selected number of fields of interest. The fields are being selected within the context of the ISPRS committees and their working groups
- The main body of the congress contains the technical sessions and poster sessions where the state-of-the-art and new developments will be presented in the subject fields and disciplines of the ISPRS Commissions and Working Groups. The latest technology will be displayed at the exhibition

The proposed set-up of the Congress Programme has been concentrated in a compact formula, starting with two days tutorials and workshops, followed by a one week Congress as follows:

Friday July 14 and Saturday July 15, 2000 Tutorials and Workshops

Sunday July 16, 2000 Registration, Special Meetings, Welcome Party

Monday July 17 up to Sunday July 23, 2000 Official Congress Programme

Monday July 17 up to Friday July 22, 2000 Scientific and Commercial Exhibition

In addition, much consideration has been given to attractive pre and post-Congress tours and to an eventful Social Programme, including a Partner Programme, for which Amsterdam and its environment offer exciting opportunities.

5. Campaigning in Vienna at the XVIIIth ISPRS Congress

To win the Congress The Netherlands Society of Earth Observation and Geoinformatics sent a delegation to Vienna to present its bid. The bid book had been carefully prepared with assistance from many, in particular the Government, the ITC, the RAI international Congress Centre and the professional congress organiser, Holland Organising Centre (HOC), which at a late stage at the end of 1998 had to be replaced by the PCO Congrex Holland BV. The organisation of the exhibition was supported by Rose International, Exhibition Management and Consultancy BV

Competition from other countries was reduced after China and Spain withdrew their bids, the remaining contender was Indonesia, which after losing its bid to The Netherlands won the presidency of Commission VI.

To ensure a good presentation to the General Assembly, a video was shown which demonstrated in a convincing and playful way, that in The Netherlands photogrammetry and remote sensing are part of everyday life. In the entrance hall of the Congress there was a special information stand for The Netherlands to explain their bid and intentions to all Congress participants, at apppopriate times supported by Dutch cheese and genever.

6. Local Organisation

Besides the professional support from Congrex Holland and Rose International, The International Institute for Aerospace Survey and Earth Sciences (ITC), as part of its 50th anniversary, committed considerable staff and logistic support , without which it would not have been possible to organise this Congress. Another very important support in the publishing of printed materials was GITC in Lemmer, The Netherlands.
There was also considerable support from the Ministry of Economic Affairs, The Ministry of Transport, Infrastructure and Water Management, and the Ministry of Development Cooperation.
Four principal sponsors, nine major sponsors and nine other sponsors , named elsewhere in this Part A of the Archives, provided sufficient financial support for the travel and local expenses of around one hundred participants from developing countries and countries in transition, as well as for supporting part of the cost of social events.
The Local Organising Committee of the Congress consisted of:

Local Organising Committee

Klaas Jan Beek	Congress Director
Johan Boesjes	Publication and Public Relations
Nico Bunnik	Sponsoring
Wim Feringa	Webmaster and Infrastructure
Fred Hagman	Exhibition and Signboard Supervisor
Cees IJsendoorn	Special Tasks
Lucas Janssen	Workshops
Martien Molenaar	Technical Programme
Rob Neleman	Treasurer
Gerard Nieuwenhuis	Exhibition and Technical Tours
Klaus Tempfli	Archives
Henk Thiadens	Poster Session Supervisor
Jan Timmerman	Awards and Archives
George Vosselman	Tutorials

Technical Secretaries
Daniela Semeraro
Saskia Tempelman

Congress Organiser
CONGREX HOLLAND BV
Rika Strik
Abey Jaarsma
Floor Schumm

Exhibition Organiser
ROSE INTERNATIONAL
Jantie de Roos
Marita Boekelman

7. The Scientific and Technical Programme

The usual length of the session was 90 minutes, providing enough space for presentation and short discussion of four to five papers per session.
Invited papers are intended to stress the specific importance of selected topics; they are scheduled at the beginning of the sessions. Three to five sessions are held in parallel. Much care has been taken by the Scientific Organising Committee responsible for the scheduling of the sessions to avoid substantial overlap in contents of parallel sessions.

All submitted extended abstracts were subject to the

reviewing process by the Commission Presidents; only accepted papers were classified either as oral presentation for one of the ICs or TCs or as poster presentation for one of the Interactive Poster Sessions. All accepted papers were included in the International Archives of Photogrammetry and Remote Sensing, Volume XXXIII, provided the final manuscripts were received in time. The archives are available on CD-ROM. The abstracts were brought together in a separate hard-copy abstract book. Almost all papers were presented in English, therefore simultaneous translation was not provided, except for the four sessions of the General Assembly of ISPRS where the Council, the Commission Presidents and the National Delegates discussed society policy matters.

Inter-technical Commission Sessions (IC)
These comprised subjects of a broader contents than that of individual technical commissions. Council and Technical Commission Presidents have agreed to organise 32 IC-sessions.

Technical Commission Sessions (TC)
These are organised by the Commission Presidents in close co-operation with the Working Group chairpersons.

Interactive Poster Sessions (TP)
The time available for interactive poster sessions is two hours. All sessions commence with a 2-minute introduction for each of the approximately twenty poster papers per session, where the authors one after the other present their work to the audience in a lecture hall. Six poster sessions are held simultaneously. After the introductory talk, the authors proceed to the poster area and continue the explanation in front of their exhibition stand. All poster sessions will take place in the afternoon.

Special Sessions (SS) Organised by the Council
To enhance the dialogue between scientists, industry, policy-makers and users, a series of special sessions will be held on issues which are expected to dominate our professions for years to come. Important inputs are the outcome of international congresses and technical meetings of the United Nations and of regional organisations organised during previous years, as well as recent technological developments.
These sessions include invited speakers from the wider circle of organisations with strategic significance for the future activities of the ISPRS scientific community. They are organised by the ISPRS Council members.

Exhibitor's Showcase Sessions (ES)
Technical Sessions are being made available for presentation by commercial firms engaged in photogrammetry, remote sensing, machine vision, spatial/geographical information systems or related technologies. Exhibitor's Showcase papers will be presented in the Forum hall between 13.00 and 17.00 hours. Sixteen sessions have been registered for presentations by commercial firms that take part in the exhibition. The sessions are chaired by experts nominated by the national committee.

Add-on Sessions
Special sessions have also been scheduled as a forum for the following international organisations:

- OEEPE (Organisation Européene d'Etudes Photogrammétriques Experimentales)
- Special session for Gottfried Konecny to commemorate his 70th birthday
- ICOMOS (International Council on Monuments and Sites) in co-operation with UNESCO and CIPA (International Committee of Architectural Photogrammetry)
- NSEOG (Netherlands' Society for Earth Observation and Geo-Informatics)
- Catcon 2 (Computer Assisted Contest)
- OGC (Open GIS Consortium)
- ISO Standards
- LH Systems Panel Session in co-operation with ITC

General Assembly (GA)
The General Assembly will meet on Sunday 16 July from 13.00 - 16.30 hours, Tuesday 18 July and Thursday 20 July from 15.00 - 18.00 hours and Saturday 22 July from 15.00 - 17.00 hours in the Forum room.

