

CHAPTER 2 REVIEW OF MAJOR MITIGATING MEASURES TO COMBAT DESERTIFICATION FOR DSS CONTROL

2.1 General

Although the accurate quantitative relation between DSS and land degradation is yet to be examined and established through continued study, it is generally believed that the rapid and massive land degradation (including desertification) in DSS originating source areas over the past few decades has contributed to the increased intensity, severity, and frequency of DSS in Northeast Asia. Rehabilitation of vegetation cover has been considered as one major means to combat DSS.

The governments of the PRC and Mongolia have formulated comprehensive programs to combat land degradation, which serve as their main thrust to alleviate DSS. With support from the UNESCAP, the UNCCD, and the UNEP, Mongolia and the PRC have developed their national action programs to combat desertification. It is generally believed that there is link between desertification defined as “land degradation in drylands” and DSS.

The Government of the PRC attaches great importance to desertification control. As early as the 1950s, as a priority task the government organized people to harness the areas affected seriously by desertification, including the effects of wind erosion, water erosion and soil salinization. The PRC has, over the past four decades, gained headway and experience in development of techniques for desertification control, using silvicultural techniques on sand fixation, control and improvement of secondary salinized soil, sand fixation along railways and highways, and building shelterbelts in desert margins.

Progress in Mongolia has been hampered by a lack of funding and trained personnel but some gains have been made¹.

2.2 DSS Mitigation Measures in the PRC

The Government of the PRC and its people has made great efforts to fight the adverse effects of desertification. As early as the 1950s, the government organized desert investigation and scientific studies on the desertified land and has given priority to fix the shifting sand and combating desertification in the seriously affected regions. From the early 1970's, the PRC has initiated and implemented successively such major ecological development programs on the basis of achievement of traditional technologies, practical techniques, know-how, and acceptable experiences. Examples are the *Green Great Wall Project* (otherwise known as “Three-North Shelterbelt” Program covering the northwest, central north and northeast areas of the PRC), *National Key Project to Prevention and Control of Sandification*, the *Coastal Shelterbelt Program*, the *Plain Farmland Protective Shelterbelt Program*, and the *National Program of Shelterbelt Development along the Middle Reach of the Yellow River*.

As a result of these measures, the forest coverage in the PRC has increased from 8% in the 1950s to 18.2% in 2002. The National Program to Combat Desertification and “the Three-North Shelterbelt” Program have brought more than 16 million hectares of farmland and 10 million hectares of rangeland under effective protection. Now, 795 counties in the plain areas have reached afforestation and the ecosystems and environment have been improved to a certain extent.

¹ “Basic Policy Guidelines of the Government of Mongolia related to DSS and Desertification Control and Environment” (National Report, 1991)

In early 2002, the Government of the PRC announced a 10-year program with a total investment of RMB54 billion (about US\$6.5 billion) to address the DSS concern in five provinces in the northern PRC. With support from ADB, the Government of the PRC also established a partnership with GEF for an overall program on land degradation in dryland ecosystems. This will provide US\$1.5 billion over 10 years. However, the linkage of these national initiatives to the regional concern on transboundary DSS is yet to be established through cooperation beyond national borders. Without an effective policy and coordination at the regional level, the impact and effectiveness of the national initiatives as a means to combat DSS will be limited.

The PRC has actively pursued measures and approaches to control sand encroachment on agricultural and grazing land as well as measures in water and soil conservation. Many of these measures have been so successful that they have been adopted the world over. Major measures are explained below.

The PRC will set up 30 desertification and DSS monitoring stations for the purpose of monitoring land cover, sandy land dynamics, and effectiveness of implementing national projects. Currently, the PRC is using 540 meteorological stations² for monitoring and forecasting DSS occurrence. Agencies involved in the DSS related activities in the PRC include the China Meteorological Administration (CMA); State Environmental Protection Administration (SEPA); State Forestry Administration (SFA); Ministry of Water Resources; Chinese Academy of Sciences (CAS); National Development and Reform Commission; Ministry of Science and Technology; and Ministry of Land Resources.

In order to combat the increasingly severe problem of land degradation, and also to respond to the increasing public demand for a better ecological environment, the PRC has invested more and more resources in the battle against land degradation. From the first half of the 1990s to the start of the 21st century, total investment in land degradation control programs has increased ten-fold. The most significant increase in investment has been within the forestry sector. There was a big increase in central government investment, through the launching of six key forestry ecological projects.

