



**FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS**



UNITED NATIONS ENVIRONMENT PROGRAMME

**PROCEEDINGS OF THE
FAO/UNEP EXPERT CONSULTATION ON
STRATEGIES FOR GLOBAL LAND COVER
MAPPING AND MONITORING**

ARTIMINO, FLORENCE, ITALY

6-8 MAY 2002

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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CONTENTS

Glossary of acronyms and abbreviations used in the text	vi
EXECUTIVE SUMMARY/RÉSUMÉ/RESUMEN DEL EJECUTIVO	v
THE ARTIMINO DECLARATION	1
PROCEEDINGS	3
Introduction	3
Opening and Orientation	4
Overview of Global User Requirements and Status	6
Presentation of the UN Land Cover Classification System	8
Plenary review of the FAO/UNEP Global Land Cover Design	11
Regional Round Table	12
Working Groups Organization and Assignment	13
Deliberations by Working Groups and Preparation of the report	14
Overall Goal and Strategic Principles	14
FAO/UNEP Land Cover Classification System	15
Procedures and Methodologies	16
Training and Capacity Building	17
Partnership and Global Coalition	18
Interim Arrangements, Outreach and Communications	19
Report preparation and the Artemino Ddeclaration	19
APPENDIX 1 – AGENDA	21
APPENDIX 2 – LIST OF PARTICIPANTS	24
APPENDIX 3 – OPENING ADDRESSES	31

GLOSSARY OF ACRONYMS AND ABBREVIATIONS USED IN THE TEXT

AFRICOVER	FAO AFRICOVER Project
CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
DB	database
DEWA	Division of Early Warning and Assessment [UNEP]
FAO	Food and Agriculture Organization of the United Nations
FCCC	Framework Convention on Climate Change
FIVIMS	Food Insecurity Vulnerability Information and Mapping Systems
GEF	Global Environmental Facility
GEO	Global Environmental Outlook [UNEP]
GIS	geographical information system
GLC	Global Land Cover
GLC2000	Global Land Cover 2000 Project EC-JRC
GLCGT	Global Land Cover Ground Truth Database
GLCN	Global Land Cover Network
GOFC	Global Observation of Forest Cover
GOLD	Global Observation of Land Cover Dynamics
GRID	Global Resource Information Database
GTOS	Global Terrestrial Observing System
IAO	Istituto Agronomico per l’Oltremare [Italy]
IDC	Italian Development Cooperation, Ministry of Foreign Affairs
IGBP	International Geosphere-Biosphere Programme
JRC	Joint Research Centre [EC]
LC	land cover
LCCS	United Nations Land Cover Classification System
LUCC	Land Use and Cover Change
MA	Millennium Ecosystem Assessment
MRLC	multi-resolution land cover
NGO	non-governmental organization
OACT	African Organization for Cartography and Remote Sensing
RRT	Regional Round Table
RS	remote sensing
SDRN	Sustainable Development and Natural Resource Division [FAO]
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNFF	United Nations Forum on Forests
WG	Working Group

NOTE: All units are metric (SI) unless otherwise specified.

EXECUTIVE SUMMARY

From 6 to 8 May 2002, FAO and UNEP held an Expert Consultation on "Strategies for Land Cover Mapping and Monitoring" at Artimino, near Florence in Italy. The Consultation, which was attended by about 60 experts from around the world, provided FAO/UNEP with advice on the merits and strategies for a proposed new Cooperative Programme: the Global Land Cover Network (GLCN).

The primary goal of the GLCN is to improve the availability of global information on land cover and its dynamics. Currently available land cover information often lacks the required levels of accuracy, or is collected using a variety of different standards, thus preventing comparison between the regions and compilation of global totals.

Land cover mapping and monitoring activities provide information that is essential for the sustainable management of natural resources and environmental protection. They provide the foundation for the environmental, food security and humanitarian programmes of the United Nations, and of other international and national institutions. Such programmes rely heavily on data supplied by FAO and UNEP.

The experts gathered in Artimino strongly supported the FAO/UNEP objective of establishing the first operational land cover programme, with a global coverage. They also noted that the development of reliable and compatible information, as required under this new global land cover programme, will bring benefits to a wide range of users in government, NGOs, and the private sector. The interests of and benefits to developing countries were also strongly emphasized during the meeting.

The Expert Consultation also endorsed the FAO/UNEP Land Cover Classification System (LCCS) as a unique and universal standard for classification of land cover. It was recognized that FAO has already successfully applied LCCS in various pilot countries, such as the AFRICOVER project. Moreover, it was thought crucial that LCCS allows land cover information classified differently to be translated and incorporated into a common global land cover database.

The endorsement is critical, because it means that this innovative and crucial component of GLCN has met the approval of an international panel of land cover mapping experts.

The panel of experts also approved several other features of the proposed programme. These include the development of a "Global Coalition," which will be a global network linking FAO/UNEP and the many other organizations that will be involved in the implementation of GLCN. Such organizations include the suppliers of Earth Observation satellite data, remote sensing and mapping agencies involved in the interpretation and processing of land cover data, and the many users and beneficiaries of land cover information that will become available at global, regional, national, and subnational levels. The Consultation also strongly supported the concept that GLCN will be an operational programme, user-oriented, and designed to meet the requirements of essential FAO/UNEP programmes, as well as those of the partners in the Global Coalition.

On the final day of the Expert Consultation, participants unanimously passed a declaration stressing the urgency of improved global land cover information and urging donor support for the new initiative.

RÉSUMÉ

La FAO et le PNUE ont organisé une Consultation d'Experts sur les «Stratégies de cartographie et de suivi de l'occupation des terres» du 6 au 8 mai 2002 à Villa Artimina, près de Florence, Italie. La Consultation, à laquelle ont participé près de 60 experts du monde entier, a donné son avis sur les mérites et le développement de stratégies pour une nouvelle proposition d'un programme de coopération dénommé: Réseau mondial de l'occupation des terres (GLCN).

L'objectif principal de GLCN est d'accroître l'accessibilité à l'information standardisée et fiable sur l'occupation des terres et de ses changements au niveau mondial. Les données dont nous disposons actuellement manquent de précision ou bien varient en ce qui concerne les normes qui sont différentes et qui empêchent donc la comparaison entre les diverses régions et la compilation des totaux mondiaux.

La répartition de l'utilisation des terres et de leur monitoring est essentielle à la gestion durable des ressources naturelles et à la protection de l'environnement. Ils prévoient des fonds pour l'environnement, la sécurité alimentaire et les programmes humanitaires qui sont cruciaux pour l'exécution de divers mandats des Nations Unies et des institutions nationales et internationales. Tels programmes dépendent fortement des données émises par la FAO et le PNUE.

Les experts réunis à Villa Artimina ont fortement soutenu l'objectif de la FAO/PNUE d'établir le premier programme visant à cartographier l'occupation des terres sur couverture globale. Ils ont en outre noté qu'une vaste gamme d'utilisateurs dans le gouvernement, les ONG ainsi que dans le secteur privé bénéficiera du développement d'information fiable et actualisée, comme proscrit par ce nouveau programme de coopération. A cette réunion, les intérêts et les bénéfices aux pays en développement ont été fortement soulignés.

La réunion d'experts a aussi reconnu le Système de classification de l'occupation des terres (LCCS) comme étant le seul et universel outil pour la classification de l'occupation des terres. Il a été reconnu que la FAO avait déjà appliqué avec succès le LCCS dans différents pays au niveau expérimental, comme par exemple avec le projet AFRICOVER. En outre, le LCCS permet à l'information sur l'occupation des terres soit d'être classifiée différemment, soit d'être traduite et incorporée dans un ensemble de données mondiales sur l'occupation des terres. L'approbation de la part des experts est essentielle, ce qui souligne l'importance apportée à cet élément innovateur et décisif du GLCN de la part d'experts internationaux qui s'occupent de cartographie et d'occupation des terres.

L'ensemble des experts a par ailleurs approuvé plusieurs autres points sur le programme proposé, y compris le développement d'une « coalition mondiale », qui constituerait un réseau mondial reliant la FAO/PNUE aux autres organisations impliquées dans l'exécution du GLCN. Font partie de ces organisations, les fournisseurs de données satellitaires «Earth Observation », les agences de télédétection et de cartographie qui s'occupent de l'interprétation et du traitement des données sur l'occupation des terres et les nombreux utilisateurs et bénéficiaires des informations qui seront disponibles aux niveaux mondial, régional, national et sous-régional. La Consultation a d'autre part insisté sur le fait que le GLCN sera un programme opérationnel, destiné aux usagers et mis en place pour faire face aux besoins essentiels des programmes aussi bien de la FAO/PNUE que de ceux des partenaires de la Coalition mondiale.

Le dernier jour de la Consultation d'Experts, les participants ont, à l'unanimité, approuvé une déclaration soulignant l'urgence de disposer de meilleures informations à l'échelle mondiale sur l'occupation des terres et en soulignant la bienvenue à une aide essentielle de la part de donateurs pour rendre très efficace cette nouvelle initiative.

RESUMEN DEL EJECUTIVO

La FAO/PNUMA, realizó una Consulta de Expertos en Artimino, cerca de Florencia, Italia del 6 al 8 de mayo de 2002, sobre las “Estrategias para la Cartografía y la Vigilancia de la Superficie Terrestre”. La Consulta, a la que participaron alrededor de 60 expertos procedentes de todo el mundo, proporcionó a la FAO/PNUMA asesoramiento sobre las ventajas y estrategias del nuevo Programa de Cooperación propuesto: la Red Mundial para la Superficie Terrestre (GLCN).

El objetivo principal de la GLCN es mejorar la disponibilidad de la información mundial sobre la superficie terrestre y sus dinámicas. La información disponible sobre la superficie terrestre al momento actual carece, a menudo, de los niveles necesarios de precisión, o a su vez se recolecta mediante el empleo de varias normas diferentes, lo que impide la comparación de datos entre las distintas regiones así como la compilación de datos a nivel mundial.