Sister Societies Meeting
ISPRS Council meeting with Sister Societies will take place on Monday 17 July, 14.00 - 18.00 hours in the Amsterdam Suite.

Sustaining Members Meeting
The meeting of the Sustaining members of ISPRS will take place on Thursday 20 July, 8.30 - 10.00 hours in Room O.

The Local Organising Committee was supported for the management of the scientific programme by a Scientific Committee, which consisted of:

Martien Molenaar	Chairman
Jan Cees Venema	Liaison to Commission I
Lucas Janssen	Liaison to Commission II
George Vosselman	Liaison to Commission III
Martien Molenaar	Liaison to Commission IV
Frank van den Heuvel	Liaison to Commission V
Klaas Jan Beek	Liaison to Commission VI
Jan Clevers	Liaison to Commission VII

8. Exhibitions

The exhibition was open to all companies and organisations with products and services in the fields of geographic information systems, mapping, photogrammetry, remote sensing , data processing, surveying, imaging, image processing, machine vision, computer graphics and related fields that are of interest to the Congress delegates. Comprehensiveness stands central in the vision of ISPRS for the next century: the integration of remote sensing and photogrammetry, with value adding of the spatial/geo-information industries, harmonising technology push with user's pull, aiming at end-to-end solutions which can make a balanced contribution to the sustainability of the environment and the well-being of humanity.

Ninty companies exhibited their products during the commercial exhibition, occupying a total floor space of over 2000 m^2. Some twenty exhibitors participated in the National and Scientific Exhibition.

Some sixteen exhibitor showcases took place, organised

by eight companies. These sessions were chaired by experts nominated by the national scientific committee. The following presentations were given:

- Compagnia Generale Represeaeree SpA (CGR): Innovative Techniques of Terrain Analysis
- ERDAS: Introducing ERDAS Stereo Analyst: Pioneering the Future of 3D Geographic Imaging
- Z/I Imaging: Photoscan 2000 / DMC 2001; TerraShare; Z/I Imaging's new visions in 2000 and beyond
- LH Systems: ADS40 Airborne Digital Sensor
- ESRI: Sharing data all around the globe; Esri's new product offering
- Applanix: Redefining Aerial Surveying with Integrated Inertial/GPS
- DELPHI 2
- Leica: FIELDLINK: GIS-Data acquisition solution for desktop and penpad computing; GPS/GIS with Leica GS50: Superior Morphology and Performance

9. Opening Ceremony

09.30 Opening Ceremony

Opening Show

Word of Welcome by Prof. Dr. Ir. Klaas Jan Beek, Congress Director

Presentation by Prof. Dr. Ir. Martien Molenaar, President NSEOG & Chairman Scientific Committee

Word of Welcome by, Lawrence Fritz, President International Society for Photogrammetry & Remote Sensing

Word of Welcome by Prof. Dr. Ir. P.J. Zandbergen, past president Royal Netherlands Academy of Sciences

Presentation by Dr. Ismael Serageldin, Vice President for special programmes of the World Bank, Chairman of the World Commission on Water for the 21st Century and Chairman of the Consultative Group on International Agricultural Research (CGIAR)

L. Fritz presenting the title "Honorary Member" to : Shunji Murai, First Vice President

John Trinder, Secretary General & A. Mikuni

Presenting The Brock Gold Medal Award to J. Dangermond, President ESRI, USA

John Trinder, Secretary General & Prof. dr. ir. Karl Harmsen, Rector ITC presenting The Otto von Gruber Award to H. Mayer & George Vosselman

L. Fritz presenting The U.V. Helava Award to M. Meister, A. Grün, H. Dan
Entertainment Intermezzo

11.00 - 11.30 Coffee Break

Marcio Barbosa presenting The Willem Schermerhorn Award to T. Woldai

Young Author Awards presentation by Shunji Murai to Babak Ameri, Satya Priya, Garry Zalmanson, Jochen Schiewe, Ansgar Brunn, Jun Li, Marc Honikel

Vision of the theme: "Geo Information for All"
K. Kasturirangan, J. Dangermond, He Changchui

12.30 Closure of the Opening Ceremony by Prof. Dr. Ir K.J. Beek

12.35 Official Opening Exhibition

10. Advertisement and Communications

Right from the beginning, the Local Organising Committee started to advertise the Congress by placing ads in professional journals. Some 15,000 copies of the First Announcement were sent to congresses and individuals. Based upon the reply card, an accurate and up-to-date address list could be prepared. The Second Announcement, containing the full programme, was sent to some 13,000 addresses, many of these announcements were disseminated at other congresses.

An exhibition stand which was specially made to promote the congress, was shown at other conferences, workshops, symposia and exhibitions in different parts of the world.

Some members of the Local Organising Committee personally went to ISPRS Symposia and many other international meetings, including the UNISPACE III Conference held in Vienna in July 1999, to spread propaganda for the Congress and to explain its goals and objectives and the proposed programme.

The Final Programme was published and given to participants at the Congress. It contained the full scientific and technical programme, as well as detailed information about the social programme and the exhibition.

During the days of the Congress days, the ISPRS Daily was published; in total seven issues were disseminated to participants, giving the latest news on the Congress.
The Editorial Committee of the ISPRS Daily consisted of the following persons:
Johan Boesjes
Stephen Booth
Marc Cheves
Trea Hofma
Lucas Janssen
Cees Jongepier
Mathias Lemmens
Jan Hein Loedeman
Floris Siteur

Finally, the Congress Proceedings were published in a series of 3 CD-ROMs. Two were given to participants at the beginning of the Congress, the third CD-ROM was

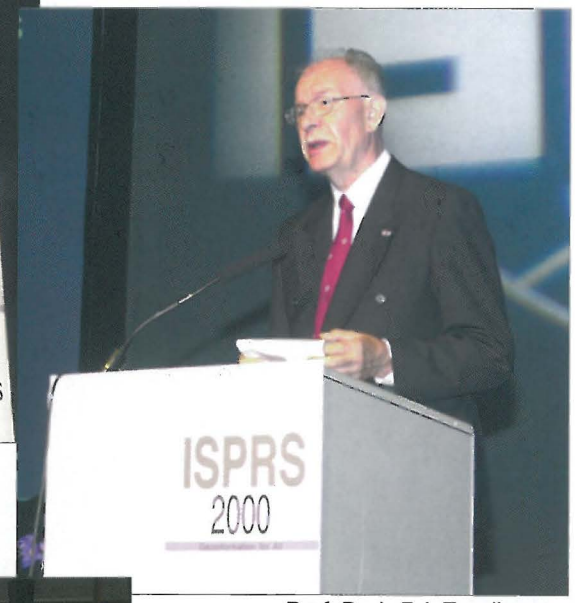
sent to participants at the beginning of 2001. This CD-ROM contained papers that were either not delivered in time, or were received in an incorrect format, or were simply missing or incomplete.

11. Final Remarks

Over more than four years Council, ISPRS officers and our local organising committee together have done an intensive job in preparing the XIXth Congress in such a way that it can be a trendsetting event, as may be expected of a Congress that takes place at the turn of the millennium. The excitement of the scientific programme and the exhibitions, contributions from many young authors, as well as the charm and warmth of the social events and encounters together should guarantee not only a successful Congress but also the active future interest of everyone in our ISPRS.