PRC prepared a National Action Plan to Combat Desertification (NAP). The NAP is a key instrument of planning and budgetary authorization of public investment projects and programs. The NAP has a time horizon of 2001-2050, with implementation spread over three phases; 2001-2010, 2011-2030 and 2031-2050. A key objective of the NAP in its first phase is to control 22 million hectares of desertified land by various means by 2010. Essentially it boils down to a combination of

- (i) direct interventions to check the spread of desertification and contain and prevent wind and water erosion (shelter belts, wind breaks, soil conservation, and control of water run-off in catchment areas); and
- (ii) community level participatory for local area development projects, which draw on local knowledge and resources to promote sustainable agriculture, natural resource management, prudent exploitation of common property resources, and non-farm alternative income generating activities.

The SFA has been the lead agency within the PRC in the development and promotion of anti-desertification projects and the NAP. The development approach pursued has primarily focused on combating water and wind erosion through vegetative means, notably:

² The PRC has established a National DSS data center. It is located in CMA with support from SEPA and SFA. This center manages the input from all the PRC government agencies whose data can contribute to DSS forecasting and monitoring.

- 1) a ban on logging in natural forest areas;
- 2) reforestation of hillsides and waste lands;
- 3) establishment of windbreaks/shelterbelts to control wind erosion;
- 4) closure of degraded grasslands and forest areas to allow for natural vegetative recovery;
- 5) replacement of annual crop production in desertification prone, semi arid, environments with perennial tree crops and/or improved pastures; and
- 6) sand dune stabilization through a mixture of revegetation with trees, shrubs and grasses (including aerial seeding) and/or use of branches, twigs, crop residues and other dead material pushed into the sand to form a lattice square grid. In places such measures have been very successful but they can come at a high cost, particularly where afforestation in semi-arid/arid climates requires the installation and use of irrigation.

The pilot program on conversion of farmland to forest and grassland (*Grain for Green program*) was launched in 2000 in 188 counties in 17 provinces. In 2001, this was expanded to 224 counties in 20 provinces. The aim of the program is to return low yielding farmland to forests and grasses. To date, the central government has spent some US\$900 million on the project, leading to the conversion of some 1.2 million hectares of farmland. In addition, over one million hectares of barren land have also been planted with trees. For 2002, there were plans to convert a further 2.2 million hectares of low yield farmland to forest and grassland and to plant more than 2.6 million hectares of barren land.

The government plans to reward farmers who convert farmland in this way. Depending on the type of land, farmers receive 1,500 - 2,250 kg of grain /ha/yr. The government also gives them seeds and saplings free of charge, and annual living expenses of US\$40 per hectare. Farmers are reportedly very happy as in a normal year their average yields may be as low as 750 kg/ha whereas they are receiving free 1,500 kg/ha (*China Daily* 12 March 2002).

The continued success of this program depends on the central government being prepared to continue providing the free grain and annual living allowance indefinitely. Given that this is a high cost approach, it may be difficult to sustain this for more than a few years. Should the subsidy stop, there is a very real risk that farmers will have little option but to revert to the growing of annual crops to meet their short-term livelihood needs, thereby undoing the ecological gains.

The Ministry of Agriculture has a parallel program aimed at revegetating degraded grasslands by replanting grasses and shrubs.

2.3 DSS Mitigation Measures in Mongolia

Basic policies set forth in the document entitled "Basic Policy Guidelines of the Government of Mongolia" related to DSS and desertification control and environment are as follows (National Report, 1991):

- Cultivation of additional land is to be avoided through measures to increase the productivity of land already under cultivation and to restore fallow and eroded lands to full productivity. Pasture land productivity is also to be increased through fertilization and reintroduction of traditional forms of animal husbandry which made effective use of pasture resources.
- Pasturelands degraded by geological exploration, road construction, defense programs and other activities are to be restored. A balance between forest use and reforestation is to be achieved. Reforestation of multipurpose trees is to be carried

out simultaneously with timber harvest. Green areas in urban settlements and forest belts between cultivated fields are to be developed.