Las actividades de cartografía y vigilancia de la superficie terrestre proporcionan una información esencial para el manejo sostenible de los recursos naturales y de la protección del medio ambiente. Proporcionan, además, el fundamento para los programas humanitarios, del medio ambiente y de la seguridad alimentaria de las Naciones Unidas y de otros organismos nacionales e internacionales. Dichos programas se basan, fundamentalmente, en datos proporcionados por la FAO y el PNUMA.

Los expertos que se reunieron en Artimino apoyaron con decisión la propuesta conjunta de la FAO/PNUMA de que se estableciera el primer programa operativo sobre la superficie terrestre con cobertura a nivel mundial. Éstos observaron también que la elaboración de una información fidedigna y compatible, como la que se requeriría en este nuevo programa mundial de la superficie terrestre, aportaría beneficios a una amplia variedad de usuarios en el ámbito de los gobiernos, ONGs y el sector privado. Durante la reunión se enfatizó, particularmente, en los intereses de los países en desarrollo y los beneficios que se aportarían a los mismos.

Asimismo, la Consulta de Expertos aprobó el Sistema de Clasificación de la Superficie Terrestre (LCCS), como norma única y universal para la clasificación de la superficie terrestre. Se reconoció que la FAO había aplicado con éxito el LCCS en varios países de forma experimental, p. ej. el proyecto Africover. Además, se consideró fundamental la capacidad del LCCS de permitir que las informaciones sobre la superficie terrestre clasificadas en diferentes maneras, se pudieran convertir e incorporar en una base de datos de la superficie terrestre común. La aprobación del LCCS es fundamental, ya que significa que este elemento innovativo y crucial de la GLCN ha recibido el apoyo de un grupo de expertos de cartografía de la superficie terrestre a nivel internacional.

Además, el grupo de expertos aprobó varios otros aspectos del programa propuesto. Éstos incluyen la elaboración de una “Coalición Mundial”; es decir, una red mundial que sirva de enlace entre la FAO/PNUMA y muchos otros organismos involucrados en la realización de la Red Mundial de la Superficie Terrestre (GLCN). Dichos organismos incluyen a los proveedores de datos procedentes del satélite para la Observación de la Tierra, las agencias encargadas de la cartografía y teledetección mediante satélite, que se ocupan de la interpretación y elaboración de datos de la superficie terrestre, como los numerosos usuarios y beneficiarios de la información sobre la superficie terrestre de la que se dispondría a nivel regional, subnacional, nacional y mundial. La Consulta apoyó también con decisión el criterio de que la Red Mundial de la Superficie Terrestre (GLCN) debía ser un programa operativo, orientado a facilitar al usuario en la obtención de datos, y diseñado para cumplir con los requisitos de los programas esenciales de la FAO/PNUMA, y de los participantes en la Coalición Mundial.

Los participantes a la Consulta de Expertos, en su último día de reunión, aprobaron por unanimidad una declaración en la que se subrayaba la urgencia de disponer de una mayor información sobre la superficie terrestre a nivel mundial e instaron a los patrocinadores a que apoyaran la nueva iniciativa.



Artimino Declaration on a Global Land Cover Network

We, the experts participating in the International Expert Consultation on Strategies for Land Cover Mapping and Monitoring, being jointly organized by FAO and UNEP in cooperation with the Italian Ministry of Foreign Affairs through the Istituto Agronomico per l'Oltremare, and with the support of the Regione Toscana, from 6 to 8 May 2002, at Artimino, Florence, Italy,

Realizing that the Earth ecosystems are increasingly experiencing anthropogenic pressures and that environmental degradation, poverty and food insecurity are strongly interlinked and continue to be the major factors threatening sustainable development in the new millennium;

Recognizing that baseline natural resource and environmental information, including in particular land cover and land cover change information, is key for addressing issues relating to poverty, food insecurity and environmental degradation and for developing operational solutions to sustainable development, and that consistent critical information components are lacking at the local, national and global levels;

Recognizing also that a number of initiatives on land cover mapping and monitoring are already in existence, but no single initiative at national, regional or international levels can effectively address the issues alone, and believing that an added value will be generated through synergy and harmonization of various initiatives among interested stakeholders;

Hereby fully **support** the establishment of a Global Land Cover Network in response to user needs and operational applications focusing on national perspectives and globally distributed responsibilities, with the objective of enabling the provision of information on land cover and its dynamics for better decision-making at all levels in support of sustainable development, through networking and harmonizing technical approaches at global, regional, national and local levels;

Invite FAO and UNEP to take the lead, in partnership with other UN agencies and international organizations and programmes, to provide technical and operational support for the development and the maintenance of the Network;

Call for building a coalition among governmental and inter-governmental agencies, academic institutions, the private sector and other interested stakeholders in the processes of institutional networking, strengthening national capacity, harmonizing land cover classification and mapping, and developing global land cover databases;

Request the donor community to financially support the development and successful operation of the Global Land Cover Network; and

Call further for all stakeholders concerned to integrate the recommendations of this Expert Consultation into their policy considerations and action plans.

Endorsed by consensus

8 May 2002



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UNITED NATIONS ENVIRONMENT PROGRAMME

**EXPERT CONSULTATION ON
STRATEGIES FOR LAND COVER MAPPING AND MONITORING**

Florence, Italy, 6 to 8 May 2002.

PROCEEDINGS

INTRODUCTION

[1] FAO and UNEP called an Expert Consultation on *Strategies for Land Cover Mapping and Monitoring* to present and develop a proposed new initiative for a joint FAO/UNEP Global Land Cover Network (GLCN) that would emphasize harmonization of relevant activities.

[2] The assessment of land cover (LC) and the monitoring of its dynamics are essential requirements for sustainable management of natural resources and environmental protection. They provide the foundation for environmental, food security and humanitarian programmes that are crucial in fulfilling the mandates of many UN, international and national institutions. Such programmes rely heavily on data provided by FAO and UNEP. Current monitoring programmes lack access to reliable and comparable baseline data. The implementation of a global programme using a fully harmonized approach is therefore essential to increase the reliability of LC information for a large user community.

[3] In 2000, FAO and UNEP laid the foundations for a cooperative programme by jointly testing and finally adopting the FAO/UNEP Land Cover Classification System (LCCS). The LCCS is based on independent and universally valid LC diagnostic criteria, rather than on a pre-defined set of LC classes. The development of a database (DB) containing all global LC data has, through correlation with already existing classifications and legends, become feasible for the very first time. AFRICOVER is the first fully operational regional LC project to have successfully applied the LCCS over a large area.

[4] The objective of the Expert Consultation was to inform partner organizations about the cooperative programme, and to draw on the collective knowledge of participants for advice on an operational strategy. The meeting contributed to the development of increased awareness of LCCS as the new global standard. The results of the meeting included the following:

- Ø Increased awareness and a common understanding of the objectives of the proposed FAO/UNEP initiative and of the potential of LCCS as the global classification standard.
- Ø Information on current land-cover-related priorities of partner organizations.



- Ø Advice on best practices for harmonization of LC mapping and monitoring projects at regional and global levels, to achieve compatibility among products through promotion of LCCS as the new standard classification system.
- Ø Advice on the structure and operation of the FAO/UNEP Global Land Cover Network (GLCN) to support its objectives.
- Ø Advice on related initiatives, such as training programmes and institutional strengthening, to increase the benefits of LC projects to developing countries.

OPENING AND ORIENTATION

[5] The three-day Expert Consultation, organized by FAO and UNEP in collaboration with the Italian Development Corporation (IDC), Ministry of Foreign Affairs; Istituto Agronomico per l'Oltremare (IAO) [Italy]; and the Province of Tuscany (Regione Toscana) was opened by speeches of welcome by representatives of the organizers. In their welcoming remarks they all stressed the importance of LC mapping for monitoring for environmental and food security in general, the considerable progress that had been made by national and regional programmes in the past, and in particular referred to the new challenge of establishing the first operational global cooperative programme, GLCN. All the participants were welcomed to the beautiful region of Tuscany in Italy, and in particular to the venue of the meeting, the Medici Villa *La Fernanda* in Artimino, and were asked to provide advice and guidance on the merits of and strategies for GLCN.

[6] In his opening address, on behalf of Mr Eckebil, FAO Assistant Director General, Sustainable Development Department, Mr He Changchui welcomed the participants to the Expert Consultation. He emphasized the goal of the meeting, namely to chart a strategy for global harmonization of information on current LC and its changes, to improve the basic inputs to planning and decision-making for sustainable development and management of natural resources and for environmental protection. The full text of the address is given in Appendix 3.

[7] Mr He mentioned the timeliness of the meeting, just before the celebration of the tenth anniversary of the milestone UN Conference on Environment and Development (UNCED, better known as the Earth Summit) in June 2002. The Earth Summit represented a watershed in attitudes towards the environment and to sustainable development. In particular, two specific actions related to LC assessment were listed among the UNCED priority requirements: bridging the data gap; and improving the availability of information. Agenda 21, the UNCED action plan, recommended the use of remote sensing (RS) and geographical information system (GIS) technologies for the coordinated, systematic and harmonized collection and assessment of data on LC and environmental change.

[8] Further reference was made to the United Nations Millennium Declaration, which included the achievement of environmental sustainability, and the preparations for the World Summit on Sustainable Development, which would take place in Johannesburg, South Africa, later in 2002.

[9] Mr He emphasized the need for categorization of LC based on the LCCS developed by FAO and UNEP, with universally valid classification criteria, rather than on a pre-determined, rigid set of LC classes. An important feature of LCCS was its compatibility with any LC classification system. He said it had been thoroughly tested during implementation of the FAO AFRICOVER project over the previous three years, and was now ready for use by international and national LC mapping and monitoring projects. Mr He asked the experts for their opinion and advice on its applicability in their own activities.