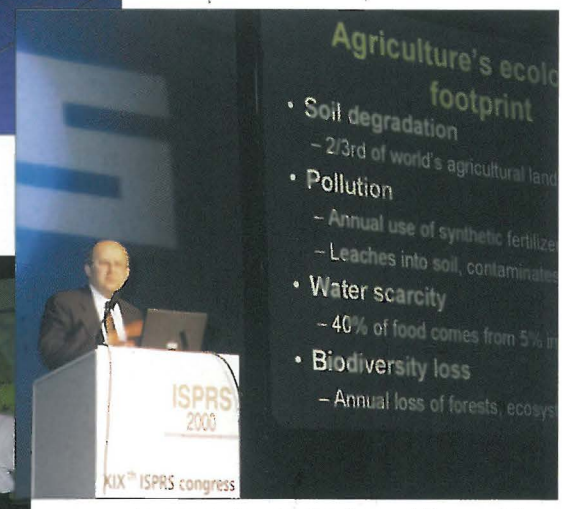
Opening Ceremony
17 July 2000

Opening ceremony Klaas Jan Beek



Prof. Dr. Ir P.J. Zandbergen

ISPRS Council



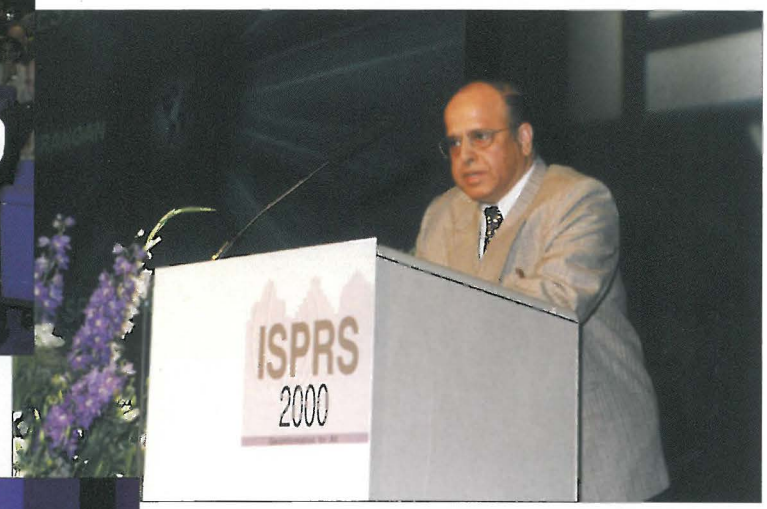
Presentation by Dr. Ismael Serageldin

Musical interlude: The Photogrammetrist's Song

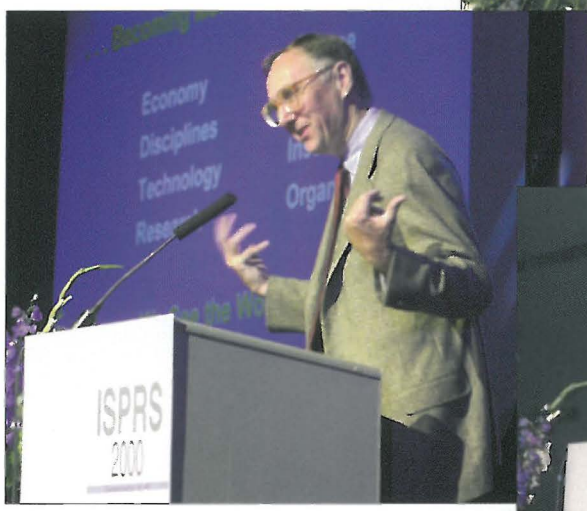
From left to right: Ismael Serageldin, Klaas Jan Beek, Piet Zandbergen, Martien Molenaar, Heinz Ruether, Marcio Barbosa and John Trinder

Larry Fritz presenting the title 'Honorary Member' to Shunji Murai

Larry Fritz presenting flowers to Mrs Murai

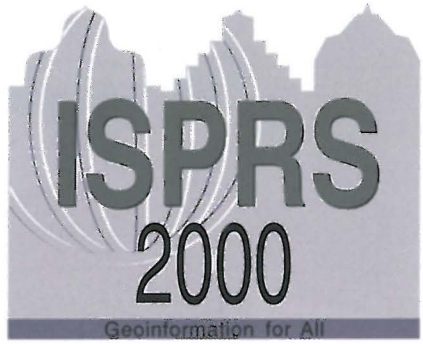


Presentation by Mr K. Kasturirangan



Presentation by Jack Dangermond

Presentation by He Changchui



First Plenary Session and Opening Ceremony

Opening Speech by Prof.Dr.Ir. Klaas-Jan Beek, Congress Director

Welcome by Lawrence W. Fritz, President ISPRS

Presentation by Prof. Dr. Ir. Martien Molenaar,
President NSEOG & Chairman Scientific Committee

Opening Speech by Past President Royal Netherlands Academy
of Arts and Sciences (KNAW), Prof. Dr. Ir. Pieter Zandbergen

Proposal for Honorary Membership of Prof. Dr. Shunji Murai by Lawrence W. Fritz,
ISPRS President

Filling the Digital Gap – Use of Geo-information and Decision Support Tools in Sustainable Agriculture Development by Dr. He Changchui, Environment and Natural Resources Service (SDRN), Sustainable Development Department Food and Agriculture Organisation of the United Nations (FAO)

Opening Speech by Prof.Dr.Ir. Klaas-Jan Beek, Congress Director

Dear Congress Participants,
Welcome to Amsterdam,

Four years have gone by very quickly since the Netherlands Society for Earth Observation and Geoinformatics (NSEOG) in Vienna was given the privilege of organising the XIXth ISPRS Congress. After being appointed Congress Director, I immediately realised that this was going to give me a lot of work. Little did I realise how much satisfaction I was going to derive during these four years from the interaction with so many colleagues world-wide who are part of the ISPRS network and strongly committed to its mandate. We were able to meet in many different places of the world during seminars, symposia and workshops, all the time witnessing a Society within which the representatives of very diverse disciplines are getting closer and closer, both personally and professionally, thanks to rapidly improving information and communication technologies. I am really looking forward very much to seeing them this week again in Amsterdam.
The question arises, with all this networking, of whether we are going to need these big congresses at all in the future? Should we start thinking of electronic meetings? So far, most people seem to agree that we need to meet in person; at least, the interest for our Congress is not less than for the previous one. However we have made some changes in the organisation of the Congress, the most important one being the shortening of the length of the Congress from two weeks to one week. A compact Congress has the advantage that everyone will be there at the same time, which is in particular of interest to the exhibitors who usually have only one week to show their new products and services.
Maybe it was because we are witnessing the start of the new millennium, inducing great expectations and renewed ideals, maybe it was because the Congress is in Amsterdam, a city with a rather non-conformist and liberal identity, that we felt that this Congress should have a strong sense of social purpose, that is why we choose the Congress Theme 'Geoinformation for All'. What we wanted to discuss is really: in the near future, do we want to live in one world, or in several, where the benefits of the new information age and of our technologies can not be equally shared for all kinds of reasons which have led to the presently existing inequalities. Can our new information technologies contribute to quick solutions for less developed countries by 'leap-frogging' some of the constraints which the richer countries have already been able to eliminate at considerable cost? Supposing that spatial/geo information has a crucial role to play in all kinds of development processes?

