



ISPRS Council Meeting Minutes

Sydney, 28-30th April 2003

By Ian Dowman, Secretary General ISPRS

Summary of Minutes

Attendees

President: John Trinder (JT)
 Secretary General: Ian Dowman (ID)
 First Vice President: Lawrence Fritz (LF)
 Second Vice President: Gerard Begni (GB)
 Congress Director: Orhan Altan (OA)
 Treasurer: Ammatzia Peled (AP)

1. Opening

JT welcomed Council to Sydney, and expressed appreciation for the long distances traveled by Council members.

2. Approval of Agenda

Discussion on the International Industry Forum (IIF) to be added to Item 14.

3. Review of previous minutes

Council Meeting in Hyderabad

Item 3.2 ID was having discussions with FAO about a MoU.

No further communication had been received from CIPA on the change of bylaws.

Item 15 IPAC and ISAC membership had been reviewed. Current membership is as follows:

IPAC

Ade Abiodun
 Raul Colomb
 Joanne Gabrynowicz
 Ray Harris (chair)
 Yukio Haruyama
 John Neer
 D P Rao
 Gunter Schreier
 Frans von der Dunk
 Alain Baudoin

ISAC

Armin Gruen (Chair)
 Clive Fraser
 Ed Mikhail
 Wolfgang Förstner
 David Rhind
 Michael Goodchild
 Martien Molenaar
 Ann Ruas
 Klaus-Ulrich Komp
 Paul Curran
 Diane Evans
 Tony Milne

Item 7.6.3 Reference to the use of SCI citation index should be made in the revised Orange Book

4. Policy Matters

4.1 Technical Commission Structure

Four responses had been received so far from the letter sent by JT to Members, all endorse the proposals, includ-

ing reordering the commissions. ID will compile responses as they come in and distribute a summary to Council. Council reviewed the schedule, which is on track at present. It was decided to hold a tele conference on Friday 13th 13.30 CEST to review progress.

The postal vote should be prepared for mailing on June 30th. There was discussion on reordering commissions, Council was split on whether to do this. It was decided to have postal vote on changing ToRs using the current numbering (with the addition of TCVIII), but vote on renumbering at the GA.

Council reviewed the draft guidelines for Technical Commissions which include the new arrangements for applying for a commission and organizing symposia. The following points need to be included:

- A management plan
- Reference to the contract
- A statement that they have read Orange Book
- Note that TCPs are officers of ISPRS

4.2 Modifications to Statutes and Bylaws

GB introduced a set of revisions that were discussed in detail. It was specifically decided not to introduce bylaws relating to an arbitration panel, nor to have an additional GA during inter-congress period. A new bylaw is proposed to permit the President to invite observers to GA.

4.3 Marketing policy

4.3.1 General policy

There was discussion on what methods to use for promoting ISPRS, with some written input from Tina Cary. It was decided that CD/Internet 'stories' should not be pursued as this had been done by others..

The suggestion to have regular quizzes, which would be aimed at the youth group, would involve a lot of work. TCVI could be asked to look at this, linked to Youth Forum in Istanbul. The idea of an ISPRS calendar was considered to be too much work and too expensive for the return.

4.3.2 Press Releases

The press release on SPOT assessment had been widely published and produced responses and more applications. It was decided to make a press release on the Second Announcement of the Congress.

Other press releases which could be made during the next 6 months were: ISPRS Foundation, ISPRS book series, results of scientific initiatives, restructuring.

4.4 Strategic Plan Actions

- Explore opportunities of mutual benefit with AM/FM
Action JT
- Ask ordinary members and WG chairs -Who are OGC Members? (i.e. who in ISPRS is active in OGC)
To be referred to TCIV who was establishing contact with OGC
- Establish a 'Yellow Pages' for geoinformation databases on internet for Highlights and/or web page
Chair WGVI/4 tasked with this
- Identify critical issues on global, regional and local level, such as user requirements in perspective of end to end systems
IPAC doing this and info fed to ICSU and COPUOS
- Structure dialogue with industry groups to stimulate interest and joint activities
Activities in several WGs, e.g. SPOT HRS assessment, Standards for Lidar
- Review and discuss inter-organisational matrices
No action – to be put on web
- Explore possibilities of joint workshops with external groups based on overlaps identified in ST4-1
Ongoing with joint meetings and activities with EuroSDR, Saudi Arabia, etc
- Establish education web page with links to education freeware, and data ed and training course with WGVI/1
Active but need more publicity, See 9.3
- Arrange for regional meeting of educators in co-operation with regional members
Ongoing in TCVI
- Request documentation of successful end to end GIS applications from companies such as ESRI. MapInfo
Action deleted
- Seek sponsorship for obtaining successful GIS applications on CD ROM for use by developing countries
Action deleted
- Seek reciprocal membership with OGC and set up procedures
TCIV active – add to TC ToRs
- Explore opportunities of mutual benefit with international groups
MoUs with IEEE-GRS, SPIE, FAO
- Advise Council on what needs to be done annually to maintain education webpage through COMMI
Ongoing
- Report annually on implementation of database updates
Ongoing
- Advise council on expansion of education opportunities programme to other regions
Ongoing

4.5 Registration and Foundation

- LF reported that an application for exemption from taxation had been lodged and an employer ID no issued.
- LF also tabled a Personal Property Return which is essentially a nil return. This needs to be returned every year. Note needs to be inc in Green Book

- JT reported that he had had discussion with Karl Kraus who wished to raise the issue of registration in Istanbul. JT would meet Karl Kraus in Vienna in June.
- LF went through the marketing and Implementation Plan for the Foundation. Advice is needed on how to design form for donations in order for donors to get tax exemption, JT will get information from FIG, but more advice needed which LF will pursue.
- Council discussed potential donors and drew up a list which was noted by LF.
- It was decided that the initial Trustees should include major donors,
- It was noted that Statute 4 and Bylaw 15 needed to be revised to note that ISPRS should use an independent auditor.
- Council approved the Operating Procedures and Marketing and Implementation Plan

4.6 Representation at meetings of other organisations

ID introduced the topic which had been the subject of email discussion because of an invitation from OOSA to send an ISPRS representative to a UN Workshop. Various opinions were expressed, varying from total opposition to providing any travel funds, to providing full support for a speaker to attend such meetings.

It was noted that UN Workshops are for the benefit of the local participants and are organized because of political agendas; they have a different purpose to ISPRS workshops and hence it is not appropriate to offer ISPRS workshops as UN events. If ISPRS is to be a co-sponsor of UN Workshops, it is necessary to fund speakers. After a vigorous debate it was decided that Council could not support speakers to UN meetings, but could offer some support to special speakers in appropriate circumstances.

It was decided to regular review the UN programme and to offer support where ISPRS interests would be advanced.

ISPRS had been invited to send a representative to the International Commercial Remote Sensing Symposium, organized by NOAA in Washington in May. SM would be attending and chairing a session, but JT had been unable to find anyone else to chair a session on Data Policy.

4.7 International Geodetic Students

ISPRS had been invited to make a financial contribution to the International Geodetic Student meeting to be held in Dresden, in June, and had made a contribution of \$1000.

We had received a letter from Professor Celik in Istanbul, who was involved in organizing the Youth Forum at the Congress. Professor Celik requested a reduction of the fee for students at Congress, and also noted that this group would be represented at Dresden. Council noted that Student fee for the Congress is \$200, and the day rate is \$130, so a student can register for the whole Congress for \$200 or can register for Saturday only and attend the Youth

forum, and also the competition on Sunday. Council felt that they could not recommend lower fees.

4.8 Geospatial Workforce Development

AP had discussed the organization of a meeting with Petros Patias, but no progress had yet been made. No communication had been received from Pam Lawhead (PL), but it was known that the US budget has been held up. LF expressed concern that this initiative was stalling as there was a great potential for ISPRS. AP was urged to renew contact with PL and set up a meeting.

4.9 ICORSE

LF had spoken with Jim Weber and Chuck Hutchinson on restructuring, the ISRSE in Hawaii conference and the Istanbul Congress. ISPRS had not provided any input to a session at ISRSE. JT, ID and LF expected to attend the meeting and it was though desirable to have at least one ISPRS session.

5. Technical Commissions

ID tabled a list of WG activities and Council discussed these. TCPs who had been asked to replace WG chairs should be urged to take action

It was noted that the following items should be included on the agenda at JMIst:

- TCPs to report on actions arising from resolutions passed at Amsterdam.
- TCPs to report on all outstanding action items.

It was suggested that there should be an item in the annual report on how well TCPs are addressing the resolutions.

6 . Congress Plans

6.1 Congress

OA referred to the Congress Director's report and explained the use of rooms at the Congress. Council also discussed the arrangements for the plenary sessions and the programme for the GA.

6.2 Council Meeting in Istanbul.

OA presented the programme for the CM and JM in Istanbul.

Members of the International Advisory Board had been invited and there would be a one day meeting, including a visit to the Congress Centre. JT and OA to prepare agenda for this session.

7. Awards

LF presented an updated schedule for the awards and the actions required by Council members. JT suggested that Council should share presentation of the awards and this was agreed. It was noted that citations should be prepared by middle of May 2004, so that booklet can be prepared by OA.

OA noted that still a problem of donors of CATCOM award. Mark Shortis (chair WG VII/3) needs to have confirmation of funding by August.

Council approved new ToRs for the Von Gruber Award.

8. ISPRS Membership

8.1 Ordinary Members

The list of defaulting members was reviewed and amended.

The situation will continue to be reviewed. A letter will be sent to those still four years in arrears in May 2004. The list should be reviewed by ID and AP and a new version provided for the next meeting with all those 4 years overdue shown.

8.2 Associate Members

Three members had never paid and were removed.