[10] On behalf of Dr Toepfer, UNEP Executive Director, Mr Tim Foresman expressed his sincere appreciation to all of the experts who had come to this meeting to assist UNEP and FAO with this landmark workshop. He reiterated that the issue of LC information was fundamental to meeting the challenges set forth in Agenda 21 and to meet the respective mandates of UNEP and FAO. The full text of the address is given in Appendix 3.

[11] Mr Foresman said he was extremely pleased to have these experts assist this joint FAO/UNEP LC initiative to make sure that what the UN was about to implement would be based upon the best peer review and feedback, thus ensuring success. Mr Foresman emphasized that, after 30 years of RS development, the UN was about to embark on the first operational use of Earth observation satellites for global LC activities. Only the meteorological community represented the other operational application of satellites for environmental purposes. He explained that FAO and UNEP had voluntarily forged this alliance to deliver global LC data to the nations of the world. The new approach would bring about changes in way that statistics, assessments and decisions were made regarding Earth-surface dynamics. He concluded his speech by stating that these changes were a requisite if we were to meet the challenges for sustainable use of the planet's resources.

[12] In her welcome address, Ms Perlini, Director General of the Istituto Agronomico per l'Oltremare (IAO), thanked all participants for their contribution to the Expert Consultation, since they represented important segments of both the users and producers of LC information. The full text of the address is given in Appendix 3.

[13] Ms Perlini explained how IAO had assisted Italian Development Cooperation (IDC) and FAO in implementing the AFRICOVER project, which resulted in a digital LC DB for eastern Africa (at a scale of 1:200 000 or 1:100 000); an innovative LC classification concept and methodology, including several *ad hoc* software tools; and training activities to strengthen national capacities in LC mapping and classification.

[14] Ms Perlini stated that IAO was also ready to participate in developing a global cooperative programme in order to define a common LC vocabulary; international standards for LC metadata; agree on procedures for data quality checking and certification; further develop and harmonize methodologies for LC classifications; and develop translation tools for data interchange.

[15] Finally, on behalf of the Regional Government of Tuscany, Andrea Cioncolini, Regione Toscana International Relations Service, welcomed the participants to wonderful Tuscany, and in particular to the beautiful venue in Artimino. Mr Cioncolini gave a short overview of the multi-faceted culture, history and economic environment of Tuscany. The full text of the address is given in Appendix 3.

[16] He noted that the issues to be addressed at the meeting coincided with the interests of Regione Toscana in international cooperation activities since they were of strategic relevance in the perspective of strengthening local development. In fact, the Regione supported polycentric development, based on the exploitation of local resources in a framework of sustainable development. The Regione Toscana supported local development projects in the Mediterranean and Balkan area, and also in Africa and Latin America. It also promoted territorial partnerships that involved local governments in Tuscany and local authorities in developing countries, aimed at supporting the process of empowerment.

[17] Mr Cioncolini concluded by expressing the hope that this meeting would help provide a context for free use of LC information that would support local decision-making.

[18] In his welcome address, Minister A.M. Iannucci, Vice-Director-General, IDC, welcomed the participants to the meeting and welcomed the collaboration among different agencies of the



UN system in fields of common interest that touched upon cross-cutting issues of crucial importance, such as sustainable management of natural resources and food security. The full text of the address is given in Appendix 3.

[19] He recalled the long involvement of IDC with the LC mapping of eastern Africa, based on satellite RS – an involvement dating back to the early 1990s – within the broader framework of the FAO/Italy Cooperative Programme, through the AFRICOVER project. He noted that AFRICOVER was considered to be one of the most successful projects within the Italy/FAO Cooperative Programme, with the further technical support of IAO in a number of activities. The project was providing a new set of tools for a model of development that was environment-oriented for the region, but within a great worldwide perspective aimed at improving the mapping and monitoring of agronomic, forestry and water resources.

[20] In his concluding remarks, he reiterated the continued support of the Government of Italy to FAO, and called on FAO, as the Executing Agency, to call for the involvement of other donors, since AFRICOVER was initially conceived as a multi-donor programme. He also extended an open invitation to UNEP to participate more directly in current and future activities.

[21] During the first presentation of the day, Mr Sayn-Wittgenstein provided an overview of the meeting, explaining the rationale, and in particular what would be expected from the participants in order to achieve the meeting's objectives. In short, the expected form was (the Agenda is given in full in Appendix 1):

- Day 1 Overview of FAO/UNEP concepts for an operational global LC mapping programme. Examples from major global and regional LC information programmes.
The FAO/UNEP Land Cover Classification System (LCCS) (benefits of its use as the global standard).
- Day 2 A Regional Round Table with 12 experts from 6 regions to draw upon national and regional experiences.
Selection of themes, break into Working Groups (WGs) for detailed discussions, with a short plenary presentation from the groups at the end of the day.
- Day 3 Continuation of WG deliberations.
Plenary presentation of WG findings, recommendations, discussion and adoption of recommendations.

[22] After the introductory remarks Messrs Foresman and He made a presentation outlining, in detail, the need for the proposed first operational LC cooperative programme with a global coverage, using the FAO/UNEP LCCS as the standard for its implementation. All participants were invited to share their views and to help draft the framework for this programme. They also introduced the envisaged three themes for the discussions in the three Working Groups (WGs), which were:

- Ø WG 1. UN LCCS;
- Ø WG 2. Methodologies for an LCCS-based global LC DB; and
- Ø WG 3. Strategic framework for development of an FAO/UNEP Global Land Cover Network (GLCN).

OVERVIEW OF GLOBAL USER REQUIREMENTS AND STATUS

[23] Following the introduction and orientation, the Expert Consultation started with four technical presentations that provided the participants with important insights concerning the current status of four important global and regional LC mapping initiatives:

- (i) Land Use and Land Cover Change Programme (LUCC) of the International Geosphere-Biosphere Programme (IGBP) – W.J. McConnell.



- (ii) Global Land Cover 2000 Project (GLC2000) – E. Bartholomé.
- (iii) Global Terrestrial Observing System (GTOS) and Global Observation of Forest Cover/Global Observations of Land Cover Dynamics (GOFC/GOLD) – D. Skole.
- (iv) The Global Mapping Project – Ryutaro Tateishi.

[24] The first presentation of a global programme was by Mr McConnell who provided the Expert Consultation with an overview of the Land Use and Land Cover Change Programme (LUCC) of the International Geosphere-Biosphere Programme (IGBP). The challenges of this academic research programme are reconstruction of past LC changes, understanding of land use dynamics, projecting land use and cover changes, and identifying vulnerable and critical regions. LUCC focuses on three priority areas:

- Ø land use dynamics, through comparative case studies;
- Ø LC dynamics, through empirical observations and diagnostic models; and
- Ø regional and global integrated models.

[25] Mr McConnell underlined the fact that LCCS would be important and useful for harmonizing LC activities at a global level. He stressed that LCCS has already been evaluated, but should be more widely tested by LUCC. Finally, Mr McConnell observed that LUCC, working on both LC and land use, would welcome a parallel land use system.

[26] Mr Bartholomé, from the Joint Research Centre (JRC), European Commission (EC), presented an overview of the Global Land Cover 2000 (GLC2000) project. Its objective was to improve global land cover (GLC) mapping, which would be useful for a range of applications. GLC2000 had been developed for applications in climate modelling and environmental management in general. The interest brought to the GLCN stemmed from the fact that European Union (EU) member states were signatories to the UN environment conventions. The EC JRC had a specific interest in vegetation cover. The VEGETATION instrument had been operational from April 1998. Since 1999, there had been increasing interest in supporting the Millennium Ecosystem Assessment (MA) initiative. In spring 2003, a full global coverage of the Vegetation Initiative could be expected to be ready for use, with data resolution of 1 km.

[27] The regions covered so far by GLC and VEGETATION tools included Africa in general, and the Great Lakes and Desert Locust zones in particular; France; Baltic Sea; Eurasia; Central Asia; China; South America, and Brazil in particular; and Canada.

[28] Mr Bartholomé noted previous IGBP efforts, and in particular the improvements made on the IGBP Classification data sets. GLC2000 was also developed to be compatible with other products. In November 2000, LCCS had been chosen as a basis for global LC mapping activities.

[29] Regarding the FAO/UNEP LCCS, Mr Bartholomé concluded that, in his view, there would be no major difficulty in adapting to or using the FAO/UNEP LCCS for a global exercise, providing that product compatibility with other LC applications was a precondition.

[30] He reminded the meeting, however, that standardization was not necessarily the best way to obtain a highly reliable and high quality product, and that the commitment should be on the quality of result rather than on a standardized methodology. He also stressed the need to strongly involve regional and local experts within the process. Mr Bartholomé concluded by noting that his current work on GLC2000 would focus on quality assessment and product acceptance.

[31] Mr Skole provided an overview of another successful global network, GOFC/GOLD. He explained its development, from a strategy to bring forest and LC under continuous observation, to a coordinated programme to use earth observation data effectively for natural resource management, policy and global change research, using spatial and GIS technologies in support of sustainable development.



- [32] The specific objectives for moving towards GOLD included:
- Ø improving access via the Committee on Earth Observation Satellites (CEOS) agency contributions and pre-processing methods;
 - Ø developing RS data, LC change, monitoring and evaluation;
 - Ø validation of LC tools and products; and
 - Ø regional carbon data bundles for the carbon modelling community.
- [33] For these purposes, four observatory programmes had been set-up, including carbon, ecosystem (for the MA), LC and forest.
- [34] GOF/GOLD had strengthened its organizations through the establishment of regional networks that assisted in coordination of both national and regional activities. The partners involved in this activity included FAO, UNEP, space agencies (which are the primary providers of data), non-governmental organizations (NGOs) and national forest agencies.
- [35] The final presentation was by Mr Tateishi, on behalf of the Centre for Environmental Remote Sensing (CERES) and its Global Mapping Project (GMP), which had been launched in 1990. Mr Tateishi also presented information about his involvement in the Global Land Cover Ground Truth Database (GLCGT). The GLCGT was based on Regional Land Cover Ground Truth (RLCGT) data and metadata. The GLCGT DB was based on LCCS. Work was also underway to standardize the legend.
- [36] After the presentation, it was remarked that the GMP was a decentralized system network rather than centralized. It was noted that New Zealand was one of the partners implementing the GMP.

