出國報告書 **(**出國類別：其他**)**

(1) 主持國際長期生態研究網之「募集基金第三次會議」ILTER Funding Raising
(2) 出席「北歐亞大陸地球科學夥伴促進會」

服務機關：行政院農業委員會林業試驗所
姓名職稱：金恒鑣 所長
派赴國家：美國華盛頓特區
出國期間：93 年 12 月 06～13 日
報告日期：93 年 12 月 16 日

系統識別號：C09401259

行政院及所屬各機關出國報告提要

頁數：50 含附件：是

報告名稱：

(1) 主持國際長期生態研究網之「募集基金第三次會議」

(2) 出席「北歐亞大陸地球科學夥伴促進會」

主辦機關：

行政院農業委員會林業試驗所

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金恒鑣 行政院農業委員會林業試驗所 所長

出國類別：其他

出國地點：美國華盛頓特區

出國期間：民國 93 年 12 月 06 日-民國 93 年 12 月 13 日

報告日期：民國 93 年 12 月 16 日

分類號/目：F8/林業 F8/林業

關鍵詞：國際長期生態研究網，ILTER，北歐亞大陸地球科學夥伴促進會，NEESPI，生態學與環境學研究中心，無線感應器之研究論文

內容摘要：

國際長期生態研究網之「募集基金第三次會議」決定：(1) 分配各委員研究可能補助的基金會及進行方式，了解如聯合國下的重要組織、世界銀行等之規定，並與已相識基金會之部門主管做進一步的聯繫。(2) 經常以「視訊會議」聯繫 (最近一次訂在 93 年 12 月 17 日上午 8-9 時)，掌握工作進度。(3) 於六個月後再相聚召開第四次會議，落實募集基金之推動。

「北歐亞大陸地球科學夥伴促進會」的計畫，該計畫是注重「陸域生態系的動態學」。本次會議爲第一次相關會議，焦點放在提出各種科學性問題，就三項子題提出科學主題，說明各子題之重要性及相關性以強調應用研究工具的必要性，關係到模式的製作及遠距的監測成效。

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一、前言：

本報告書爲報告人在美國華盛頓特區主持國際長期生態研究網之「募集基金第三次會議」(12 月 8 日)；暨出席「北歐亞洲地球科學夥伴促進會」(12 月 9-10 日) 的會議報告。

二、行程：93 年 12 月 06 日至 12 月 13 日

日期	行程地點	工作內容
12 月 06~07 日	台北→洛杉磯→華盛頓特區	啓程、轉機、抵達，主持會前會議
12 月 08 日	華盛頓特區	主持國際長期生態研究網之「募集基金第三次會議」
12 月 09~10 日	華盛頓特區	出席「北歐亞洲地球科學夥伴促進會」
12 月 11~12 日	華盛頓特區→西雅圖	返程、轉機
12 月 13~14 日	西雅圖→台北	轉機、(14 日 7:30 抵台，旋即上班)

三、會議過程

(一) 國際長期生態研究網之「募集基金第三次會議」

時間：2004 年 12 月 8 日

地點：美國華盛頓特區，美國國家科學基金會

主席：金恒鑣 (國際長期生態研究網主席)

出席者 (依字母排列)：

Clyde Goulden	美國費州自然資源研究院
Frances Li	資深專案經理，國際科學與工程學處，美國 NSF
Henry Gholz	處長，國際科學與工程學處，美國 NSF
John Vande Castle	執行祕書，國際長期生態研究網
Michel Gutelman	顧問，國際長期生態研究網
Steven Hamburg	教授，美國布朗大學

Terry Bodenhorn　　教授，伊利諾州大學

William Chang　　資深專案經理，國際科學與工程學處，美國 NSF

本次會議在華府美國國家科學基金會舉行，由報告人主持。目的乃在汲取專業人士申請聯合國發展規劃 (UNDP) 項目下的經費之經驗與意見，研擬進行方式與其他可能之募款途徑。目前補助國設定爲 (1) 南非洲 4-6 國家，與 (2) 東南亞洲 4-6 國家。申請之款項用途作爲 (1) 強化受補助國之網際網路的基礎建設 (cyber-infrastructure) ，包括 Internet, wireless sensor network, Information technology and management；(2) 強化人力資源能力 (human capacity)，包括訓練、教育與擴大社會參與層面三大項。

會議中決定：(1) 分配各委員研究可能補助的基金會及進行方式，了解如聯合國下的重要組織、世界銀行等之規定，並與已相識基金會之部門主管做進一步的聯繫。(2) 經常以「視訊會議」聯繫 (最近一次訂在 93 年 12 月 17 日上午 8-9 時)，以掌握工作進度。(3) 於六個月後再相聚召開第四次會議，落實募集基金之推動。

1. 會議主要內容 (附件一)

會議討論焦點爲「募集基金」相關議題，先討論由 ILTER Network 顧問 (Michel Gutelman) 所撰寫之〈募集基金草稿〉(附件二)。Michel 建議 ILTER Network 向聯合國開發計畫署(UNDP, United Nation Development Programme)，申請補助 ILTER 網路的會員網 (初步對象爲南非洲區域) 發展相關「長期生態研究」工作。所有募集基金計畫需在 ILTER 的執行委員會內形成與討論，並提案給 UNDP，建議 UNDP 召開「圓桌會議」。募集計畫針對進行「跨試驗地的合作案」。申請的基金只用於基礎建設，訓練人員，協調工作，諮商會議，而非用於薪資與科學研究。此募集策略應在半年內有所進展。與會人員認爲要多元化資助之機構，因此 ILTER Network 要取得更多募集基金的相關資訊及申請管道。會議中建議向耶魯

大學的森林與環境學院長暨 UNDP 的前署長 Gus Peth，或世界銀行的可持續發展主管 Bob Watson 接洽。Steve Hamburg 答應協助這些接洽工作。

在發展多元資助機構方面，亦可借鏡巴西 ILTER 諸位召集人獲得補助「2004 年區域性 ILTER 會議」之經驗。

Clyde Goulden 提供外蒙古向世界銀行募集基金的經驗，並指出可分別向許多可資助的機構申請，例如全球環境基金 (The Global Environment Facility, GEF)，美國國際發展機構 (US Agency for International Development, USAID) 及美國科學基金會(NSF)。Clyde 進一步建議 ILTER Network 可採取的步驟 (附件三)。他建議不用跨國 (cross-border) 一詞，改用跨試驗地 (cross-site) 或跨網 (cross-network)，以避免政治敏感性。建議印製文書宣傳品，提高 ILTER Network 的國際能見度。

然而，解決 ILTER Network 運作之短期基金的困難亦迫近眉睫，故可分別募集多元機構，以有效推動 ILTER Network 之工作。

2. 後續工作

(1) 將請 Dr. Michel Gutelman 於2005年2月再度來台灣與報告人合作撰寫新版本之募集基金計畫書，並與紐約 UNDP 組織密切連繫，繳送計畫申請書。
(2) 重新製作 ILTER Network 的文宣品。
(3) 在下次 ILTER Network 委員會議中報告進度及商議後續工作。

(二)「北歐亞大陸地球科學夥伴促進會」(NEESPI)

北歐亞洲是指北緯 40°以北之地區，主要包括蘇聯等極地凍原與冰封地區，該研究計畫主要由美國航太總署 (NASA) 所支助，尋找氣候變遷之環境指標與氣候變遷造成環境與生態之長期效應。

該計畫 (NEESPI) 主持人有意加入報告人主持之「ILTER Network」，並希望與 ILTER 進行各項國際學術研究合作。會中報告人出席並演講國際學術合作之重點項目 (12 月 10 日 10:30)。其議程請參考附件四。

1. 會議主要內容

美國的全球性策略內歐洲大陸是一個核心目標區之一。然而，對跨越歐亞大陸洲北方的廣袤地區 (北緯 40 度以北，佔全球陸地面積的 19%，更是該緯度以北的 59%陸地) 及有多樣與獨特的環境，美國卻缺乏與之聯繫及來往。那些地區包括了地球最北方的凍原帶及其南方的半漠地區與漠地。這地區在全球布局內的環境變遷佔有不可忽視的重要性，其內的北寒林 (boreal forests) 約佔全球北寒林總面積的七成。

就全球尺度而言，此地區是研究「全球變遷過程」的關鍵地區。過去一個世紀的研究顯示：北歐亞大陸洲的內陸地區，地表氣溫上升真況有待明瞭，尤其是近世紀以來，其大氣圈、水文圈、寒凍圈，地表覆蓋呈現了令人擔心的巨大變遷。此變遷尚有待提證精確定量數據，來衡量與協助全球環境策略的制定。爲達到此目的，該地區要發展監測與技術模式製作的能力，始能回答變遷帶來的全球尺度的衝擊與因應。

全球系統的功能可包括三項大尺度的過程，而各過程是相互影響下，呈現了全球系統的功能。此三大過程爲：

1. 生物地球化學循環 (Biogeochemical Cycles)；它影響全球大氣，海洋、土壤形成，生物區系之演化。

2. 能量與水循環 (Energy and Water Cycles)：它影響大氣與地表環境，水文圈與寒凍圈之間的能量、水、大氣、溶氣物，微量氣體的密切關係。

3. 人類活動 (Human Activity)：人類自有農業文明開始到最近的各種活動，造成之影響足以廣大到全球的系統。

美國的航太總署 (National Aeronautics and Space Administration, NASA) 發起「北歐亞大陸地球科學夥伴促進會」(North Eurasia Earth Science Partnership Initiative, NEESPI) 的計畫，該計畫是注重「陸域生態系的動態學」。本次會議爲第一次相關會議，焦點放在提出各種科學性問題，就上述三項子題提出科學主題，說明各子題之重要性及相關性以強調應用研究工具的必要性，關係到模式的製作及遠距的監測成效。詳細內容詳見網頁 http://neespi.gsfc.nasa.gov/science/science.html

2. 報告人之工作：

報告人之報告重點乃在介紹「國際長期生態研究網」 (ILTER

Network)[見附件五]。主要內容介紹該網絡的願景，任務、目標、緣起與最近發展。全文注重

(1) 資訊科技與資訊管理；

(2) 網際基礎設施；

(3) 建置人力能力；

(4) 推展國際網之服務項目;

(5) 介紹「無線感應器系統」之功能與前瞻潛性；

(6) 例舉最近國際合作之成就

(http://sensor.nchc.org.tw/lakemetabolism/)；

(7) 建議採用尖端科技研究生態學及如何促進國際合作之要點。

本報告結束後，深受與會者 (如 Andrey Kushlin) 感興趣。Kushlin 爲世界銀行的林業專家，主管東歐洲與中亞州地區的負責人，兼本計畫的贊助者 (附件六)，他要求報告人提供「無線感應器之研究論文」 (該論文將於 2005 年載於國際學術刊物 *BioScience* 上) ，作爲推展相關研究之參考。

四、結論與建議

1. 政府應有計畫地善用此「國際長期生態研究網」(ILTER Network) 組織之資源，可提升我國在生態學之學術研究水準，更能促成先進各國對我國研究之肯定，並可進一步協助其他許多國家的生態學研究，增加我國之影響力。
2. 政府宜早日考慮在我國成立國家級之「生態學與環境學研究中心」，積極有計畫地生產生態與環境之科學資料與知識，爲我國環境政策提供有科學根據之參考資料。

附件一：「募集基金第三次會議」紀錄

Notes of the ILTER funding discussion meeting December 8, 2004 - Washington D.C.
John Vande Castle

Meeting Attendees:
Dr. Hen-Biau King
Terry Bodenhorn
William Chang
Frances Li
Henry Gholz
Clyde Goulden
Michel Gutelman
Steven Hamburg
John Vande Castle

The initial point for discussions of potential ILTER funding is based on a document prepared by Michel Gutelman (appended below, appendix 1). In this document, Michel suggests ILTER to look towards UNDP for support of a subset of ILTER Networks, initially starting with South Africa. The request for funding should be formulated and discussed by the ILTER Executive Committee and proposed to UNDP with the formation of a "round table". The funding proposal should focus on cross site, collaborative projects. The round table discussions could include other funding representatives such as NSF, EU etc. The funding could include help for equipment, training, coordination, consulting and infrastructure, but not for regular salaries or scientific research itself..

The meeting attendees thought this was one strategy for funding, and it should be considered within a 6 month timeline. Information on exactly how to request the funding, and how to channel the funding will be needed. Other outside people can be consulted regarding this such as Gus Speth, current dean of Yale and past UNDP director, or Bob Watson from the World Bank. Steve Hamburg said he will follow up on these contacts. The meeting attendees also suggested that funding needs to come from a variety of sources – a multi-pronged effort. Funding is really needed for the ILTER Network as a whole, to conduct meetings, coordination and science. One suggestion was to also ask the Brazilian ILTER coordinators the procedures they used to obtain funding for the 2004 Regional and ILTER Coordinating Meeting.

Clyde Goulden provided details regarding funding for the Mongolian ILTER project at Lake Hovsgol. He noted that it was important for funding the project to come from a variety of sources, in this case GEF and USAID as well as NSF funding. He also pointed out the ILTER represented an "umbrella" that was able to be used as a basis for additional funding and support. Clyde also prepared a follow-up document with some further suggestions for ILTER funding (it is included as appendix 2, below). In it, he points out that funding from UNDP is a good idea if it will work, but be sure that important funding sources are represented such as USAID, GEF, EU, World Bank, etc. He also pointed out that the wording "cross-border" should not be used for political

reasons – perhaps use cross-site or cross-network instead. Clyde mentioned that regional conferences to focus on specific regional problems should be considered. He also mentioned that visual materials such as brochures, presentations etc are important and should emphasize why ILTER is important and what it has and can accomplish.

Follow-up discussion by Frances Li, Michel Gutleman, Clyde Goulden and others mentioned that ILTER should focus on research rather than only on needs of developing countries. In particular developed countries could include support from their own institutions. ILTER should not plan only on the UN funding route, especially considering a potential long lead time, but pursue a number of sources in parallel. ILTER should also encourage each member network to pursue its own funding to support ILTER science. ILTER science should be a focus of regional and annual ILTER meetings, perhaps expanding the meetings themselves, although administrative issues need to be included as well. A generic proposal template of text for potential ILTER funding could be drafted, for use as a "boiler-plate" for proposals to various funding sources. The text should point out the importance of ILTER and its successes, and include the whole ILTER experience, and not only emphasize specific examples such as US-Taiwan projects. This text should be approved by the ILTER Executive Committee for approval, and be modified as needed to fit the scope of various funding agencies.