8.3 Regional Members

8.4 Sustaining Members

Yildiz Technical University was approved as new member

8.5 LF tabled an email from student at York University, Canada, enquiring about a student chapter of ISPRS. It was noted that there was a proposal to set up a WG in TCVI on student affairs at the Congress, if this is successful, the idea can be extended in following Congresses.

8.6 AP showed the design for flag for Sustaining Members. Council approved the design and asked AP to produce and distribute these.

8.7 Certificates for membership and awards were tabled by ID. The tri-lingual design was approved with the map moved down on page to avoid clutter with the title.

8.8 ID had been in contact with the Centre Régional de Télédétection des Etats de l'Afrique du Nord (CRTEAN) who now wished to become a Regional Member and had invited ISPRS to become an Associate of CRTEAN. Council welcomed both of these proposals and asked ID to conduct a ballot for CRTEAN to become a Regional Member.

9. ISPRS Publications

9.1 Database and Blue Book

AP reported that changes had been made to the database software and the data had been updated.

AP would make some further changes as suggested by Council and ID would check the data and then the Blue Book would be produced. Council will be given a chance to review the Blue Book and send any corrections to ID, and changes in format to AP.

9.2 ISPRS Bulletin

ID reported that the March issue of Highlights with the annual report had been published on time.

The June issue of Highlights was short of copy. Something on the Second Announcement for the Congress will be sent by OA. Council were asked for other material.

It was decided to ask GITC to carry out a reader survey.

OA suggested that the blue colour of the front cover be changed so that the ISPRS logo was clearer. Council asked ID to discuss this with GITC.

9.3 Home Page

Council expressed continued satisfaction with the home page. JT noted the wealth of material available on the WGVII site, which was not all easy to access. It was decided to ask FR to write something on the home page for Highlights and particularly to explain what educational material is available.

9.4 Archives

ID reported that all available copies of Archives of continuing interest were now held at GITC, with a small stock of older issues at UCL. GITC were now aggressively marketing the Archives and would shortly produce an up to date listing of their holdings.

OA requested that the Istanbul Archives be produced on DVD, all volumes could be on one DVD with good search software. Council agreed with this and noted that the contract therefore needs to be amended.

9.5 Orange Book

ID presented a revised structure of Orange Book which would avoid duplication and make it easy for TCPs of WG chairs to see which sections applied to them. Council approved this and asked ID to produce a new draft of the Orange Book for the next JM. Council also noted some changes to be made to the draft contract for TCPs and noted that JT had asked TCPs for further comments. JT would produce draft guidelines for refereeing papers for inclusion in the Orange Book.

9.6 Green Book

Draft information had been prepared by JT, LF and ID which was tabled. This was discussed and it

was agreed that this was a good basis to proceed. ID would prepare a new draft for next meeting.

9.7 Journal

Council discussed the matter at length including the topics of finance, subscription rates, editorial input, publicity, title and subscription list. JT, ID and EB will meet with Elsevier in May.

9.8 Book series

Dr Maxim Shoshani has been appointed as Book Series editor. JT and ID will meet with Balkema on May 19th to discuss a contract.

10. Financial Affairs

10.1 Financial report

AP explained the financial report for 2002, and expressed satisfaction with the current situation, particularly the income from the Symposia. Due to changing exchange rates it had been necessary to change the ratio between SwF and USD. Council approved Financial report with appreciation to AP for an excellent job.

10.2 Budget

The budget had already been agreed by email. AP reviewed the main points, including SwF20000 for the Foundation and SwF20000 for the Science Initiatives. This is an additional expenditure of SwF30000, but loan for the Congress will be repaid to offset this, leaving an overall surplus.

10.3 Funding for new ISPRS initiatives

Council reviewed the application for funding for new ISPRS initiatives. It was noted that SwF20000 had been included in the budget for this.

In future applications should be endorsed by a TCP and linked to TCs or WGs. Also it should be made clear that applications should not be primarily for travel.

11. Relations with International and other Organisations

11.1 COPOUS

ID introduced his report on the COPUOS Science and Technology Meeting. The issue of attendance at UN Workshops has been discussed under item 4.6. UN Damascus workshop to be held now in June – OA may be able to attend this meeting. A questionnaire on ISPRS activities related to the UNISPACEIII follow up had been answered by JT.

11.2 CEOS

SM is organising a meeting on Calibration in

December which will incorporate a meeting of the ISPRS/CEOS Task Force on Radiometric and Geometric Calibration.

- 11.3 **ICSU**
ID had attended a meeting on Health and Well being, a report was circulated GB reported that Medias France is active in this area and would welcome collaboration.
JT reported that he may go to the International Union of Biological Sciences meeting on Biological Indicators in Hong Kong, 2-5 December 2003.
- 11.4 **SPIE**
Council approved a revised MoU with SPIE.
- 11.5 **Joint Board**
JT will attend a Joint Board Meeting at the ICA Congress in Durban and attend the Congress opening. It was noted that JT will invite Societies to a Joint Board meeting in Istanbul, (possibly on Thursday 15th). OA to make provision for such a meeting.
- 11.6 **CIPA**
- 11.7 **FAO**
ID reported that he was having discussion with FAO on a MoU.
- 11.8 **The Society for Imaging Science and Technology**
AG had suggested link with this group. Council decided to initiate low level exchange of information such as links on web page and exchange of newsletters.

12. Reports from Council

All members of Council tabled a written report. AP suggested including past Council members etc in database. This was agreed and LF will send the information which he has and ID will add these to the database.

13. Review of Actions

- 13.1 Outstanding action were reviewed and updated.
- 13.2 ID reviewed new actions from this meeting.

14. Other Business

- 14.1 **International Industry Forum**
JT tabled a revised draft of the ToRs. There is a

need to demonstrate to industry that there are benefits. LF suggested that the 'Spatial Technologies Industry Association, (STIA), might be interested in collaborating on this. It was suggested that we should consider change of name – Remote Sensing Industry Forum was suggested.

14.2 Bids for Commissions

The only formal bid had come from Japan (Comm VI), but it was known that bids from Germany (Comm III) and a joint bid from France and Morocco (Comm VII) were being considered. Council members were urged to canvas other members to prepare bids.

15. Next Council Meeting

The next meeting would be a Joint Meeting with TCPs from 16th to 23rd August 2003 in Istanbul.

At present there was no firm venue for the JM in Spring 2004. This meeting should be held in the 3rd week in March. Greece and Israel were possible venues.

16. Close

JT closed the meeting and thanked Council for attending and for the constructive discussions. Council unanimously thanked JT for his generous hospitality.

Abbreviations used in the text

TCP I	Stan Morain (SM)
TCP II	Chen Jun (CJ)
TCP III	Franz Leberl (FL)
TCP IV	Costas Armenakis (CA)
TCP V	Petros Patias (PP)
TCP VI	Tania Maria Sausen (TS)
TCP VII	Rangnath Navalgund (RN)

- Assistant to Secretary General
Kate Barber (KB)
- Chair Finance Committee (FC)
Heinz R  ther (HR)
- Chair International Science Advisory Committee (ISAC) Armin Gruen (AG)
- Chair International Policy Advisory Committee (IPAC)
Ray Harris (RH)
- International Committee On Remote Sensing of Environment (ICORSE)



ISPRS Book Series Editor Appointed

By John Trinder, ISPRS

I wish to inform you that ISPRS has appointed Maxim Shoshani from Technion in Israel as the ISPRS Book Series Editor to manage the proposed ISPRS Book Series. His tasks are described as follows:

The Book Series Editor shall:

- Be responsible for the overall management of the Series.
- Appoint individual Book Editor(s) as appropriate. In the case of books related to events, the selection of the Book Editor should be made in agreement with the event organisers.
- Be responsible for maintaining continuity, planning, advice and co-ordination, and homogeneity of standards.
- Not undertake language editing. (Individual Book

Editors will be responsible for checking overall presentation, completeness, equations, figures, tables and references.).

- May overrule decisions of the individual Book Editors to ensure maintenance of appropriate standards of the Series.
- Submit periodic reports to ISPRS Council with commentary on improvements, problems, plans and achievements.

If you have any proposals or suggestions for a book in the series, please contact Maxim "Maxim Shoshani" (maximsh@technion.technion.ac.il). This is his personal address. He may establish an ISPRS address subsequently. Please pass this message onto appropriate persons in your Commission/Committee.



Confusion about Fusion

By Tony Schenk, Ohio State University

During the past decade fusion has emerged as a technology for combining data from multiple sources to perform inferences that may not be feasible from a single source alone. Fusion has a strong interdisciplinary flavour, drawing as it does on statistics, pattern recognition, artificial intelligence and cognitive science, decision theory and signal processing. Fusion spans a wide range of military and non-military applications.

Over the years, several definitions of fusion have been proposed. In my view, the inequality $R > \sum P$: best captures the notion of fusion: the result, R , is greater than the sum of its parts, P . This is precisely what fusion is all about: exploitation of the synergism in the data acquired or in information extracted from multiple sources, for example sensors and databases, such that the result is better than combining the sources without synergism. Obviously, the challenge lies in finding synergism, making it explicit and employing it. Fusion encompasses theories, techniques and tools suitable for exploiting synergism and for measuring it qualitatively or quantitatively. Often, synergism in data or information comes in the form of relationships.

Fusion and Confusion

The interdisciplinary nature of fusion and its wide range

of application generate a Tower of Babel problem: no unified terminology, no standards and a great deal of jargon that confuses even specialists. Fusion has also become a very fashionable buzzword. Hence, it is tempting to add it to the vocabulary without much worrying about its scope. As a consequence, the inequality quoted above to characterise fusion becomes an equation, fusion is stripped of its prime objective and becomes confusion. Examples are abundant. Take sensor fusion for example. Quite often you may realise here that the author is really talking about sensor integration or bore sighting, without using any building blocks of the fusion framework. This is misleading and adds to the confusion of fusion. The next example is less critical. I am sure you have come across the term image fusion in the context of establishing a common reference frame for images (spatial and/or temporal), or of determining a DEM from a stereo-pair. My question here is why sacrifice specific terms such as orientation or DEM generation for the sake of a generic buzzword?