PRESENTATION OF THE UN LAND COVER CLASSIFICATION SYSTEM

- [37] After the presentations on ongoing regional and global LC mapping and monitoring programmes, a number of presentations focused on acknowledgement of the need for GLCN, with LCCS as its global standard. The presentations were:
- Ø UNEP requirements for using GLC – T. Foresman.
 - Ø FAO requirements for integration and approach to LC classification – J.S. Latham.
 - Ø Overview of alternative systems for LC classification – Z.D. Kalensky.
 - Ø Using the FAO/UNEP LCCS – A. Di Gregorio.
 - Ø FAO's existing networks, outreach and advocacy programme – L. Alinovi.
 - Ø UNEP's existing networks, and operational capacities – T. Foresman.
 - Ø Process design for delivering an LCCS Global Database – L. Alinovi and T. Foresman.
- [38] In his presentation on UNEP requirements, Mr Foresman explained the information requirements of UNEP, in particular for environmental assessment and early warning. He provided a short overview of the structure and activities of the UNEP Division for Early Warning and Assessment (DEWA), with an emphasis on the Global Environment Outlook (GEO), building regional networks like GEO Africa Environment Outlook and its collaborating centres; provision of policy-relevant guidelines to member countries; and early warning for prevention and mitigation of non-crisis processes and events, either natural (drought, floods, fire) or anthropogenic (pollution and conflicts).
- [39] Mr Foresman summarized his presentation by saying that UNEP was fully committed to a process for harmonized data collection at national level that would lead to aggregated and integrated results regarding the status and trends of the environment, which could be applied to



regional and global assessments and early warning, and, finally, be useful for social and economic sectors at multiple levels.

[40] In his presentation, Mr Latham stressed the importance of networking and outreach as integral activities of GLCN, as well as the drive to harmonize global data through adoption of LCCS. The FAO/UNEP LCCS was created in response to a need for:

- Ø harmonized and standardized collection of LC data;
- Ø availability of LC data for a wide range of applications and users; and
- Ø comparison and correlation of LC classes.

[41] He emphasized the important role of the developing countries in this process and, as advocated for GLCN, the corresponding need to develop capacity at national and local levels in order to ensure the sustainability of an LC monitoring capacity. This bottom-up approach had been applied successfully in LCCS regional programmes, such as AFRICOVER.

[42] In the following presentation, Mr Kalensky provided an overview of alternative systems for LC classification, using AFRICOVER as an example, and showing the development towards adoption of LCCS over time. Initially, AFRICOVER was designed in the early 1990s for use with RS data and was expected to be based on the second level of the Anderson Land Use and Land Cover Classification System. In the meantime, comparison of LC classification systems based on predefined classes clearly demonstrated limitations for global and regional or continental applications. Furthermore, there were considerable inconsistencies in definitions of LC classes in the various systems, which made comparison of their classification results questionable.

[43] Convinced of the importance of harmonization of LC terminology and definitions for LC mapping at regional and global scale, FAO and UNEP developed LCCS, that was based on independent and universally valid LC diagnostic criteria rather than on a predefined set of LC classes. It had an inherent flexibility, applicability in all climatic zones and environmental conditions, and compatibility with existing classification systems, and thus allowed synergy with other international initiatives involving LC mapping and monitoring.

[44] LCCS output provided a comprehensive LC characterization, regardless of mapping scale, LC type, data collection method or geographical location. The number of classifiers used determined the level at which the LC was classified. Thus, more numerous classifiers were needed when more detailed classification of LC was required.

[45] Mr Kalensky concluded that a number of new promising initiatives, such as GLC2000 and ASIACOVER were using LCCS, but that strong political support was needed to make GLCN a success. He also reiterated the crucially important roles NGOs and academic institutions had in this process.

[46] Mr Di Gregorio provided an overview of the AFRICOVER methodology, approach and the existing tools for data production and harmonization. The major advantages of LCCS included:

- Ø LCCS gave the user a high level of flexibility in LC mapping (through the potential to define a large number of LC features, at least 100 000). This allowed the user to calibrate interpretation efforts according to the information content required;
- Ø despite the large number of classes, each had a distinct and unambiguous meaning; and
- Ø LCCS created an absolute level of standardization among different users.

[47] Mr Di Gregorio further described some of the major applications for which LCCS could be used, including:

- Ø all LC and natural resources mapping activities at any scale in any part of the world;
- Ø as a bridging system between LC maps that used local or non-standardized legends;



- Ø as a possible link between small-scale global mapping activities and detailed large-scale national mapping programmes; and
- Ø as a bridging system to link natural resources statistical censuses with mapping programmes at national or regional level.

[48] In conclusion, Mr Di Gregorio observed that more effective tools for data re-elaboration (e.g. Africover Database Gateway (ADG)) and development of more detailed and standardized mapping accuracy (e.g. Mapping Accuracy Programme (MAP)) were all necessary activities and tools to set up LC DBs that could be used by a large end-user community, at regional, subregional, national and subnational levels. The envisaged end result would be a global standardized network of LC data that would open the door to a wide range of new applications.

[49] In his presentation on FAO's existing networks, outreach and advocacy programme, Mr Alinovi reminded the audience of FAO's responsibility to serve its member countries, primarily through its extensive primary institutional network and highly decentralized structure of Regional, Sub-Regional and National Representations and Liaison Offices, and strong field programme.

[50] Mr Alinovi also raised important issues related to existing LC networks and related data, including existing gaps in data production and harmonization of information needs inside and outside the UN system. He drew attention to an important initiative in this respect, the Food Insecurity Vulnerability Information and Mapping System (FIVIMS). FIVIMS was an inter-agency initiative and an immediate follow-up activity to the World Food Summit. At the national level, integration and harmonization of data for FIVIMS was implemented through a network of information systems that gathered and analysed data germane to measuring and monitoring food insecurity and vulnerability. This network was collectively referred to as the *national FIVIMS*. At the international level, FIVIMS was implemented through a diverse programme of activities that aimed to support national FIVIMS and establish a common DB and information exchange network, referred to as *global FIVIMS*.

[51] Bearing in mind all the ongoing networks and harmonization efforts, Mr Alinovi outlined some important outreach activities needed to enhance the effectiveness of GLCN for all the different user groups with an interest. The activities included:

- Ø support to comparative case studies and activities tracking LC mapping status in individual countries;
- Ø development of resource kits and associated course material for use in distance learning;
- Ø regional and thematic electronic conferences on LC inventory and change, methodologies and tools;
- Ø regional and focused workshops on LC inventory and change, methodologies and tools; and
- Ø wide diffusion of a GLCN Newsletter and operational web site: *globalcover.org*.

[52] In a presentation on UNEP's existing networks, and operational capacities, Mr Foresman provided a historic overview of UNEP networks, starting from 1972, when a global vision was launched. The first networks developed included EARTHWATCH, Global Environment Monitoring System (GEMS) and INFOTERRA. In 1982, the Global Resource Information Database (GRID) network joined the list. In 1992, under UNEP's supervision, the Global Environmental Outlook (GEO) networks GEO 1 and GEO 2 were born. Currently, UNEP was a leader in global environmental assessments and a provider of information to assist decision-makers and citizens around the world.

[53] In a shared presentation on the process design for delivering the LCCS global DB, Messrs Alinovi and Foresman discussed the framework and important modalities of establishing such a global network and DB, requesting feedback from the audience.



[54] They started by emphasizing the opportunities for GLCN, with the aim of using LCCS as the international standard, although they made clear that GLCN was not restricted to any single methodology nor to a single category of earth observation data, present or future.

[55] Both also emphasized the need to clarify and identify the ultimate user groups at local, national and regional levels to increase the impact of GLCN information. A clearer focus would certainly help in gaining access to the right data, which still was often restricted by legislation.

[56] Through discussion, the following progression of project stages were proposed for GLCN:

- (i) raw data (Earth Observation);
- (ii) processed data (rectified, calibrated);
- (iii) production of LCCS information;
- (iv) LC products, produced by FAO, UNEP and others; while
- (v) ultimate beneficiaries would include:
 - Ø international conventions, such as the UN Framework Convention on Climate Change (FCCC), the UN Convention to Combat Desertification (CCD), the UN Convention on Biological Diversity (CBD), the Ramsar Convention on wetlands, etc;
 - Ø United Nations Forum on Forests (UNFF);
 - Ø Global Terrestrial Observing System (GTOS);
 - Ø land use planning in every country; and
 - Ø disaster mitigation.

[57] In the discussion that followed it was stated that the system under consideration should ensure that it would be inclusive of all users and, importantly, meaningful to future users. Moreover, the GLCN should provide a forum for technical partners to discuss technical issues in detail. There was also general agreement that there was a pressing need for harmonization of standards in many countries, especially where the basic use of GIS and spatial analysis still needed to be promoted.

[58] Another comment identified that new opportunities exist for GLCN and its partners, in the light of high resolution elevation data, i.e. 90-m cells, and other advanced technology soon becoming available in the public domain, which would also support enhancements to the extraction of LC information.

[59] At the end of the first day, participants were given the opportunity to make comments. The following statements were made and endorsed by the meeting:

- Ø there was a need for the availability of excellent pilot studies to develop LCCS products;
- Ø there was a need to recognize and apply lessons learned from both successful and unsuccessful projects;
- Ø there was a need to go beyond harmonization of LC standards, to be able to understand what would be effective in particular countries, since not everyone approached problems in the same way;
- Ø there was a need to improve the quality assessment process to make the work more effective;
- Ø the geospatial data-user community had to increase its visibility and demonstrated usefulness;
- Ø there was a need to elaborate a strategy within the UN community to make efforts more effective; and
- Ø further refinement was needed of the participants' common vision for the meeting, and to define the process for its endorsement by the participants.