I am very glad that we have found a keynote speaker for our Opening Ceremony who is very well qualified to comment on these issues from the user requirements point of view: Ismael Serageldin, until very recently Vice President of the World Bank for Special Programmes, in which capacity he chaired the CGIAR, the Consultative Group for International Agricultural research, a consortium of sixteen international research institutes with a budget of around 360 million US dollars per year to contribute to global food security, in particular the security of the World's poor. Serageldin also chairs the Global Water Partnership and the World Commission on Water for the 21st Century and is therefore very much involved with the looming global water crisis.

In addition, we have during the Opening Plenary Session three very well qualified speakers from our own environment to comment on the Congress theme, K. Kasturirangan, the Director of the Indian Space Research Organization (ISRO), Jack Dangermond, the President of ESRI and He Changchui, head of the remote sensing unit at FAO. They will look from their professional angles at issues of availability, accessibility, benefit, understandability, usefulness and affordability of geoinformation in the years to come. By having these presentations during the Plenary Opening Session of our Congress, I am sure that this will encourage a good discussion on the ultimate purpose and application of our sciences in problem-solving under different socio-economic conditions, during subseqnent days when we split up into smaller groups of a more specialised nature. To encourage a broader look at the challenges of our professions we have also organised, in co-operation with the Technical Commission Presidents, about thirty Inter-commission Technical Sessions.

I acknowledge in particular the support of Commission V, which, of course, is not in the first place focused on geo information but on spatial information for other than geographical applications. Their field is attracting a growing

number of professionals from application areas, which are rather new for ISPRS. These involve animation and virtual reality, in addition to the many close range applications of photogrammetry that are emerging, from medicine to archeology. Finally, I want to express my gratitude for the generous support of our sponsors, public and private, who have enabled us to keep the Congress fee at a reasonable level and to support the travel of about eighty people from the developing countries, Central and Eastern Europe. Almost a hundred countries are represented at this XIXth Congress of ISPRS. I look forward to meeting many of you during the coming week. With also the social programme and the technical tours, it will be a busy week. If, after all, one week proves to be too short , the next Congress Director is welcome to change it: China, Spain or Turkey?

Welcome by Lawrence W. Fritz, President ISPRS

Distinguished Guests, Ladies and Gentlemen:
On behalf of Council and our 120 Ordinary, Associate and Regional Member Societies, it is with honor and pleasure that I welcome you to this XIXth ISPRS Congress. ISPRS is now 90 years old! Less than two weeks ago, on July 4th, ISPRS celebrated the 90th anniversary of its founding. Fifty-two years ago, The Netherlands hosted our Society's VIth Congress in The Hague. We are pleased to return now for our XIXth Congress, a Congress that marks the transition of our Society into the 21st Century.
This ISPRS Congress is an event of celebration and achievement - scientific, commemorative and social. Scientific, as you will see in the extensive technical program prepared by our seven Commissions and their 45 Working Groups; Commemorative because of the long and glorious role that The Netherlands has had in helping shape the viability of ISPRS; and Social for the many opportunities for us all to interact and enjoy the events and wonderful distractions prepared by our hosts. Our achievement is exemplified by the leading role the photogrammetric, remote sensing and spatial information sciences are taking by helping the global community rapidly advance in this 'information age.'

The Netherlands Society was formally admitted to ISP Membership at the Paris Congress in 1934 and has been very active in its affairs ever since. At the Rome Congress in 1938, the leadership of ISP was awarded to The Netherlands, with Prof. Willem Schermerhorn elected ISP President. Prof. Schermerhorn was responsible for many noteworthy achievements, including initiating the International Journal of our Society and founding the ITC. He also became Prime Minister of the Netherlands in the post war years and he was elected an Honorary Member of ISPRS. Thus, the 1948 Congress in The Netherlands was a time of rebirth for the Society. And as we speak of achievements and Schermerhorn, let us remember those who have contributed to the scientific heritage of our Society and have since passed on. Since 1996 three notable colleagues have died. They were Carper Tewinkel, who during 1968 through 1976 was ISPRS Secretary General and 1st Vice President, was the 1964-1968 Commission III President and served many years as Editor-in-Chief of the Photogrammetric Engineering Journal; Dr. Roberto Pereira da Cunha, our recent 1992-1996 Commission VII President and Coordinator of Institutional Relations at INPE; and Dr. Hellmut Schmid, the recipient of the 1968 Brock Gold Medal Award, who introduced our disciplines to the generalized least squares method for solving the collinearity equations and who envisioned and led the world-wide satellite triangulation program. I ask you all to please stand for a moment of silence in remembrance and appreciation of these and all of our colleagues and friends who have died since our last Congress. Thank you.

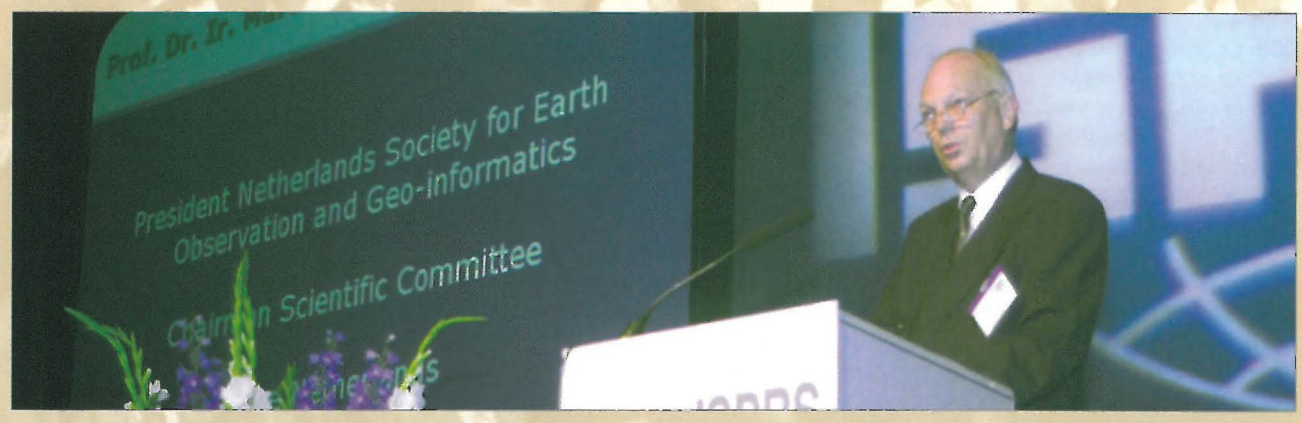
Just as the 1948 Congress here in The Netherlands was a time of rebirth for the Society, this 19th Congress launches the Society's plan for the future. The Society leadership has formulated an ISPRS Strategic Plan to help manage the influence that our sciences and technologies will have in meeting the challenges of the global community in the foreseeable future. We recognize that our disciplines are experiencing major changes in the way that we acquire, process and disseminate imagery and the information products derived from it.
We see the modern role of ISPRS and its Members as pro-