Fusion Issues

The fusion framework offers the potential for solving problems more effectively. My favourite application is automatic object recognition from multiple sensors, such as aerial camera, laser scanner and hyperspectral scan-

ner. Ongoing research suggests that information derived from these sensors is complementary and, indeed, makes the whole larger than the sum of the individual parts. However, challenging questions arise and answering them leads to exciting interdisciplinary research. Consider the chain source-data-feature-information-knowledge. Where in this chain should fusion take place? How is information checked for its independence? And now the cardinal question: what exactly is synergism, how can

it be best exploited, and how can we determine the success of fusion?

Tony Schenk, Ohio State University, 2070 Neil Avenue, Columbus, OH 43210, USA, E-mail: schenk.2@osu.edu

This article has also been published in the December 2002 issue of GIM International.



The U. V. Helava Award

Best Paper 2000

By Emmanuel P. Baltsavias, Editor-in-Chief, ISPRS Journal of Photogrammetry and Remote Sensing

The U.V. Helava Award, sponsored by Elsevier B.V. and Leica Geosystems GIS & Mapping, LLC (formerly LH Systems, LLC), is a prestigious ISPRS Award, which was established in 1998 to encourage and stimulate submission of high quality scientific papers by individual authors or groups to the ISPRS Journal of Photogrammetry and Remote Sensing, to promote and advertise the Journal, and to honour the outstanding contributions of Dr. Uuno V. Helava to research and development in Photogrammetry and Remote Sensing.

The Award is presented to authors of the best paper, written in English and published exclusively in the ISPRS Journal during the four-year period from January of a Congress year, to December of the year prior to the next Congress. The Award consists of a monetary grant of SFr. 10,000 and a plaque. A five-member jury, comprising

experts of high scientific standing, whose expertise covers the main topics included in the scope of the Journal, evaluates the papers. For each year of the four-year evaluation period, the best paper is selected, and among these four papers, the one to receive the U.V. Helava Award.

The second U.V. Helava Award will be presented at the 20th ISPRS Congress, Istanbul, 12-23 July 2004. The five-member jury appointed by the ISPRS Council evaluated the 28 papers of Volume 55 (2000) and announced its decision for the Best Paper. The winner of the 2000 Best Paper is:

Fuzzy spatial objects and their dynamics

Martien Molenaar, Tao Cheng



Martien Molenaar, International Institute for Geo-Information Science and Earth Observation (ITC), P.O. Box 6, 7500AA Enschede, Netherlands



Tao Cheng, Joint Laboratory for Geoinformation Science, The Chinese University of Hong Kong, Shatin, NT, Hong Kong, P.R. China

Jury's rationale for the paper selection

This paper constitutes a continuation of previous own work on fuzzy spatial objects extending it to their evolution and dynamics. It is an interesting, innovative work with high theoretical value, formalising the uncertainty of dynamic spatial objects. The potential and practical significance of the theoretical concepts for change and trend analysis of fuzzy spatial objects, especially in environmental monitoring, is high and this needs to be verified by further practical tests. The paper is well written and clearly presented and includes a real-world application.

On behalf of the ISPRS and the U.V. Helava Award jury, I would like to congratulate the authors for this distinction and thank them for their contribution. I would also like to thank the sponsors of the Award, and the jury members for their hard work and thorough evaluations.



The Brasil Campus-Centre for Space Science and Technology Education for Latin America and the Caribbean-CRECTEALC

By Tania Maria Sausen, Campus Brasil-CRECTEALC, Ministério da Ciência e Tecnologia, Instituto Nacional de Pesquisas Espaciais, E-mail: tania@ltid.inpe.br

In response to the General Assembly's endorsement of the recommendation of UNISPACE 82, that the United Nations Programme on Space Applications should assist member States in enhancing their indigenous capability at the local level, the Office for Outer Space Affairs-OOSA developed a proposal for the establishment of Centres for Space Science and Technology Education in the developing countries.

The objective of these Centres is to enhance the capabilities of member States in different areas of space science and technology that can advance their social and economic development. The principal goal of the Centres is the development of skills and knowledge of university educators and research and applications scientists, through rigorous theory, research, applications, field exercises, and pilot projects in those aspects of space science and technology that can enhance social and economic development in each country.

Each Centre initial programmes shall focus on remote sensing and geographic information systems; meteorological satellite applications; satellite communications and global-positioning systems and atmospheric sciences.

The programme of the Centre's is directed towards the university educators and researcher; telecommunication professionals and specialists; systems managers, engineers and planners.

The Centre for Latin America and the Caribbean-CRECTEALC

On 11th March 1997, Brazil and Mexico have signed an Agreement to establishing the Centre, at the Ministry of External Affairs, in Brasília, Brazil. On 19th May 1997, the Agreement by the Mexican Government was confirmed and officially publicised by the Mexican Government Press. On 12th and 15th December 1997, the Agreement by the Brazilian Government was confirmed and officially publicised by the Brazilian Government Press.

On 15th October 1999 the first meeting of the Centre Governing Board was held, the Headquarters Agreement for the Operation of the Centre in Brazil was signed and the first Centre Secretary-General was nominated. On April 29th 2002, the second meeting of the Centre Governing Board was held and the second Centre Secretary-General was nominated.

The structure of the Centre shall be as follows: the Governing Board; the Advisory Committee; the Secretariat

and the Secretary-General; the Campi-Brasil and Mexico. Each Campus will have a Director nominated by the Governing Board.

The Governing Board is the principal policy-making organ of the Centre. It consists of one representative from Brazil, one representative from Mexico and one representative from each country of the region or from any other interested country which has signed a Co-operation Agreement with the Centre.

The seat of the Secretariat, at this moment located in Brazil, will rotate between Brazil and Mexico every four years, a period that could only be renewed once for another period of four years if the Governing Board so decides. The Secretariat is headed by a Secretary-General (at this moment is Dr. José Marques da Costa, a Brazilian scientist) who is the chief administrative officer of the Centre. He shall be appointed by the Governing Board upon recommendation of the participating States.

The Regional Centres for Space Science and Technology Education have to orient their activities to:

- (a) Education in the fields of remote sensing and GIS; satellite communications; satellite meteorology and global climate; and space and atmospheric sciences in two separate programmes:
 - (i) Core 9-month education programmes leading to a diploma from the regional centre
 - (ii) Advanced 12-month programmes leading to a master's degree
- (b) Training: short-term and customised training (duration depending on the type of training)
- (c) Research: specific research projects
- (d) Consultancy, particularly in combination with projects in the region



Figure 1, The XVI International Course opening class at INPE/CRECTEALC auditorium.



Figure 2, The XVI International Course students, the Brasil Campus Director, the CRECTEALC General Secretary and the IAIA Director, in the XVI Opening Class.

On 5th August 2002, during the third Council Centre meeting, Dr. Tania Maria Sausen, a researcher from INPE, was officially nominated the Brasil Campus Director. For the next four years the following activities are planned for the Brasil Campus:

- To establish the Remote Sensing and Geographical Information Systems course in 2003
- To propose and establish the Satellite Meteorology Course in 2004; Space Science and Atmospheric course in 2005; the Satellite Communication course in 2006
- To improve the Campus facilities, such as computer labs, offices, classrooms, auditorium and of experts in the field of space science and technology equipment
- To develop educational material for the courses

The International Course on Remote Sensing and Geographical Information Systems-Brasil Campus will be held in the Brasil Campus, from 5th April to 6th December 2003. Since 1985, after a request of the OOSA/UN, INPE has been held the International Course on Remote Sensing for Latin American and African professionals. This specialisation course is seven months, and since the beginning around 145 professionals got a diploma in remote sensing.

The International Course on Remote Sensing has been adapted to the OOSA/UN curriculum proposed for the Centres and now is named International Course on Remote Sensing and Geographical Information Systems-Brasil Campus and the course was extended to nine months long (1,320 hours).

The International Course on Remote Sensing and Geographical Information Systems is oriented on the training of the uses of systems and techniques of images interpretation of orbital remote sensors and geographical information systems for the management of natural resources and environmental control. This objective should be achieved through the following:

- Introductory Disciplines: Introduction to Computing, Introduction to Remote Sensing and Geographical Information Systems, Introduction to Statistics
- Fundamental Disciplines: Fundamental of remote sensing and GIS; spectral behaviour of natural targets, platform, sensors and sensor systems
- Technical Disciplines: Photogrammetry and cartogra-

