Asia's afforestation sites, Zone 1, adjacent to the Lake and Water Resource Restoration Project, carries about 25,000 three-year old sea-bugthorns plants. The mean income of the population in Bayannuur is at the range of US$96 per month. If the project paid each worker from the community the mean monthly national income of Mongolia, US$300, for rearing the trees and forest, then the revenue could support about 57 households after deducting the contribution to the "forestry co-operative" and management expenses.

Given the population of Bayannuur is about 1,350 in 322 households,[46] the model could serve as an alternative source of self-support for about 18 per cent of the households. The model appears to be promising, as the international demands for the sea-bugthorn extract

Figure 17: Sea-bugthorn Berries

Figure 16: Sea-bugthorn Products

Source: Image downloaded from http://seabuckthorn.com/

44 Green Asia (2011) "Sustainable Land Management and Sustainable Regional Development: The Case of Mongolia," Presentation file, January 2011.

45 Ibid.

46 Korea International Co-operation Agency (2011) "Feasibility Study on the Lake and Water Resource Recovery Project in Bayannuur Soum, Monglia," (in Korean) Seoul, January 2010, p.25.

are increasing.[47] Green Asia sees that a forward linkage could be created by setting up small-scale enterprises in the community for adding values to the berries.[48]

In the case of Zone 1, the project could be sustainable with revenue covering 57 households, about US$203,600 per annum (p.a.), the contribution to the co-operative, 30 per cent of the total revenue, about US$112,500, and the maintenance and management including salaries for the securities hired for the site, US$58,900.[49] As such, the revenue model of the project appears to be highly plausible and solid.

The forestry co-operative is a scheme that is designed to encourage community participation and increase in employment. Anyone in the community can be hired as a candidate member of the co-operative by assuming the task of rearing 1,000-1,500 trees in the shelterbelt in addition to attending the training courses in the winter seasons. After three years, one becomes a full-member of co-operative and is given 300 sea-bugthorns but without the ownership of the trees, as the trees are common property of the co-operative. However, the member has a right to the berries yielded by her trees. In this way, the member has access to an extra source of income.

One of the programmes designed to enhance social awareness and participation in the anti-desertification programmes that Green Asia has developed is the "Eco-Tour." Green Asia in Seoul, Korea organises volunteer groups to their four project sites in Bayannuur. The "tourists,"—students of all grades from elementary school to university, office workers, civil servants, etc.—then have an opportunity to witness the urgency and magnitude

Figure 18: Eco-Tourists at Bayannuur

Source: Green Asia (2010)

47 Shin Ki-ho (2011) Personal interview, Team Leader of Operation, Green Asia, Ulaanbaatar: Mongolia, 21 December 2011.
48 Shin Ki-ho (2011) Personal interview, Team Leader of Operation, Green Asia, Ulaanbaatar: Mongolia, 21 December 2011.
49 Green Asia (2010).

of desertification. During their stay in the sites, these volunteers work together with Green Asia, planting seedlings, digging irrigation canals, etc.

The programme has met with a high degree of positive responses and appeared to be very inculcating. Thus far, some 800 visitors volunteered to work at the sites and have had "hands-on" experiences in fighting desertification.

2.4.2 Challenges ahead

Notwithstanding the potential, Green Asia may not see the yield of cash crops but only three-year old seedlings trans-planted from the nursery set up for a different project. And sea-bugthorns will need at least five to six years to yield berries.

The Lake and Water Resource Recovery Project is an Overseas Development Assistance (ODA) programme funded by a branch of the Government of Korea, KOICA. At the end of the expiry, the end of 2013, the ownership of the project shall be handed over to the beneficiary/recipient of the aid programme, the Bayannuur Soum government. Green Asia will have to turn over the management of the project as well as other programme assets—facilities, equipment, etc.—to the recipient, who will have to assume the responsibility for the recovery of the eco-system.