Sep-09-2004

OUTLINE OF A PROPOSED STRATEGY.

UNDP has a proven record in organizing, with significant successes, many "Round Tables" where donors are invited are invited to contribute to a variety of development causes for the benefit of diverse groups of countries. Up to now, the main purposes for which donors meeting have been organized are to fight poverty and AIDS, to develop education, to improve the development of health and sanitation sectors, access to water, economic infrastructures and agriculture Something has been done, but rather little, for research in ecology and environment and even less for the cross-border/long term type of research.

- *The overall strategic goal of the proposed exercise is therefore for ILTER to convince UNDP to put its donor's portfolio at the service of ILTER Network and take a leading role in organizing, for the benefit of selected member countries*[1] *and sites of the NETWORK, such round tables of potential donors.*

To reach this goal:

- An explicit request addressed to UNDP to support ILTER Network activities should be prepared and presented to this institution by the ILTER Executive Committee. The request should be forwarded directly to the Administrator of UNDP, Mr. Mark Malloch Brown.

- The request should be a detailed document (and its executive summary) exposing the background rationale and justification. A demand for a high level meeting between ILTER and UNDP should be attached to this document.

- The document to be prepared should concretely develop the following elements:

    - General institutional and operational history of the ILTER NETWORK and quantitative and qualitative description of its present status.
    - Statement of objective and of the rationale of the ILTER Network activity, insisting on its specificity: cross/border long term research.
    - Description of technical, ecological, political and social advantages of wide scale and long term ecological research type of research[2] and political gains at local and global level.
    - *Explanation of the reason why, when and "where" in the Network a funding problem emerges for some countries deprived of sufficient*

[1] For political reason it is not possible to request assistance of UNDP for the whole ILTER Network. . Therefore the assistance will be requested only for part of it: the less "well off" countries whose research budgets who can't afford the cross-border equipment and training needed for long term/cross-border research.

[2] Part of this topic are somewhat already developed in my report (par 4,5,6) .

national resources for research and its short terms and long term consequences.

- Description of past efforts for funding network activities[3].
- The document should then explain why support from UNDP to ILTER Network is politically justified. The purpose of this section is to convince UNDP that the uniqueness type of ILTER cross-border and long term research has direct and indirect worldwide positive political, economical and social effects .This is among others reasons, because, it contribute to the elaboration of a scientific foundation needed to rationally design and establish conventions, treaties, laws and other regulations with worldwide, regional or sectorial validity related to ecology, environment and natural resources conservations and management Involving operationally more developing countries in the cross border/long term research exercise which is one of the purpose of the demand addressed to UNDP will have also the advantage of rising awareness and contributing to set environment and ecology concerns at a higher level within their priorities.
- A section of the document should develop the argument that the products of the wide scale/long term ILTER Network research can significantly contribute to strengthen the UNDP, its agenda and its efforts to reach several of its own political economical and social priorities. It should shows how ILTER activities will contribute to shoulder the fundamental principle of intervention of UNDP at global level like promoting in relation with developing countries ecological concerns, sustainable development, preservation and good management of natural resources, and other governance aspects.
- In matter of communication it should be stated that the collaboration between ILTER and UNDP will enhance their respective international status and visibility.
- The likelihood that the "plaidoyer" of ILTER may persuade UNDP to consider its demand and embark in discussions to support cross border and long term research funding will be strongly strengthened if its intervention is officially shouldered at the highest possible level, by the "heavy weight" active in the Network: USA, CHINA, SOUTH AFRICA, BRASIL, MEXICO, FRANCE and others. The Executive Committee should explore the possibility of such support an be ready to lead coordinated action toward UNDP.

- For multiple reasons not developed here I suggest that the support of UNDP for selected members should no be, for the time being, for the entire Network. Instead The assistance should be considered as a pilot experience to be conducted with a limited group of 6-7 East/South African countries.

- If and when discussion start, the ILTER team must be ready, to discuss and answer at best as possible a few questions related to the funding needs:

[3] Part of this topic already dealt with in my report (with useful remarks made by Frances) n my report par. 10-16

- Capacity of ILTER Network to prepare an outline of *an operational plan* of a large scale /long term cross border research for a selected group of ILTER sites.
- Capacity to estimate with reasonable precision the resources needed for each country of the group. According to past recent fundraising experience, in my view, an amount of funding of 15-20 millions US$ for the 5 countries to be spent in 2-3 years will not be considered excessive [4].
- Description of the expected results of the technical plan and evaluation of its contribution to the UNDP ecological development and socio-political agenda.
- Statement of how the resources gathered will be managed and propose an capacity to propose a management setup in line with the usual requisite of UNDP for round table and development umbrella programme.

- This present strategy document should be spread among the important members of ILTER (not on the internet) to see if they agree with it, reject it or want it modified. If this general strategy is agreed upon and when the decision to proceed is officially taken, four main tasks should be started simultaneously under the supervision of the Executive Committee:

  - *Start to prepare of the document for request intended for UNDP* (cf. proposed content above). Somebody should write a draft document and its executive summary, submit it to the "heavy weight" of the ILTER members. First an exchange of views should be organized trough E-mail. Then a special session of *discussion suggestion and approbation* of the present strategy as it is or modified should be organized when the next meeting of the Executive Committee will be held (Mexico if I remember well).

  If well conducted a fully approved document should be obtained after 2 months of elaboration, discussion and amendments.

  - *Organize and prepare a justified research plan covering about maybe 5-10 research common topics, calculate an approximate global costing and estimate what part of the cost should be covered by donors for the group of beneficiaries agreed upon.* If the proposal to start the whole exercise with 6/7 African countries is agreed upon, I suggest that the coordination and design of the above mentioned plan and costing should be delegated to the South African ILTER representative.

    This document is fundamentally the one that will be later on adjusted and submitted to the donors when the Round Table is organized.

[4] Considering that 2 countries will pay for themselves and taking into account that this amount will mainly cover: equipment, technical training and the cost of technical scientist meetings.

If well conducted, with a sufficient budget (in particular for travel and design costs of the plan) that can be estimated between 150.000 and 250.000 US$, this task should be finished in about 4-5 months.

If UNDP agree to get involved, it should be possible that it will design and fund a “preparatory assistance project” of approximately this amount to coordinate the elaboration of this document. This preparatory assistance in my view should include a budget line covering the cost of a UNDP consultant to better lead the preparation of the document and make it more conform to the UNDP usual format. It is also possible that this project may include the cost of organizing the round table of donors itself. In that case it will most likely be considered as a “Regional Project”. It is also possible that UNDP may agree to support the ILTER demand with a project conceived as a “cost sharing project”. In this case, part of the resources will have to come from within the ILTER Network.

附件二：〈募集基金草稿〉

Appendix 2 - Funding Sources for ILTER

To: ILTER Funding Committee

From: Clyde E. Goulden, International Consultant,
Hovsgol_GEF project, Mongolia
Director, Institute for Mongolian Biodiversity and Ecological Research,
Academy of Natural Sciences, Philadelphia, PA 19103

Suggestions from Discussion:

Michel Guterman's suggestion re UNDP round-table discussions with potential donors:
Excellent idea if UNDP will pick it up and go with it. ILTER committee should participate in the organization to be certain that important funding sources are represented, e.g., World Bank, GEF, European Union, USAID, ASEAN, Asian Development Bank, European and Asian country international funding offices and other regional low-interest loan groups interested on "economic development with environment protection".

A. Two strategies:

1. Fund a central organization only
2. Focus on a region (e.g., Africa, Asia, the Steppe, the tropical rain forest)
3. Fund individual ILTER networks for ca. five years (followed by a phase-out of funding) that is gradually replaced by local or regional governments or foundations. (Here I would emphasize communicating with existing in-country groups with a history of research and some success to invite them to join the ILTER, rather than having to start new institutes or research groups with no existing funding base.)
4. Selection of what countries to begin with needs to be thought out carefully, particularly from the stability aspect of local governments.

I would **not** emphasize "cross-border" research, instead call it regional or global research. Boundary conflicts among countries (e.g., China/Russia, Bolivia/Peru, several African countries) are "cross-border" and hamper progress all over the world.

Suggestions from personal experience:

1. Be patient, this is a long-term and very slow process, definitely one step at a time and only by stressing accomplishments of existing ILTER networks and what they can do for a developing country, can it be attractive and successful.
2. Be flexible, funding arguments that work for one country may not work for another.
3. Organize at least four regional conferences (South America, Africa, Asia, Middle East) to which key scientists from each interested country would be invited for a scientific conference on focused or targeted research to solve regional or local environmental problems. Environmental protection alone is not appealing to a developing country unless it leads to economic alternatives such as ecotourism.

The importance of avoiding environmental devastation that will allow economic sustainability is a very important argument.

4. Develop visual materials such as brochures, short videos, powerpoint presentations, booklets similar to the previous ILTER network publication edited by Jim Gosz, but .
    a. Stress why ILTER is important, what it can provide to individual countries and to the global community
    b. Emphasize accomplishments of present ILTER networks and LTER
    c. What can a broader ILTER network contribute?
    d. Emphasize capacity building for “Role of ILTER in environmental problem solving with economic development”.

Revised Hovsgol MSP-R Brief080601.docMEDIUM-SIZED PROJECT – TARGETED RESEARCH BRIEF

MONGOLIA – DYNAMICS OF BIODIVERSITY LOSS AND PERMAFROST MELT IN LAKE HOVSGOL NATIONAL PARK

PROJECT IDENTIFIERS	
1. Project name: *Dynamics of Biodiversity Loss and Permafrost Melt in Lake Hovsgol National Park, Mongolia*	2. GEF Implementing Agency: *The World Bank*
3. Country or countries in which the project is being implemented: *Mongolia*	4. Country eligibility*: Mongolia ratified the Convention of Biological Diversity on September 9, 1993, and the UNFCCC on September 30,1993*
5. GEF focal area(s): *Biodiversity and Climate Change*	6. Operational program/Short-term measure: *Targeted Research Window for OP #12 on Integrated Ecosystem Management*
7. Project linkage to national priorities, action plans, and programs: *The recently completed National Environmental Action Plan 2000 identifies both the role of melting permafrost in generating carbon dioxide, and the controlling of deforestation and forest degradation especially in relation to the management of protected areas and buffer zones, such as through the effects of grazing and fire, as major environmental issues. The conducting of meaningful and goal-oriented research in priority areas is specifically mentioned in both regards. The Mongolian Academy of Sciences (MAS) and the Ministry of Nature and Environment (MNE) are very concerned about impacts of livestock grazing and global climate change on biodiversity and the environment. A 1999 resolution adopted by the Government designated MAS and MNE as responsible for long-term environmental monitoring activities in Hovsgol National Park (HNP) and has provided a small budget for research.*	
8. GEF national operational focal point and date of country endorsement: *This proposal has been reviewed and approved by Mr. B. Ganbaatar, GEF Operational Focal Point for Mongolia. Endorsement signed on September 25, 2000*	
PROJECT OBJECTIVES AND ACTIVITIES	
9. Project rationale and objectives: *Grazing impacts on the forest margins in permafrost areas are a widespread problem across Eurasia with the consequent loss of biodiversity, and the melting of permafrost, consequent decay of organic matter, and release of carbon dioxide. The goal of the proposed research is to support the OP12 on Integrated Ecosystem Management. Using Lake Hovsgol National Park as a case study, the targeted research will provide for the long-term protection of such forest/steppe areas by better understanding the scale and dynamics of natural and anthropogenic changes.* *Objectives:* *a. To identify the impacts of pasture use and forest cutting on the dynamics of forest, steppe, riparian zones, and streams in tributary valleys*	Indicators: *a. An objective assessment of land use practices in the forests and adjacent steppe, and riparian zones.* *b. An evaluation of the interaction of the above biological and ecological impacts especially on ecosystem functions.* *c. A definition of climate change impacts on the rate and nature of permafrost melt.* *d. A better understanding of appropriate land use practices objectively defined to reduce grazing pressure on land cover, forest regeneration, and permafrost.* *e. An economic analysis of alternative land uses.*

of Lake Hovsgol. *b. To define how those impacts interact and are affecting the melting of permafrost (and thus release of carbon dioxide), soil characteristics, and plant and animal biodiversity.* *c. To inventory climate change effects in HNP.* *d. To determine sustainable resource use patterns that will also protect biodiversity, permafrost and soil sequestration of carbon.* *e. Calculation of costs and benefits of alternative land use practices, especially as related to pastoral nomads.*	
10. Project outcomes: *a. Regional and global benefits of conserving significant biodiversity and slowing release of carbon dioxide in Mongolia and elsewhere in central Asia.* *b. Databases and models to predict impacts of various livestock numbers and combinations, and different timber-cutting regimes.* *c. Menus of viable alternative patterns of resource use to protect biodiversity and to sustain ecosystem function in soils, riparian zones and streams.*	Indicators: *a. Empirical evidence of the means to reduce the loss of and disturbance to biodiversity.* *b. Demonstrated means of improving stream water quality.* *c. Recommendations produced for better spatial management of grazing animals.* *d. Recommendations proposed to reduce the rate of permafrost melt.* *e. New zoning plan produced for HNP and surrounding areas.* *f. Active involvement of local communities in devising and undertaking more sustainable land use strategies.*
11. Project activities to achieve outcomes (including cost in USD of each activity): <u>*Baseline Characterization and Monitoring*</u>*: Document baseline environmental conditions in eight watersheds, defining impacts of current patterns of grazing, forest cutting, permafrost, plant cover and aquatic resources.* *Cost: $472,500* <u>*Measurement of Climate Change Impacts:*</u> *Determine whether land use practices and climate change have linear or synergistic interaction effects on permafrost and biodiversity.* *Cost: $230,000* <u>*Impact Mitigation Assessment:*</u> *Monitor and evaluate changes in areas with managed and unmanaged land use practices and with fenced and unfenced riparian zones. Economic analysis of alternative land use strategies.* *Cost: $150,000* <u>*Workshops, Reporting and Dissemination*</u>*: Produce clear and visually attractive publications for herders, and run regional and local workshops on research findings.*	Indicators: <u>*Baseline Characterization and Evaluation:*</u> *a. Maps prepared of land cover, grazing areas, permafrost depth, tree growth,* gers*, number of livestock, and aquatic resources.* *b. Parameter changes monitored regularly in valleys with different land use practices.* <u>*Climate Change Impacts:*</u> *a. Interactions defined between climate changes and human activity impacts on land vegetation cover.* <u>*Impact Mitigation*</u>*:* *a. Mitigation effects on soil, permafrost, land cover plants, riparian zone, stream hydrology and chemistry evaluated.* <u>*Reporting and dissemination*</u> *a. Production of an interesting range of written and visual materials based on research results.* *b. At least one workshop held per* soum *(sub-*

Cost: $185,000	*district), and one regional (Eurasia) workshop.*

12. Estimated budget (in US$ or local currency):

GEF:	*$829,900 (including PDF A)*
Co-financing for the increment	*$95,000*
Co-financing for baseline:	*$132,500*
Associated co-financing for Park management:	*$377,500*
TOTAL:	*$1,339,900*

Co-financing sources are from the Mongolian Academy of Sciences, Mongolian parliament, and USAID-Dept of Interior.