- A program for preservation of the Gobi region is to be carried out including plantation of forests and revegetation of river banks.
- A program for reducing the rate of desertification and for drought amelioration will be introduced including research into cloud seeding.
- Monitoring systems are to be developed and programs including the establishment of an Institute of Ecology and a Gobi Desert Research Center, are to be instituted to monitor environmental conditions and assess long term climate change trends and to predict their influence on human living conditions and health.
- All efforts by individuals, private or state enterprises and domestic or foreign organizations aimed at restoration of soil or water resources reintroduction of wildlife enrichment of natural resources (e.g. through reforestation) recycling of wastes and introduction of waste minimization and other environmentally sound technologies are to be encouraged.
- The economic system established by the government will be adjusted to the natural environment and will ensure that demands on the natural environment will not exceed normal environmental tolerance levels.

Also, policies related to environment and DSS control has been included in the Mongolian Action Programme for the 21st Century (MAP 21), the National Environmental Action Plan, and National Desertification Action Programmes.

The Government of Mongolia has developed a “Gobi Regional Development Plan” but no specific program on prevention and control of DSS is in place as of the present. However, the National Action Plan (NAP) to combat desertification includes measures that will contribute to achieving this. Implementing the NAP is a priority of the Mongolian government.

2.4 Effectiveness of the Current Mitigation Measures

In the PRC, especially in the “Three-North” regions, active efforts have been made and effective achievements have been obtained in some areas by adopting various countermeasures and approaches to combat desertification since early 1950’s.

Notwithstanding the success stories, the area of land in the PRC that is degrading is increasing year by year during 1995 to 2000 (and at an accelerating rate). The frequency of DSS is increasing, especially the incidence of severe DSS events.

The cost effectiveness, replicability, sustainability and technical ease of implementing the interventions and control measures has yet to be demonstrated on a scale that is commensurate with the area of land that needs to be treated in the DSS source areas. The analysis presented here indicates that the process will be long and costly. But the damage cost of DSS is high. To do nothing is not an option.

Box 2.1 A Case Study of DSS Prevention and Control from Yulin Prefecture, Shaanxi

Yulin Prefecture of Shaanxi Province is an example of efforts to prevent and control DSS at the sub-regional level. The prefecture is located in the northwest PRC, and on the south edge of the Mu Us Sandy Land. The desert area, about 24,400 km² accounts for 56% of the total land territory of the prefecture. There are seven counties with a combined population of 1.1 million.

About 1,500 years ago, Yulin was covered with dense forests and grasses. Gradually, due to the wars in past dynasties and irrational economic development activities in the past 50 years, vegetation coverage has been seriously damaged and the environment has deteriorated. By the early 1950, the forest and rangeland has completely disappeared and much arable land has been turned into wasteland. Hundreds of thousands of farms and a lot of villages have been buried by shifting sands. The disasters of shifting sands and frequent winds have resulted in huge damage to the production of local crop-farming and animal husbandry.

From mid-1950's, the people of Yulin have been organized on a large scale to fight sand movement and prevailing wind with practical techniques, traditional knowledge and know-how and positive help of preferential government policy. After more than 40 years of efforts, the micro-climate and ecology, environment and productive conditions in Yulin have been obviously improved. Natural calamity decreases year by year. The annual incidence of sandstorm has declined from about 70 days in 1950's to nearly 20 days in 1990's. The height of sand dunes has been decreased by one third. The annual spreading speed of dune movement has dropped from 5-7 m/year to 0-1 m/year. The average sand silt discharge from blowing sands to the existing rivers in the prefecture has been decreased up to 51%. Similar examples can be found in all affected areas in arid, semi-arid, and dry sub-humid areas at different scales in the PRC. The efficiency of the application of traditional knowledge, practical techniques and know-how for combating desertification and controlling DSS is remarkable and there is great potential in applying them to future efforts to combat desertification and prevent and control DSS.

Source: Dr Lu Qi, Chinese Academy of Forestry, Beijing.

From the extensive catalogue of experience with technologies and know-how accumulated over the past decades, it should be possible to develop packages that can be applied at reasonable cost over large areas. To do this soon enough and to reduce the hazard that DSS represent will require further effort from the governments in the DSS source areas and considerable support from the partner countries in Northeast Asia and the international donor community

The lessons from past national programs and projects include:

- The realization that DSS is non-point source and serious transboundary environmental problem, which requires an integrated regional approach. Moreover, a coordinated regional approach is needed in tandem with national initiatives.
- There is need to undertake interventions and remedial actions on a scale that is commensurate with the scale of the DSS –source areas.
- A cross-sectoral and integrated ecosystem management approach in combating desertification is more likely to achieve desired results.
- It is essential for all stakeholders to work together for DSS reduction. Varying responsibilities are required from the national government, local governments, and local communities.
- It should be possible to develop packages of measures that can be applied at reasonable cost over large areas.