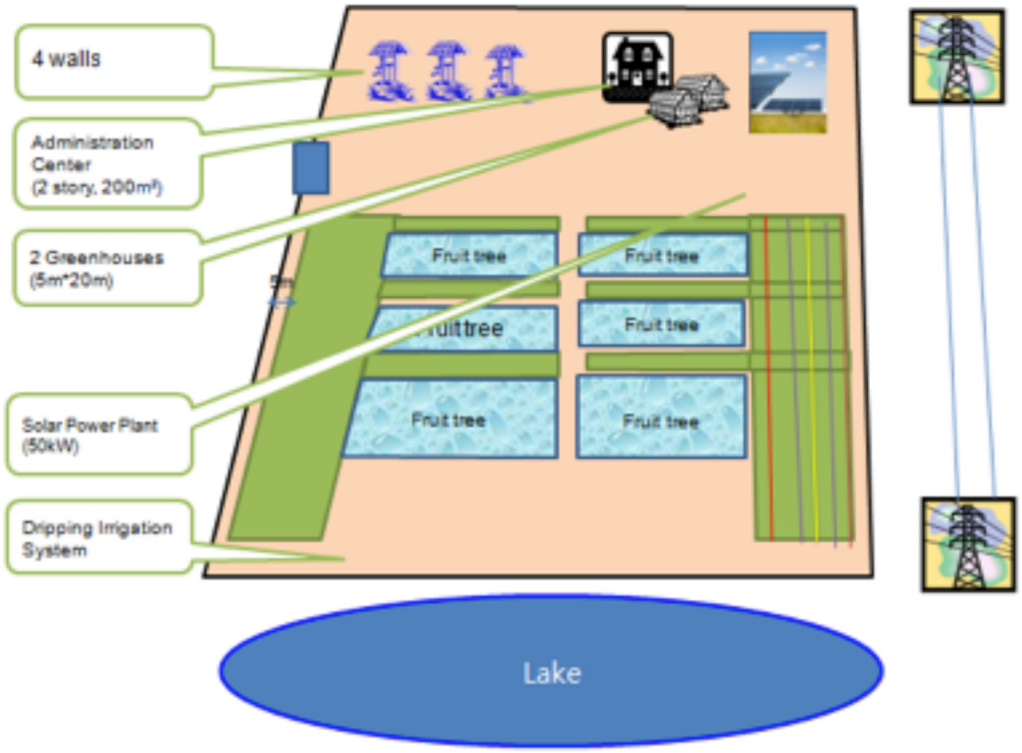
This uncertainty leads to a few immediate questions: "Will the project continue based on the model even at the changing hand of management?" Better yet, "who will run the maintenance of the solar power generation system installed on the site?"

The lack of power supply from the national grid made it necessary to install a 5kW solar power generation facility on the site for irrigation (Figure 18). This installation was justified as motors were needed to pump underground water to irrigate seedlings as well as replenish water to level water reservoirs. In case of inverter malfunction or damage to solar panels, which would lead to power failure, the entire project could be jeopardised, as shown in the cases addressed in the Tree Planting Initiative.

Based on this necessity, Green Asia needed to recruit local engineers who were qualified to assume maintenance on the solar power generation system. However, this was not easy. The soun is a small town in a remote area where even one person trained in the field of engineering could not be found. It is still questionable whether Green Asia will ever find qualified personnel to whom they can transfer the knowledge related to the solar power generation system.[50]

50 Some hopeful news is that students majoring in Renewable Energy will soon be graduating from the School of Power Engineering in the Mongolian University of Science and Technology (MUST). However, whether or not these graduates would be willing to come and work in one of the harsh climate areas in the nation is another question.

Figure 19: Schematic Plan for the Lake and Water Resource Recovery Project



Source: Green Asia (2010)

Conclusions and Lessons Learned

Desertification is a serious natural catastrophe that deserves more attention from people around the world. As discussed, desertification is closely related to the livelihoods of people living in arid and semi-arid areas around the world. The causality between land degradation and desertification and climate change (e.g. the dzud) may run both ways. To this extent, land degradation and desertification today affects everyone around the world rather than just those who live in a particular locale.

Apparently, food shortages and famines that currently occur in certain parts of the globe are a direct impact of the desertification process. When the salinity level rises in a farmland, the amount of crop outputs certainly decreases. Perhaps this is the beginning of the vicious cycle where once fertile lands are lost. As such, desertification encroaches on the lives of people.

However, the truth is rather appalling that human activities, not natural causes, paradoxically are the major causes of this disastrous natural phenomenon. Albeit some categorise that human activities are controllable, as opposed to nature being uncontrollable, it is not easy as one may think because of the disparate interest of stakeholders involved. For

example, those herders who lost everything in the repeated dzud do not have too many options left to sustain their livelihood except to fall into illegal logging or mining; poverty stricken farmers will find it difficult to consider leaving the fallows or practicing sustainable land management as their immediate concern is to optimise their production level and subsist. As a result, they would not be concerned about the specific type of crops that are more environmentally beneficial to the land let alone sustainable land management practices on the whole. Instead, they would choose to earn a little more cash from cash-crops even if they may be harmful to the land in the long-run. Obviously, this exacerbates the condition of the lands and the farmers may be in fact discounting their future on a compounded rate of interest.