13. Information on project proposer: *The Mongolian Academy of Sciences was established in 1961 and is the central institution in charge of developing science and technology in Mongolia. It operates 26 research institutes in basic and applied sciences with a total of 1600 staff members. According to the Mongolian Law "On the Legal Status of the Mongolian Academy of Sciences" adopted by the Parliament in May, 1996, MAS reports to the Parliament and the Cabinet of Ministers.*

14. Information on proposed executing agency (if different from above): *The Geoecology Institute of the Mongolian Academy of Sciences was established in 1997 by Resolution 31 of the Mongolian Government. Its major research areas are forest resource management, forest fire, silviculture, reforestation, water resource management, water and permafrost analysis, soil conservation and pasture land management. The Institute has four divisions covering water resource management, land resource management, reforestation and protection, and water analysis. At present time the Institute is implementing about ten research projects related to long term ecological research, ecological and economical assessment of water, land and forest resources of the country, water supply in rural areas, land survey of Ulaanbaatar city and hay land survey and mapping of the country. Some of its projects have been funded by international donors such as UNDP, JICA and FAO.*

15. Date of initial submission of project concept: *April 1999*

INFORMATION TO BE COMPLETED BY IMPLEMENTING AGENCY:

16. Project identification number: *P072391*

17. Implementing Agency contact person: *Tony Whitten, Senior Biodiversity Specialist, The World Bank, 1818 H St. NW, Washington D.C. 20433, phone: +1-202-458-2253, fax: +1-202-522-1666, email: twhitten@worldbank.org*

18. Project linkage to Implementing Agency program(s): *The Country Assistance Strategy (CAS 17604-MOG, June 2, 1998) states that the Bank will assist the Government's poverty reduction efforts through support for initiatives to promote sustainable land and resource use emphasizing participation of stakeholders.*

Dynamics of Biodiversity Loss and Permafrost Melt in Hovsgol National Park, Mongolia

1. Project Description

1.1 Project Rationale and Objectives

Uncontrolled or badly managed grazing is a common issue across the countries in Eurasia where the extensive management of various domestic animals (sheep, goats, cattle) and the gathering of fuelwood has caused the forest edge to retreat. The loss of forest causes the ground to be exposed to sunlight, the permafrost (layer of frozen soil) to melt more than normal, aerobic decomposition to occur, and thus carbon dioxide to be produced. While little can be done to alter the immediate course of climate change, protecting vegetation cover by promoting certain land-use practices can slow the rate of permafrost melt by retaining the insulating capacity of vegetation. The protection of land cover vegetation is fundamental to maintenance of permafrost, and to the protection of Mongolia's water resources, biodiversity and natural ecosystems. Identifying precisely what factors and in what combinations are most important in the conservation-orientated management of such ecotones has rarely been attempted. The project is capitalizing upon a national commitment to ensuring science-based sustainable management of an important national park, in order to derive lessons and models to apply elsewhere within the great band of temperate forest-grassland mosaic between eastern Europe and eastern Russia/northern China.

Hovsgol, a large tectonic lake that is a sister to Lake Baikal, is between 2-4 million years old and one of the least-polluted lakes in the World. The Lake (51^{o}N, 100.5^{o}E) was designated a national park in 1992, comprising 900,000 ha of the southern limit of the Siberian taiga forest (mainly larch), as well as steppe grassland, mountain tundra, and the Lake. The zone of continuous permafrost parallels the transition from taiga to steppe. The Park will soon be expanded to more than two million ha by the addition of the Darhad Basin. The Lake, at 1645 m a.s.l., contains around 60% of Mongolia's surface freshwater. The park is being nominated as a UNESCO World Heritage Site.

The Park includes many Mongolian "Red Book" species of plants (including those of medicinal value), birds, and mammals, notably the snow leopard, musk deer, moose, wild sheep and ibex. Recent biodiversity studies have indicated that stream and riparian communities are very diverse, with many endemic species. For example, there are over 400 taxa of diatoms in the Hovsgol Basin, of which many are endemic and others appear to be undescribed species. A remarkable 101 species of crane flies have been collected in the area recently, mainly from tributary stream valleys, including 11 undescribed species.

The goal of the proposed targeted research in Lake Hovsgol National Park (HNP) is to support the OP12 on Integrated Ecosystem Management. Using Lake Hovsgol National Park as a case study, the targeted research will provide for the long-term protection of all the ecosystems by better understanding the scale and dynamics of natural and anthropogenic changes. The overall objective is to identify sustainable land use practices that will protect biodiversity, ecosystem function, and permafrost. The specific objectives of the proposed project are:

- To identify the physical impacts of different intensities of pasture use and forest cutting on the dynamics of forest, steppe, riparian zones, and streams in tributary valleys of Lake Hovsgol.

- To define how those impacts interact and are affecting the melting of permafrost, soil characteristics, and plant and animal biodiversity.
- To inventory climate change effects in ecosystems of HNP.
- To determine sustainable resource use patterns that will improve land management and also protect biodiversity, permafrost and soil/forest sequestration of carbon, and possibly lead to programs for the rehabilitation of certain areas.

Questions that are central to achieving these objectives include:

- What are the physical impacts of alternative nomadic pasture uses, forest loss and climate change on the wetland, stream and lake ecosystems of HNP and how do they interact?
- Within forest, steppe, riparian zones and aquatic habitats, how are these impacts affecting permafrost melt, soil moisture, water chemistry and altering plant and animal diversity and ecosystem function?
- What land use practices have the greatest impacts within and outside the ecosystems where they occur, which have the least, and how can an understanding of these relationships lead to sustainable use of resources?
- Will altered land use practices lead to a recovery of damaged valleys, reducing ecological impacts among the ecosystems and slow the rate of permafrost melt in impacted valleys?

The answers to these questions will both be immediately applicable to HNP itself, and of considerable relevance to conservation management across over a dozen countries eligible for GEF funding.

1.2 Current Situation

In and around HNP different patterns of livestock grazing are present in the numerous tributary valleys of the Lake. Some herdsmen maintain more traditional ways of grazing their livestock on upland hill slopes, allowing livestock to enter streams only in a few selected spots. Other herdsmen allow their livestock to graze freely in riparian zones where there are shade trees and a lush growth of grasses and sedges with a higher-than-normal sodium content. In the past, stream valleys were protected from summer grazing, and the grasses in valleys were cut in September for winter fodder. There are also differences in occupancy, with some herdsmen grazing their livestock in the valley only during the summer, moving to Soum centers or steppe areas with working wells, while others remain sedentary in the valleys year round. The impact on local forestry resources of the Park are greatest in valleys with sedentary families, because of their use of winter fuelwood, and starting grass fires in the early spring to promote young growth. Another recent change is an increase in numbers of livestock. During the difficult economic period of the 1990s, herdsman were encouraged to increase their herd sizes; notably the number of cashmere goats. At the same time, export of meat to Russia was substantially curtailed. These two processes led to a rapid build up in herd sizes and increased pressures on pasture resources.

When the two major towns on the Lake, Hatgal (south end of lake) and Hanck (north end of lake), were included within the Park boundaries, local citizens had limited options for sustainable livelihoods. The import/export trade with Russia that ended in the late 1980s had made Hovsgol one of Mongolia's most successful economic centers. Export of livestock also slowed as a result of import laws and economic problems in Russia. Recently, people have had to leave Hatgal for jobs elsewhere and residents inappropriately blame the Park for the changes. A substantial level of animosity exists between the Park and the local citizens and this has made it difficult to enforce Park regulations. Further, the small size of the Park staff and the inadequate budget

makes communication with people living in HNP difficult. Currently the developing environmental problems of HNP, and their long-term implications, tend to be ignored by all levels of government and the people in the Lake's watershed.

While little can be done to alter the immediate course of climate change, protecting vegetation cover by promoting certain land-use practices can slow the rate of permafrost melt by retaining the insulating capacity of vegetation. The protection of land cover vegetation is fundamental to maintenance of permafrost, and to the protection of Mongolia's water resources, biodiversity and natural ecosystems. On the other hand, attempts to eliminate grazing within the Park, a strategy that has failed in other protected areas of Mongolia, will antagonize the community against the Park. Similar land use problems that are just beginning to appear in Mongolia have persisted and are worsening in other areas of Central Asia and southern Siberia, as pasture use becomes more sedentary. Nomadic pasture use in Central Asia has been shifting away from low-density sustainable grazing with sustainability, towards larger herd sizes and "over-grazing". This leads to a disruption of upland vegetation and bare, easily eroded soils. Riparian zone soils are compacted, eroded, and no longer hold moisture or retain nutrient chemicals. Aquatic biodiversity taxa are very sensitive to riparian zone disturbances. Eutrophication of stream and bay areas of the Lake can already be seen in six embayments where grazing is most severe. These conditions in HNP and elsewhere threaten Mongolia's clean water resources and encourage the spread of diseases (e.g. *Giardia* and *Cryptosporidium*), posing threats to local people and future tourism opportunities.

The significance of the proposed work extends beyond the National Park boundaries because permafrost melt represents a global threat to boreal forests and the hydrological balance and the 'Siberian' taiga forest represents almost 20% of the world's forestry resources and serves as a major carbon "sink" for the whole Northern Hemisphere. The information gained from the proposed research will be transferable to other areas of Mongolia and to other cold semi-arid regions of Central Asia.

The Mongolian Academy of Sciences (MAS) is the lead scientific agency responsible for obtaining scientific data on environmental resources. Scientists from MAS and the National University combined with Russian scientists to organize scientific expeditions to Lake Hovsgol between 1970 and 1990 to study climate, hydrology, ecology and economic resources of the basin. Since that time evidence of poor land use practices have substantially increased throughout the Country, so much so that by 1996, Mongolia's Biodiversity Conservation Action Plan recommended study of sustainability of pasture lands and forests. At the request of MAS, the Mongolian Council of Ministers in 1997 established a Long-Term Ecological Research (LTER) Network with the mandate to study environmental problems that affect stressed natural and economically important ecosystems and recommend solutions to mitigate impacts and to encourage sustainability of resources. Lake Hovsgol is the first LTER site, and the present proposal is one of the first programs to address this mandate. The proposed project thus adds value to ongoing work and will both feed on experience already gained, and feed into future work in the area.

HNP has been receiving assistance from NASA ($280,000) for acquiring, digitizing and interpreting Landsat 5 and 7 images, and using a grant from USAID/Department of Interior these are being compared with old Russian land use/topo maps of the area. The USAID grant has also allowed professional exchanges among US National Park Service and HNP staff, for some water quality monitoring of the Lake, and for development of infrastructure for tourism.

This project is one of three different types of GEF projects being prepared in the Altai-Sayan area of Mongolia.

- A full UNDP-GEF project for the Conservation and Sustainable Use of Biodiversity has been prepared by WWF for the Altai-Sayan Ecoregion.
- A GEF MSP, the Eg-Uur Watershed Conservation Initiative, is under preparation in a watershed to the east of Lake Hovsgol. This is a private sector/community conservation project implemented by the International Finance Corporation/World Bank and concerns a community of riverine aquatic biodiversity which is not found in the Lake.
- The current proposed targeted research project is distinct from those above (and from other Mongolian environmental projects including the UNDP-GEF project in Eastern Steppes of Mongolia) because it is targeted research aiming to address the combined impacts of overgrazing, deforestation and climate change in an area with permafrost and of high existing and potential ecotourism activity. The research project complements on-going water quality monitoring in the Lake Hovsgol Basin, supported by MAS and by the U.S. Department of Interior, and will focus on eight tributary streams with in-depth analysis of impacts.

1.3 Expected Project Outcomes with Underlying Assumptions and Context

The main outcome of the of the research will be an objective assessment of the physical, biological and human dynamics affecting the shifting transition zone between the taiga forest and the steppe. The proposed project is based on the overriding assumption that researchers, local government agencies, communities and individuals will cooperate and make decisions that will be in accordance with the goal of the project. The consultation and community participation, especially in the finalization of project design, should ensure that the project is given support and the involvement of stakeholders during the project should sustain that cooperation. Other risks/assumptions are given in section 1.5.

Regional and global benefits of conserving significant biodiversity in Mongolia and elsewhere in Central Asia. The research will point the way to the means for the recovery of riparian zone soils and vegetation diversity, improved water resources, increased productivity of grasslands, regeneration of forests, and a reduced rate of permafrost melt. These tangible achievements will have relevance elsewhere in northern Mongolia and Central Asia.

Databases and models to assist the prediction of impact intensity of various livestock numbers and combinations, and different timber-cutting regimes. The targeted research will collect empirical data to promote the understanding of environmental sustainability in the HNP region. The data will be used to develop conceptual and linear regression models to evaluate and predict the impacts of varying levels of anthropogenic resource use and livestock numbers on forests, steppe, riparian zones and streams. The data collected will be contrasted with the impacted valleys to provide predictive information on permafrost melt and the rates of decomposition of organic matter in disturbed lands with permafrost soils. These data can be used to predict release rates of sequestered carbon for this general region, and will be contrasted with results from other localities around the world.

Alternative patterns of resource use to protect biodiversity and to sustain ecosystem function in soils, riparian zones and streams. The above results will be correlated with the information on anthropogenic activity, livestock grazing, and other land use practices to define those activities that have the greatest and least impacts. By studying ecosystem functions such as primary production, biomass, soil water retention, nutrient retention, optimal levels of resource exploitation that allows use, but without abuse, of the environment will be estimated. The economic analyses will allow the selection of viable alternative land use strategies.