Table 2.1 gives a summary of some successful measures in the north of the PRC to control desertification with an indication of their applicability and limitations and a measure of their cost and effectiveness.

Table 2.1 Review of Available Desertification Control Technologies in the Northern and Western PRC

No.	Technique / Methods	Sites Where Applicable	Limitations / Benefits	Relative Cost Effectiveness	Overall Rating ¹
Biological Methods					
1	Shelterbelt networks to protect farmland	- Within farmland - Along banks of canal	- Only a few tree species suitable - Long-horned beetle damaged - High consumption of water - Good protection results - Making micro-climate for crops - Supplying timber	- Relatively expensive - Simple management - Resulting in yield reduction in the marginal field.	4 Effectiveness 4 Durability 4 Maintenance
2	Sand fixation forest for fixing mobile sand dunes	2/3 of leeward side of mobile dunes from bottom	- Hard condition for shrubs to survive - Labor intensive - Long life (20-40 years) - Fixing sand dunes	- Cheap - Relatively easy to Maintain	4 Effectiveness 4 Durability 3 Maintenance
3	Wind break forest	Between farmland and sand dunes	- Labor intensive - High consumption of water - Good ecological & economic benefits	- Relatively Cheap - More effort to maintain	4 Effectiveness 4 Durability 2 Maintenance
4	Enclosure for grazing land and forest	Desert grassland Forest area	- Increasing biodiversity - Few labor requirement	- Cheap - Easy to Maintain	4 Effectiveness 4 Maintenance
5	Air seeding for grazing land and afforestation	Loess plateau Desert grazing land	- Must have aircraft - Relatively high concentration of rainfall - Efficient for making grazing land and afforestation	- Cheap in large area - Low labor cost	4 Effectiveness 4 Durability 3 Maintenance
6	Blocking in front and pulling from behind	Dune chains	- Labor intensive - Reduce sand blown off - Stabilizing mobile dune	- Relatively expensive	4 Effectiveness 4 Durability 3 Maintenance
7	Grass Kulum to block wind and sand and to create pasture	Pasture land	- Labor intensive	- More effort to maintain	4 Effectiveness 3 Durability 2 Maintenance
8	Integrated management of small watershed with planting	Loess plateau	- Labor intensive - Can cause blow out - Long life - High social value as it provides cash to local people	- Relatively expensive - More effort to maintain	4 Effectiveness 4 Durability 2 Maintenance
9	Combating soil secondary salinization with vegetation	Mis-managed irrigation areas Lower reach of river	- Labor intensive - Few species - Improving soil	- Costly - More effort to maintain	2 Effectiveness 4 Durability 2 Maintenance
10	Combating industrial-mining induced desertification with vegetation	Mining area	- Labor intensive - High consumption of water - Good ecological & economic benefits	- More effort to maintain - Costly	2 Effectiveness 4 Durability 2 Maintenance
Engineering Methods					
11	Clay sand barriers	2/3 of leeward side of mobile dunes from bottom	- Must have clay - Labor intensive - Preventing Rain water from infiltration (crust on surface) - Long life	- Costly	4 Effectiveness 4 Durability 4 Maintenance
12	Straw checkerboard	2/3 of leeward side of mobile dunes from bottom	- Must have local supply of straw - Labor intensive - short life (2-4 year)	- Cheap - Low labor cost because of low cost of rural labor	4 Effectiveness 2 Durability 3 Maintenance

¹ Subjective rating is based on the results from consultations with local community and used a scale of 1 (lowest) to 5 (highest)

Source: Compilation of Consultant Team.