Hence, the most effective approach would be the creation of incentive conditions that could alter the stakeholders' behavior from negative to positive contributions in the fight against desertification. Therefore it appears that an effective plan to combat desertification should also address and incorporate the socio-economic distress of proposed regions where anti-desertification measures are to be implemented. Obviously, planting trees are not enough.

Recently, this argument has drawn the attention of many. It was also adopted in the new NAP CD and the Government of Mongolia. Some NGOs appear to have integrated the concept into their action principles. Green Asia's Sustainable Regional Development Model is a model that would be quite effective in the midst of all this. However, there is a constraint that abates the effectiveness of the model. Because of the nature of planting and subsequent establishment, projects of this sort—afforestation, reforestation, etc.—will have to have had a duration of at least 10 years until some tangible and visible results are evident. Furthermore, Green Asia, being an international NGO of a relatively small scale, is uncertain whether they are able to mobilise resources large enough to continue the project on its own for a longer period of time. Perhaps this type of constraint is quite common to all NGOs regardless of their size.

The availability of qualified human capital is another concern. As implied in the case of Green Asia operating in Bayannuur Soum, the utilisation of cutting-edge technologies needs to be accompanied by a maintenance scheme. The key challenge to this caveat, however, in developing countries appears to be the shortfall of educated and trained personnel. This leads to an important implication: investment in people is the most important pre-requisite to the success of anti-desertification programmes.

As such, some important lessons that can be drawn from the discussions thus far can be summarised as follows:

- Human activities, rather than climate changes, impose more significant damages on desertification;
- Albeit some categorise climate changes as uncontrollable factors while human activities are controllable, this simple dichotomy loses its validity when dealing with desertification unless socio-economic aspects, which soon escalate to politico-economic

problems, are fully addressed. This is supported by the conceptual model brought forth by the Millennium Eco-system Assessment and echoed by the new NAP CD;

- Human activities are closely related to socio-economic factors. Hence, the nexus of the socio-economic factors and desertification merit closer analysis;
- Combating desertification may only be meaningful when a long-term plan is in place and it is given continuous and consistent attention;
- By the same token, technologically, desertification can be dealt with in a substantial degree; but any plans for the restoration of nature on the edge need to have community participation if they are to be successful;
- Technologies cannot be transferred unless the receiving party is fully prepared for it, especially qualified personnel;
- So, the matter ultimately falls back to people. Thus, it is important to invest in people. According to Green Asia, "investing in people is investing to fight against desertification."

References

Citizens Information Media Center (2008) A Survey on the Occurrence of Dust Sand Storm in Mongolia and a Study on the Promotion of the Countermeasures," (in Korean), March 2008.

Green Asia (2009) "Towards the Green Asia," Presentation file, October 2009.

Green Asia (2011) "Sustainable Land Management and Sustainable Regional Development: The Case of Mongolia," Presentation file, January 2011.

IBRD/The World Bank (2006) "Mongolia: A Review of Environmental and Social Impacts in the Mining," Discussion Paper, http://siteresources.worldbank.org/INTMONGOLIA/Resources/Mongolia-Mining.pdf. (Access date: 16 December 2011), Environment and Social Development Department, East Asia and Pacific Region, May 2006.

IBRD/The World Bank (2006) Mongolia: Lessons from Tree Planting Initiatives, http://siteresources.worldbank.org/INTEAPREGTOPENVIRONMENT/Resources/final_tree_planting.pdf, (Access date: 20 December 2011) September 2011.

Je, Jin-su (2010) "Combating Desertification Project in Mongolia: For Our Common Future," Presentation file, Green Asia.

Je Jin-su, Personal interview, Deputy Secretary General, Green Asia, Seoul: Korea, 26 December 2011.

Joint UNEP/OCHA Environment Unit (2007) "Fact-finding mission: Sodium cyanide and mercury pollution and mining related environmental emergencies in Mongolia," http://ochanet.unocha.org/p/Documents/2007_July_SodiumCyanide-mercurypollution_miningrelatedEEinMongolia.pdf . (Access date: 16 December 2011) The United Nations, July 2007.

Khaulenbek, A. (2008) "Desertification in Mongolia," Presentation file, Green Asia.

Korea International Co-operation Agency (2011) "Feasibility Study on the Lake and Water Resource Recovery Project in Bayannuur Soum, Monglia," (in Korean) Seoul, January 2010.