1.4 Activities and Financial Inputs Needed to Enable Changes

Baseline Characterization and Monitoring: This component will focus on:

- Monitoring of all tributary streams entering the Lake, and of the Lake itself, for water quality changes
- pasture uses and climate change (five years) and their impacts in eight tributary stream valleys of Lake Hovsgol,
- evaluation of damage caused by livestock grazing patterns, tree cutting and fires in valleys on biodiversity and permafrost,
- characterization and monitoring of soil, permafrost, terrestrial vegetation, hydrology and chemistry of stream water, wetlands and Lake bays of the stream valleys, and
- characterization and monitoring (five years) of biodiversity and definition of ecosystem function.

The incremental cost for this activity is $340,000, all of which $340,000 is requested from GEF.

Measurement of Climate Change Impacts. This component will allow the definition and monitoring of valleys unoccupied by herdsman and used to determine how climate change interacts with different land use practices in inhabited stream valleys by calculating carbon sequestration (soil organic material) of present soils, and for different treatments of land-cover disturbance and permafrost melt.
The incremental cost for this activity will be $230,000, $200,000 of which is requested from GEF.

Impact Mitigation Assessment. This component will determine the means of improving land use practices in selected valleys in order to sustain the forest, riparian zones and steppe under different numbers and types of livestock. Economic analysis of alternative land use opportunities will be developed to insure selection alternatives are viable.
The incremental cost for this activity will be $150,000, all of which is requested from GEF.

Workshops, Reporting and Dissemination**:** This component will produce clear and visually attractive publications for herders, and run workshops in community centers on research findings and cost benefit analysis (in addition to normal reporting). Another major outcome of this component will be to host a workshop on impacts of grazing practices and climate change to discuss the outcome of the case study in Hovsgol and make broad recommendations for similar forest-grassland ecotones. Workshop invitees would come from countries across Eurasia with forest-grazing conservation issues (including GEF OFPs). Disseminate this information widely.
The incremental cost for this activity will be $185,000, $115,000 of which is requested from GEF.

Total incremental costs are $924,000, of which $804,100 is now requested from GEF ($24,900 already granted under PDF A).

1.5 Sustainability Analysis and Risk Assessment

The sustainability of the project will be insured by the strong support of the Mongolian Government and particularly from the Ministry of Nature and the Environment (MNE), once the program is approved and implemented.

In addition to the financial support of the GEF, the leaders of the project will apply elsewhere for support to sustain additional activities, as needed. It is intended that monitoring started at the beginning of the project will continue as part of the Mongolian LTER effort. Support for this will be sought from private foundations and the U.S. Government.

The major risks in the project and remedies include:
A poor experimental design. Those involved in the project are and will continue to work with statisticians to insure that the design represents a good ANOVA and/or multiple regression design, and that sampling is accomplished in the most efficient manner. However, the design cannot be completed until the actual variability in pasture use among valleys is understood.
Reluctance of the herdsman to participate in the project. Agreements must be established and maintained for their involvement. Experience on other environmental issues such as setting fishing limits, has been very positive assuming that local individuals see the benefits of such a change. In other areas of Mongolia, an enthusiastic response by herdsman when asked to join a *Khot ail* or communal group consisting of a few ger families for the purposes of establishing guidelines for pasture use has been reported.
An inability to distinguish impacts of alternative land use practices. This is unlikely because substantial differences in the valleys during our prior work have already been observed. Nevertheless, all pasture practices will need to be monitored throughout the study to insure few changes in treatment effects until best practices are defined.
A risk that herdsman will not modify their behavior following identification of best land use practices. Again, assuming that co-management groups are established, experience has been that the local citizens are anxious to protect the Lake and they want tourism, particularly if they can see ways that local people will benefit. Therefore they are likely to cooperate. All information regarding the results and recommendations from the project will be published locally and this will be very important in having improved land use practices adopted.
Changes may be so slow as to be undetectable over a five-year period. The impacts have been very dramatic during the last five years but it is believed that herd sizes have stabilized or at least will not continue their steep rise. It will soon be possible to export animals to Russia. This possibility may encourage herdsman to raise even more livestock. This must be monitored carefully, and if necessary, negotiations will be held with herdsman to maintain present conditions during the study period. It is believed that it is still possible to reverse the impacts in most valleys. Furthermore, by fencing off the lower reaches of some stream systems early in the study, it should be able to see rapid improvements.

1.6 Stakeholder Involvement and Social Assessment

Land use practices and sustainability issues in and around HNP were discussed in different fora in the countryside with herders, as well as in Hatgal and Hanck with administrative officers and political leaders. The last of these stakeholders were particularly concerned about the environment, and the mayors of both communities encouraged the preparation team to focus on environmental protection issues and they confirmed that they believe tourism can help their economies. These consultations revealed that at Hanck, one of the city council members has kept invaluable records on cattle, forest cutting, and an increase in algae growth in nearby tributary streams entering the Lake. The preparation teams also met with citizen groups in Hatgal and Hanck and with fishing groups along the west side of the Lake, all of whom voiced concern for land use problems.

The team gave presentations and solicited input at MNE-sponsored workshops in Hovsgol Aimag to discuss these issues. Invariably, local people spoke strongly of their love for the Lake and of

their desire to protect it and support for the research – and of their need for economic support. They see tourism as very important in the future economy, and recognize that it is important to protect the Lake and its watershed to attract tourists. One result of these discussions has been a recognition that whereas older herdsman have continued to use traditional practices, younger herdsman who have recently moved into the Lake area, are totally unaware of good land use practices.

2. Incremental Cost Matrix

	Baseline	**Alternative**	**Increment (GEF and other)**	
Global Environmental Benefits	Park management, reduced poaching, protection of environmental resources.	Evaluation of impacts of alternative land use on biodiversity and permafrost melt.	1. Capacity building training of young scientists to work on ecological assessments in field. 2. Identify best land use practices for protection of significant biodiversity. 3. Measure permafrost melt and impacts on taiga forest. 4. Define impacts that accelerate melt of permafrost. 5. Measure carbon sequestration in permafrost soils, and loss rates of soil carbon as permafrost melts.	
Domestic Benefits	GIS analysis (USAID) based on NASA mapping. Develop base topographic and land cover maps for Park GIS. Develop infrastructure for tourism using USAID-Dept. of Interior funding	Database and GIS additional Database overlays from detailed analysis in eight tributary stream valleys of the Hovsgol Basin.	1. Monitoring and evaluation of permafrost, soils, riparian zones, stream hydrology, distribution of important plant and animal species in eight tributary streams. 2. Provide information for co-management groups to develop guidelines for best land use practices for the Park and for Mongolia. 3. Establish new strictly protected areas in wetlands and riparian zones to protect freshwater flow into the Lake and as a water source for Mongolia. 4. Provide additional biodiversity and ecological information for development of tourism in the Park.	
Costs			**Non-GEF**	**GEF**
Park management	$87,500 (GoM) $290,000 for FY01, plus unspecified additional amount expected for FY02 (USAID-DOI)	$377,500	0	0
Baseline characterization and monitoring	$72,500 (GoM) $60,000 (USAID-DOI)	$472,500	0	$340,000
Measurement of climate change impacts	0	$230,000		$200,000
Impact mitigation assessment	0	$150,000	0	$150,000

Regional workshops, reporting and dissemination	0	$185,000	$70,000 (GoM)	$115,000
PDF A Activities	0	$49,900	$25,000 (GoM and Acad. Nat. Sciences Philadelphia)	24,900
Total	*$510,000*	*$1,464,900*	*$95,000*	*$829,900*

3. Budget

(Not including the $377,500 associated co-financing for Park management)

Component	**GEF**	**Other sources**	**Project total**
PDF:	24,900	25,000	49,900
Personnel:	150,000	102,500	252,500
Subcontracts:	250,000	0	250,000
Training and institutional support:	35,000	70,000	105,000
Equipment:	190,000	30,000	220,000
Travel:	125,000	30,000	155,000
Miscellaneous	25,000	0	25,000
Project total (PDF + project costs):	829,000	227,500	1,056.500

4. Implementation Plan

Duration of Project (in months):	
Activities	Project-months
Completion of project activities	6 12 18 24 30 36 42 48 54 60
Monitoring	
Workshops/consultations and final project design	---
Climate Monitoring	----------
Permafrost Monitoring	----------
Soil Studies	----------
Hydrology	----------
Forest distribution and condition	----------
Grassland distribution and condition.	----------
Study Reviews	
Impact Assessment	X X X X X X X X X
Forest	
Grassland	
Terrestrial Biodiversity	----------
Aquatic Biodiversity	----------
Fencing Experiment	----------
Study Reviews	----------

Economic Costs and Benefits Analysis	X X X X X X X X
Reports to Public (talks/articles)	
Study Reviews	----------

Final Reports, Brochures, Workshops, Publication of results.	---------- X X X X X X ----------

5. Public Involvement Plan

5.1 Stakeholder identification

The initial workshops/consultations will be the means of fully identifying the stakeholders. It is expected that the major stakeholders who will be involved in the project will be local herdsmen living in the study valleys of the Park. However, local communities who would most likely benefit from the growth of ecotourism in the area are also stakeholders; if the pristine conditions of the Park are destroyed it will jeopardize future income from tourism. Obviously, local and regional political leaders will also be interested in the outcome results of the study. For the herdsmen, their involvement will be direct because they will provide input into the methodologies, be engaged in data collection, and throughout the project will be asked to provide information on the costs and benefits of their activities within the Park.

5.2 Information dissemination and consultation

The information gained from this study will be disseminated to local herdsman within and beyond the project area, townspeople, elected officials, local and national media, MNE at HNP and UB, and representatives of the scientific community. In addition to regular reports that will be given to the Ministry and the Mongolian Academy, two means will be used to disseminate information. First, forums will be organized in the Soums surrounding Lake Hovsgol and its buffer zones to discuss the project itself, what it hopes to accomplish, community support needed and for feedback and suggestions. Second, illustrated booklets will be developed and published of the study's major findings and recommendations. These will be distributed throughout the Hovsgol Region, and be made available to the MNE for distribution elsewhere in Mongolia. Throughout the development of this information dissemination, we will continuously consult with local groups for "feedback" regarding the feasibility of implementation and to review "costs" of the recommendations from the study.

Herdsmen in the valleys selected for the targeted research will be contacted early in the project to obtain their advice, support and involvement. Workshops with local groups in all Soums will be held throughout this project, and will be extended up to the Aimag Government's office. The Mongolian Government's strong endorsement of the Long Term Ecological Research concept as a means to understand environmental problems and identify solutions, has led us to pursue the present targeted research effort.

5.3 Stakeholder participation

Local herdsmen will be involved from the very beginning in designing the study and in its execution. Their input is essential to realizing the objectives of the study, to improve land use practices in a way that will protect the National Park and encourage the development of a tourism-based economy. Members of local communities will be encouraged to become aware of

the goals of the study and to participate as possible in its effective development. As the project develops, alternative solutions to reducing grazing pressure, fires and forest loss, and degradation of riparian zones and the Lake, will be discussed with local citizens in all Soums of HNP, and socially and culturally relevant products will evolve from this.

6. Monitoring and Evaluation Plan

Responsibility for monitoring and evaluation will be taken by the Steering Committee comprising representatives from the National Park, local MNE office, Aimag and Soum governments, MAS with the Project Manager acting as Secretary.

Prior to beginning annual operations, a proposed plan with benchmarks and indicators for the year will be prepared, discussed with the scientists, presented to the national/international Scientific Advisory Group (to ensure quality), and to the World Bank. The year's activities will also be discussed with the local herders so they are aware of, and can have input to, all activities in their valleys.

The Project Manager will maintain a schedule with designated deadlines for completion of specific activities, and for the completion of progress reports for forwarding to the Steering Committee, the national/international Scientific Advisory Group, and the World Bank.

Part of the project budget has been allocated to annual Steering Committee meetings and to the costs of the Scientific Review Committee.

Targeted Research proposal: Biodiversity Loss at Lake Hovsgol
Annex: Research Methodologies

Prepared by J. Tsogtbaatar and Clyde E. Goulden

1. Study Sites

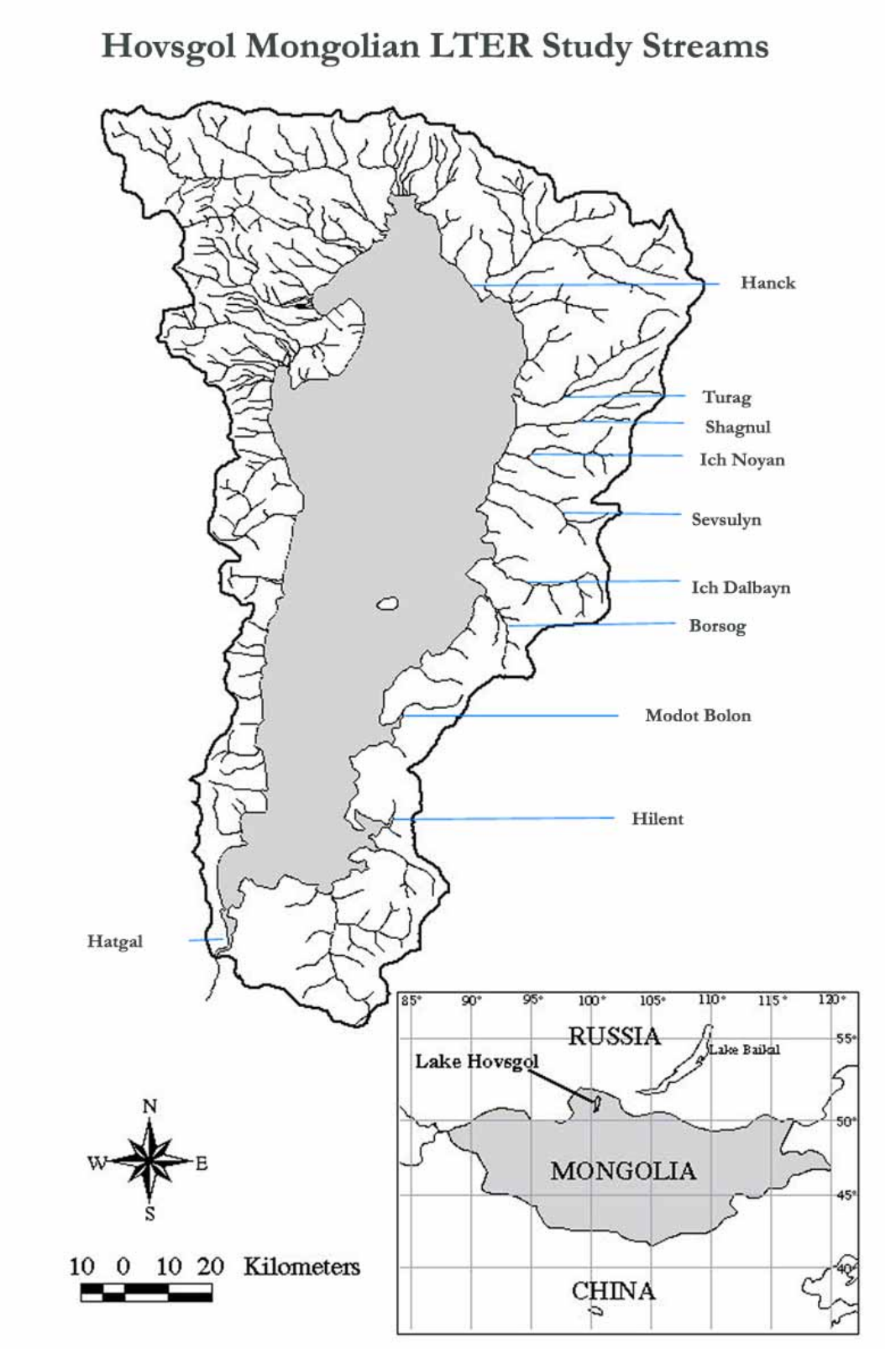
The targeted research will study eight stream valleys along the eastern shore of the Lake (Table 1). These are selected from twenty-six tributary streams and numerous smaller intermittent streams that enter the Lake. The eastern shore streams have similarly structured valleys with meandering flows into wetlands prior to entering the Lake.