viding "Information from Imagery." Our sciences and technologies are no longer data driven but are now information driven, thanks to many of the marvelous advancements made in the computer and communications disciplines. We have broadened our horizons and are now engaged in extracting the spatial, spectral and temporal information embedded in imagery. As a result, the global community already tastes the benefits provided by the rapid advancements toward all-digital technology and for spatially enabled applications, which are destined to improve the quality of life for all humankind. This Congress will expose you to these many achievements and to the scientists from all over the world responsible for them, and it will recognize those who have made the foremost achievements.
It gives me great pleasure to introduce to you some of the leaders of our sister Societies. They are ICA President Bengt Rystedt, IAG President Fernando Sanso, IHO Director Neil Guy, IGU past President, Hermann Verstappen, FIG Secretary General Christian Andreasen, ICA Secretary General Ferjan Ormeling and IAG Secretary General Christian Tscherning. I ask them please to stand to be recognized. These distinguished guests are meeting here this week to continue growth of positive interdisciplinary cooperation with one another and with the international science community. There are several other distinguished colleagues that I wish to recognize here today. May I ask Honorary Members Friedrich Ackermann and Gottfried Konecny to rise. I offer best wishes of the Congress to the other four Honorary Members who could not be with us today. And I am very pleased for us to recognize Per Olof Fagerholm from Sweden, a distinguished member of the ISPRS Council for 16 years, during 1952 through 1968. He served on the ISPRS Council with Prof. Schermerhorn back in the early 1950s. We are very pleased to have these major contributors to our Society here with us today.

Dear distinguished guests, ladies and gentlemen, I encourage you to participate fully in all that Congress Director Klaas Jan Beek and his hard-working organizing committee have prepared for you. The Congress is an excellent opportunity to meet and greet colleagues and friends from all sectors of our global community. The lasting friendships you form at an ISPRS Congress will bring a warmth to your heart that is unforgettable and rewarding.

Many of you may have not seen this Chain of Office which I am honored to wear today. It was a gift to the ISPRS in 1964 jointly from The Photogrammetric Society and the Royal Institution of Chartered Surveyors in Great Britain. It was given to "symbolize the growing unity of scientists and technicians occupied with the work of importance for the peace and prosperity of the world." Let us keep these goals in mind as we enter this Congress. I wish you all a successful Congress and thank you for your attention.

Presentation by Prof. Dr. Ir. Martien Molenaar, President NSEOG & Chairman Scientific Committee



Distinguished guests, friends and colleagues,

Our Congress Director, Klaas Jan Beek, talks in his opening address about six years of anticipation and preparation. Well, that might be true for him but the Council of the Netherlands Society for Earth Observation and Geoinformatics has been thinking about this event for a much longer period.
For quite some time we have received requests to take once more a major responsibility on our shoulders for ISPRS and, indeed, the last time was in the inter congress period 1984-1986 when we took responsibility for Commission VII. At that time, it was also Klaas Jan Beek who volunteered as Commission President. Since then our contributions have mainly been at working group level. Well, why did it take us so long to offer our services again to ISPRS to take care of a major event? An why now? When we explained our bid in Vienna we gave several reasons.
One reason was that Willem Schermerhorn organised the first congress in the new era that started after the Second World War. So we thought that it would be in his spirit if we could organise the first congress in this new millennium, which is also expected to be the start of a new era.

The second reason was also related to Willem Schermerhorn, and that was because of his greatest contribution to our profession. This year it is fifty years ago that he founded ITC and that is an event that certainly deserves ample celebration.
The third reason was indirectly also related to Willem Schermerhorn. The fact was that his second successor, Klaas Jan Beek, decided to step down as Rector of the Institute in 1996. It would have been a shame if we had left a man with so much energy without a job. So we decided that we would volunteer him for the job of Congress Director this time. And indeed he was impulsive enough to accept this job. I am sure that there have been moments when he regretted that he did not think twice before he accepted it.

I should immediately add that such a big event cannot be organised by one person. We were happy to see that so many members of our society took responsibility and supported the Local Organising Committee in their work. Not only our members were involved but also other professions. This Congress is really the product of the joint efforts of the whole professional field in The Netherlands. All the main organisations were involved, be it by physical support, by services or in the form of sponsoring. We are very grateful for these contributions.
But an organising team is not sufficient to get such a project going. They can only create the conditions for the Congress; the real work has been done by the ISPRS community. It was at the joint meeting in Stuttgart 1998 that ISPRS Council and Commission Presidents helped us to define session themes within the context of the overall congress theme 'Geoinformation for All'.
After that the call for abstracts went out and we were happy to receive many abstracts, about 1,400. Then the whole network of the ISPRS organisation got into action to select papers and make proposals for sessions. Finally, more than 1,000 papers were submitted and these will be presented in more than seventy oral sessions and thirty poster sessions this week.
In addition to that, industry and professional organisations showed great interest in using the opportunity of this congress to show their new products. Twothousand square metres of exhibition space have been booked for more than seventy stands. This Congress is once more a proof of the fact that science, the development of technology and the development of new commercial products by industry are closely related. But even more important is the fact that the presentations at this congress also show that the development of our professional field has a direct impact on policy issues related to environmental management. The developments in our professional field can no longer be seen as just interesting scientific problem-solving. There are societal consequences we have to be aware of. We have to think about these consequences and we have to take responsibility in this respect. These issues have been expressed in the six interpretations we gave to the Congress theme 'Geoinformation for All'.

Ladies and gentlemen, we have done all we could to prepare the Congress with its scientific programme, its exhibition and its social programme. Now that the preparations have been done, it is your turn as participants to make the Congress.
On behalf of The Netherlands Society for Earth Observation and Geoinformatics and on behalf of all the other organisations that have been involved in the preparation of this Congress, I welcome you. We all hope that you will have an interesting, fruitful but certainly also an enjoyable week here in Amsterdam.

Opening Speech by Past President Royal Netherlands Academy of Arts and Sciences (KNAW), Prof. Dr. Ir. Pieter Zandbergen

Ladies and gentlemen,

I have the honour to have been asked by the President of the Royal Netherlands Academy of Arts and Sciences, Prof. Dr Rob Reneman, to say a few words to you in his name.

Perhaps you may think that the world, due to photogrammetry and remote sensing, has become a rather small world but in The Netherlands the world is always much smaller than you think of as possible.
So you may learn that Rob Reneman and Klaas Jan Beek, your Congress Director, graduated at the same time from the same high school here in Amsterdam and I myself, being the predecessor of Rob Reneman as President of the Academy, served the world of photogrammetry and remote sensing for fourteen years as Chairman of the board of ITC during the years that Klaas Jan Beek was the Rector of ITC.
So already in this way there are a number of ties, at least in The Netherlands, between the Academy and this congress.

By the way, I have heard that ISPRS exists ninety years and the Academy is a little bit older. It was founded when Louis Napoleon, brother of emperor Napoleon of France, was King of The Netherlands in 1808. Although there existed many so-called 'learned societies' in the different provinces of The Netherlands, only the central power of the French occupation could establish one unique Academy, something the united provinces would never have ceased quarrelling about. Now the Academy has the duty by law to advise the government in a broad sense on any matter related to scientific research and the use of scientific knowledge. The Academy has the care for two clusters of institutes, one for the life sciences and one for the a and g sciences.