phy, image interpretation, GIS and image processing techniques

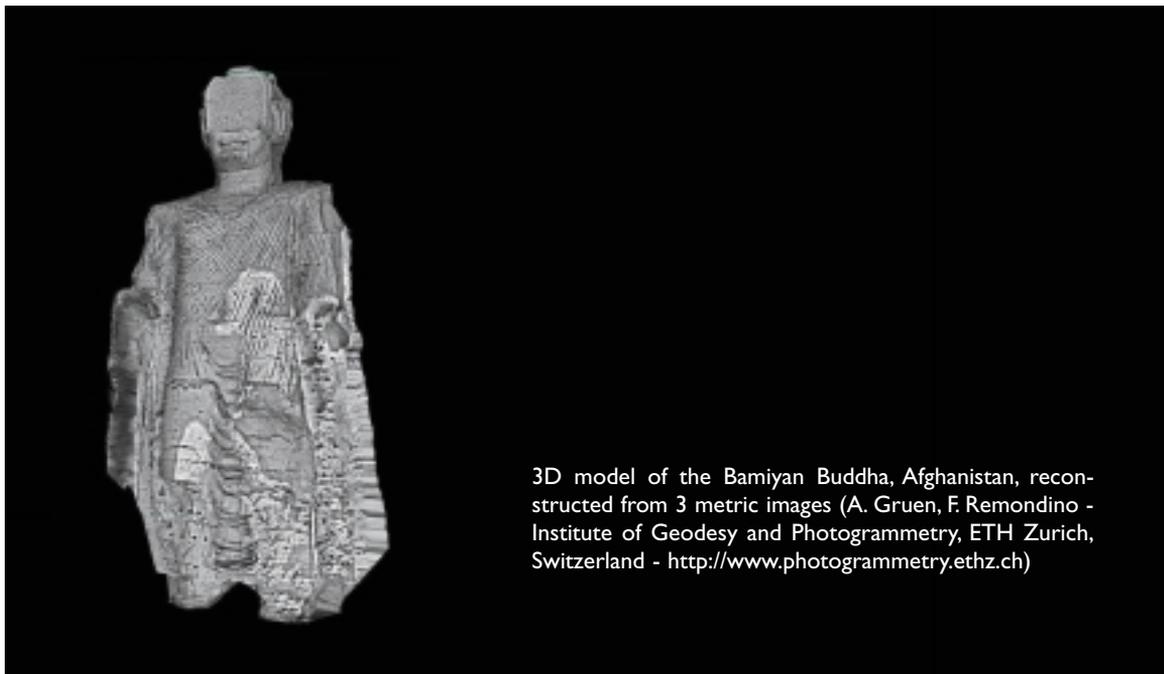
- Complementary Activities: Seminars-Amazonian Deforestation Project-PRODES, in partnership with INPE, Brazil; Remote Sensing and GIS Applied for Regional Planning in Bolivia, in partnership with CLAS, Bolivia; Remote Sensing, GIS and WEB Mapping in Chile, in partnership with CPR&SIG, Chile; Remote Sensing and GIS Applied to Coastal Studies in French Guyana, in partnership with IRD, French Guyana; Project Planning in Remote Sensing and GIS. Technical visits to private companies and universities that works with remote sensing and GIS. The discipline Methodology on Scientific Research to fulfil the requirement of the National Council for Education of Brasil, for all post-graduation courses (*latus* and *strictus sensus*). Pilot Project: Each student must develop a pilot project. Its objective is to carry out the knowledge and skills acquired during the course approaching themes related to the training area of the student and under an advisor supervision. The XVI International Course opening class was in 12th April (Figures 1 and 2)



Figure 3, The CRECTEALC General Secretary and the IAIA Director signing the agreement during the XVI International Course Opening Class.

In this ceremony was signed an agreement between CRECTEALC and the Inter-American Institute of Global Change Research-IAI, with the main goal to develop research and educational activities in partnership (Figure 3).

The countries of the region as well as other interested countries can participate in and support the operations of the Centre. They may provide specialists for teaching and research as well as financial, facilities and other contributions to further the objectives of the Centre. A Co-operation Agreement with the Centre shall be concluded with any country which is interested in the activities and programmes of the Centre. The Centre shall open for participation in its activities and programmes by representatives of national and international entities and institutions.



International Workshop on Radiometric and Geometric Calibration



December 2-5, 2003

Gulfport, Mississippi, USA

located along the sandy white beaches of the
Gulf of Mexico, about one hour from New Orleans



Commission-I, Working Group 2 of the International Society for Photogrammetry and Remote Sensing, in collaboration with the Committee on Earth Observing Satellites Working Group on Calibration and Validation, and NASA Stennis Space Center, announces an International Workshop on Radiometric and Geometric Calibration.

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- Review best practices for post-launch calibration of commercial satellite sensor imagery for government uses
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- Present these results to the ISPRS General Assembly as a Joint ISPRS/CEOS-WGCV report

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XX Congress - A Turkish Marriage

By M. Orhan Altan, ISPRS 2004 Congress Director

ISTANBUL

ISPRS
2004



A marriage can be majestic, routine, but never bland. To really enjoy a marriage between two people, the best way is to attend a wedding ceremony lasting three days in any village in Anatolia, when the whole village participates in the festivities.

Though nowadays when more liberal customs prevail in the villages, traditionally it is the boy's family who starts the long drawn out process of finding a suitable wife and making the arrangements. In the village where everybody knows everybody else, the choice of brides is usually short listed long before a proposal is made. It is the prospective bridegroom's mother who usually opens the subject of marriage to her son, nearly always after his return from doing his military service, which is currently for a period of eighteen months. However in the present climate where it is quite common for the village boys and girls to meet, if not freely, then surreptitiously, boys have usually picked their favourite girls even before their moth-

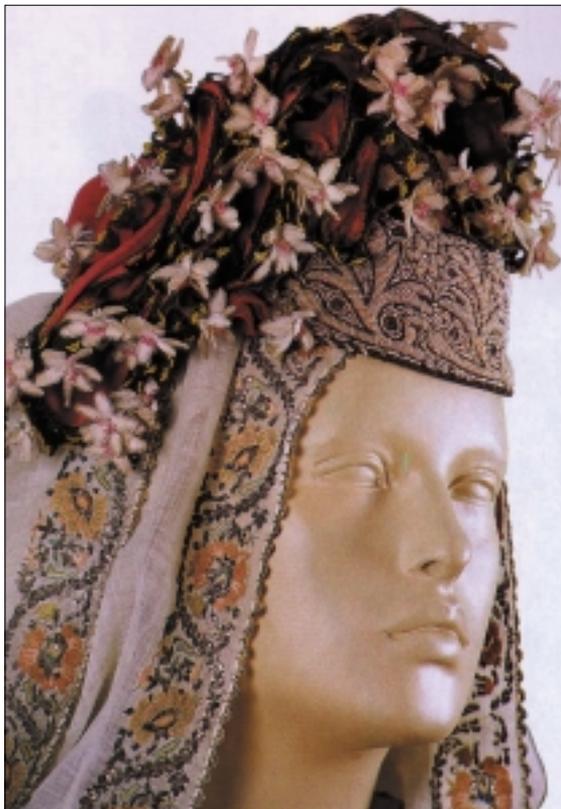
ers open the subject. When mother and son have agreed on the prospective bride, an official visit is arranged, when father, mother, son, and all the brothers and sisters descend on the bride to her house. Of course this is by no means a surprise for the bride to be, she puts on her finery and awaits the visit. The boy's family is made welcome and coffee rather than tea is served, always prepared by the bride to be, who stands in a corner while the coffee is consumed.

This is the time that the girl is inspected from head to toe by the boy's family, the girl blushing and the boy shamefully looking down and concentrating on his coffee! The preliminary theatrics having been duly gone through and the weather having been discussed at long length, as if that was the purpose of the visit, a deadly hush falls on all present. The time has now come for the ritualistic asking for the hand of the girl. The boy's father then asks the formal question and the girl's father gives the appearance of being shocked at this sudden question, giving the impression that he never expected such a question and that he needs time to seriously consider the matter. This is the queue for the woman to step in, the boy's mother starting conversation extolling the virtues of her son, then answered by the girl's mother praising her daughter, while both fathers nod their heads in agreement! The charade can be chown out for a considerable length of time, particularly if there are uncles and aunts present, but in most cases the bride's father ends up by reluctantly agreeing to the proposal.

Meanwhile neither the boy nor the girl is given the opportunity of expressing their views.

When the ritual is over, the boy's family leave a small present for their hosts, the young boy kissing the hand of his prospective in laws, but God forbid, not kissing his fiancé, even on the cheek!

Now starts the real financial part of the business of matrimony! Both fathers agree to meet at the village coffee house. If there are uncle's presents, so much the better, it gives one side on the other a numerical and vocal advantage! The bride's father demands an outrageously high "head money" for his daughter, claiming that she is the prettiest girl in the village, as well as being the most docile and accomplished girl in the village. Be that as it may, both sides are fully aware of the land holdings and wealth of the other but the charade must be played out in full, to save the honour of both families. In nearly all cases agreement is reached over such mundane things as the number of skirts the bride will bring, as well as what soft furnishing



Needle lace jasmine flowers crown a head-dress of tulip motifs and pearls.



An *üçetek* dress worn over a seersucker blouse, and a head-dress consisting of a velvet cap embroidered with seed pearls and a headscarf with a design of roses.

cushions, you name it, it will all be recorded on a list drawn up by both sides!

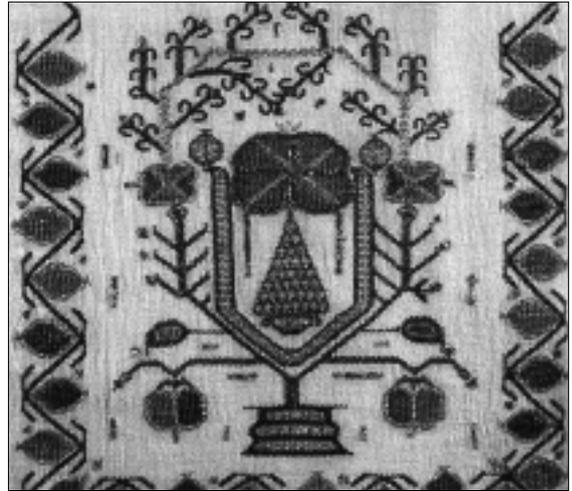
Exhausted by all this haggling which can go on for a few hours, over innumerable cups of tea paid for of course by the boy's family, both sides return home, only to find all the female relatives waiting for them, anxious to know how they have fared in their ritualistic house trading. The poor male fathers then divulge the result of their long



An 18th-century Ottoman palace dress made from a type of cloth of gold known as *Selimiye*, and with a gold *fliqree* belt around the waist.



This costume is from Bursa patterned with flowers from head to toe.



A tree of life motif embroidered on the sash symbolises the wish of a bride for happiness, good fortune, long life and children.

hours of bargaining only to find that the women folk are far from satisfied, one side claiming that they were far too generous, the other that the daughter had not received then true worth! It is indeed a time for discord within both families, which usually only last to a week!