Table 1. Eastern Shore Tributaries (from north to south) for proposed GEF program, Lake Hovsgol, Mongolia. NPU = Nomadic Pasture Use.

Stream	Coordinates	Length (km)	Area of Watershed (km^2)	Impacts/Condition
Turag gol	51.30492N 100.78981E	23	231	NPU moderate in hills. 8 family gers
Shagnuul gol	51.25622N 100.84789E	18	110	NPU heavy in valley 8 family gers
Ih Noyon gol	51.21284N 100.75759E	21	118	NPU heavy in hills 4 family gers
Sevsulen gol	51.16615N 100.74839E	23	140	NPU moderate in valley 4 family gers
Ih Dalbayn gol	51.03894N 100.72843E	27	161	NPU low 2 family gers
Borsok gol	50.99159N 100.71057E	11	69	No NPU 1 family ger (a hunter)
Monine gol	50.81966N 100.64746E			No NPU No gers
Hilent	50.70079N 100.52441E			NPU very heavy in valley 9 family gers

2. Study Methods

The methods outlined below are preliminary and will be refined at a research design workshop. The project will be discussed with herdsmen in each valley to seek their input to refine the methodology and design, and to obtain their support and participation in the study. Previous research in the area has also revealed individual herdsmen who are inclined to document environmental changes. The project will enlist their help and these herder-researchers will work with fellow herders and so inadvertently promote the development of environmental understanding.


Hovsgol Mongolian LTER Study Streams
Hanck
Turag
Shagnul
Ich Noyan
Sevsulyn
Ich Dalbayn
Borsog
Modot Bolon
Hilent
Hatgal
N
W
E
S
10 0 10 20 Kilometers
85°
90°
95°
100°
105°
110°
115°
120°
55°
50°
45°
40°
RUSSIA
Lake Baikal
Lake Hovsgol
MONGOLIA
CHINA

The study is based on existing variations in land use practices and stocking rates along the Lake's eastern shore. This allows the valleys to be used as treatments along a gradient, ranging from heavy activity in valleys nearest towns to little activity in valleys farthest from towns. Activity levels can be characterized by (1) the number of livestock units (SSUs[1]), (2) grazing behavior in valleys, (3) nomadic or sedentary behavior, and (4) loss of forest.

Valley "treatment effects" or activity levels (independent variables) can be contrasted with reference valleys with little activity to define significant deviations by ANOVA. Within the east/west trending valleys, forested and steppe slopes are nested separately. However, the gradient of changes in dependent variables among valleys with different activity levels can best be analyzed by multiple regression. Multiple dependent variables can be pooled using canonical correspondence analysis and the coefficients used in regression which allows the variance of dependent parameters to be partitioned among the independent parameters to better define cause and effect relations. Methods will include development of Standard Operating Procedures and Quality Assessment/Quality Control to ensure comparability of data collection methods among valleys.

Standard Stocking Units are considered as a means to initially review the project data for trends and will be used only to generalize the dataset as an independent variable in a regression analysis. The field studies will collect detailed information *by species* on seasonal grazing behavior, grazing species preferences, extent of trampling, effect of input of dung[2] and how dung amounts and distribution may vary among yak, cattle, goats, sheep, and horses, and mixed herds. The number of cashmere goats has greatly increased during the last two years in some, but not all, of the valleys adding substantial new impacts. The more detailed information will be used as independent variables in the analyses, but without the full statistical design of the project, it has not been determined the best approach for this, but will be discussed during a Design and Methods Workshop and in discussions with local herders prior to beginning the field monitoring.

It is of vital importance that herders are included in the project at its onset. Without significant empowerment, the local population will perceive that "outsiders" are taking over and the project will be in danger of having little societal impact. The local herders recognize themselves as the true caretakers of their environment and consequently the "real" experts. The local herders recognize themselves as the true caretakers of their environment and consequently the real experts. However, herders are not a uniform group; when some herders' perception is that natural resources are resilient and inexhaustible, or when they seek affluence regardless of environmental costs (as is the case among some new herders) then environmental damage can ensue and the project will have to engage in dialogue with them and share views. Precedent data indicates that there are also forward-thinking individuals among the local population.

The target region has experienced a recent significant increase in both human and livestock populations. This is mostly due to migrations from surrounding soums. The negative impact upon the environment in some project zones is due to livestock exceeding the carrying capacity regardless of herding practices. Project concerns would then need to be extended into surrounding soums.

[1] - SSU—Standard Stocking Units, equivalent units that in Mongolia equate horse, yaks, cows, and goats as number of sheep

[2] - dung tends to be collected and burned; but it is a very important variable especially if it is collected for burning in some valleys but not in others

Therefore, at the very beginning of the field work, discussions will be held in the field with herdsmen about their herding practices, and what they believe to be good and bad land-use practices. Their concepts and indicators will be documented and incorporated into the project design. Observed impacts of different land use practices will be discussed and evaluated with herder groups. The East Asian International Long-Term Ecological Research (LTER) network will meet at Lake Hovsgol in July 2001 providing the opportunity to have some of the very best ecosystem and terrestrial ecologists in the world participate in a Design and Methods Workshop to review and refine the design of this targeted research program. More specific methods and analyses, including how to analyze information for specific grazing animal species, will be important topics for discussion at the workshop.

A draft methods manual will be prepared following the LTER workshop and discussions with local herdsmen will further refine the design and this will also serve to enlist the help of the herdsmen in each valley in gathering information on behavior and health of their grazing animals; i.e., the number of animals of each type, where the animals graze, how much time is spent in an area, where do animals get water, and how fast young animals are growing, and how rapidly adults are gaining fat. Actual field analysis by the team will verify the number of animals of each species, and timed observations should verify the behavior of the animals. The herders will also assist in the interpretation of the results.

A. LAND USE MAPPING

Grazing and Forest Use
Grazing and forest use will be timed and recorded by herders for one week each month in each valley. Participatory time allocation study methodology and diary recording techniques will be used. The information gathered will describe and map the behavior of herdsmen and their livestock, noting the number of each livestock species, when and where they feed and behavior patterns in riparian zones and streams. Forest loss due to tree cutting or fires will also be mapped and recorded. This information , location and timed movements, herdsman days in valley, and percent of forest loss) will be used to define annual activity levels.

Comparable sampling transects in each valley will be established consisting of a single 100 m deep cross section of the valley from forested hillside, through the riparian zone and stream, to the steppe. Permanent monitoring locations in each habitat (forest, steppe, riparian zone, stream) along the transect will be used to characterize land use impacts. Measurements will be augmented with fixed-point photography to maintain visual records of change.

The proposed monitoring in the steppe areas of each valley will provide detailed information on both the grazing pressure (density of livestock by species and monthly distribution) and on the long-term spatial variation in range-land condition, biomass and species composition. Consideration will be given to constructing experimental exclosures in each of the zones that will exclude livestock. This will provide further information on the effects of grazing pressure on the steppe.

Land cover at fixed points along the cross-valley transects will be monitored by a combination of a “point quadrat” method and “clipping plots”, both methods found to be most effective relative to alternatives.

Alternative patterns of resource use
Having defined and monitored reference and impact sites in the tributary valleys, and recorded all activity as a baseline, the next step will be to fence off riparian and stream areas in two valleys

with similar disturbances and continue normal land use outside of the fenced area. Two valleys that are not seriously disturbed will also be fenced as "controls". Alternative ways to provide water for livestock will be established. These will include construction of wooden troughs filled with water by gasoline powered pumps, activation of wells, construction of cattle ramps to enter streams at specific locations (of otherwise fenced stream sections). Salt licks will also be established near the watering areas. The fenced areas will be monitored carefully to define the changes within the protected areas and measure resilience of biota in recovery from prior poor resource use. The other four valleys will not be altered but will continue to be monitored. This should allow us to quickly define responses to altered regimes in an array from full- to low-disturbance levels, and areas within fences that were previously disturbed but presently protected.

B. Biodiversity and Ecosystem Function

The aim of this component is to define zones of physical impacts in forests, steppe, riparian zones. This will lead to defining impacts on biodiversity and ecosystem function. Ecosystem function will be defined in terms of biomass, yield or primary production, ability to protect soil and permafrost, and for riparian zones, ability to protect water quality (suspended sediments and NH_3 are particularly good indicators). Annual biomass yields will be measured in random samples from plots, and aquatic habitats in the stream valleys. Net primary productivity will be measured as yield (terrestrial) or as oxygen production in aquatic habitats. Leaf Area Index of canopy and ground vegetation will be measured by LAI-2000. Chlorophyll (biomass) in aquatic habitats will be measured by fluorometry. Estimates of net ecosystem productivity will use the LTER and WMO joint method. Sustainable conditions for streams and resilience of the biota (ability to recover from disturbances) will be defined in fencing experiments that will fence off reference and disturbed streams and riparian zones following initial baseline characterization.

Forest

Tree stumps from cut trees or the presence of deadfall and burned stumps from fires can define the original boundary of the forest at low elevations in the mountains. Numerous fires in the region cause major mortality among young trees at the forest-steppe transition and usually at lower elevations so that it is unlikely that larch is able to regenerate. Forestry experts estimate that a young larch seedling requires 20 years to be established.

In permanent grids of 100 x 100 m, the following variables will be sampled (a) tree species and density, (b) seasonal changes in canopy leaf area index (LAI), (c) growth rates of trees (dendrochronology methods), (d) seedling growth rates and survival, (e) survival from fires, (f) area covered by sheep walks, and (g) location and area of erosion channels will be measured on a monthly basis during the growing season. Sustainability will be based on estimates of forest area and mean annual increment (MAI) or current annual increment (CAI) and the growth of seedlings.

STEPPE

Point quadrat methods consist of either throwing a dart backwards over the shoulder along a line of the transect, or using a pin frame. At each spot, measurements are taken within the frame: basal or crown cover of plants, and bare ground, litter, stone, or basal plants, canopy – either grass, forb, shrub, or tree; C_3/C_4 plants, state of growth; and category of use by livestock. In addition various parameters of soil condition and erosion will be estimated.

The time required for each monitoring method at each transect will be noted as part of the initial attempt to develop a power analysis of number of samples required, and the time investment. The presentation of data will include the mapped locations of all permanent transects, spreadsheets

with transect data in raw and summarised form, and summary tables of data enabling easy comparison of transects.

This system will be incorporated into the monitoring program by placing a set of cross transects along each valley transect. Six cross transects will be selected in steppe grassland for **each** valley transect. A full set of grassland monitoring data will be collected from each transect, making 48 transects in all spread over the eight valleys.

To fully evaluate the effects of fire on rangeland health, fire effects will be investigated on an opportunistic basis within the monitoring zones. If wildfires pass across some of the replicates, multivariate statistical techniques may reveal the separate influences of fire and grazing pressure.

The following collecting methods will be used to gather information on the condition or composition of the steppe.

a) The location of all permanent transects will be permanently marked. A combination of GPS fix, compass bearings on landmarks, and a description of position relative to local features, can be used to aid detection of the markers. The direction of the transect should be checked by compass.

b) The method for measuring plant species frequency will measure species at the canopy rather than at the base. This type of measurement is commonly accomplished with the use of a pin frame. Pin frames are easy to construct and use and there are additional benefits over current methodology, particularly in the reduction of human bias.

c) The point quadrat method will also be used to measure soil, litter and basal cover. Visual descriptions and photographs of each site will be included in the overall methodology.

d) Two strategies are possible in the use of point quadrats for cropping, one based on a fixed number of point quadrats and one based on a fixed number of contacts with whatever is being measured. In practise, the number of quadrats used will be a compromise between the numbers that are practicable and the precision required for measuring the cover of less abundant plants.

e) Because the clipping and separation of herbage is time-consuming, only ten samples from each quadrat will be collected. The data will be reviewed continuously. Rather than bulking the ten samples the clippings from each sample will be kept in separate bags, dried and weighed separately for biomass estimates. This will greatly strengthen the power of statistical comparisons between transects (enabling the estimation of variation in biomass within sites and between sites). In view of the time required for separating components of the sward into forbs, grass and litter before weighing, this procedure should be considered as optional. If separation is attempted, the recommended procedure for sub-sampling is to thoroughly tease out and mix the sample, divide it into quarters, and then recombine the diagonally opposite quarters. One of the resulting two portions is set aside. The process is repeated on the remaining portion as often as necessary to achieve a sample of suitable size for separation into components.

f) An important character of pasture in ungulate studies is the canopy height. This is the average of a number of measures of height in which a light disc or other marker is lowered down a graduated rod or rule until it first touches a leaf or stem. Canopy height has been found to be the best single predictor of habitat choice by grazing ungulates in Africa out of a set of some 40 different measurements. Visual methods of estimating plant height are highly subjective and will not be used in quantitative comparisons. A simple method of twisting a thick insulated electrical wire around a metre rule to form a sliding tongue will be used instead. The rule is placed in the

sample site and the wire is lowered into the canopy, the height of the first contact with a plant is read directly off the rule. If no plant is contacted, that measurement is taken as zero. This equipment will be used in conjunction with the point quadrat technique to estimate canopy height collecting 50 random measurements for each valley transect.

g) A burn category will be included, as possible, in the general site description at each transect which provides information on the time since the pasture burned and the presence of pre-burn and post-burn vegetation.