Cont. Table 2.1

No.	Technique / Methods	Sites Where Applicable	Limitations / Benefits	Relative Cost Effectiveness	Overall Rating ¹
Engineering Measures Combined with Biological Methods					
13	Straw or clay sand barriers combining with vegetation	2/3 of leeward side of mobile dunes from bottom	- Must have local supply - Labor intensive	- Relatively Cheap - Easy to Maintain	5 Effectiveness 5 Durability 4 Maintenance
14	Building farmland by leveling sand dune with water	Sand dune	- Must have water - Less Labor requirement - Good results	- Cheap - Easy to Maintain	5 Effectiveness 4 Durability 4 Maintenance
15	Building water conservation project, reclaiming barren land, and improving soil to form new oases	Intermountain basins surrounded by snow-capped peaks	- Must have water - Labor intensive - Long life - High social value as it provides cash to local people	- Relatively expensive - Low labor cost because of low cost of rural labor	4 Effectiveness 4 Durability 3 Maintenance
Chemical Methods					
16	Covering sand dune with pitch or making sand barren with asphalt felt	Sand dune	- Must have chemical materials - Labor intensive - Changing soil surface - Long life	- Expensive - Easy to Maintain	4 Effectiveness 4 Durability 4 Maintenance
17	Chemical materials (plastic film, dry water or soil moisture protector) to protect or supply water	Arid areas	- Must have chemical materials - Labor intensive - short life - Good results	- Expensive	4 Effectiveness 1 Durability 2 Maintenance

¹ Subjective rating is based on the results from consultations with local community and used a scale of 1 (lowest) to 5 (highest)

Source: Compilation of Consultant Team.

2.5 Financing Mechanism for Current DSS Mitigation Efforts in the PRC

Projects initiated by the central government of the PRC play an important role in the strategy to prevent and control DSS. More money is now spent in prevention and control of DSS. In Ordos Plateau (one of the focus areas), there was US\$60 million invested in forestry construction from 2000 to 2002, more than the total investment from 1950 to 2000. Since 1998, the central government of the PRC has initiated six main ecological improvement projects, such as

- Natural Forest Protection Program,
- Returning cultivated lands to forests or pasture (*Grain for Green program*),
- Treatment of the DSS source areas that threaten Beijing and Tianjin Districts,
- Water and soil conservation in key areas,
- Phase 4 of “Three-North” forest shelterbelt system development,
- Protection and improvement of natural grasslands.

Almost all of the key projects are related to the prevention and control of DSS, but only *Treatment of the DSS source areas that threaten Beijing and Tianjin Districts*, and *Phase 4 of “Three-North” forest shelterbelt system development* has the single aim of DSS prevention through controlling land degradation. According to the plan, from 2000 to 2010, the central government will allocate a huge amount of money to curb the country’s land degradation with over US\$700 million going to Beijing and its surrounding areas.

Table 2.2 National Key Projects Implemented in Focus Areas of the PRC

Focus Area	National Projects	Funding Source	Total Budget (US\$ mil)
Alashan	<ul style="list-style-type: none"> Natural Forest Protection Program Returning cultivated lands to forests or pasture Phase 4 of "Three-North" forest shelterbelt system development 	Central govt Local govt	60 10
Hulunbuir	<ul style="list-style-type: none"> Natural Forest Protection Program Returning cultivated lands to forests or pasture, Phase 4 of "Three-North" forest shelterbelt system development, Water and soil conservation in key areas, Returning grazing-lands to grasslands Protection and improvement of natural grasslands 	Central govt. Local govt	40 20
Xilingol	Treatment of the DSS source areas that threaten Beijing and Tianjin Districts.	Central govt. Local govt.	72 28

Ordinarily, the financial resources for implementing the key projects in the PRC come from three channels:

- National budget,
- Funds raised by local governments,
- Loans from the four state-owned commercial Banks on "reduced interest rate" – with the interest payable by central and local governments³.

Since 1998, the central government of the PRC has been carrying out an active fiscal policy and the state has borrowed money for the key projects, or gone into deficit spending.

Besides the national resources used in key projects and other investment, foreign capital and donations also play an important role in prevention and control of DSS. The important foreign aid to the PRC has been oriented mostly towards projects that reinforce economic structures and services, which received 61% of allocated resources. The productive sectors received 8.2% and agriculture, which is part of this sector, a modest 4.9%.

Table 2.3 State Budget Appropriation Investment in Ecological Project of Inner Mongolia Autonomous Region

Year	Amount of Budget Appropriation (US\$ million)
1999	207
2000	213
2001	244

³ Until 2001, the loans from the four state-owned commercial banks used in forestry development and prevention of desertification were on a "subsidized interest rate" basis. But in July 7, 1999 People's Bank of China made a new ruling. Special "reduced interest rate" loans could be retained until the end of 2000 but from 2001, the decision whether the bank lends the special loan should be decided upon using commercial rules.