Now both sides start the real business of financing the wedding arrangements. Fields and/or cattle have to be sold, a house for the bridegroom to be built, overseen by the bride's family, gold coins to be brought, and furnishing purchased. Meanwhile the young couple usually meet in the presence of the bride's family, exchanging information on the progress of the arrangements.

Should all go well, wedding arrangements are started, with both sides bringing in professional caterers to feed their guests? On the bride's side these caterers will all be female cooks. An invitation to the wedding is distributed by a relative who will verbally issue the invitation and offer a sweet, which, if accepted signifies that invitation is accepted.

Wedding ceremonies are usually started after midday prayers on the Friday, and guests congregate in the village square, where alcoholic drinks are provided by the groom's side. The women visit the houses of both sides to inspect the furnishings and gifts which are all laid out for inspection. The bride is also decked out in all her finery which she has rented from a shop in the nearest town. Guests are expected to present their hosts with an envelope containing money in order to help defray costs! The bride's house will have some female musicians consisting of a violinist, a drummer and a clarinet player providing music and the bride is expected to dance with all the female guests in town! Quantities of food are expected to be provided throughout the three days, with special tradi-



A white crepe kerchief edged with needle lace blossom is wound like a garland about the head decoration hung with gold coins.

tional dishes reserved for special occasion! On the men's side, another orchestra, this time male will be playing in the village square, with the young boys showing off their dancing ability to all the young girls watching them from the flat rooftops! Needless to say, raki, the traditional man's drink will be flowing freely. This being an occasion when it is acceptable for the men to drink as much as they can.

Saturday is the day when the gifts and furnishings are carried to the matrimonial house, where it is carefully checked and displayed for all to see! Needless to say, more drinking and festivities continue all day and late into the night!



Yellow slippers embroidered inside with silver flowers.

ISPRS Commission II WG II/5, WG II/6

ISPRS Commission IV WG IV/1, WG IV/2

First Announcement and Call for Papers

Fourth ISPRS Workshop on Dynamic and Multi-dimensional GIS ITC, Enschede, The Netherlands, 29–30 August 2003

You are wholeheartedly invited to participate in the Fourth ISPRS Workshop on Dynamic and Multi-dimensional GIS (DMGIS03). The workshop is organised as a collaboration of four of ISPRS Working Groups, spanning two ISPRS Commissions: II/5, II/6, IV/1 and IV/2.

This workshop is the continuation of DMGIS'97 at Hong Kong, DMGIS'99 at Beijing and DMGIS'01 at Bangkok. The workshop series has become one of the important scientific events of ISPRS. It is unique in a sense that it focuses on themes that would transform GIS from static modelling and operation in two dimensions to dynamic modelling and operation in multiple dimensions. The objective of the workshop is to provide a platform for scholars and professionals in the areas of dynamic and multi-dimensional GIS to exchange research ideas and interests, to present their newest research results in these areas, to discuss the cutting-edge technology, define important areas of application for this technology, and to promote international collaboration in these fields.

Technical Sessions

The topics of the Workshop will be based on the fields that the organising WGs work on, but will especially focus on issues related to the use of GIS to (a) represent and analyse dynamic spatial processes, and (b) represent and analyse spatial phenomena of higher dimension.

The topics of the Workshop can be further characterised as:

- Spatial relations and reasoning
- Multi-dimensional spatial modelling
- Digital terrain and landscape modelling
- Heterogeneous spatio-temporal databases
- Spatial database revision
- Web-based distributed spatial databases
- Multi-source data fusion
- Spatio-temporal data mining
- Multi-scale and multi-media representation
- Multi-dimensional decision support systems
- Other related topics

Information and Inquiries

For information and registration, sponsorship, accommodation or otherwise, one is advised to first visit the Workshop's web-site: <http://www.itc.nl/dmgis03/>

Alternatively, one can contact the Workshop's secretariat:

ms. Saskia Tempelman Tel. +31 53 4874 333
 Conference Secretariat Fax +31 53 4874 554
 ITC: E-mail: tempelman@itc.nl, Hengelosestraat 99,
 P.O. Box 6, 7500 AA Enschede, The Netherlands

XXth Congress

International Society for
Photogrammetry and Remote Sensing



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IMPORTANT DATES

Deadline for submission of abstracts	20 September 2003
Deadline early fee	.....	01 December 2003
Deadline for applications for Fellowships to Support Congress Expenses	.....	31 December 2003
Notification of authors	.....	01 January 2004
Deadline for registration to Tutorials and Workshops	.....	30 April 2004
Deadline for submission of full papers	.....	30 April 2004
Deadline guaranteed hotel reservations	15 June 2004



for more information visit
www.isprs2004-istanbul.com

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ISPRS Youth Forum

Invitation to the Youth Forum Sessions to Be Held for the First Time During the XXth ISPRS Congress in Istanbul

Youth Forum Sessions

Youth Sessions, which will be held for the first time during the ISPRS 2004 Congress, are considered as important by the ISPRS Technical Commissions.

On Saturday, 17 July 2004, there will be oral and poster sessions organised by the young attendees. There will be sessions on:

- Photogrammetry
- Visualisation and Animation
- Remote Sensing
- Geographic Information Systems and Spatial Data Management

education and training methodology, future perspectives of the profession, the views of the youth community and their expectations from the professional society and pressures of technological developments.

'Youth Forum' Best Paper Award

There will be two 'Youth Forum Best Paper Awards' for best papers presented at the ISPRS Youth Forum Sessions. The applicants should be the first author who is younger than 30 years old on 1 July 2004. The deadlines for submission of full papers 30 April 2004 must be observed.



The students who are currently working on their graduate, master and PhD studies on these subjects, are welcome to attend the sessions of interest to them. Papers on applications of the above topics, may be accepted as Oral or Posters presentations, after referee reviews. Full text of these papers will be printed in the Proceedings Special Volume. Posters will be displayed for the whole day. Authors are requested to consult ISPRS Orange Book (<http://www.isprs.org/documents/orangebook.html>) for instructions. Papers submitted to the Youth Sessions should be clearly indicated on the ABSTRACT SUBMISSION FORM, LINE WG (3).

Panel Session

The Panel Sessions' subject is 'Professional Contributions on Sustainable Development'. This panel will be focused mainly on sustainable development including professional

'Youth Forum' Best Poster Award

There will be three 'Youth Forum Best Poster Awards' for best papers presented at the ISPRS Youth Forum Poster Sessions. The applicants should be younger than 30 years old on 1 July 2004 and first authors. The deadline for submission of full papers on 30 April 2004 must be observed.

Social Programme

Orienteering by GPS 'An alternative way to learn about Istanbul's historical places by means of a geodetic competition on Sunday, 18 July 2004'.

Summer Camp for Youths

If sufficient number of requests are received, a summer camp will be organised after the congress as part of the social program of ISPRS 2004 with a special nominal fee. For details please refer to the Congress web-site.

Prizes for Best Papers by Young Authors

XXth ISPRS Congress

ISPRS Council will award up to ten (10), cash prizes to encourage young authors to participate in the XXth ISPRS Congress in Istanbul, Turkey, July 12-23, 2004. The prizes will be awarded in the form of travel subsidies of SFR 2,500 to each author who is 35 years of age or younger on the 1st July 2004, single author and whose submitted paper is judged as deserving the award. In order that papers can be judged in time for the Council to offer the travel subsidies to authors prior to the Congress, the final version of the paper must reach the Congress Director, Prof. Dr. M. Orhan Altan, not later than 31st January 2004.

An additional copy of the final paper together with evidence of birth date must be submitted to the President of ISPRS, Prof. Dr. John C. Trinder, who will co-ordinate the judging of the papers.

Results of the judging will be announced by 31 March 2004 and the ISPRS Treasurer will send the funds to the winners. The winning authors have to reply in writing that they will be present at the Congress and present their papers in a Technical Session at the Istanbul Congress.

Conditions:

- Born on or after the 1 July 1969
- Single author
- Age proof in English and additional copy of final manuscript to the President of ISPRS
- Deadline for submitting the abstract of paper (*): 20 September 2003
- Deadline for submitting the full manuscript (*): 31 January 2004

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Note: If you have access to the WorldWideWeb, you will find regularly updated information about the Congress at the address; www.isprs2004-istanbul.com

(*) The electronic submission is encouraged!

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Determining Sustainability Indicators by Remote Sensing

By John C. Trinder, School of Surveying and SIS and Tony K. Milne, School of Biological, Earth and Environmental Sciences, The University of NSW, Sydney, Australia,

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Sustainable development is that which meets the needs of the present without foreclosing the needs or options of the future. There is often a time lag between a development and its negative environmental impacts. As well, the impacts of developments on the environment may be difficult to evaluate over a limited period. Early warning indicators need to be developed that identify and monitor impacts before excessive damage on the environment occurs. These indicators should account for ecological, economic and environmental dimensions of development, and should aid the assessment of the effectiveness of policies designed to protect the environment. Environmental indicators derived from remote sensing technologies should enable the mapping, monitoring and determination of the status and condition of natural and managed ecosystems in order to provide timely information to identify environments at risk. They should improve environmental decision making by contributing to the implementation of sustainable development practices through more informed environmental management. They require an inter-disciplinary approach, involving inputs from specialists on the physical environment with those involved in socio-politico-economic environments, to indicate landscapes and ecosystems at risk, and to provide information for management decisions related to sustainable development practices.