In addition, Species of crane flies and abundant phytophagous (grasshoppers and other grass eating) insects will be collected as indicators of impacts on biodiversity of riparian zones by sweep nets using a catch per unit effort procedure (so not to disturb soils and vegetation by digging). Birds and small mammals will be censused regularly along transects in all habitats.

Satellite imagery can provide extensive spatial and temporal information on grazed landscapes which is capable of separating grazing impact from seasonal variability and natural landscape heterogeneity. Medium resolution data of the type available from Landsat 7 can provide unique information on land use, land cover and the occurrence of wildfires. Landsat 7 images from 1999 and 2000 of the Hovsgol region are now being used for land cover maps, and Russian land cover maps from 1936 and 1947 are under analysis for comparative purposes. Additional images can be purchased during the proposed project. Ground surveys will be used to calibrate the various tones of the prints of each scene. All calibration has to be sorted out before the imagery is assigned categories, analysed and quantified. In combination with a GIS, the remote sensing method has the potential to further identify grazing-induced land degradation across valleys.

The use of remote sensing for rangeland studies has become a highly technical subject and extensive experience in the technology is required in order to use it successfully. The University of Maryland and the ICC institute of the Ministry of Nature and the Environment (Mongolia) are working on the Hovsgol area to interpret land cover images from Hovsgol.

Streams
Hydrology and water chemistry of streams, wetlands and Lake bays will be monitored at fixed locations along the stream between the transect and the Lake. This will include mapping the boundaries of all aquatic habitats. Stream hydrology will be measured at gauging sites above wetlands from discrete streams and outflow to the Lake (seepage can not be measured) and used to estimate hydrologic budgets. Evaporation rates will be measured using standardized methods with pans. Water quality measurements will be made in June, July, and September and will include temperature, suspended sediments, dissolved oxygen, CO_2, turbidity, particulate organic material, dissolved organic material, pH, total P—dissolved (PO_4) and particulate, total nitrogen, NH_3-N, NO_2-N, NO_3-N, Fe, Mn, Ca, Mg, Na, K, Si, SO4, CO3, HCO_3, Cl)— using standard methods (LTER and WMO [World Meteorological Organization]).

Algal biodiversity will be determined by studies of diatom diversity on diatometer slides. Benthic invertebrates will be collected, identified and biomass determined in three replicated 0.20 m^2 samples taken bi-weekly from each stream site at three fixed locations through the transect zone. Fish will be collected by seining and survival of spawn estimated to predict future yields under different stream conditions.

Sustainability Assessment
There will be null effects in reference valleys, impacts in populated valleys, changed and unchanged in fenced areas. Each site will be defined by observation, terrestrial net production (growth), Leaf Area Index or biomass, and biodiversity parameters. The most telling indicators will be declines in productivity of good food species in the steppe, recession of the forest, and a reduction of aquatic biodiversity. These parameters can be used to reject poor practice alternatives and to focus on best possible use practices that allow sustainable use of the valleys without losses of biodiversity. How soil temperatures and permafrost melt responds has yet to be determined. Application of fencing to damaged valleys will then determine the resilience of the endemic biota when impacts are removed.

Sustainable land use practices and stocking rates for the steppe and forests will be predicted from the collected data and models. Protection of permafrost conditions must be a component of forest and steppe sustainability. Sustainable conditions for streams should be defined as characteristic of natural, undisturbed conditions. Research in temperate regions suggests that if riparian zones are not disturbed, water quality, biodiversity and ecosystem function will be protected. However, comparable data do not exist for streams and lakes in boreal regions with permafrost. Sustainable stream systems will be characterized in reference valleys. Two disturbed valleys and two reference valleys will be protected by fencing riparian zones to determine if the endemic populations and ecosystem functions return in formerly damaged streams (now protected by fencing) and to measure resilience of the communities.

C. Climate Change Impacts
The aim of this component is to define climate change impacts and human activity impacts on permafrost and soil carbon storage and land vegetation cover.

Permafrost Depth
Permafrost depth and temperature will be measured at a permanent well site in each valley with continuous compact digitized temperature recorders. One hundred rod measurements will be made of frozen-ground depth within a series of grids in each habitat on a bi-weekly basis, following ITEX (International Tundra Experiment) methods. Soil temperature (10, 25, 50, 100 cms depths) to permafrost and soil moisture (bi-weekly) from beginning of thaw in the spring until freeze in the fall will be measured. Soil types (Russian system), particle size structure, compaction, organic content and carbon, pH, redox potential, chemistry (dissolved and particulate P, total nitrogen, NH_3, NO2, NO_3, Fe, Mn, Ca, Mg, Na, K, SO_4, CO_3, Cl), will be measured annually following LTER and WMO joint methods.

Carbon Sequestration
Soil organic matter will be measured annually at all locations and along with carbon biomass of vegetation, will be used to estimate changes in carbon sequestration due to anthropogenic activities and associated with permafrost melt. Protocols for calculating carbon sequestration recommended by the IPCC (Intergovernmental Panel of Climate Change) will be adopted in this study.

Climate Change
Simple weather stations will be set up in each valley to collect data that will be compared and calibrated with the long-term weather data sets from the weather stations in Hatgal (collected since 1963) and Hanck (collected since 1971) which show significant warming trends (1.44^{o} C in 33 years). We will measure air temperature (continuous), precipitation (amount and timing), winds (force and direction), and evaporation rates (periodically) throughout the study in each

valley near the wetlands and the Lake. Soil and permafrost temperature, and changes in the depth of the active zone will be measured weekly. The methods of WMO and LTER will be used.

Ground Vegetation Cover
Parameters to characterize steppe habitats will include monthly measurements in m^2 plots of (a) percent ground plant cover, (b) ground LAI, and annual measurements of (c) plant biomass and yield and (d) plant species. Parameters measured in riparian zones will include (a) percent plant cover, (b) plant species, (c) yield, (d) soil temperature, compaction, moisture content and redox potential. Vegetation cover and plant biomass (g/m^2) samples will be collected and analyzed to determine the variability within sample site and between sample sites to define sample numbers required. In general, however, three samples or measurements will be collected at each location for each parameter. Study methods will follow those prescribed in the WMO and LTER programs.

Sustainability Assessment
The results of vegetation, soil, and permafrost studies from undisturbed valleys will provide baseline conditions for climate change impacts. The impacts in valleys occupied by herdsmen will be contrasted with this baseline (contrasting permafrost depth, temperature, and soil carbon content as dependent variables rate), using regression, ANOVA and ANCOVA to define the enhancement effect of forest cutting, fires, and grazing on climate change impacts.

D. Economic analysis of alternative land use opportunities

The economic analysis will calculate the benefits accruing to individual herdsman, versus individual and regional benefits from sustainable land use alternatives, protection of biodiversity, and development of sustainable tourism in HNP. The benefits that will be calculated will include those from consumptive use by livestock or forest cutting (e.g., productivity), non-consumptive use (ecotourism), indirect benefits (carbon sequestration, ecosystem resilience), and non-use benefits or future use options (medicinal plants and genetic storage of endemics). Direct and indirect costs will be calculated for each of the different land use and management alternatives. Incremental costs associated with changes in land use, fencing, construction of watering troughs and costs of pumps and benzene, or construction of stream ramps for livestock will be included.

Costs associated with present land use practices will be obtained from herdsmen and from Soum centers where records are maintained for numbers of livestock, costs of maintaining herds and benefits from numbers sold or traded each year. Benefits from tourism will be determined from present income (virtually nil for herdsmen today) versus alternative scenarios of support with increased tourism dollars (such as purchase of trucks for small companies to pick up and take animals to market). All cost/benefit calculations will be calculated for each Soum to correct for costs associated with differences in distance to markets.

The costs of protecting medicinal plant and benefits will be calculated on the basis of the present value of medicinal plants and their potential yield under sustainable conditions in HNP, vs. the probability that a species will become extinct with current land use practices. Costs and benefits of aquatic biodiversity protection will rely on its value to attract tourism (due to perceived "pristine" condition) and on the estimated benefits of maintaining water quality vs. costs of water purification and estimated costs of disease care for human and livestock use of contaminated waters. Cost and benefits of carbon sequestration can be estimated from benefits of natural storage vs. retrofitting of industrial and power generating plants for countrywide carbon emission reductions, using IPCC protocols.

3. CAPACITY BUILDING

The project team will hire fifteen recent graduates from Mongolian universities as field and laboratory assistants for the five-year period of the project. The very best individuals available will be selected and if they remain throughout the project, they will be provided with opportunities (and the wherewithal) to attend graduate classes at the universities during the winter months (tuition is $500 per semester). They will also have the opportunity to participate in meetings, and if possible to study abroad and work with foreign scientists as a means to encourage them, using funds from LTER sources and from the National Science Foundation (US). The Mongolian Academy would like to see the best of these individuals become the next generation of ecologists for the country.

Local high school graduates will also be hired to expand the local knowledge base about the environment and the encouragement of environmental protection. The project will identify the most promising individuals. It has been very difficult for local students from the countryside to enter universities in Ulaanbaatar. This project should be a means to facilitate their entry into the university system. Individuals will receive training in the identification of studied biodiversity groups, e.g., grasses, forbs, bushes, diatoms, insects, birds and small mammals. Physical and chemical analysis of soil and water samples, and the study of permafrost will be included in training workshops. Collection methods and data analysis will also be carefully introduced to the entire group. Individuals will participate in all workshops, and will be involved in the preparation of written methods, experimental design, statistical analysis, and report preparation.

Past research have revealed additional untapped potential resources among the herdsmen. Grooms accompanying expeditions conducted over the past five years have shown interest in fieldwork. They have often developed into active assistants concerning the research activities. Although few of them have completed primary school and are past the age eligible for enrollment in secondary school, they have shown remarkable potential in academic pursuits. It would not be beyond the scope of the project to reinstate the “Distance Learning Education” program formerly practiced among some universities in Ulaanbaatar. It is entirely possible that such herdsmen could fulfill their potential in environmental studies while maintaining their livelihood as herdsmen. Their prospective contribution to the Park and project would be significant and would further the empowerment of the local population. Such herdsmen could then be an eventual resource as future park rangers or project team members.

This training will ensure that Mongolia will have the necessary materials and skills to continue such work in the future.

Annex: Research Methodologies

附件四：「北歐亞大陸地球科學夥伴促進會」議程：

http://ltpwww.gsfc.nasa.gov/neespi/meetings/interagency/interagenda.html

INTER-AGENCY NORTHERN EURASIA EARTH SCIENCE PARTNERSHIP INITIATIVE AND SCIENCE REVIEW MEETING

09-10 December 2004
WYNDHAM City Center Hotel
1143 New Hampshire Avenue,
NW, Washington DC 20037; (202) 755 0800
AGENDA

Thursday, December 09 – Day 1
8:30 *Registration* (outside meeting room - TBA; ***M. Coughlin and I. Koval***)
8:30 ***Morning Coffee***

***Meeting Opening*:**
9:00 Welcome, Review of Agenda & Brief Introductions - ***D. Deering, NASA***
9:05 Official Welcome ***C. Schmullius****, Chair, NEESPI Executive Steering Committee,* **Friedrich-Schiller-University, Germany** and ***A. Georgiadi****,* **Russian Academy of Sciences**
9:15 NEESPI Overview - NEESPI history, objectives, and general strategy and meeting objectives - ***D. Deering,*** **NASA**
9:30 Potential Value of an Integrated, Northern Eurasia Regional Research Program – ***R. Lawford****,* **International GEWEX Project Office**
9:45 *Earth System Science Partnership and Perspectives for the NEEPSI* – ***R. Fuchs,*** – **International START Secretariat** (to be confirmed)
10:00 Example of Potential NEESPI Collaborations – The World Bank and NEESPI -***A. Kushlin,*** **World Bank**
10:15 NEESPI Science Plan overview (including introduction of Science Plan presenters) -***P. Groisman*****, NOAA**
10:40 ***Coffee-Stretch Break Science Plan Presentations:***
11:00 – SP Part 1: Land Use Interactions, the Human Dimension and NEESPI -***D. Ojima,*** **Colorado State U**

11:20 – SP Part 2: The Ecosystem Approach to the NEESPI and the Carbon Cycle – ***H. Shugart,*** **U of Virginia**
11:40 – SP Part 3: Terrestrial and Coastal Ecosystems Interactions with Climate **– *P. Groisman*****, NOAA**
12:00 – SP Part 4: Cold Land Processes: Permafrost, Glaciers, Snow Cover – ***V. Romanovsky,*** **U of Alaska-Fairbanks**
12:20 – 1:30 Lunch (Wyndham dining room – lunch provided**)**
Working Lunch Presentations: 1) "Global climate change and its impact on the Earth…" *(~10 min.-movie)* 2) International Polar Year (Potential NEESPI Linkages) *(to be confirmed)*
Science Plan Presentations – continued:
1:30 –SP Part 5: Atmospheric Aerosols and Pollution – ***I. Sokolik,*** **Georgia Inst. Tech**.
1:50 –SP Part 6: NEESPI Science Plan "Highlights": External Review --***C. Vorosmarty****, Chair, External SP Review Committee,* **U of New Hampshire**
2:10 –European Commission Sponsored Research Relevant to Earth Science Issues in Northern Eurasia"
– ***I. Troen****,* **European Commission, DG Research, Directorate I – Environment**
2:25 –"From Siberia-II to NORTH: European Contributions to the NEESPI" -***C. Schmullius,*** **Friedrich-Schiller-University, Germany**
2:40 –"Russia Far East Research Programs and International Collaborations" – ***V. Sergienko****,* **President, Far East Branch, Russian Academy of Sciences**
3:00 –"Potentials for NEESPI Collaborations in the Ukraine" – ***V. Kosterin,*** **Ukraine President's Local Self-Governments Development Foundation; Supervisory Board, Transbank**
3:15 Coffee-Stretch Break