PLENARY REVIEW OF THE FAO/UNEP GLOBAL LAND COVER DESIGN

[60] At the start of Day 2, Mr Sayn-Wittgenstein provided a summary of the key presentations and key issues from Day 1. He found broad consensus among the participants in the following areas:

- Ø a high degree of support for the general concepts and approaches of GLCN and adoption of LCCS;
- Ø user requirements should be the foundation of global LC design. This should start with the definition of users, and the involvement of stakeholders, not only government but also NGOs, academics and private sector;
- Ø more effort needed to be put into the estimation of benefits, including partner benefits in particular; and
- Ø RS would be the primary data source.

[61] Finally, Mr Sayn-Wittgenstein mentioned that four pillars seem to emerge for the establishment of the cooperative programme: Network, Harmonization, Interoperability, Partnership and Global Coalition.

[62] Minister A.M. Iannucci, Vice Director General, IDC, delivered the Government of Italy's blessing on the meeting. He said that he was pleased to see collaboration among different agencies of the UN system in fields of common interest that touched upon cross-cutting issues of crucial importance, such as sustainable management of natural resources, and food security.

[63] He recalled the long involvement of IDC with LC mapping of eastern Africa, based on satellite RS, dating back to the early 1990s, within the broader framework of the FAO/Italy Cooperative Programme, through the AFRICOVER project. He noted that AFRICOVER was considered to be one of the most successful projects within Italy's Cooperative Programme with FAO. He recalled the valuable technical support of the IAO in a number of activities in support of the AFRICOVER project. The project was providing a new set of tools for a model of development that was environment oriented and at the whole-region level, which would result in an improvement in the mapping and monitoring of agricultural, forestry and water resources.

[64] In his concluding remarks he called on FAO, as the Executing Agency, to call for the involvement of other donors, since AFRICOVER had been initially conceived as a multi-donor programme. He also extended an open invitation to UNEP to participate more directly in current and future activities.

REGIONAL ROUND TABLE

[65] The larger part of the morning had been set aside for a Regional Round Table (RRT), involving 12 selected experts from 6 regions worldwide, who made presentations on the main LC mapping activities in their respective regions. The purpose of the RRT was to create awareness of regional LC mapping programmes and priorities, and to obtain regional advice on strategies and common standards for global LC mapping. In particular, the round table and subsequent discussions were expected to bring up important issues, to be discussed in more detail in the WGs.

[66] The organizers had invited two experts from each region to participate, and they had been requested to prepare a brief response on: national and regional LC mapping activities; predominant standards and methodologies used in the region; provide opinions on the applicability of the FAO/UNEP LCCS as the new standard; and comment on proposed establishment of GLCN.



[67] The following experts were selected:

Near East and North Africa	Muftah Unis and Sami Abdel Rahman
Africa (sub-Saharan)	Mark Thompson and Yemane Teckleyohannes
America (Central and South)	Dalton de Morrison Valeriano and Stella Navone
America (North)	Mathew Fladeland and Bob Ryerson
Asia	Dirk Van der Stighelen and Ravoori Nagaraja
Europe	Guenter Fischer and Louisa Jansen

Summary

[68] The main points raised during the RRT presentations are summarized below.

[69] *Use of GIS and RS*

- (i) Digital LC mapping was more predominant than analogue mapping (but this did not equate to raster vs vector analysis).
- (ii) GIS and RS were widely used in all regions, yet reliable LC information was not available in some countries.
- (iii) The main GIS software used for LC mapping and monitoring were ArcView and ArcInfo.
- (iv) LC data was primarily used for crop and forest inventory surveys at national and regional level, although increasingly used by new user groups for other environmental, industrial and food security purposes.
- (v) New applications for LC data were thought to be numerous, making the detail and flexibility of the information available at different scales all the more important.

[70] *Standards*

- (i) In developed countries, *de facto* standards were used, such as Multi-Resolution Land Cover (MRLC) in North America and Coordination of Information on the Environment (CORINE) in Europe.
- (ii) Lack of standardization at country, regional and global levels was felt by all to be an important impediment for integration of data sets, and hence a constraint on well-informed decision-making.
- (iii) Using AFRICOVER as a successful regional programme in Africa, the FAO/UNEP LCCS was seen by the panel to be an important step towards a new standard to be used by all.
- (iv) In applying LCCS, it was important to establish user requirements and to provide the level of detail required by users.

[71] *Integration of datasets at national, regional and global level*

- (i) Large countries, like Canada, China, India and USA, and regional networks in Europe, Latin America (PNUMA/GEF), sub-Saharan Africa (SADC), Asia (MRC) and the Arab countries (ACSAD), had successfully set up networks to integrate different datasets to enable cross-country comparisons.
- (ii) Examples of successful national and regional integration of datasets were available. South America provided a particularly good example of how mapping projects in different countries, dealing with a common problem (desertification), could lead to regional cooperation and the successful establishment of a regional network. GLCN would have to determine how such regional networks could be linked to or associated with the global network.
- (iii) One of the main problems felt by these networks was the problem of integration of datasets using different classification systems, classes and legends.



- (iv) The panel members emphasized a bottom-up approach with capacity building, which was felt essential, especially in developing countries and regions.

[72] ***LCCS and its use as a global standard***

- (i) Regions where GIS/RS were extensively used (e.g. North America and Europe) saw the benefit of a neutral classification system for the establishment of a global dataset. The requirements for LCCS to become the standard would include the need to allow cross-comparisons of disparate studies.

[73] At the end of the presentations, issues were discussed, which led to a number of comments and recommendations.

- (i) GLCN was needed to facilitate the creation of the first global dataset, based on integration of national and regional DBs.
- (ii) Success stories and problems identified by operational networks should be analysed and the lessons derived integrated into the cooperative programme to establish a GLCN.
- (iii) Further pilot studies were needed in different regions of the world to assess the applicability of LCCS. Once these proved successful, support should be sought for implementation of regional programmes for LCCS worldwide.
- (iv) While it was recognized that the primary beneficiaries of GLCN would be FAO's and UNEP's programmes, GLCN design should nevertheless also take into consideration the LC information requirements of both government entities and NGOs.

WORKING GROUPS ORGANIZATION AND ASSIGNMENT

[74] After lunch, to all participants in plenary session, Mr Sayn-Wittgenstein introduced the proposed three thematic WGs. These were briefly discussed and adopted by the participants. The participants were then asked to move into the group of their choice and to discuss the issues.

[75] The three WGs were:

- (i) WG 1 – United Nations Land Cover Classification System (LCCS).
- (ii) WG 2 – Methodologies for an LCCS-based Global Land Cover Database.
- (iii) WG 3 – Strategic Framework for Development of an FAO/UNEP GLCN.

[76] During early plenary discussions it had emerged that there was a high level of agreement among all participants on major issues involving rationale, objectives and approaches to GLCN. Where this impinged on a WG's terms of reference, the WG typically re-stated and confirmed the earlier agreement, before moving on to other topics.

[77] Working groups met on several occasions in plenary session to review progress and to adjust their *modus operandi*. During one such session, it was decided to form a small committee with the task of drafting the "Artimino Declaration."

[78] WG deliberations continued until noon on Day 3, when plenary presentations were made. Detailed WG presentations and information on WG membership are provided in the attached CD-ROM.

DELIBERATIONS BY WORKING GROUPS AND PREPARATION OF THE REPORT

[79] The WGs continued their deliberations and prepared their reports and recommendations, which were presented in plenary session following lunch on Day 3.

[80] The conclusions and recommendations of the WGs established at Artimino were a synthesis of the main results of the Expert Consultation (submitted, reviewed, modified and adopted in



plenary). This was the expected result of an agenda that placed WG activities near the end of the meeting, following a series of presentations on FAO and UNEP programme objectives, and following technical presentations by potential partners, who described user requirements, LC classification systems, current methodologies and regional issues.

[81] The main conclusions and recommendations of the three WGs for the establishment of GLCN have been summarized under the following headings:

- (i) Overall Goal and Strategic Principles
- (ii) The FAO/UNEP LCCS
- (iii) Procedures and Methodologies
- (iv) Training and Capacity Building
- (v) Partnership and Global Coalition
- (vi) Interim Arrangements, Outreach and Communications

Overall Goal and Strategic Principles

[82] The overall goal of the GLCN was to improve the access to and availability of reliable, standardized information on global LC and its dynamics.

[83] LC information was essential for the sustainable management of natural resources, environmental protection and disaster mitigation. It provided the basis for the environmental, food security and humanitarian programmes that were crucial in fulfilling the mandates of many UN, international and national agencies.

[84] To achieve its goal, GLCN would be built on four pillars:

- (i) a network providing support to regional and national networks within a global cooperative programme;
- (ii) harmonization of existing classification systems;
- (iii) interoperability (from global to subnational levels); and
- (iv) partnership and global coalition.

[85] Furthermore, a number of principles applied to GLCN:

GLCN as an operational programme

[86] It was a network that met very real demands for LC data from the operational users, with benefits and feedback. The main objectives were neither academic nor purely scientific.

GLCN as a user-driven programme

[87] User requirements had to come first and should be the foundation of the global LC design. Feedback loops would have to be provided throughout the design to respond to user requirements. An early requirement was to identify users and stakeholders, not only in government but also in NGOs, academia and the private sector. Who were the stakeholders in each country?

Country requirements were of paramount importance in the implementation of GLCN

[88] One of the strengths of FAO and UNEP programmes lay in their close relationship to country programmes. GLCN would take a bottom-up approach and be guided by country requirements. Necessary project liaison, feedback loops, training and institutional strengthening projects would be implemented. Many of the benefits of GLCN would be realized at the country level.