The planning for DSS prevention and mitigation projects by the banners (i.e., counties in Inner Mongolia Autonomous Region) and prefectures in the focus areas of the PRC are actually found in their respective 10th Five-Year Plan and 11th Five-Year Plan covering a period of 10 years from 2001 to 2010. The same plans were used as the platform for the proposed demonstration projects in the focus areas of the PRC. Reference for the projects derived from these plans are shown in Tables 2.4 to 2.8.

In Hunlunbir, Xilingol and Alashan, although the projects involve different banners, they have the same content of investment. The capital cost of the demonstration project in Hulunbir is US\$14,164.380, in Xilingol US\$14,755.760, in Ordos US\$36,833.630, in Alashan US\$5,492.900. Other investment and project management cost are US\$10,200,000. So the total cost of the demonstration projects is US\$ 81,446,670.

Table 2.4 DSS Prevention and Mitigation Plan Cost for Hulunbuir

Project Elements	Quantity		Investment		
	Unit	Amount	Unit price (US\$)	Amount required ^{1/} (US\$ '000)	
Training center for farmers and herders	Site	1	121,951 /site	122	
Stabilizing sandy land using physical measures	Ha	3333.33	402.44 /ha	1,341	
Stabilizing sandy land using biological measures	Grazing ban	Ha	13333.33	1,951	
	Scots pine planting (3-year-old seedlings)	ha	4,000	573.16/ha	2,293
	Shrubs planting (direct seeding, <i>Hedysarum</i> spp., <i>Caragana</i> spp.)	ha	5333.33	182.93/ha	976
Shelterbelts surrounding urban centers and Pasture shelterbelts	ha	4,000	463.41 /ha	1,854	
Model households for sustainable grassland management	Grazing by rotation	ha	333.33	18.29/ha	6
	Livestock improvement			2439.02	2
	Stall and shed building	m ²	200	18.29/m ²	4
	Wind and solar power	set	1	1219.51	1
	Feed processing facility	set	1	4878.05	5
	Sub-total	households	300	18292.68/ household	5,488
Monitoring	Equipment, manpower			140	
Grand total for Hulunbuir				14,164	

1/ May not add up due to rounding off.

Table 2.5 DSS Prevention and Mitigation Plan Cost for Xilingol

Project Elements	Quantity		Investment		
	Unit	Amount	Unit price (000 \$)	Amount required ^{1/} (US\$ '000)	
Sand barriers	ha	2667	402.44 /ha	1,073	
Tree planting	ha	13333	182.93/ha	2,439	
Containerized seedlings growing	Seedling	20,000,000	0.04/plant	732	
Closures	ha	33333	91.46/ha	3,049	
Resettlement of displaced herders and farmers	Household	600	1219.51 /household	732	
Demonstration households for agro-pastoral, integrated, stall-feeding activities	Wind and solar power	Household	1	1219.51/ household	0.01
	Stall-feeding	M ²	200	18.29/ M ²	0.03
	Fencing and grazing by rotation	ha	333	18.29/ha	0.05
	Forage processing equipment	Household	300	4878.05/ household	0.04
	Well digging and water supply	Well	1	2439.02/well	0.02
	High-yield forage plots	ha	0.67	1097.56/ha	0.06
	Livestock breeding and improvement	Household	1	2926.83/ household	0.24
	Sub-total	Household	300	21951.22	6,585
Monitoring	Equipment, manpower			146	
Grand total for Xilingol				14,756	

1/ May not add up due to rounding off.