3:30 ***International Panel-led Discussion*** Topics on Northern Eurasia research, National and International Program Needs and Concerns, including

- relevant research programs of national agencies
- Issues associated with integrating across research programs
- Government agencies, science organizations, and private industry roles
- Means and methods for collaborations
- Identification of "accessible" partners
- Long term measurements/monitoring,
- Gaps in existing projects/programs and how they can be filled

5:00 General Q&A session ***(D. Deering, P. Groisman…)***
Presentation of Day 2 Agenda and Objectives
5:30 Adjourn Day 1

NEESPI Interagency Meeting, Day 2, Session
Friday, December 10
8:30 ***Morning Coffee***
9:00 Day 2 Agenda and Objectives

Available remote sensing data in support of the NEESPI –
V. Gershenzon, SCANEX, Russia

GLOBE in Northern Eurasia and Potentials for the NEESPI - ***E. Stonebraker,***

National Science Foundation supported research of relevance to NE –
A. Kerttula, C. Dudka, NSF

10:30 Coffee-Stretch Break
International Long-Term Ecological Research –
Hen-Biau King, Chair, ILTER

NASA's Research Programs and strategies for the supporting the NEESPI, e.g.,
LCLUC Program - ***G. Gutman, NASA HQ***
10:30 ***Coffee-Stretch Break***
10:45 Discussion: Potential Areas/Approaches for Participation in and Support of the NEESPI:

Agency/Organization Response:	Ukraine
Agency/Organization Response:	China
Agency/Organization Response:	Japan
Agency/Organization Response:	Russia
Agency/Organization Responses/US:	NSF
	NOAA
	USFS
	USGS NIH
	USAID
	NASA
	Dep of State, other
Agency/Organization Responses:	EU/EC
International Science Program Responses:	GEWEX
	IGBP
	GTOS
	ILTER

Next Steps – ***D. Deering***

NEESPI Interagency Meeting, Day 2, Session 2
13:30 ***Discussion of NEESPI Organizational Structure***
A focused workshop designed for primary meeting participants interested in participating in the further development of the NEESPI, becoming a NEESPI partner and potentially serving on the NEESPI Executive Steering Committee.
4:30 Adjourn Day 2

Remarks on the Development of of International LTER Network

ILTER

International Long Term Ecological Research

Hen-biau King
Chair,
ILTER Network

10 December 2004
Washington, D.C., U.S.A.

International LTER Network

The ILTER Network consists of Research Networks of scientists, collectively engaged and dedicated to multi- and interdisciplinary long-term and large spatial scale research and monitoring in ecological science including human dimensions.

Vision
Mission
Goals

ILTER

International Long Term Ecological Research

www.ilternet.edu

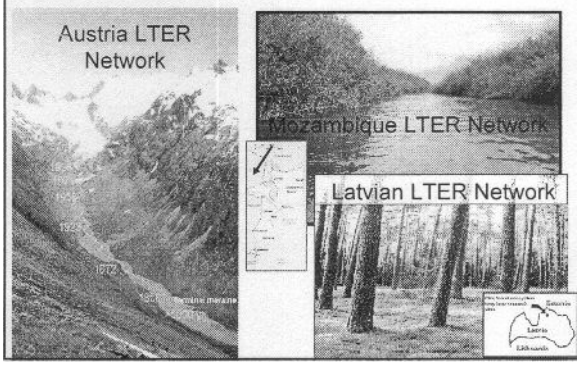
Introduction (1/2)

- The ILTER Network was formed in 1994. It currently has 30 member networks with more than 100 sites.
- Many more potential ecological research sites have followed the LTER similar concepts and conducted LTER-like research. Some are interested in and many are closely involved in activities carried out by ILTER Network.

Introduction (2/2)

- The numbers of member networks are likely to expand within a few years.
- International research collaborations among member networks will surely become more active.

Three New Member Networks



NEESPI Science Plan

Why Northern Eurasia?

This region has been studied in detail for more than a century by Soviet and Russian research projects, yet the abundance of data that has been collected has not been utilized enough to study these problems and is in danger of being lost.

Information Technology & Information Management

- If we want to make the ILTER a real network, we must have data available, accessible, and queryable.
- Such data will form a foundation for scientific and educational collaborations across member networks.

Current Goal

Towards building a compatible Information Management System (IMS) which could accommodate IM systems among sites of other Member Networks in the ILTER community

Cyber-infrastructure for Ecological Studies

- The technical advances in cyber-infrastructure have changed the way ecological research is conducted at local, regional and global scales.
- The advances by a number of projects have lead the way to real-time monitoring and analysis of global research.

Current major focuses of ILTER Network

Data Collection & Management

- Data should be collected, used, shared, and synthesized.
- Data should be passed to the generations to come as science legacy.

Promotion of ILTER

Capacity Building

- Cyber-infrastructure: Sensor/ SenserNet; IT & IMS
- Human Capacity Development: training, and education
- Cross-site Research Collaborations: Impacts of disturbances on landscape ecology, ecosystem management

Internet & Web Services

- Internet has the promise of solving difficulties of cross-site collaboration, sensors automation, and analytical services.
- We intend to develop standardized web services infrastructures to integrate geographically widely distributed and remotely located LTER sites.

Web Services

- We promote developing web services based information system for LTER sites' comparisons study
- We require not only collaboration of multi-disciplinary researchers but also integration and synthesizing of collected data.

Examples: WSN Applications

- An ecosystem ecologist collects data from 30 meteorological and stream flows stations located throughout 1760 ha in one minute instead of the 2 days it takes to hike to each of the sensors.
- A technician replaces a failing stream flow sensor within hours of the failure of its predecessor, thus avoiding a month or more of lost data;

- A stream biologist is able to use data from upstream flow sensors to increase the collection rate of downstream samplers so that the impact of a full flood cycle on stream chemistry can be assessed right at the peak of the flood;
- An ecosystem ecologist collects soil moisture data from 50 soil-moisture sensors located throughout 15 different watersheds over an area of 300 ha. in one minute instead of the two days it takes to walk to each of the sensors;

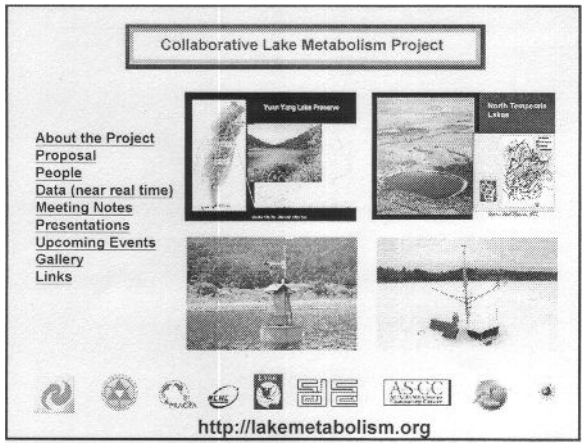
- An avian biologist is able to use audio data to detect the presence of birds in study sites from 20 different states without leaving her desk, and is able to confirm her tentative identifications by playing the calls of target species to stimulate responses at each location;
- A graduate student counting plants in a permanent plot is able to use an online key to aid in plant identification and can confirm difficult identifications via a videoconference link to their advisor.

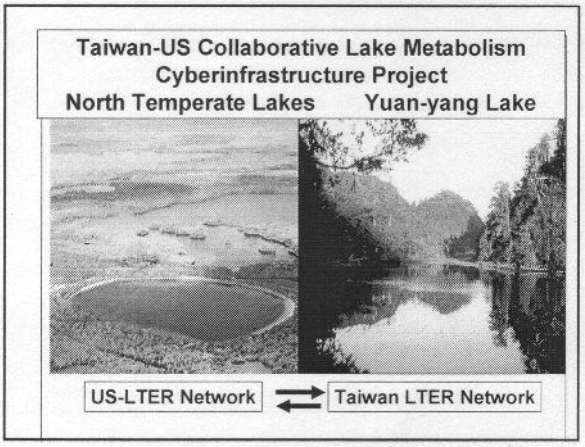
Lake Metabolism Project

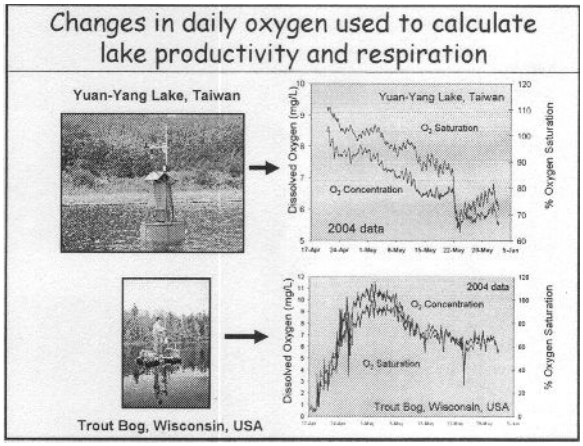
- These advances break down barriers to limited scale research, and permit comparisons to be made across any imaginable scale of observation.
- The Lake Project demonstrates that sensor networks can be applicable to the research of field biologists and ecologists.

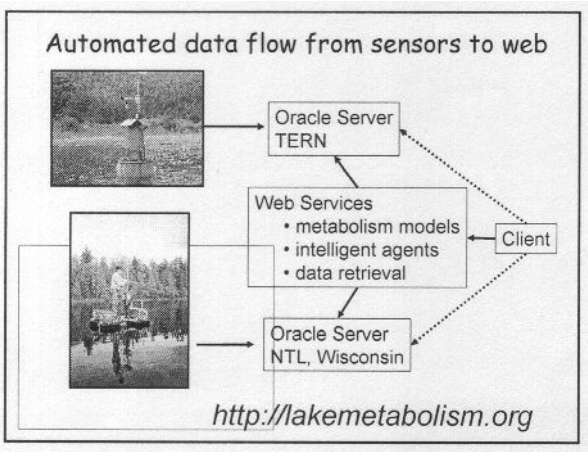
Lake Metabolism Project

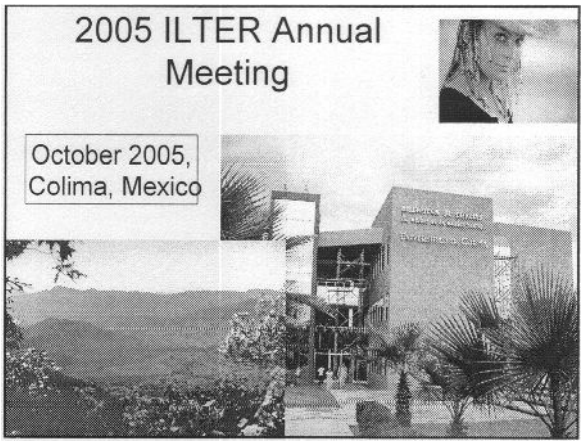
- It demonstrates an intercontinental wireless connectivity to field sensors on two sides of the Pacific Ocean.
- Experiments are being carried out in near real-time based on the incoming data from the 2 lake sensors.
- Web services address the dynamic cross-site data integration and analysis on lake metabolism.