It is in the cluster of the life sciences that we find The Netherlands Committee for Geodesy. There also exists a Council for the Earth sciences. Perhaps you only see a connection in a remote sense between these bodies and the subject of your congress but remember that Prof.

Schermerhorn, who was a member of the Academy from 1956 until his decease in 1977, was trained as a geodesist after finishing his study for his masters degree in civil engineering and subsequently became an internationally renowned photogrammetrist. His influence has been far-reaching within this discipline. Of course, there are also other persons who have become well known, for instance the Academy members Baarda, Rummel and Teunissen.

It, of course, goes without saying that for a densely-populated country such as The Netherlands, which historically seen, has largely been reclaimed from the surrounding waters, it is paramount to know what is the dynamic development of the prime factors determining the possibilities for housing, industrial development and leisure activities and maintaining a clean environment and that all in a sustainable way. You may imagine that this is, practically speaking a nearly impossible requirement. For instance, there have been studies that predict that within five to ten years, the traffic in The Netherlands is bound to come to a standstill, at least without taking very drastic measures. It is clear that detailed information on what is going on in such circumstances is vital.

The Dutch government supported for fifteen years, a programme in remote sensing which is now coming to an end. At the moment there is an attempt to establish a platform upon which the government, the scientific institutions and commercial enterprises are working together. Besides this, there is an attempt to start a programme in which the protection of coastal areas is largely monitored by radar-equipped airplanes. It will be quite clear to you that The Netherlands needs very reliable information on the status of the country to be able to create conditions for a future worth living. In this respect we expect much of this congress. I close my opening speech by wishing you a very successful congress and a rewarding stay here in The Netherlands.

Proposal for Honorary Membership of Prof. Dr. Shunji Murai

by Lawrence W. Fritz, ISPRS President

Distinguished Guests, Distinguished Delegates, Ladies and Gentlemen.

The Statutes and Bylaws of the International Society for Photogrammetry and Remote Sensing provide for the election of individuals as Honorary Members "nominated by the Council and elected by the Congress." Honorary Membership is "In recognition of distinguished services to the ISPRS and its aims." "There may not be more than seven living Honorary Members of the Society at any given time. Honorary Members shall have the right to attend all meetings of the Society, except Council meetings, and shall not be called upon to pay registration fees at functions sponsored in the name of the Society."

Today our Society has six Honorary Members: Dr. Frederick Doyle, Mrs. Aino Savolainen, Prof. Wang Zhizhou, Monsieur George de Masson d'Autume, Prof. Dr. Gottfried Konecny, and Prof. Dr. Friedrich Ackermann. Just prior to the 1996 Vienna Congress, our 7th Honorary Member, Prof. Placidino Fagundes, passed away. Council nominates Prof. Dr. Shunji Murai to be elected by this Congress. Prof. Murai, may I ask you to come onto the stage?

Prof. Shunji Murai was born in Tokyo in 1939. As an undergraduate, he was a sportsman and he represented Japan in rowing at the Rome Olympics in 1960 and at the World Championship in Lucerne, Switzerland in 1962. He graduated in 1963 from Department of Civil Engineering, Faculty of Engineering, University of Tokyo. He worked as a Civil Engineer in Ghana for a year and returned to the University of Tokyo where he worked in photogrammetric research. In 1970, he received his Doctoral Degree of Engineering from the University of Tokyo, where he became Professor of the Institute of Industrial Science in

Larry Fritz presenting the title 'Honorary Member' to Shunji Murai

1983. During 1992 through to 1999, he served also as Professor of Environmental Remote Sensing and Geo-information at the Asian Institute of Technology. He performed this dual Professorship between Tokyo and Bangkok, Thailand remarkably well.

He entered the international scene and became Secretary of ISPRS Commission I on behalf of Japan from 1976-1980 and took on a major role in running the Commission. In 1980 he was instrumental in the formation of the Asian Association on Remote Sensing and he has served ever since as its General Secretary. For each of the past 20 years he has organised the very successful Asian Conference on Remote Sensing.

This Congress marks the conclusion of his 16 years as a member of the ISPRS Council. He served as Congress Director for the very successful Kyoto Congress from 1984-1988, ISPRS Secretary General from 1988-1992, President from 1992-1996 and First Vice President from 1996-2000. His travel on behalf of ISPRS has exceeded more than 240 international trips!

As the first President of ISPRS from Asia, his strategy was to introduce new approaches to the foundation of ISPRS laid down by previous presidents. His major accomplishments have been the acceptance of geographic information systems as a discipline within ISPRS activities, the introduction of ISPRS Associate Membership, the creation of the ISPRS Young Author's Awards, the Computer Assisted Technology Contest Prizes (CATCON) and many technological advancements of which seven have been granted patents and two are pending patent approval; and he is the author of many books in the spatial information sciences.

He has supervised many local and international Doctoral Students in Japan and in Thailand.

He has received many recognitions, including Honorary Fellow of ITC here in The Netherlands, Honorary Professor of Wuhan University in China, Honorary Doctor of ETH in Switzerland, and the Most Exalted Order of the White Elephant from Thailand and more.

Clearly, Shunji has earned the respect of his international peers and he is richly deserving of being elected as an Honorary Member of the ISPRS.

May I ask the Congress to approve with applause the election of Shunji Murai to Honorary Member of the Society.

Prof. Shunji Murai, my congratulations to you. It is with great pleasure that I present you with this certificate of Honorary Membership.

Filling the Digital Gap – Use of Geo-information and Decision Support Tools in Sustainable Agriculture Development

by Dr. He Changchui,

Environment and Natural Resources Service (SDRN), Sustainable Development Department

Food and Agriculture Organisation of the United Nations (FAO)

The Issue of the Digital Gap

With the human population expected to peak at 8 billion, the new century presents greater development challenges to various stakeholders in dealing with global environmental changes, such as those related to desertification, land degradation, loss of biodiversity and climate change and natural disasters. Unless we collectively take extraordinary measures now to overhaul the Earth system, it will become much disturbed and less productive.

Although for more than a decade, in particular since the adoption of Agenda 21 at the UNCED in 1992, a number of international conventions or multilateral environmental agreements have been adopted and pockets of progress have been made in several areas, policies and institutional frameworks, technologies, methodological approaches and effective mechanisms are still to be sought for systematic implementation of the Conventions and related environmental agreements and for monitoring of progress at various levels. The problems are linked to several domains - scientific, technical, institutional and political, but most fundamental is perhaps to take stock and assess the Earth's conditions and environmental trends and introduce responses that can reduce the vulnerability and enhance the resilience of various ecosystems of the Earth.

The current understanding of the Earth system by scientific communities world-wide, in particular, of how the climate systems and the major global cycles function, such as carbon and water cycles, has made dramatic progress in the past decade. To further study sustainability and its background noise - environment, global changes and associated driving forces, more concerted and integrated efforts will be required for systematic observation of the Earth system: its atmosphere, lithosphere and biosphere. Such an effort is also essential for constant investigation of interactions between humans and various components of the Earth system and for monitoring of the impact of anthropologic activities on the Earth environment. Traditional means of collecting data and information about the Earth's environment, such as land, soil, water and forest and other eco-systems, are under a serious challenge.