FAO/UNEP Land Cover Classification System

LCCS should be accepted as the standard for harmonization of global LC information

[89] This conclusion was reached not only by WG 1, which was responsible for evaluating LCCS, but also in plenary discussion. In addition, several presentations from potential partners included statements of support. One important consideration was LCCS' ability to provide a standard, while giving individual users the freedom to employ their own systems. This requires specificity in describing why a class was given a specific label; LCCS translators can then complete the process. Other positive factors were the successful operational test of LCCS in the AFRICOVER project, and favourable opinions resulting from other mapping projects. Other arguments in favour of LCCS included:

- (i) LCCS was an innovative LC classification system that met the needs of a broad-based multi-user community, and in this sense was a truly multi-user-oriented methodology that could be used to compare LC information collected at common scales from various land observing systems, including *in situ* observations and measurements, aerial photographs and RS satellite data.
- (ii) LCCS was an open, transparent and evolving system based on user participation.
- (iii) LCCS had the prerequisites to become the international reference standard for LC classification. It was technically sound, and acceptable to the user community.

[90] *Actions recommended for global implementation of LCCS*

- (i) Promote, within the LC community, awareness of LCCS' potential, with participation in applications development.
- (ii) Evaluate and respond to feedback from a wide range of applications and users.
- (iii) Develop pilot studies of nested LC systems, including up- and downscaling of LC data.
- (iv) Establish a user-community network to facilitate exchange of experiences and training, including the development of training tools such as tutorials, distance learning approaches, guidelines and frequently-asked-question (FAQ) tools, and to propose changes to and upgrades of LCCS.
- (v) Establish a technical panel to:
 - evaluate feedback from users; and
 - screen and assess proposed changes to and upgrades of LCCS.
- (vi) Organize subregional workshops to promote the use of LCCS and to encourage participation in the network.
- (vii) Set up an *ad hoc* working group to pursue International Organization for Standardization (ISO) certification of LCCS.
- (viii) Ensure that LCCS users produce metadata.
- (ix) Populate the LCCS Translator Module with translations of existing legends, in particular global, regional, subregional and national legends, to be certified by the technical panel, with the active involvement of the authorities responsible for the legends.

Procedures and Methodologies

Satellite remote sensing would be the most important global LC information source

[91] Advances in technology and the large number of current and proposed satellites made Earth Observation the most efficient method of obtaining global LC information. Satellite data were also the only practical way of filling the data gaps that would inevitably be identified as the first global LC DB was assembled. LANDSAT 30-m data would be the primary LC data source for the foreseeable future.



[92] The use of satellite data should in no way prevent the use of other methods, such as aerial photography and ground survey.

Metadata should be provided for all components of the global LC DBs

[93] Metadata were an essential requirement for all modern DBs, and metadata would play an essential role in the harmonization of information using LCCS. The use of metadata should include field observations and calibration and validation data.

A Global, LCCS-based, LC DB should be assembled

[94] The methodology proposed for development of an LCCS-based Global Land Cover Database had two tracks, a fast track, based on translation of existing LC DBs into LCCS nomenclature, and a standard track, based on mapping and monitoring methods developed for new LC mapping, e.g. in the AFRICOVER project.

[95] The outline fast track methodology would be:

- (i) Inventory of existing LC DBs.
- (ii) Review of their LC legends, class definitions, accuracy and dates.
- (iii) Selection of DBs compatible, at least on an interim basis, with FAO and UNEP information requirements.
- (iv) Screening LC classes (e.g. elimination or grouping of some classes, depending on their definitions).
- (v) LCCS translation of LC classes.
- (vi) Editing, formatting and labelling of translated LC classes.
- (vii) Inclusion of fast track LC classes, as separate data layers, labelled to identify their accuracy and dates, in the LCCS global LC DB.
- (viii) Inclusion of information on the fast track LC classes in the LCCS metadatabase and its dissemination through GLCN.

[96] The outline for standard track methodology would be:

- (i) New coverage by high resolution Earth Observation satellites would be the primary source for input data. In areas with persistent cloud cover, SAR satellite data would be used.
- (ii) The uniform geodetic framework for global correspondence within the the LCCS LC DB would have the parameters specified by WG 2 (see attached CD-ROM).
- (iii) Interpretation of satellite data would be supported by the GeoVis and AIMS software packages developed in the framework of the AFRICOVER project (FAO).
- (iv) Content and architecture of the LCCS DB would provide flexibility for generation of multi-level and multi-application LC products corresponding to FAO and UNEP LC information requirements. Its geometric accuracy would be compatible with requirements of LC mapping at up to 1:100 000 scale and related GIS data integration, processing and modelling.
- (v) The main project product would be a GIS-based LCCS DB from which digital and hard copy mapping and statistical products would be generated. The LCCS DB would become part of the FAO/UNEP GLCN. Its component regional and national LC DBs would be maintained by regional and national organizations.
- (vi) Development of a metadatabase that would be available on the FAO/UNEP GLCN website.

[97] Fuller details can be found in the report of WG 2, given in full in the attached CD-ROM.



Training and Capacity Building

Training to be a continuing activity

[98] Training and capacity building were considered a prerequisite for partnership agreements with many regional and national organizations. Proposed components of this process were identified.

Country-level capacity building

[99] Preparation stage:

- (i) selection of regional offices within the network and international training centres for areas outside the network;
- (ii) training of the trainers from the network by FAO/UNEP (expected duration: 4 weeks); and
- (iii) preparation of training materials (guidelines and manuals).

[100] Implementation stage:

- (i) regional training in different countries;
- (ii) training groups of 15 to 20 persons;
- (iii) frequency of 3 to 5 times;
- (iv) training content should cover background, RS, GIS and LCCS; and
- (v) training types would include:
 - orientation training, for countries advanced in GIS and RS (duration: 3 weeks), and
 - two-stage training for other countries (elementary level (3 weeks), and advanced level (4 weeks)).

[101] Feedback stage:

- (i) from countries to the countries in the network;
- (ii) from countries to FAO/UNEP; and
- (iii) from network to FAO/UNEP.

Training for translation experts

[102] Experts would support the network and countries on a continuing basis, *inter alia* through:

- (i) selection of experts from the network, other training organizations and professionals;
- (ii) training content (duration 4 weeks), to include:
 - well known systems for LC mapping and monitoring;
 - LCCS;
 - technical solutions in methodologies, concepts, processes, etc. (e.g. designing cartography, resolution, ground truth, processing); and
- (iii) continuing interactions through meetings every 6 months within the expert group to exchange experiences.

[103] **Partnership and Global Coalition**

- (i) FAO and UNEP should forge a Global Coalition with the major organizations involved in the development and use of the LC information to be produced by GLCN.
- (ii) The organizations to be included in this Coalition should be identified and the role of partners should be described. Organizations include satellite operators and other suppliers of data, RS data interpretation and mapping organizations, data analysis experts, and a large number of users and producers of value-added products.



- (iii) FAO/UNEP should complete an inventory of worldwide LC initiatives. It was noted that this initiative had begun with the questionnaires submitted by participants in the Artimino Consultation.
- (iv) FAO/UNEP should develop a data policy for GLCN data. This policy should cover such topics as ownership of data, intellectual property, restrictions on distribution and use of data, any charges for data reproduction and use, data security, and availability of data for private-sector initiatives.
- (v) FAO/UNEP should review the data policies of potential partners before making commitments for partnership in GLCN. This was important, because partners might place restrictions on data that precluded the intended use in GLCN. Examples might be royalties, prohibition of commercial use of data, or restriction on distribution of data to certain parties.
- (vi) The main users and beneficiaries of GLCN information should be identified. The users and beneficiaries would include the major UN Conventions.
- (vii) Demonstration pilot projects should be initiated early in the pre-operational stages of the programme. Possibilities included projects in China, Africa and South America. Such projects were important as a training ground, to develop operational procedures, and to provide evidence of progress.
- (viii) Benefits resulting from GLCN, and especially partner benefits, should be described and quantified. Estimates of programme benefits were important in winning support for the programme, and could also be of significant value to programme partners. An example of partner benefits would be the reliable estimation of LC changes that resulted in carbon credits.

[104] **Interim Arrangements, Outreach and Communications**

- (i) FAO/UNEP should assign responsibility for liaison and coordination of the GLCN initiative during the immediate future. Working Groups referred to a “secretariat” or “facilitator.”
- (ii) Promotional activities in the regions and elsewhere should be initiated. Supporting materials included kits for training seminars, and material to assist in the briefing of senior officials.
- (iii) Opportunities to inform and promote GLCN should be exploited. The World Summit for Sustainable Development, in Johannesburg, August-September 2002, might be such an opportunity.
- (iv) Potential donors should be identified and informed, and donor submissions prepared.

REPORT PREPARATION AND THE ARTEMINO DECLARATION

[105] When the WG reports had been finalized, a draft “Artimino Declaration” was presented by a small committee, discussed in plenary and modified, before being endorsed by the entire meeting. The initiative for the Artimino Declaration had been taken in one of the WGs as a means to send a strong political signal for technical and financial support in support of the newly established GLCN.

[106] The full text of the Artemino Declaration was presented at the start of this report.