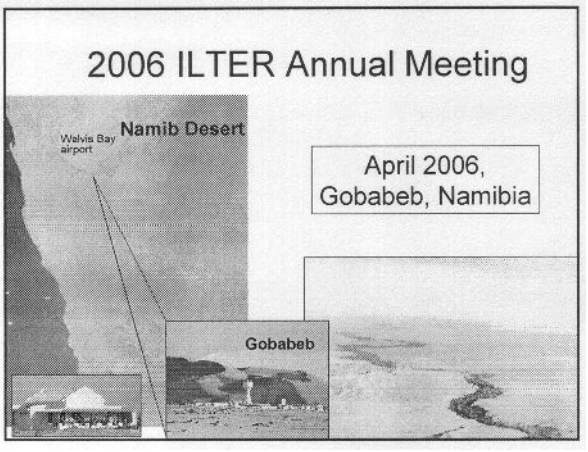


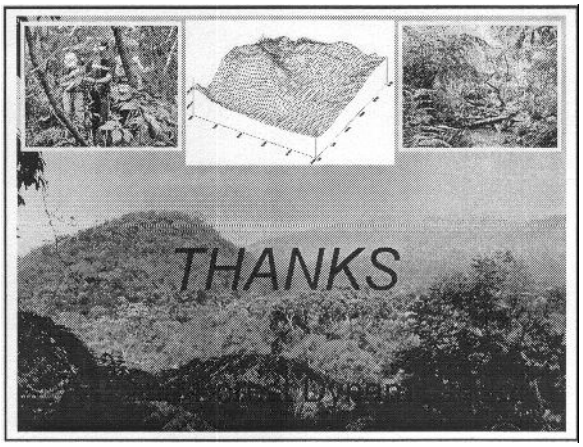




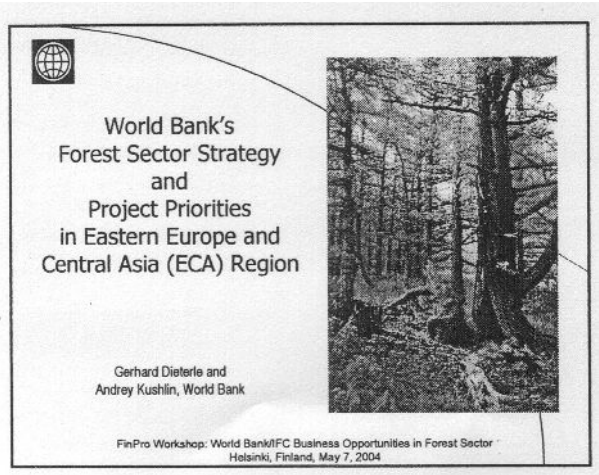


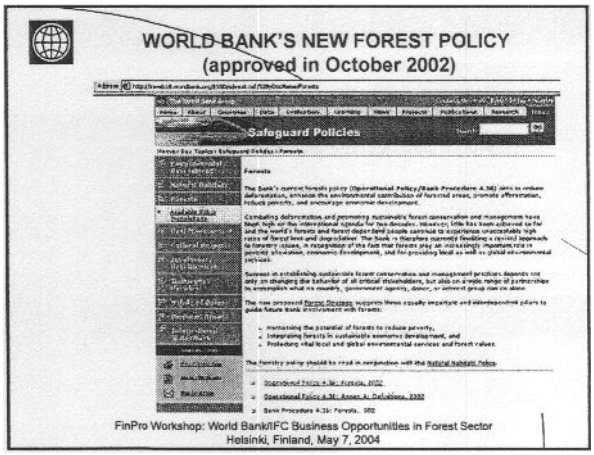


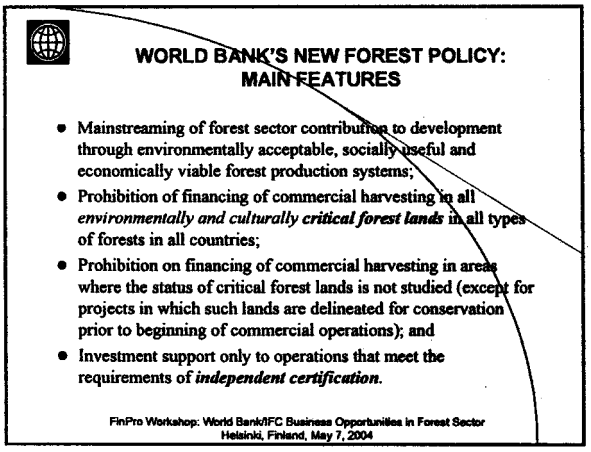

2006 ILTER Annual Meeting
Namib Desert
Walvis Bay airport
April 2006,
Gobabeb, Namibia
Gobabeb

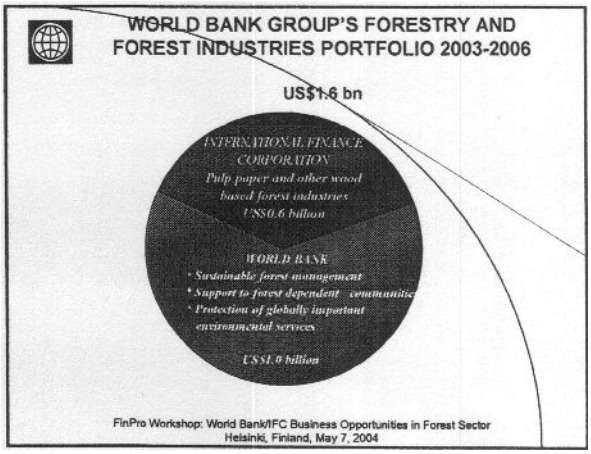

THANKS

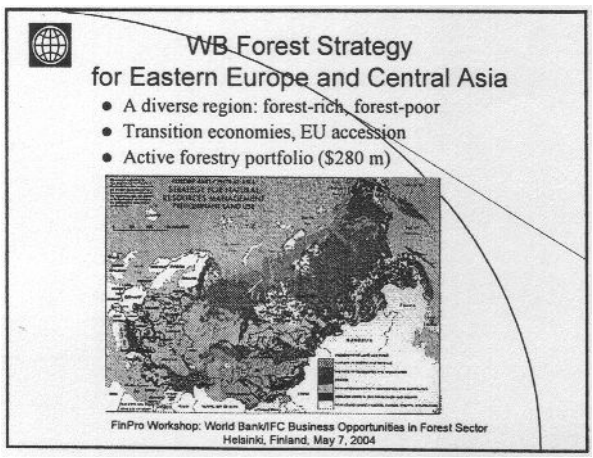
附件六：「世界銀行森林部門之政策及在東歐暨中亞洲地區的優先計畫案說明」

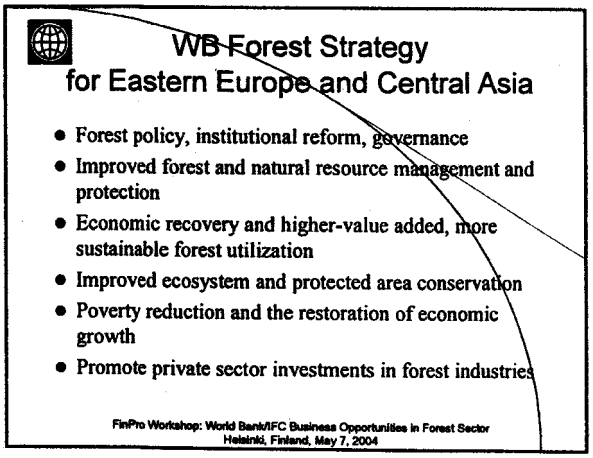












World Bank Forest Financing in ECA Region (as of April 2004)

Country	Project Name	Year Approved	Loan (Grant) Amount (US$ million)
Under Implementation	**Under Preparation**		
Albania	Forestry	1996	8.0
Armenia (IDA / GEF)	Natural Resource Management & Poverty Reduction	2002	8.3 (5.1)
Bosnia & Herzegovina	Forest Development and Conservation	2002	3.0
Georgia	Forests Development	2002	16.0
Georgia (GEF)	Protected Areas Development	2001	(8.7)
Romania	Forests Development	2001	25.0
Romania (GEF)	Biodiversity Conservation Management	2000	(5.5)
Russia	Sustainable Forestry Pilot	2000	60.0
Under Preparation	**Under Preparation**		
Albania (IDA / GEF)	Watershed Management	2005	8.0 (4.3)
Azerbaijan (IDA/GEF)	Shah Dag Rural Environment	2005	8.0 (5.0)
Bosnia & Herzegovina (GEF)	Forest & Mountain Biodiversity Conservation	2005	(7.0)
Bulgaria (IBRD/GEF)	Forest Development	2004	30.0 (5.0)
Moldova (PCF)	Soil Conservation Forestry	2004	5.2
Kazakhstan (IBRD/GEF)	Forest Protection and Rehabilitation	2005	30.0 (5.0)
Romania (PCF)	Afforestation of Degraded Agricultural Land	2004	3.7
Russia (GEF)	Fire Management in High Biodiversity Value Forests of the Amur-Sikhote-Alin Ecoregion	2004	(6.0)
Tajikistan (IDA/GEF)	Community Oriented Watershed Development	2004	10.0 (4.5)
Turkey (IBRD/GEF)	Anatolia Watershed Rehabilitation 2	2004	37.0 (7.0)

WORLD BANK MAIN INVESTMENTS IN ECA

RUSSIA	$ 40 million
ROMANIA	$ 32 million
BULGARIA	$ 30 million
KAZAKHSTAN	$ 30 million
GEORGIA	$ 16 million
BOSNIA	$ 4 million

PRIORITIES:

- *Create a legal, institutional and fiscal policy enabling framework for sustainable forest management improved forest governance and for private sector investment*
- *Separate State oversight and management functions from commercial activities improve revenue collection*
- *Strengthen government capacity for oversight and monitoring of transitions in forest ownership*
- *Investments to increase productivity of forest resources*
- *Increase productivity and market access to improve competitiveness of both large and smaller scale forest based industries*
- *Consolidate and expand Protected Areas. Mainstream biodiversity protection into sustainable management of production forests*

System Approach for Forest Sector Development is Required

Policy Framework	Best Practice Tools
• Lease and concession rights •Investment climate: trust, laws, banking system; • cooperation of forest management and forest industries	•Standards for SFM/ Certification •HCVF •Low impact logging •Forest Protection/Health/ Safety •Silvicultural Techniques
Strategic Investments	**Access to Markets**
•Processing Capability (quantity + quality •Forest Production (infrastructure, Research & Development, etc) •Banking System (safeguard + investment policies)	•Link Producers to Consumers •Assessment of consumer preferences (environment/ sourcing) •Strategic Market Development (countries, sectors, products, promotion etc.)

From Forest to Industry

- Inventories/Planning ⇒ Predictability of raw material availability
- Silviculture, Fire-fighting, Pest management, Plantations ⇒ Sustained supply of raw material to the chain of custody; Better timber quality
- Certification, Lease policies ⇒ Better image of industry and access to sensitive markets; Secure investment climate; Openness to newcomers; Incentive for innovations

From Industry to Forest

- Reduced impact logging ⇒ Less damage to natural regeneration, less erosion; Conservation of biodiversity & potential for non-timber activity
- Reduced waste / higher degree of processing ⇒ Less annual off-take; Respect of regeneration cycle; Sustainable production and carbon sequestration capacity
- Higher added-value, Higher profitability ⇒ Higher revenues for financing forest management; Incentive for permanent forests instead of conversion

From Forest & Industry to People

- Profitable industry and good policies/governance ⇒ High revenues accruing to Govt and local communities
- High-degree processing ⇒ Additional job opportunities; Impact on national economy
- Renewable resources managed sustainably ⇒ Jobs and revenues are sustainable over-time
- Sound land-use planning ⇒ Development of non-timber / small-scale industries
- Improved professional skills and knowledge ⇒ Higher productivity; Lower social cost from accidents and illnesses

Russia's Comparative Advantages in the Global Pulp and Paper Products Market

- *Largest remaining global softwood resource*
- *Large captive domestic market*
- *Good overseas marketing prospects in western Europe and China*
- *Low production costs because of opportunities for integration with the sawmilling industry and access to low cost fiber*
- *Keen interest of world top producers and financial institutions in investing in Russia if current constraints to private sector investment can be overcome*

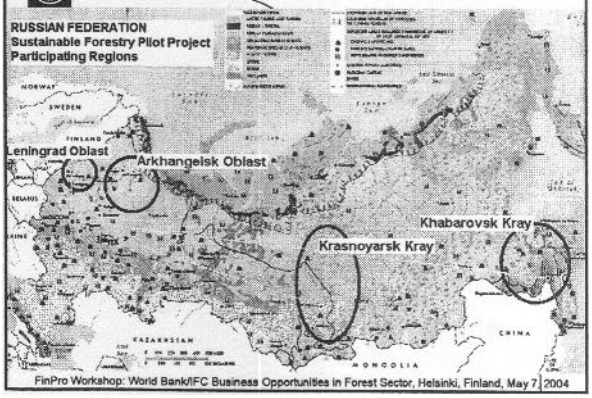
Russian Government Priorities for Forest Sector Development 2002-2010

- *IMPLEMENT INSTITUTIONAL REFORMS: CREATE AN ENABLING ENVIRONMENT FOR PRIVATE SECTOR INVESTMENT*
- *INCREASE RUSSIA'S SHARE OF WORLD FOREST PRODUCT EXPORTS*
- *ESTABLISH AN INTERNATIONALLY RECOGNISED SYSTEM OF INDEPENDENT CERTIFICATION*
- *STRENGTHEN REMOTE SENSING , INVENTORY AND MONITORING OF FOREST CHANGE*
- *CONSOLIDATE AND EXPAND RUSSIA'S NETWORK OF PROTECTED AREAS*

How is the World Bank Involved in the Russian Forest Sector ?

- Sustainable Forestry Pilot Project
- Policy Dialogue (Workshops, Policy Note)
- Comments on New Draft Forest Code
- WB/WWF Alliance: Analysis of Standards for Forest Certification; HCVF Identification and Mapping
- Forest Sector Partial-Risk Guarantee
- IFC: Investments and Technical Assistance

Sustainable Forestry Pilot Project



Main Elements of the Pilot Project in Participating Regions

- **Improve Planning of Forest Management and Forest Use**
  - regional forest policy, forest inventory, HCVFs, regional forest use strategy, SFM standards, FMP technologies, fire detection and protection, forest management training
- **Introduce Intensive Methods of Forest Management and Forest Use in the Wood Supply Zones of the Pilot Forest Industry Enterprises**
  - separation of leskhoz functions, intensive forest regeneration & thinnings, log tracking, chain-of-custody and certification, enterprise training

OPPORTUNITIES FOR THE WORLD BANK AND IFC TO CONTRIBUTE TO GOVERNMENT OF RUSSIA'S DEVELOPMENT PLANS FOR FORESTS AND FOREST INDUSTRY DURING THE PERIOD 2003-2010

ROLE OF THE WORLD BANK	ROLE OF IFC
• Support rapid implementation of legal, institutional and fiscal policy reforms	• Provide long term debt financing for expansion and modernization of pulp, paper and other forest industries
• Strengthen governance mechanisms for containment of illegal logging	• Equity and quasi equity investments
	• Syndicated loan financing
• Support development of independent certification mechanisms	• Provide financing and technical assistance to small/medium scale forest industries
• Provide investment capital for forest protection and management and for strengthening of forest education training and research	• Reduce IFC client company investment risks through application of the World Bank Partial Risk Guarantee mechanism
• Mobilise grant funding through the GEF and WWF/WB Alliance for expansion of Protected Areas and management of forests of high conservation value.	• Provide technical, legal and environmental expertise to Russian forest industries

CONSTRAINTS TO PRIVATE SECTOR INVESTMENT IN RUSSIA's FOREST INDUSTRY (1)

CONSTRAINTS TO RESPONSIBLE PRIVATE SECTOR INVESTMENT.	ACTIONS BEING TAKEN BY THE WORLD BANK TO ASSIST GOVERNMENT OF RUSSIA AND PRIVATE COMPANIES TO MINIMISE THESE CONSTRAINTS
• Insecurity of raw material supply	• Ongoing Bank support to GOR through a $ 60 million Forestry Project which is helping to put in place contractual arrangements for ensuring secure log supplies to industry
• Containment of illegal logging operations which undercut possibilities for investment in SFM	• Lessons being learned from a series of ongoing Bank supported regional Forest Law Enforcement and Governance initiatives could support Government of Russia 's concern to apprehend those engaged in illegal logging and other types of forest related corruption
• Confusion over competing certification schemes	• Ongoing Bank financed survey by GFA consultants of existing schemes in Russia and steps needed to put in place an internationally acceptable Russian certification scheme

CONSTRAINTS TO PRIVATE SECTOR INVESTMENT IN RUSSIA's FOREST INDUSTRY (2)

CONSTRAINTS TO RESPONSIBLE PRIVATE SECTOR INVESTMENT.	ACTIONS BEING TAKEN BY THE WORLD BANK TO ASSIST GOVERNMENT OF RUSSIA AND PRIVATE COMPANIES TO MINIMISE THESE CONSTRAINTS
• Environmental pressure being brought to bear on industrial companies to exclude from logging forest areas of high conservation value (HCVF's)	• Environmental pressure being brought to bear on industrial companies to exclude from logging forest areas of high conservation value (HCVF's)
• Investment risks (including political risks)	• Investment risks (including political risks)