Lecraw, Donald J., Philip Eddleston, and Alene McMahon (2005) A Value Chain Analysis of the Mongolian Cashmere Industry, Economic Policy Reform and Competitiveness Project (EPRC)/ Chemonics International Inc., Ulaanbaatar, May 2005, USAID.

Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-being: Desertification Synthesis. World Resources Institute, Washington, DC.

Mongolia, The Government of (2010a) National Action Program for Combating Desertification in Mongolia: 2010-2020, Ulaanbaatar, Mongolia: Ministry of Nature, Environment and Tourism.

Mongolia, The Government of (2010b) "Mongolia Proposal for Global Agriculture and Food Security Programme: Integrated Livestock-based Livelihoods Support Programme, http://www.gafspfund.org/gafsp/sites/gafspfund.org/files/Documents/Mongolia%204%20of%209%20GAFSP%20Proposal.pdf. (Access date: 18 December 2011), Ulaanbaatar, 21 September 2010.

Mongolia, The Government of (2011) Mongolian Statistical Yearbook 2010, National Statistical Office of Mongolia, Ulaanbaatar.

Mongolian Academy of Science (2008) "Dynamics of desertification in Mongolia and its trend," Research Project, Desertification Study Centre of Geoecological Institute.

Natsagdorj, L. (2008) "Climate Change and Desertification in Mongolia," Presentation File, Green Asia.

Nixson, Frederick and Bernard Walters (2004) "Privatisation, Income Distribution and Poverty: the Mongolian Experience," Report submitted to UNDP (Mongolia), January 2004.

Park, Soon-Ung (2011) "WMO Sand and Dust Storm Warning Advisory and Assessment System: Achievements and Implementation plan in 2011-2015," Presentation file, 4th JSC/WWRP, Geneva, Switzerland (21-24 Feb. 2011).

Shin Ki-ho (2011) Personal interview, Team Leader of Operation, Green Asia, Ulaanbaatar: Mongolia, 21 December 2011.

Tsedendamba, L., T. Banzragch, S.Enkhbold, and S. Davaanyam (2010) "Mongolia's New Policy for Combating Desertification and alignment with Millennium Development Goals-based Comprehensive National Development Strategy of Mongolia," Conference Paper presented at 2nd International Conference: Climate, Sustainability and Development in Semi-arid Regions, August 16-20, 2010, Fortaleza-Ceará, Brazil, http://www.icid18.org/files/articles/599/1279508799.pdf (Access date: 20 December 2011)

United Nations, The (1997) "The United Nations Convention to Combat Desertification: A New Response to an Age-Old Problem," http://www.un.org/ecosocdev/geninfo/sustdev/desert.htm, (Accessed: 16 December 2011) Earth Summit +5: Special Session of the General Assembly to Review and Appraise the Implementation of Agenda 21, 23-27 June 1997, New York.

United Nations, The (2008) "Youth Statement," at Children and Youth Major Group, Desertification, Wednesday 7 May 2008 at 3-6pm Session, UN Department of Economic and Social Affairs, http://www.un.org/esa/sustdev/csd/csd16/statements/youth_7may_desertification.pdf.

United Nations, The (2010a) "Learning to Combat Desertification," http://www.unesco.org/mab/doc/ekocd/intro_learning.htmlUNEP, (Access date: 16 December 2011) UNESCO (Original Data Source: CRU/UEA, UNEP/DEWA).

United Nations, The (2010b) "Mongolia: Dzud Appeal," www.undp.org/cpr/documents/recovery/mongolia_appeal.pdf. (Access date: 16 December 2011), The UN Country Team Consolidated Appeal, May 2010.

United Nations, The (2011) "World Statistics Pocketbook: Mongolia," http://data.un.org/CountryProfile.aspx?crname=Mongolia (Access date: 16 December 2011), UN Statistical Division.
U.S., The Government of (2011) "Background Brief: Mongolia," Diplomacy in Action, http://www.state.gov/r/pa/ei/bgn/2779.htm, (Accessed: 16 December 2011), U.S. Department of State.
World Bank, The (2011) World Development Indicators (On-line), http://data.worldbank.org/ (Accessed: 16 December 2011).
The World Bank (2011) "Mongolia Environment," http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTEAPREGTOPENVIRONMENT/0,,contentMDK:20266325~menuPK:537827~pagePK:34004173~piPK:34003707~theSitePK:502886,00.html#NRM (Access date: 16 December 2011).