APPENDIX 1

AGENDA FOR THE FAO/UNEP EXPERT CONSULTATION ON STRATEGIES FOR LAND COVER MAPPING AND MONITORING

Villa Artimino, Florence, Italy, 6 - 8 May 2002

Note: All proceedings will be in English

The Facilitating Team comprised L. Sayn-Wittgenstein, Z.D. Kalensky,
T. Foresman, J.S. Latham, R. Verduijn and L. Alinovi

Monday, 6 May 2002

08:30 - 09:00 Registration

Opening and orientation

Chair: Leo Sayn-Wittgenstein

09:00 - 09:45 Opening. Welcoming addresses on behalf of:

FAO

UNEP

Istituto Agronomico d'Oltremare

Region of Tuscany

Italian Development Cooperation, Ministry of Foreign Affairs

09:45 - 10:00 Break

10:00 - 10:15 Round Table Introductions

10:15 - 10:30 Overview of the consultation (Leo Sayn-Wittgenstein)

10:30 - 11:00 Overview of goals and objectives of the meeting; introducing the concepts for an operational FAO/UNEP Global Land Cover Cooperative Programme (Tim Foresman and Changchui He)

11:00 - 11:30 Coffee Break

Overview of Global User Requirements and Status

Chair: Z.D. Kalensky

11:30 - 11:50 IGBP assessment of users' requirements for global land cover information (W.J. McConnell)

11:50 - 12:15 Status of Global Land Cover (Global Land Cover 2000), results achieved and future requirements (E. Bartholomé)

12:15 - 12:35 GTOS and GOFC/GOLD requirements for global land cover information (D. Skole)

12:35 - 12:50 The Global Mapping Project (Ryutaro Tateishi)



12:50 - 13:10 UNEP requirements for using global land cover for integrated global assessment, early warning and future initiatives (T. Foresman)

13:10 - 14:15 Lunch

Presentation of the UN Land Cover Classification System

Chair: Bob Ryerson

14:15 - 14:40 FAO requirements for integration and approach to land cover classification; requirements and progress (John S. Latham)

14:40 - 15:00 Overview of alternative systems for land cover classification (Z.D. Kalensky)

15:00 - 15:30 Methodology, approach and existing tools to be used for harmonization of data and new datasets using the FAO/UNEP Land Cover Classification System (LCCS) (Antonio Di Gregorio)

15:30 - 16:00 Coffee break

16:00 - 16:30 FAO's existing networks, outreach and advocacy programme (Luca Alinovi)

16:30 - 17:00 UNEP's existing networks and operational capacities (Tim Foresman)

17:00 - 17:30 Process design for delivering LCCS global database (Luca Alinovi and Tim Foresman)

17:30 - 18:00 Plenary discussion

Tuesday, 7 May 2002

Utility of FAO/UNEP methodologies for regions and countries

Chair: René Verduijn

09:00 - 09:30 Plenary review of the FAO/UNEP Global Land Cover Design (Leo Sayn-Wittgenstein)

09:30 - 11:00 Regional Round Table. Experts from six regions to respond to a set of questions regarding the utility and applicability of the proposed design strategy.

<i>Region</i>	<i>Experts</i>
Near East and North Africa	Muftah Unis and Sami Abdel Rahman
Africa (sub-Saharan)	Mark Thompson and Yemane Teckleyohannes
America (Central and South)	Dalton de Morrison Valeriano and Stella Navone
America (North)	Mathew Fladeland and Bob Ryerson
Asia	Dirk Van der Stighelen and Ravoori Nagaraja
Europe	Guenter Fischer and Louisa Jansen

11:00 - 11:30 Coffee break

11:30 - 12:00 Regional Round Table: Discussion on panel response

Working Groups organization and assignments

Chair: Leo Sayn-Wittgenstein

12:00 - 13:00 Three working groups will be discussed and formed

Review of Guidelines for Working Groups

WG 1 - UN Land Cover Classification System (LCCS) (Co-chairs: Louisa Jansen and Paolo Sarfatti)



Overview of lessons learned from the application of LCCS, its global applicability, compatibility with other LC classification systems and harmonization options among LC classification systems. Review of LCCS distance-learning software packages and their user-friendliness. Formulation of a requirement for development of LCCS-based international LC classification standard acceptable to ISO.

WG 2 - Methodologies for establishment of LCCS-based Global LC Database
(Co-chairs: Mark Thompson and Z.D. Kalensky)

Recommendation of appropriate methodologies for the establishment of an LCCS-based global LC database compatible with information requirements of FAO and UNEP programmes, to include methodologies for conversion of existing LC databases to LCCS standards, as well as methodologies for LC mapping and monitoring (remote sensing input data, mapping scales, minimum mapping areas, validation of results, formats of LC products).

WG 3 - Strategic Framework for Development of FAO/UNEP Global LC Network
(Co-chairs: Leo Sayn-Wittgenstein, Luca Alinovi and John S. Latham)

Drafting a strategic framework for cooperation with space agencies and other relevant organizations in development of the FAO/UNEP Global Land Cover Network (GLCN). Specific tasks to be considered are the GLCN institutional infrastructure, linkages with existing LC databases, LC data transfer protocols, dissemination policy for LC data products and their cost, global LC meta-database, and LC capacity building in developing countries.

- 13:00 - 14:00 Lunch
- 14:00 - 15:00 Working Group Discussions and Deliberations (continued)
- 15:00 - 15:30 Coffee break
- 15:30 - 17:30 Working Group Discussions and Deliberations (continued)
- 17:30 - 18:00 Plenary discussion on progress, emerging issues and new elements, cross-cutting areas, methods and tools, data sets, etc. (Facilitator: Leo Sayn-Wittgenstein)

Wednesday, 8 May 2002

Deliberations by Working Groups (continued) and preparation of the report

- 09:00 - 11:00 Working Group discussions
- 11:00 - 11:30 Coffee break
- 11:30 - 13:00 Preparation of Working Group reports and recommendations
- 13:00 - 14:30 Lunch
- 14:30 - 15:30 Reports to Plenary by three Working Groups (Facilitator: Leo Sayn-Wittgenstein)
- 15:30 - 16:15 Coffee break
- 16:15 - 16:30 Final discussion and vote on Artimino Declaration
- 16:30 - 17:00 Finalization of the Expert Consultation report, with review of contributions
- 17:00 - 18:00 Closing remarks and next steps



APPENDIX 2

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APPENDIX 3

OPENING ADDRESS

BY

JACQUES-PAUL ECKEBIL

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On behalf of Mr Jacques Diouf, the Director-General of FAO, I would like to welcome you all to this FAO/UNEP Expert Consultation on Global Land Cover and Land Changes Monitoring Strategy.

I am encouraged to see the high level international participation at this important meeting, which will chart a strategy for global harmonization of information on current land cover and its changes. This goal involves one of the basic inputs to planning and decision-making of sustainable development and management of natural resources and environmental protection.

The theme of the Expert Consultation is particularly timely. Next month will be the tenth anniversary of the milestone UN Conference on Environment and Development (UNCED, better known as the Earth Summit), which represents a threshold in attitudes towards environment and sustainable development. The following two specific actions related to land cover assessment were listed among the UNCED priority requirements: bridging the data gap, and improving the availability of information. Agenda 21, the UNCED action plan, recommended the use of remote sensing and GIS technologies for the coordinated, systematic and harmonized collection and assessment of data on land cover and environmental degradation.

The launch of four UN-coordinated international environmental initiatives further strengthened the UNCED recommendations:

- the Framework Convention on Climate Change;
- the Convention on Biological Diversity;
- the Convention to Combat Desertification; and
- the Agreement on Basic Principles for Sustainable Management of Forests, which has evolved into the United Nations Forest Forum.

The implementation of these major environmental initiatives requires the availability of reliable land cover information. Modern geo-information technologies, in particular satellite remote sensing and geographical information systems, provide the most effective tools for obtaining such information at the global, regional and national levels. They thus have an important role in the planning and implementation of strategies for the achievement of three priorities related to sustainable development and food security, namely:



- conserving and managing land and water resources to ensure food production for the growing population in developing countries;
- introducing sustainable agricultural practices to prevent degradation of land and water resources and thus to maintain their life-supporting capacity; and
- improving environmental protection in order to preserve a sound ecological balance and biological diversity, and to mitigate the effects of natural and human-induced disasters such as agricultural drought, floods, forest fires, soil erosion and landslides.

Essential requirements for the achievement of these three objectives are the availability of reliable, timely and location-specific information on current land cover and land use, as well as the assessment of past changes and the modelling of future trends. It is an attainable goal, but its fulfillment requires stakeholder participation and improved access to relevant information.

The importance of land cover information is reflected in a growing number of land cover mapping and monitoring projects that are being implemented at all levels, from global to local. It can be seen from the agenda that some of these projects will be reviewed at this meeting. These projects are important and provide valuable information for decision-makers responsible for sustainable development and environmental protection. However, there is a lack of harmonization among projects. They use different definitions of land cover categories and different classification, mapping and monitoring systems and methodologies. For example, there are several cases where the definition of “forest” differs among organizations in the same country. Other problems involve differences between approaches to the validation and accuracy assessment of classification results. Under these circumstances, the comparison of results among land cover mapping and monitoring projects is difficult and potential benefits from their use are lost.

FAO, in cooperation with UNEP, has developed a new concept for land cover classification, the United Nations Land Cover Classification System (LCCS). The LCCS categorization of land cover is based on universal, generally valid classification criteria, rather than on a pre-determined, rigid set of land cover classes. The system has been thoroughly tested during implementation of the FAO AFRICOVER project over the last three years. It is now ready for use by international and national land cover mapping and monitoring projects. An important feature of LCCS is its compatibility with any land cover classification system. Therefore it can be used for harmonization of diverse land cover legends: an essential requirement for integration and synergetic processing of land cover data based on different classification systems. The LCCS will be demonstrated at this meeting. We would like to hear your opinion and advice on its applicability in your own activities.

In conclusion, I would like to refer to the United Nations Millennium Declaration, which includes the achievement of environmental sustainability and establishment of a global partnership for development among its Millennium Development Goals. The major objective of this Expert Consultation is the formation of such a global partnership in the area of your expertise, to enhance the global availability of harmonized and user-friendly operational methodology for land cover monitoring and information products, effectively contributing to sustainable development and food security. At present, we are in the midst of preparations for the World Summit on Sustainable Development, which will take place in Johannesburg, South Africa, later this year. The progress of implementation of UNCED Agenda 21 will be reviewed at the Summit, and a new strategy that should further strengthen sustainable development and environmental protection will be adopted. I have no doubt that land cover mapping and monitoring will play an important role in the follow up and the implementation of decisions adopted at Johannesburg. We are facing challenging tasks and there will be many obstacles along the road, but by joining forces



Welcoming Addresses



and mobilizing our efforts, we shall succeed. There is no alternative other than a global partnership.

Thank you for joining us at this important meeting and my best wishes for your deliberations.