The advance of digital technology provides an unprecedented opportunity for data collection, information processing, networking and sharing, which has a significant contribution to make to the development of the globalised knowledge economy, making economic development in various nations more interdependent. However, those who possess the digital techniques and its applications will be the more major beneficiaries. Current statistics show that about 88% of Internet users are those from the industrialised countries, whose population is only 17% of the world total. The rich nations share the total world GDP of 86%, export market of 82% and the direct foreign investment of 68%, as compared with the mere 1% shared by these poorest nations. Without a united vigilance among the world's policymakers, increased digital capability

promises to widen the divide between the prosperous and the disadvantaged. Currently, over 4.5 billion people in developing countries can not expect to live beyond the age of 40 and do not have access to knowledge or services to significantly improve their lives. Nearly 1.2 billion people live on less than $1 per day. Some 780 million people are chronically malnourished and some 1.3 billion people cannot access clean drinking water. Additionally, each year, floods, earthquakes, tornadoes, famine and disease outbreaks place hundreds of millions of people in peril, robbing them of basic life necessities.

Will the new digital age close the gap between the advantaged and disadvantaged? While commercial interests will drive much of the change and innovation, the people that would benefit most have little or no access or purchasing power. Information for all, in particular, providing information access to the disadvantaged as well as building the social infrastructure required to provide them with sustainable purchasing power will be a daunting task for governments, international organisations and the non-profit sector at large. The UN system and NGO sector will continue to play a critical role in caring for the world's disadvantaged and providing the means to improve their global social standing. Information, both as product and service, will play a key role in the globalisation process and is essential for addressing the sustainability issue. Information technology is arguably today the fastest advancing research and development and commercial sector-whether the focus is collection, storage, transformation or transmission of information, new advances are introduced seemingly every day. International organisations, especially the UN system, the NGOs and government agencies, need to join their hands in promoting availability, accessibility, usefulness, producibility and understandability of information for all. Equally important is the growing necessity to share information between agencies and organisations, as well as the public at large, in such a way that information is used in an integrated, timely and reliable manner for decision making. Wider connectivity, greater accessibility and reliable content, as well as more flexible capacity for use of information for all people of the world are critical dimensions in reducing spatial marginalisation and filling the digital divide.

Filling digital divide in spatial information domain-GIS and remote sensing as proven decision support tools for sustainable development in FAO

The importance of information and decision support tools for sustainable management in agriculture, forest and fisheries has been long recognised by FAO, which introduced remote sensing in renewable natural resources management in the early 1980s. In response to UNCED decisions, an Environment and Natural Resources Service (SDRN) was created within the Sustainable Development Department (http://www.fao.org/sd) through the merger of several environmentally related programmes, including the FAO Remote Sensing Centre. The Service supports a wide range of normative and field programmes concerned with development of environmental database and decision support tools, environment analysis and natural resources management. Remote sensing and GIS have also become important tools for addressing issues relating to environmental agreements, such as Conventions on biological diversity, desertification and climate change.

1. Satellite Environmental Information Monitoring System

In the field of environmental monitoring, FAO has since 1988 been operating the Africa Real Time Environmental Monitoring Information System (ARTEMIS). ARTEMIS supports the operational monitoring of seasonal growing conditions and vegetation development over Africa, based on hourly Meteosat and daily NOAA-AVHRR data. Specifically, the information is provided for use in early warning for food security, crop forecasting, desert locust control, animal health, water resources management and forestry applications. ARTEMIS distributes routine images containing information about rainfall and vegetation activity, by electronic means to users at FAO Headquarters and at regional and national levels. The rainy season performance assessment capability of the system, based on the use of GMS data, also covers Eastern Asia since 1996. NOAA AVHRR-based vegetation index coverage is now accessible by South and Central America. The various tools and technology developed by FAO and its collaborators have been transferred to a number of regions/subregions for operational uses in environmental and food security monitoring.

Currently, FAO, in co-operation with the European Commission through its Space Applications Institute of the Joint Research Centre (JRC), is implementing a routine flow of global 1 kilometre resolution VEGETATION data from the SPOT-4 satellite. FAO has also entered into a formal agreement with NASA for the development of the use of Earth observation data from the MODIS instrument on the TERRA satellites. Similar discussions are ongoing with EUMETSAT and ESA concerning the use of data from future Meteosat Second Generation (MSG) and ENVISAT satellite missions, respectively.

As an essential operational early warning tool, an integrated computer workstation capable of integrating remote sensing, agrometeorological, socio-economic and statistical data on a common geographic basis has been developed in the context of its Global Information and Early Warning System (GIEWS) on Food and Agriculture. The enabling facility has also been transferred for use at the regional level in the SADC region and has the potential of being made operational in other parts of the world.

Remote sensing and GIS technology have also been used in the development of schemes to control transboundary livestock diseases under the FAO EMPRES Programme. Earlier studies relating normalised difference vegetation index (NDVI) datasets from ARTEMIS to tsetse distribution and land utilisation types in Nigeria and Togo led to the establishment of an operational information system to define policies for African animal trypanosomiasis control. Remote sensing is used to define technical concepts for tsetse control in countries where high-resolution satellite imagery is available to discern land utilisation types. A project is currently being prepared to design maps and GIS to assist eleven western African countries affected by onchocerchiasis. GIS also plays a central role in the establishment of a Global Livestock Geography, comprising the

production of ten kilometre resolution maps showing the distribution, over time, of the different livestock species world-wide.

In the framework of its EMPRES Programmes the Reconnaissance and Management System of the Environment of Schistocerca (RAMSES) system has been implemented. RAMSES improves the use of Meteosat and NOAA-AVHRR data for the early detection of locust breeding areas in Africa, in association with locally collected, geo-referenced field data and the historical desert locust database. The database, which resides at FAO in a dedicated GIS called SWARMS, covers a span from the late 1920s to the present.

2. Land Cover Mapping

To assist in addressing land cover information required for land dynamics study and sustainable natural resources management, FAO is implementing an AFRICOVER project, which was initiated in 1995. The project aims to establish a multi-purpose digital land-cover database for selected sub-regions in Africa. It produces land-cover maps on the scale 1:250,000 (1:1,000,000 and 1:100,000 in certain cases), using the same geographic references and projection system in Africa, as well as a common harmonised legend, with updated information on drainage, topography, roads and land-cover features, etc. The project has been implemented by FAO through close co-operation between regional and national remote sensing centres and mapping agencies in Africa. Through involving major stakeholders in the countries in technical workshops, a harmonised land-cover classification system and geometrical parameters were defined for the project. The east African component of AFRICOVER is anticipated to be completed by 2000. In addition, preparatory and methodological work has resulted in a number of publications on mapping guidelines and standards, including a publication on the land cover classification system which contains four modules on classification, legend, field data and translation.

Since 1996, the World Bank, together with FAO, has been implementing a Regional Environmental Information Management Project (REIMP) in Central Africa. This project aims at improving and strengthening of planning and management of natural resources in the countries of the Congo Basin by providing the various stakeholders with appropriate environmental information. The project involves some one hundred organisations from the public, private and NGO sector, which all work in a national and regional network structure. As the lead agency, FAO is responsible for the normative as well as technical control activities of the project.