Table 2.6 DSS Prevention and Mitigation Project Cost for Ordos

Project elements	Quantity		Investment		
	Unit	Amount	Unit price (US\$)	Amount required ^{1/} (US\$ '000)	
Dalate Banner					
Stabilizing sandy land using multi-layered sand barriers	ha	2666.67	475.61/ha	1,268	
Stabilizing sandy land using physical measures	ha	1333.33	402.44/ha	537	
Artificial and mechanized tree planting	ha	13333.33	274.39/ha	3,659	
Introduction of tree planting machinery	set	50	6097.56/set	305	
Feed processing plant	plant	2	146341.46 /plant	293	
Containerized seedling production facilities (annual production capacity of 30 million seedlings)	facility	5	34146.34 /facility	171	
Family based eco-pasture and livestock farm in sandy areas	household	100	24390.24 /household	2,439	
Monitoring (equipment and manpower)				867	
Total for Dalate				9,341	
Hangjin Banner					
Sandy barriers	ha	2000	402.44/ha	805	
Afforestation by aerial seeding	ha	13333.33	128.05/ha	1,707	
Family based eco-pasture and livestock farm	Feed processing equipment	set	1	4878.05/set	5
	Breeding livestock	head	2 dairy cows, 20 sheep		5
	Stall and shed establishment	m ²	200	18.29/ m ²	4
	Well digging	well	1	1219.51/well	1
	Greenhouse	m ²	400	18.29/ m ²	7
	Silos facility	m ³	150	16.26/ m ³	2
	Forage plots	ha	0.20 –0.33		0.5
	Shelterbelts	ha	1.33	548.78	0.7
Sub-total	household	150	25609.76/hou sehold	3,841.46	
Mongolian willow (<i>Salix mongolica</i>) chip mill	mill	3	73170.73 /mill	220	
Mechanized tree planting	ha	6666.67	182.93/ha	1,220	
Monitoring (equipment and manpower)				779	
Total for Hangjin				8,572	
Ertok Banner					
Training center	site	1	121951.22 /site	122	
Family based eco-pasture and livestock farm	household	150	24390.24/hou sehold	3,659	
Small-scale feed processing plant	plant	2	146341.46 /plant	293	
Sand barriers	ha	30,000	402.44/ha	805	
Planting by aerial seeding	ha	200,000	128.05/ha	1,707	
Mechanized tree planting	ha	100,000	182.93/ha	1,220	
Mongolian willow processing mill	mill	2	73170.73 /mill	146	
Monitoring (equipment, manpower)				795	
Total for Ertok				8,746	
Grand total for Ordos				36,834	

1/ May not add up due to rounding off.

Table 2.7 DSS Prevention and Mitigation Project Cost for Alashan

Project elements	Quantity		Investment	
	Unit	Amount	Unit price (US\$)	Required ^{1/} (US\$ 000)
Resettlement for ecological restoration (experimenting various measures including insurance schemes and development approaches)	Person	800.00	1,219.51 /person	976
Technical and professional training for farmers and herders	Person	2,500.00	36.59 /person	91
Grazing ban	ha	133,333.33	14.63/ha	1,951
Planting by aerial seeding (fringes of deserts)	ha	6,666.67	164.63/mu	1,098
Sandy barriers (fringes of deserts)	ha	2,000.00	439.02/mu	878
Monitoring (equipment and manpower)				499
Grand total for Alashan				5,493

1/ May not add up due to rounding off.

Table 2.8 Other Investment and Project Management for DSS Prevention and Mitigation Plan in Inner Mongolia Autonomous Region

Elements	Investment required (US\$ 000)
Capacity building	8,000
Institutional development and policy framework	500
Public awareness	500
Project management	1,200
Total	10,200

Table 2.9 Total Cost of DSS Prevention and Mitigation Plan in Inner Mongolia Autonomous Region

Elements	Capital cost estimate (US\$ 000)
Hulunbir	14,164.38
Xilingol	14,755.76
Ordos	36,833.63
Alashan	5,492.90
Other investment	10,200.00
Grand Total	81,446.67

New laws such as the “*Law on Desertification Prevention and Treatment*” (January 2002) and policies such as “*China adopts preferential policies on west development*” (State council circular, November, 2000) are issued in order to stipulate the responsibility of government at all levels and to encourage private sector to take part in the prevention and control DSS. According to the “*Law on Desertification Prevention and Treatment*”, government at all levels are responsible for the control of desertification and the central government should increase investment and create more favorable policies.

The main contents of favorable policies include the recognition that central government is responsible for providing the majority of grain and seedling subsidies and cash subsidies pertaining to the implementation of state-approved projects that:

- convert cultivated land to forest and grassland;
- protect natural forests; and
- prevent and eliminate land degradation.

The central government will provide proper compensation for losses of local financial revenue incurred by the implementation of projects that convert cultivated land to forestry and grassland and protect natural forests.