1. Introduction

Only in the last few decades have we recognised the extent to which humans can modify and alter the energy and mass exchanges that occur between atmosphere, oceans and biota, and understood that the changes being wrought may be beyond the resilience of natural systems to absorb. While we marvel at the diversity of the Earth's environments, we have little knowledge of the functioning and interaction of these environments at a global scale. As well, we do not have precise information on the location, extent and impact of the human modifications that are taking place. There is general agreement among scientists that unravelling the processes involved in the functioning of the Earth system, together with identifying the forces acting to promote global change, as well as determining the rate of that change, requires the availability of sets of compatible, homogeneous global data for a variety of key terrestrial variables. For example, to understand issues of climate change the NASA EOS (Earth Observation System) Science Program, which supports the US Global Change Research Program (USGCRP), has identified 24 variables within the atmosphere, solar radiation, land, ocean, and cryosphere that need to be measured. Systems

have been planned and/or launched to measure these variables remotely. This requires a multi-disciplinary study by many scientists.

2. Sustainable Development

Sustainable development refers to the adoption of practices in relation to environmental use and management which provide a satisfactory standard of living for today's population and which do not impair the capacity of the environment to provide for and support the needs of future generations. The concept of sustainability in respect of the use of environment resources includes the notion that the outputs derived, whether they be from land, water or air can be produced continuously over time, and that a balance can be achieved between the rate of economic growth, their use and environmental quality, that minimises the risk of long term degradation. It is argued that through careful management and the use of appropriate practices the long-term viability of the environment can be maintained. The exploitation of non-renewable resources should be addressed through a societal based transition to the use of renewable resources. A sustainable development practice is one which is sensitive to ecological constraints and seeks to minimise the undesirable effects of exploitation and use which might impact negatively on the longer-term viability of a resource. It is also one in which the full economic and environmental replacement costs associated with the use of a resource should be met.

Sustainable development cannot be divorced from issues of equity, welfare, lifestyle and the expectation of improved standards of living in most countries. Nor can the implementation of sustainable development practices be separated from the economic and political structures that exist within and between countries. The Principles of the 1992 Rio Declaration, which were reaffirmed at the 2002 Johannesburg World Summit on Sustainable Development define the roles of the stakeholders in the sustainable development, and rights and responsibilities in development processes. The Johannesburg declaration went on to refer to: '...the three components of sustainable development, economic development, social development and environmental protection as interdependent and mutually reinforcing pillars. Poverty eradication, changing unsustainable patterns of production and consumption, and protecting and managing the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development'.

The recommendations of the draft Johannesburg Declaration for sustainable development included statements on conservation and management of resources by:

- planning and management of land resources,
- combating deforestation and conservation of biodiversity,
- combating desertification and drought,
- protection of the quality and supply of fresh water,
- protection of the oceans and coastal areas,
- rational use and development of their living resources
- protection of the atmosphere from pollution
- the management of natural disasters

Many models of development are based purely on economic measures, which emphasise the economics of development, with little concern for natural resources. According to Daly (2000) sustainable development must take into account the ecological, economic and social components of development. His model of an economy is based on 'ecological economics', in which the economy grows by transforming its environment from natural capital into man-made capital. Optimal growth occurs when the marginal cost of natural capital transformation is equal to the marginal benefits to mankind. In this scenario, there is a limit to the natural capital and therefore expansion of an economy is stringently limited. This provides a measure of sustainability. Sustainable development can be defined in terms of the available natural capital. If the transformation of natural capital to man-made capital is above the optimal level, then the development can be interpreted as unsustainable.

Sociological factors are also important in assessing sustainability of development. These factors are concerned with why things happen, rather where they happen (Rindfuss et al 1998). Knowledge of the relationship between human activity and development is essential to understanding the reasons and impact of the development, and hence contributing to its sustainability.

Kates (2000) has reviewed the relationship between population and consumption in terms of the formula $I=P \times C$, where I = environmental degradation and/or resource depletion, P = the number of people or households and C = the transformation of energy, materials and information. The simple formula shows that as population increases, resource depletion also increases. In addition, in terms of Daly's model above, the value of C must be controlled by the optimal level of transformation of natural capital. Therefore, as population increases, since natural capital available for transformation effectively remains constant, there will be even less natural resources available per capita. The maintenance of sustainability therefore becomes even more difficult and yet more critical.

The large scale implementation of sustainable development practices is unlikely to occur or be successful without accompanying economic, social and political change.

Governments have to institute policies that encourage the implementation of production methods that operate within ecological limits and which lead to different patterns of resource consumption than currently exist. Policies should favour innovation and technological change which offer resource efficient solutions and what Clayton et al, (1996) call progressive adjustments, with emphasis on system level sustainability at the national level, and project sustainability at the local level. They also advocate using the "precautionary principle" which assumes that all natural systems are vulnerable thereby demanding that adequate risk evaluation be part of any development process. Lambin et al (1999) in the LUCC (Land Use and Land-Cover Change) Implementation Strategy have stated that humans are unlikely to change their behaviour unless they see the benefits. This is clearly the challenge of transition to a sustainable world.

Governments should remove incentives that lead to resource depletion, such as concessions for mineral extraction, offering underpriced logging permits and providing subsidies for cultivating marginal land, all of which operate against sustainability, and implement policies that regulate, control or prohibit excessive resource exploitation and that encourage conservation and efficiency (Clayton op.cit.). Obviously changes have to take place at the local level. But change must also be addressed within national boundaries and through international co-operation and collaboration. Sustainable development can only result through a participatory process of assessment and commitment which involves international, national, community and individual stake-holders in the decision making process. Spatial considerations in this process extend from individual parcels of land to regions of continental and oceanic proportions.

3. Sustainability Indicators

The determination of sustainability of development is complex and not clearly defined. In addition, there may be a time lag between development and its negative impact. The concept of sustainability indicators has been developed to monitor progress and assess the effectiveness and impact of policies on natural resource development (Rao 1998). Becker (1997) has described the approaches that can be taken for assessing sustainability as 'exact measurement of single factors and their combination into meaningful parameters' and 'indicators as an expression of complex situations', where an indicator is 'a variable that compresses information concerning a relatively complex process, trend or state into a more readily understandable form' (Harrington et al 1993). A term that is also used in relation to the measure of sustainability of a region, usually a country, is Environmental Sustainability Index (ESI), which 'measures the progress toward environmental sustainability of 142 countries.' (Yale Center for Environmental Law and Policy, 2002). ESI are large scale measures of the environmental performance, which are not measurable by remote sensing. ESI is therefore not relevant to this paper.

Becker (1997) has listed sustainability indicators under the headings of Economic, Environmental, Social and Composite. Environmental indicators for agriculture include such items as *yield trends, coefficients for limited resources, material and energy flows and balances, soil health, modelling and bioindicators*. Indicators used in practice are usually application specific, but are expected to be unbiased, sensitive to changes, and convenient to communicate and collect. Dumanski (1997) has described a land quality indicator for assessing sustainable land management, which includes *nutrient balance, yield trend and variability, land use diversity and land cover*, which are relevant to short term studies. These indicators should be complemented by other indicators related to economic viability, system resilience, and social equality and acceptability.

Berroterán (1997) has suggested the following criteria for assessing sustainable agriculture: *environmental and technological criteria* such as agro-diversity, soil degradation and water use, land availability and use, crop yield, energy efficiency and fertiliser use; *economic criteria* such as cost-benefit ratio and import and export ratios; and *social criteria* such as availability of food and sustenance per capita. From the indicators, a 'sustainability index' was determined that led to the conclusions on the sustainability of a particular agricultural practice. Gameda et al (1997) referred to the Framework for Evaluation of Sustainable Land Management (FESLM), which aims to determine the environmental, economic and social sustainability of farming systems, based on a case study in Canada. There are five categories of indicators under the headings of *Productivity, Security, Protection, Viability and Acceptability*. Those given under *Productivity* are *soil fertility, crop productivity, and crop resilience*. Driessen (1997) has stated that a land-use system is 'biological sustainable if essential attributes of a land unit do not deteriorate to the extent that intervention is required'. He then discusses the complex process of developing land quality indicators.

The objectives and scope of the LUCC (Lambin et al. 1999), which is a core project of IGBP (International Geosphere-Biosphere Programme) and IHDP (International Human Dimensions Programme On Global Environmental Change) are broadly described as: assessing the patterns and processes of land-cover change; determining human responses to land-use and land-cover change; developing integrated global and regional models; and developing databases on land surface, biophysical processes and their drivers. The strategy has three foci, of which Focus 2: Land-cover Changes is the most relevant to this paper. It states as follows:

'To measure land-cover change by remote sensing, one needs:
(i) biophysical indicators strongly related to land-cover conditions which can be measured by remote sensing;
(ii) a reference state for the land-cover at every location as a standard against which to compare current situations;
(iii) a technique of detecting changes. Land-cover change

analysis requires the measurement of a set of indicators of the biophysical attributes of the surface, the seasonality of these attributes and their fine scale spatial pattern.'

Lambin et al. (1999) describe the need to define both direct and indirect indicators that describe various aspects of land-cover change. For LUCC, direct indicators describe the physical environment, whereas indirect indicators describe secondary interactions or consequences that occur in adjoining systems. While appropriate indicators have yet to be determined, those relevant to LUCC should firstly describe the characteristics and types of land cover, and secondly land quality.

Becker (1997) has discussed the implementation of sustainability indicators in terms of time and space. Many indicators, including some of those mentioned above do not cover adequate time spans to demonstrate intergenerational changes, which is the principal criterion of sustainability. The criteria for the selection of Sustainability Indicators, as recommended by Becker, and compiled with reference to the work of a number of scientists, are given in Table 1. The complexity of defining sustainability indicators is revealed by these sets of criteria.

4. Application of Remote Sensing Sustainable Development

The application of remote sensing for defining sustainability indicators is not well developed, but remote sensing has the potential for providing important inputs to sustainability studies. Put briefly, it is necessary to identify those indicators that can be measured reliably by remote sensing on a regular basis, are reproducible, without bias and truly reflect the characteristics of the environment when it is changing. Appropriate indicators must be determined in association with experts in the particular fields in which the indicators are being developed.