OPENING ADDRESS ON BEHALF OF UNEP

BY

DR TIMOTHY W. FORESMAN

DIRECTOR, DIVISION OF EARLY WARNING AND ASSESSMENT, UNEP

On behalf of Dr Toepfer, UNEP's Executive Director, and the team at UNEP, I wish to express my sincere appreciation to all of the experts who have come to this meeting to assist UNEP and FAO with this landmark workshop. The issue of land cover information is fundamental to meeting the challenges set forth in Agenda 21 and to meet the mandates for UNEP and FAO.

We are extremely pleased to have these experts assist this joint FAO/UNEP land cover initiative as we must make sure that what the UN is about to implement is based upon the best peer review and feedback to make it a success. The success is needed as we address the litany of convention needs and issues that have been well expressed in the FAO opening remarks.

What we are truly pleased about is that after 30 years of remote sensing development, the UN is about to embark on the first operational use of Earth observing satellites for global land cover. The meteorological community represents the only other operational use of satellites for the environment.

The fact that FAO and UNEP have voluntarily forged this alliance to deliver global land cover data to the nations of the world will bring about changes in way that statistics, assessments, and decisions are made regarding Earth surface dynamics. These changes are requisite if we are to meet the challenges for sustainable use of the planet's resources.

Again, on behalf of UNEP, I wish to thank all of the scientists and national experts who have taken the time and energy to help FAO and UNEP successfully launch the first operational global land cover network.



WELCOME ADDRESS

BY

MS PERLINI

DIRECTOR-GENERAL

ISTITUTO AGRONOMO PER L'OLTREMARE

Mr Chairman, ladies and gentlemen, distinguished hosts, dear colleagues, it is a great honour for the Istituto Agronomico per l'Oltremare to be co-organizers of this high level meeting. Let me warmly thank FAO and UNEP, the main organizers of this expert consultation, and the Region of Tuscany, the other co-organizer, and, of course, all of you who have convened here, in this beautiful Villa, which, together with the surrounding landscape, is a wonderful example of the civilization of this land.

This meeting sees the participation of experts from many different countries and from different types of organizations.

You represent here, in a wide sense, important segments of both the user and the producer communities of land cover information.

Land cover is what we can directly observe on the earth both from space and from the ground, and it is the "visible" result of the many complex interactions between natural resources and the action of man during time. We all know by experience that land cover changes over time under the pressure of natural forces and human activities, and so it is a highly dynamic parameter with a clear socio-economic dimension. Only the very recent advances in geo-information technologies give us the opportunity to represent this time dimension of land cover and to utilize it at scales appropriate not only for global monitoring activities but also for more detailed scales, needed for food security and integrated natural resources management activities.

During the last years, many different methodologies have been developed to map land cover and to monitor these changes, in order to improve the knowledge of our resources, to better manage the land on which we live and to assess the impacts of our actions. Several programmes have been developed to produce databases at different scales and for different purposes. These efforts have generated different data sets, different analytical tools, different technical languages, all of which have their specific scope and field of validity.

We think that now the time has come to develop a cooperative programme in order to define a common land cover vocabulary, develop international standards for land cover meta-data, agree on procedures for data quality checks and certification, further develop and harmonize methodologies for land cover classifications, and develop translation tools for data interchange. Hence we gave the maximum of our collaboration to the development of this meeting, which we think is a concrete step in this direction. We all know that geo-information is a cutting-edge technology, which is rapidly and continuously evolving, and a great risk linked to this rapidity is to widen the gap between developed and developing countries, due to technical and financial constraints.



Also for these different reasons, the Government of Italy has financially supported the AFRICOVER project, which is producing three different and equally significant results:

1. a digital land cover database for Eastern Africa (at a scale of 1:200 000 or 1:100 000);
2. an innovative land cover classification concept and methodology, including several *ad hoc* software tools; and
3. a considerable amount of training activities to strengthen national capacities in land cover mapping and classification.

The Istituto Agronomico per l'Oltremare has assisted the Italian Development Cooperation and FAO during these years, since the very beginning of the project. Through specific agreements with FAO, we have been fully involved in the implementation of some of the project activities, such as the development of the database of Eritrea and of the Democratic Republic of Congo.

Through this intense experience, we had the opportunity to test in depth the proposed concepts, methodologies and tools.

From this experience we can draw the preliminary conclusion that we now have a land cover classification system that is truly scale, geography and sensor independent.

Nevertheless, we are fully convinced that methodology development is a never ceasing process that has to keep pace with the technology advancement and with the new emerging needs expressed by the user community, which asks more and more for standardized, interchangeable, continuously updated and quality checked data.

Soon two events will take place – the World Food Summit and the World Summit on Sustainable Development – and the results of this high level expert consultation could feed these events with practical and technical consideration useful for better understanding and management of our environment, for sustainable use of our renewable resources, and for food and environmental security.

IAO is ready to participate in this process and to take full part in the network that will be established in the future to harmonize our activities.

Let me express again my welcome and wish for you to have a fruitful and positive discussion during the next three days.



WELCOME ADDRESS

BY

ANDREA CIONCOLINI

REGIONE TOSCANA, INTERNATIONAL RELATIONS SERVICE

First of all let me welcome you on behalf of the Regional Government of Tuscany. Many of you have probably already visited our old cities, historical towns and countryside; for some others this three-day meeting probably represents a good opportunity for a first visit. To all of you, we wish you a pleasant stay in Tuscany.

You are in one of the 20 Italian Regions. With its 3.5 million inhabitants, Tuscany is well known in the world not only for its rich cultural heritage, but also for economic development based on small- and medium-sized enterprises in traditional sectors such as textiles and leather, but highly competitive on the global market, having chosen quality as the key aspect of their innovative production.

Our economy is also based on tourism, agri-tourism and qualified agriculture, which is becoming a new opportunity for job creation for younger generations. Generally speaking, a key aspect of Tuscany is remarkable endogenous development based on the interaction of various economic sectors. What I say is probably already well known, but it's useful to create a good link with the objectives of your important initiative.

The issues of this meeting meet with our main interests in international cooperation activities. In fact, they are directly connected to the local dimension of development, which is one of the main goals of our initiatives with Developing Countries. Being at a territorial level of government, we are mainly interested in supporting a polycentric development, in which we firmly believe, based on the exploitation of local resources in a framework of sustainable development.

In a few words, I can tell you that we are mainly engaged in projects in the Mediterranean area (southern and eastern coasts) and the Balkan Area, because they represent our priorities in this geo-political context. But we also promote and support projects and programmes of local development in Africa (mainly Angola, Burkina Faso, Congo and Senegal) and in Latin America (Argentina, Brazil, Chile, Cuba, Dominican Republic and Nicaragua).

We promote territorial partnerships that involve Local Governments of Tuscany and Local Authorities in Developing Countries, aimed at supporting the process of empowerment, so as to increase their awareness of being "engines" of the development in their areas. The main features of sustainable development in Tuscany can be fruitfully exchanged in cooperation projects in order to enhance local policies and programmes.

What you are going to do together in this meeting is actually of strategic relevance in the perspective of strengthening local development. From reading your papers, it is obvious that the approach has the clear aim of achieving widespread use of the results of your joint work.



Welcoming Addresses



Both national and local levels of government in developing countries need suitable and up-to-date information about their lands in order to improve land use by more conscious and aware planning. A context of free use of land cover information makes our role easier in implementing projects of cooperation because we can aim our activities at supporting local decision-makers and at improving the process and the results of the initiatives.

We do hope that in the follow-up to this meeting the most advanced centres of Tuscany can be associated with your activities. In this regard, I do not need to say a word about the Istituto Agronomico per l'Oltremare of Florence, which you know very well and which represents our light, our landmark in this sector.

Have a good meeting and best wishes for your future activities.



WELCOME ADDRESS

BY

MINISTER A.M. IANNUCCI

VICE DIRECTOR GENERAL, ITALIAN DEVELOPMENT COOPERATION

It is a great pleasure for me to be here today, to represent Italian Cooperation in this important meeting, jointly organized by FAO and UNEP to bring together experts from different countries, with the aim of coordinating strategies for Land Cover Mapping and Monitoring projects.

The need to harmonize existing methodologies of projects being implemented in the field of land cover mapping is largely felt, especially by the users of land cover data, and cannot be underestimated, in order to maximize the results expected by such projects.

In this respect we welcome the initiative taken by FAO and UNEP to organize this meeting that is both useful and timely. We are also very pleased to see a practical example of collaboration among agencies of the United Nations system, in fields of common interest that touch upon cross-cutting issues of crucial importance, such as sustainable management of natural resources and food security.

Italy has always encouraged such joint initiatives that, while respecting the specific roles and competence of the organizations involved, have a broader impact and a multiplier effect on potential beneficiaries.

I wish to recall that Italian support to the Land Cover Mapping of East Africa, based on Satellite Remote Sensing, dates back to the early 1990s, within the broader framework of the FAO/Italy Cooperative Programme, through the AFRICOVER project. The project was meant to be a subregional component of a larger, multi-donor FAO programme, expected to provide a homogeneous database for land cover mapping of the whole of Africa.

The project funded by Italy is considered to be one of the most successful within our Cooperative Programme with FAO. It began in 1995 and is still ongoing in a second phase, which was financed in 2000 to allow the completion of activities started in the first phase, with the participation of the Istituto Agronomico per l'Oltremare in a number of activities.

Aimed at improving the mapping and monitoring of agricultural, forestry and water resources, the project is providing a new set of tools for a model of development that is environment-oriented for the whole region in a worldwide perspective.

We expect more complete and sustainable results to the benefit of the participating countries, but also, in the longer run, for other developing countries and regions, as well as for meaningful applications of the new tools generated within the AFRICOVER project, aiming at the economic and social development of poor countries.

From the beginning, Italy has stressed the concern to have other partners in what was initially conceived as a multi-donor programme, and I would like to take this occasion to reiterate our expectation to FAO, as the Executing Agency of the AFRICOVER project, while inviting UNEP to participate more directly in present and future activities.

I would like to conclude with my best wishes to all participants for a useful and successful meeting.