The government encourages afforesting activities and cultivating grass on barren mountain tops and unproductive land and converting cultivated mountain slopes to forest land and grassland in the western region. The government allows those economic entities or individuals engaged in afforestation and grass planting to own the wood and grass in question and hold land use rights over such areas. Any economic entity or individual may apply to afforest these areas to protect the environment and improve the ecosystem and to use these state-owned barren mountains and land in accordance with the law. The only conditions are that sufficient amount of capital should be invested in the project and afforestation should be successfully completed. As long as these conditions are met, any party may purchase the right to use state-owned land at a reduced rate.

Such land use rights will remain in effect for 50 to 70 years and the concerned party can apply to have those rights renewed at the end of the 50 years. These rights can be inherited or transferred. In the event that the state reclaims those land use rights for development purposes, the affected party will receive compensation in accordance with the law. No felling of trees is allowed in forested areas that have been converted from cultivated land under state grain subsidies. The overall amount of agricultural land should be carefully maintained to preserve national food security. There should be a balance between the area of agricultural land lost to other purposes and the amount of reclaimed agricultural land.

DSS is not only a national problem, but also a regional problem. Countries and international institutions in the region realized this (Box 2.2).

2.6 Financing Mechanism for Current DSS Mitigation Efforts in Mongolia

The national budget of Mongolia provides a limited amount of funding on an annual basis for its NAP-related activities. Disbursements from the national budget for activities to aid the implementation of the NAP are increasing annually.

In 1998, the Fund for Environmental Protection was set up. About 35 million Tugrugs (Tgs) have been allocated to small- to medium-sized projects related to the NAP.⁴ However, in spite of some 300% increase in the national budget allocations to environmental protection during the past five years, the total amount of money spent in the environmental sector in 2002 was less than 1% of the country's GDP. Of the total 2.3 billion Tgs that was allocated for environmental protection, 44% of the budget went to desertification monitoring activities while 40.5% was spent on nature protection and 15.3% went to staff costs.

Non-budget funds for the environmental sector are made up of donations and grants from international organizations, foreign aid and private donors. Of the total external assistance, 21% was spent on biodiversity conservation, 21% on monitoring, 17.6% on Protected Areas Management, 8.2% on forest protection, and 5% on reducing water pollution.

⁴ US\$1 = 1,180 Tgs

Box 2.2 Examples of Foreign Investment and Bilateral Aid to the PRC to Combat DSS

(a) From 2001 to 2004, 3,600 million Japanese Yen loan from the Japan Bank for International Cooperation (JBIC) has been invested in ecological shelterbelt development along the Yellow River in Inner Mongolia Autonomous Region. The period of the Japanese Yen loan is 40 years and can be extended to 50 years.

(b) Sino-German Government Cooperation Program of Desertification Land Treatment in Inner Mongolia. The main content of the program is tree planting and combating desertification. According to the agreement between the PRC and Germany, the total investment of this program is 113.70million RMB; Germany made a donation of 16 million Mark (equals to 72 million RMB); the supplement to projects from the PRC side is 33.34 million RMB; free-labor input by the local farmers and herdsmen is regarded as the PRC investment of 8.36 million RMB.

(c) Sino-Australian Grassland Protection Technological Cooperation Program has been implemented in Inner Mongolia Autonomous Region. According to the agreement between the PRC and Australian government, the total investment of this program is RMB 68 million (US\$8.3 million); Australia made a donation of A\$5 million (RMB 40 million); the supplement from the PRC side is RMB 28 million. Besides the direct investment, this program supplies loans to herdsmen. As of year 2000, the total loan is RMB 3.758 million. Reportedly, 1334 participating households raised their income by RMB 1,000 per year.

(d) Sino-Korea Government Cooperation Program of Combating Desertification Forestation Project. The main components of this program are: 1) the rehabilitation of the upper stream watersheds of Miyun reservoir in Beijing from 2001 to 2003, and 2) the forestation project on the desertification prevention in five areas of the western PRC from 2002 to 2005. According to the agreement between the PRC and the Republic of Korea, the total investment of this program is US\$ 12.3 million; the Republic of Korea made a contribution of US\$ 6.3 million, whereas the supplement to projects from the PRC is US\$ 6 million as in-kind contribution. Total forestation area will be around 9,500 hectares.

(Note: US\$ 1= RMB 8.2)