There have been many examples of papers given on the general topic of the application of remote sensing for sustainable development, eg ISPRS (1998). They have generally covered examples of image products available for assessing sustainable development, remote sensing techniques for extracting relevant information about the environment, and case studies in which characteristics of the environment have been derived and assessed in terms of the sustainability of a particular form of development. A good example is that of Rao (1998), which describes the so-called Integrated Mission for Sustainable Development (IMSD) in India. In this case-study, three types of data were collected in the study area: satellite image data, collateral data and socio-economic data. A resource database describing all aspects of the terrain surface, integrated into a GIS was then formed to provide a set of decision rules for assessing sustainable development, leading to an action plan. In this case appropriate indicators were apparently determined to suit the application.

Table I refers primarily to the selection of indicators. Once they have been defined, the method of determining them, including the role that remote sensing will play, can be ascertained. A number of the indicators quoted above for assessing the sustainability of agriculture for example, can be assessed by remote sensing and incorporated into GIS as an enabling technology. Likewise, other aspects of the environment, such forest management, afforestation, reforestation and deforestation (ARD), can be assessed in terms of appropriately defined indicators (Imhoff et al 1999).

The reproducibility of measurements from remote sensing data must be proven, since many aspects of remote sensing are still considered as experimental rather than operational. Therefore remote sensing experts will need to be able to calibrate and validate their measurements used for determining sustainability indicators by remote sensing. This is an issue being addressed by CEOS Working Group on Calibration and Validation (WGCV) as well as ISPRS WG I/2. It is a significant issue requiring attention by remote sensing experts using a range of sensors.

From the point of view of technologies based on current satellite sensors, remote sensing can input spatial and temporal information into both physical processes and socio-economic models. The following discussion seeks to demonstrate the positive contribution remote sensing can make to a range of sustainability indicators.

- vegetation degradation and clearance - this is typically manifest by a reduction in biomass and changes in cover type. A number of optical sensors using vegetation indices and change detection techniques permit the mapping, monitoring and measurement of the areal extent of the change.
- forest disturbance - small and relatively subtle changes to the forest canopy caused by processes such as selective logging, fuel wood collection, treefall and windthrow may be detectable through changes in biomass, as well as by measures related to forest texture all of which can be determined from radar, such as multi-frequency and polarimetry systems;
- biodiversity - the species composition of a forest, which influences its spectral response, as well as patterns of clearance, have the potential to provide generalised indicators of biodiversity, that may be used to aid conservation practices as well as sustainable timber harvesting policies. Also radar is sensitive to structural variations in surface materials and has proved useful in differentiating between habitat types
- land cover change, the greatest threat to biodiversity and a major variable in the loss of nutrients from productive lands; land cover may be mapped and monitored by a range of remote sensing data sources, including optical and radar; this requires development of techniques to spectrally unmix the class composition of mixed pixels to capture land cover modifications systematically and on a repetitive basis;
- agricultural crop estimation, involves the application of appropriate hyperspectral vegetation indices derived from the regular and systematic data capture over agricultural regions, and when combined with agrometeorological data, can provide daily, weekly and annual information on crop condition and status; this data can also be used to generate yield estimates and comparisons of annual production trends
- soil condition and erosion - vegetation disturbances and agricultural management practices influence the susceptibility for soil erosion; direct and indirect indicators of this potential may be derived through spectral characterisation of the soil (if exposed) or of vegetation conditions (if covered); changes of the soil surface composition over time are indicators of land degradation, salinity and erosion;
- inland water quality and coastal wetland condition - agriculture, fish productivity, human consumption are all highly dependent on the availability and quality of the aquatic environment; hyperspectral remote sensing data and synthetic radar data may be used to analyse these indicators;
- potential for landslides - within forest catchments, landslides are a major source of sediment, with the slipped land highly erodible for a considerable period after the initial movement; with major cover changes being mapped from optical data with volume estimates, height displacement and flood level measurements are best obtained from interferometric radar
- drought stress is commonly marked by abrupt changes in land cover and vegetation condition as encountered in rainforest drying out and exacerbated long term by phenomena such as the El Nino; it strongly influences the curing rate and fire potential of a forest; hyperspectral indicators of the canopy moisture content detected by remote sensing may reveal the spatial distribution of drought impacts that can help plan the human use of fire to minimise the potential for catastrophic damage.
- local, regional and global changes in surface temperature; variations in rainfall distribution and variability; increases in atmospheric aerosols; declining extent of snow and ice cover and enhanced greenhouse gas emissions all are now routinely monitored and measured by Earth satellites, providing information for planning and implementing sustainable development practices.
- disaster management - indicators for natural disaster management can be identified and characterised from the interaction of the environmental components

involved in any natural disaster event. This information can then be input into physical process models and married with data that incorporates the behaviours, outcomes and experiences from previous similar events in order to provide the basis for defining the degree of risk and vulnerability and for designing and implementing appropriate disaster reduction and response measures.

The information derived from remote sensing can be directly related to measuring important socio-economic impacts. Rates of land cover change and drought, for example, will strongly influence vegetation yield, which substantially impact upon human health and well-being. They will for example, influence the demand for and rate of fertiliser application, which may be associated with downstream pollution. Issues such as soil erosion are a major concern for land users, but also are strongly associated with major consequential impacts, including the silting of lakes and damage to hydroelectric power stations.

Remote sensing and GIS are important tools for the management of sustainable development. However, defining sustainability indicators and understanding their application in assessing and monitoring sustainable development is a multi-disciplinary activity, involving experts in remote sensing, as well as those in ecology, biology, sociology, human resources and politics. Close co-operation with such a team of experts will be essential in these studies in future.

5. Linking Remote Sensing and Social Sciences

The Johannesburg declaration emphasises the three pillars of sustainability: environmental, economic and social. While remote sensing can determine the 'what' and 'where' of changes that have occurred to land surface characteristics brought about by humans, the social sciences aim to determine 'why'. That is, '...to socialise the pixels is to take remote sensing imagery beyond its use in the applied sciences and towards its application in addressing the concerns of the social sciences' (Geoghegan et al 1998). Two approaches suggested are 'mining' and 'modelling'. 'Mining' the pixel refers to seeking social meaning in the imagery, while 'modelling' aims to extract further social information from the imagery.

Examples of mining the pixels are given by Wood et al (1998) (Entwisle et al 1998) and Andersen et al (1999), the first two being on-going at the time of writing. These studies demonstrate the difficulties in relating the physical nature of the terrain surface with the social activities of humans, because of the lack of consistency of the physical and social data in terms of time of acquisition, as well as the resolution of the data. Wood et al (1998), studying deforestation in the Amazon, used Landsat MSS data to determine the impact of deforestation and a sub-set of the Brazil population and agricultural census for 1980 and 1991. Significant relationships were determined between

the levels of deforestation and such variables as population density, rural migration density and ranch density. INPE (1998), in providing details of deforestation of the Brazilian Amazon tropical forests, has also commented on the sociological causes of deforestation, the types of farmers responsible, and the implications of government controls on deforestation.

Entwisle et al (1998) classified Landsat TM and SPOT data for studying land-use/land-cover change in Thailand. Social data was derived by longitudinal and multi-level surveys of households and villages over a period of 10 years from 1984-1994. The purpose of the study was to determine the relationship between land cover and the in- and out-migration of the population in the villages. Andersen et al (1999) have studied the relationship between socio-economic and biophysical factors towards the cause of bushfires. They used NOAA-AVHRR for analysing vegetation and night-time AVHRR images to detect the fires. Socio-economic data was derived from the national census, and the data were analysed using a GIS. Variables such as distance from urban areas and roads, population density and land cover types were related to the occurrence of fire outbreaks.

While these studies are restricted to particular aspects of human activity in separate countries, a detailed reading demonstrates the difficulties of combining remote sensing and socio-economic data. The measurement of indicators relating physical and sociological factors therefore presents considerable difficulties. An analysis of the social and, economic aspects, as well as the physical aspects of development, are essential for understanding the long-term sustainability of an activity that impacts on the environment.

6. Conclusions

The purpose of this paper is to present some principles for assessing sustainability of development, and to describe the ways in which remote sensing can be used in this process. Definitions of sustainable development have been given and the approach to its assessment based on sustainability indicators described. While a number of indicators are currently available, there appears to be no consensus on the most appropriate indicators for a particular application.

The application of remote sensing and as a tool for assessing sustainable development must be related to the sustainability indicators that can be measured with the technology. An attempt has been made in this paper to describe some of the indicators that are measurable with remote sensing. While remote sensing will not be the only tools for assessing these indicators, they should make an important contribution to this multi-disciplinary process, provided they satisfy scientific criteria, such as being subject to strict calibration and validation. A great deal has yet to be learnt about these processes and how the full potential of remote sensing can be achieved in this very important issue of sustainable development.

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World Summit on Sustainable Development

Johannesburg August/September 2002

By Allan Falconer, represented ISPRS

The organising committee of the World Summit on Sustainable Development (WSSD) permitted ISPRS to be represented at the summit by a delegate with Non-Governmental Organization (NGO) status. Your delegate was Dr. Allan Falconer, Professor of Geomatics at The University of Mississippi. Allan was scheduled to attend the Summit in support of the US exhibit that featured environmental survey work by government, NGO's and the private sector. Included in the extensive display was a substantial section on Global Climate Change programs and research. The supporting satellite technology and geographic information science that have been developed by U.S. scientists in government agencies, NGO's and the private sector were well represented also.

The summit was a remarkable undertaking. To understand the WSSD requires both the formal context and the operational reality of the meeting in Johannesburg. Formally the WSSD was a United Nations sponsored meeting that was held in the Sandton Convention Center in Johannesburg, South Africa from 26 August to 4 September 2002. The official delegates were primarily representatives of the governments that comprise the United Nations. In addition representatives of all the Major Groups identified in Agenda 21 of the 1992 Earth Summit were invited to participate in the Johannesburg summit. The Agenda 21 group includes "farmers, local authorities, women, business, science and technologists, youth, workers, indigenous peoples and NGO's." Much of the official material about the summit is available from the summit web pages <http://johannesburgsummit.org> and the links they contain.

The web-based material provides access to the documents and the formal resolutions of the summit. At the summit itself the geographic technologies were well represented. In the Sandton Convention Center the plenary hall had a video loop of the earth shown as a rotating sphere with surface features generated from earth resources satellite data. As the sphere rotated, the screen provided zoom-in views of significant cities. These shots used high-resolution satellite and aircraft data to provide close-ups of Rio de Janeiro (the site of the 1992 Earth summit) Johannesburg (the site of WSSD) and Nairobi (the Headquarters location of UNEP).

The use of this GIS technology to roam the earth and zoom in to areas of interest was a valuable and continuous reminder of the technology available for the monitoring of the planet. The display, organized by UNEP's DIAEWS Office, was courtesy of NASA (data) and ESRI

(software). This dynamic display operated as a screen saver between formal uses of the video system and provided a striking demonstration of current technology in active use by ISPRS members.

South Africa, the host country, made detailed preparations for the Summit and created the Johannesburg World Summit Company (JOWSCO), a non-profit corporation, to manage logistics. JOWSCO proved to be an effective operation, maintaining information on literally hundreds of parallel events taking place at and around the Summit itself. The flow of the delegates from one activity to the next was facilitated by the JOWSCO shuttle service operating between the main Sandton Conference Center and three other main sites.

Ubuntu Village was the main focus for the exhibits and the Forum on Science, Technology and Innovation for Sustainable Development. Located at the Wanderers Stadium in Johannesburg's Innesfree Park. Ubuntu Village had pavilions with displays of relevant technology and project achievement from around the world. The exhibits were held in 11,000 square metres of covered space comprising the largest moveable event venue in the world.

National and International Agencies staffed booths and information centers that provided a wealth of material about sustainable development. Exhibits included the products from national and international space programs, with remote sensing products showing changes in natural resources over time. Other exhibits addressed energy efficient cooking systems, recycling that builds homes from discarded soft drink cans, and Brazil's exhibit dispensed freshly baked cookies (delicious). Clean potable water, adequate food supplies, energy for cooking and heating, effective sanitation and access to medical services, especially in urban environments were all major themes.

Ubuntu Village provided the venue for the Forum on Science, Technology and Innovation for Sustainable Development. An extensive range of topics covering energy from nuclear power to ethanol jelly, health, including the AIDS crisis in Africa, sanitation, water and affordable housing were discussed. Presentations covered local national and global views and the whole Forum was a series of valuable presentations that gave technical substance to the Summit. The speakers included leaders of national agencies, scientists and community representatives. Special interest groups were encouraged to hold meetings and the overall schedule provided a comprehensive forum for discussion.

The Water Dome, located at Northgate, Johannesburg, in a large exhibit complex, provided an exhibit and venue for water related events. It was also the site for press conferences and a center for Summit discussions of the world water crisis. Water was a dominant theme at the Summit and there was a strong focus on water as a key issue in sustainable development. This venue was used to announce a number of initiatives being launched to address and solve the worldwide water crisis. The exhibits at the Water Dome included large displays of programs by national, regional and international agencies.

Of particular interest to ISPRS members were the weather and related water management programs using remote sensing and aerial survey data. The Dutch Water Pavilion provided a well-organized approach to integrated water resources management. With its philosophy of public-private partnership it demonstrated the benefits of cooperative efforts using educational institutions (especially ITC, IHE,) private sector (aerial survey and civil engineering contractors) and government agencies. Individual projects in partner countries made a clear case for cross sector, interagency and international cooperation if the full benefits of development activities are to be enjoyed by all partners.

The Civil Society Global Forum was held at a third venue, the Exhibition Center for the National Agricultural Society (NASREC), this is located south of Johannesburg. Operating independently of both the UN and JOWSCO this was an extensive exhibit of NGO activities especially self-help projects covering every topic from children's playgrounds in urban areas to village water cooperatives. Hundreds of these projects from across the world addressed critical issues from the local perspective. Accompanied by local handicraft stalls and sales outlets of sheltered workshops this was a colorful venue. It provided one big reality check on the high-flown phrases of the diplomats.

The diplomats of the official delegations were in effect discussing if their countries would really do anything about the one billion people on this planet without safe drinking water and the two billion without adequate sanitation. It is at the country level that these questions must be addressed because it is the bi-lateral trade, development assistance and UN contributions that finance our world's response to these issues. International Agencies (UN and other) cannot operate without budget, unbalanced trade agreements deny funding flows to the disadvantaged partner, and foreign aid programs need financing, these are all budget issues at country level.

A source of confusion and irritation at the Sandton Center was the obvious incompatibility between the official capacity of the Convention Center (approximately 6,000 people) and the total number of delegates officially registered to attend (in excess of 15,000). After several differ-

ent procedures were announced to limit the number of NGO and other delegates entering the Sandton Convention Center it became clear that the official delegates representing the UN member countries were the people primarily intended to attend the plenary sessions.

The reaction of the NGO's to their second-class status (admission to the plenary hall only on a space available basis) was understandable. Many of these delegates had traveled from third world countries where communities had shared meager resources to support their attendance. These delegates were expected to present the viewpoint of their communities in the major plenary sessions. Arriving to find that as a delegate from an NGO their entitlement was only a chance of a seat (best case scenario) and only if the plenary hall was not filled with official delegates caused an unwelcome readjustment to the plans of many delegates.

Inherent in the issue of sustainable development is the concept of an equitable distribution of our planet's resources. If we do not achieve this then we will have an unsustainable situation and development becomes moot. NGO delegates clearly were intent on making their case for a more humane apportionment of the earth's basic resources. Their primary concern was with the availability of clean drinking water and adequate food. Sanitation and health issues were of great concern and so was the issue of energy for cooking food. Secure shelter, and right of peaceful abode were also major concerns.

The Secretary General encapsulated these issues for many delegates in his synthesis of the five key thematic areas; Water, Energy, Health, Agriculture and Biodiversity (WEHAB). Throughout the Summit the concept of management and monitoring of the world's resources was the latent issue. Clearly we do not know if we have reached sustainability unless we can assess the changes in our resource base and determine if we have achieved a balance between demand and supply or consumption and renewal.

The International Steering Committee for Global Mapping (ISCGM) and the Ministry of Land Infrastructure and Transport (MLIT) of the Government of Japan organized a session on the Global Mapping Partnership. This was probably the best session addressing ISPRS interests directly. The session clearly identified the value of mapping skills and the importance of accurate geographical information. Representatives of Japanese government agencies (MLIT, and The National Space Development Agency, (NASDA)), the South African Government (Surveys and Mapping), the International Cartographic Association (ICA), the UN Environment Program (UNEP), the US Geological Survey (USGS), and the ISCGM each made presentations.

The need for accurate baseline data, and for monitoring change was clearly established. Global mapping is a necessity if we are to understand and manage the resources of

our planet. We need an agreed spatial framework for this work and we need to harness geographic information systems to facilitate our analysis. Without this we cannot have sustainable development. ISPRS members are encouraged to support this initiative and to keep informed of the ISCGM through its web site <http://www.iscgm.org> where the progress of global mapping will be reported.

Overall the World Summit was a success in terms of creating a focus on major issues. It was a success in providing a forum for discussing the fundamental premise of sustainability and highlighting the issue of equitable distribution of resources. For professionals in the geographic sciences it clearly gave the important signal that there is an acute need for our skills. All the areas of resource mapping, monitoring and management are critical in the handling of our planet's natural resources.

It is this geographic information that is essential in understanding the issues of distribution and it requires the science of geography to address the issues effectively. This is readily apparent in the provision of water and food and more than ever in the fight against poverty. ISPRS members and their professional activities are clearly essential to effective progress with these issues. National societies need to convey this message to their governments and to their international development agencies with a real sense

of urgency as we are approaching the point of failure in the sustainability of essential life support systems.

The ecological illustration of the lily pond where the lily pads doubled their coverage of the open water each day should give us cause to reflect on the status of world water systems. The day before the whole pond is covered with lily pads is the day when there is still half of the pond free of vegetation. Have we reached that point with the world population that has access to potable water? If not, does the metaphorical last day (when fully half of the resource is available) give us time to plan and implement sustainable human access to the essential life sustaining substance of potable water?

Has the surveying, mapping, planning, analysis and implementation been done to support the need and have we, the people of the world, made the investment in distribution and disposal systems to support requirements of the coming generation? Surveying, Photogrammetry, Remote Sensing and Geographic Information Systems, the whole complex of Geospatial Science or Geomatics faces a major challenge if the management of natural resources is to rise to meet the challenges discussed at the World Summit on Sustainable Development. As professionals in these fields we have both an opportunity and a moral duty to provide the data and to assist in the provision of solutions to the distribution problem.

Announcement for the forthcoming ISPRS WG IV/4 Event

ISPRS WG IV/4 is organising a tutorial on 'Spatial Data Infrastructure for Urban Planning and Management' in collaboration with Indian Society of Remote Sensing at Indian Institute of Remote Sensing, Dehradun, India from 6th - 8th November 2003.

The topics for discussion are

- Spatial Data Infrastructure Concepts - its components and Purpose, standardisation and metadata concepts (SDI Technology)
- Spatial Data Semantics for NSDI
- Key Spatial Data requirements for Urban Infrastructure Management
- Urban Information System for Urban Planning
- SDI for Urban Infrastructure management
- Geoinformatics for Urban Development plan
- Web enabled information system for urban planning
- Urban Growth and Urban Land Management
- Cityscape (3-D modelling, city models)

Please see for more details at <http://202.54.60.200/isprs>