3. Coastal Zone Management

In support of coastal area ecosystems management, an Integrated Coastal Assessment and Monitoring System (ICAMS) was developed to monitor water quality and coastal resources distribution and usage parameters by using multiple Earth observation data, such as satellite data from SeaWIFS and future ENVISAT sensors and in situ measurements. Such a system will provide data of appropriate spatial and temporal scale to address information needs in coastal management, such as the origins, the causes and implications of changes in coastal water quality on associated resources. End-to-end operational viability of the ICAMS approach is currently being demonstrated through pilot applications at three European sites that address a range of coastal issues: monitoring eutrophication in Po Estuary (Adriatic, Italy), a study of fisheries oceanography in the North Aegean (Greece) and risk assessment of "red tides" in Bantry Bay (Ireland). Efforts are also underway to apply the ICAMS concept to address Nile Delta coastal area management issues in Egypt, with an emphasis on further consolidation of the Nile River Monitoring and Forecasting System by incorperating a related control/decision support system.

4. Forest Resource Assessment

The 1990 Forest Resources Assessment (FRA) project of FAO demonstrated that with the help of remote sensing, information on changes in forest and land use could be obtained on a global basis in a cost-effective, timely and statistically sound manner. To address information needs of the international community for studies on global changes, FAO has decided to continue to implement FRA on a regular basis in order to build consistent and reliable time-series observations of forest and land use. FAO is currently executing the global forest resource assessment for the year 2000 (FRA 2000) which relies on the use of remote sensing for many of its components, ranging from coarse resolution global coverage for land cover mapping to high and very high resolution multi-date satellite imagery for surveying global and regional forest/land cover changes. The FRA 2000 includes an active country capacity building activity, allowing countries to participate actively in the assessment process.

FAO considers forest fire management and related activities an integral part of the conservation and sustainable management of forests, which is at the core of the forestry programme of the Organisation. Activities related to the use of fire as a tool, as well as those related to fire prediction, prevention and control, have received long-standing attention in FAO programmes. FAO has consistently provided information and technical assistance to its member countries and to the international community in the area of forest fire prevention, control and management, within the framework of the regular and field programmes. The draft Strategy for Forestry in FAO, prepared within the proposed FAO Strategic Framework, includes provision for a database on forest fires and technical assistance in forest fire management and the focusing of attention on policy, legal and institutional issues related to forest fire management.

With the Government of the Netherlands, FAO has also developed a Forest Assessment and Monitoring Environment (FAME) concept. This programme aims at defining, developing and implementing a dedicated operational end-to-end satellite remote sensing capacity for providing real-time access to appropriate remote sensing data for supporting sustainable forest management at the sub-national level, complementary to the FRA programme. During 1998, FAO contributed to a comprehensive FAME User Requirements Study (URS), co-ordinated by the International Institute for Aerospace Survey and Earth Sciences (ITC). The Final FAME-URS Report was issued in June 1999 and a number of follow-up activities under the FAO/Netherlands co-operation framework have benefited from the study.

5. Agrometeorology and Crop Modelling

FAO has a long history of involvement with climate related activities such, as agroclimatological studies in the 1960s in areas where large agricultural developments were anticipated, and the study on the prevalent effect of climate on the variability of food supply and the estimate of food production potential in developing countries. The results of these major undertakings led to the elaboration of a general methodology and the accumulation of a valuable set of reference climatic datasets in FAO.

Currently, the main activities on agroclimatic databases and agrometeorology, using data both from satellite and in situ observations, include: (i) management of the climatic database for about 25,000 stations world-wide (FAO-CLIM); (ii) production of digital maps (at various levels) based on the climatic database; (iii) compilation of a database of African sub-national crop statistics; (iv) real-time monitoring of food crop condition and yield forecasting, in particular for African countries; (v) fulfilment of specific requests which require the analysis of climatic data to be integrated with socio-economic variables. Together with ARTEMIS, AGROMET is providing essential value-added analysis and related information products for FAO's operational GIEWS on Food and Agriculture.

GIS tools are used for geo-statistics and spatial interpolation routines, such as transforming point value into interpolated surfaces. As the interpolated surfaces must represent the ground truth in great detail, several techniques are used in order to "help" the interpolation of the selected variable to obtain a continuous surface with the highest resolution. To get this, remote sensing products like DEMs, NDVIs, and CCDs are used.

6. GIS Database Development

Collection, storage and maintaining of various geophysical data and global digital databases for environmental analysis and sustainable agricultural development is a priority area for FAO. It has so far developed a soil map of the world and an agro-ecological zones map of the developing countries; the continental shelf and fishing (statistics) areas of the oceans; coastal lowlands in the developing countries. Several pilot GIS databases have also been developed to carry out evaluation of marine resources, integrated terrain unit and water basins study in Africa.

A number of GIS analysis and applications projects have also been implemented. These mainly include: estimation of available arable lands for the major FAO study Agriculture Towards 2010; Africa, South and Central America inland aquaculture site suitability analysis for fish farming potential; soil suitability analysis studies for various crops in Africa; potential food self-sufficiency at high and low input levels; dominant land resources types map for Africa; nutrition Profiles map; fish distribution maps for the Mediterranean; World Food Summit support maps. Currently, remote sensing and GIS technology have also been used for Food Insecurity and Vulnerability and Poverty Mapping in FAO, in cooperation with several other agencies.

FAO envisages the increasing use of Global Positioning Systems (GPS) in surveys and the integration of remote sensing data into GIS-based land resource information systems. FAO is considering using remote sensing to assess and monitor the progress of soil and water conservation works carried out in the field within the framework of national programmes assisted by the World Food Programme (WFP).

7. Technical Support for Remote Sensing and Information Management at National Level

In addition to global and regional projects, FAO is currently executing, or providing technical backstopping for, to some sixty field projects with a major component of remote sensing, GIS and information management systems in more than fifty developing countries covering Africa, Asia, Latin America and the Caribbean, and Central and Eastern Europe. FAO has recently also been actively involved in developing and field testing several new remote sensing methodologies through pilot projects in a number of countries, including: shrimp farms inventory and monitoring in Sri Lanka and wetlands mapping and assessment in Zambia by using SAR data from the European Radar Satellite and ground water exploration in the Syrian Arab Republic using satellite remote sensing combined with GIS technology. In economies in transition, FAO offers advice on the use of remote sensing and GIS in planning and implementing agricultural land reform and in assessing and monitoring environmental damage. At present, such assistance is being provided to Albania, Czech Republic, Hungary, Poland and Slovakia.

From a vision to missions: Digital Earth and its potential impact on agriculture and sustainable development

1. Digital Earth

Through space observation systems, intensive in-situ measurements and sampling in strategically selected locations, and a wide range of modelling techniques, the understanding by scientific communities world-wide of the Earth system, in particular, how the climate systems and the big global cycles such as carbon and water cycles, function, has made dramatic progress in the past decade. For a better scientific understanding of the background noise of sustainability- the environment, global changes and associated driving forces, as well as their potential impact on sustainability, more concerted efforts will be required for systematic observation of the Earth system: atmosphere, geosphere and biosphere, including in particular the various ecosystems. Such an effort is also necessary for constant investigation into interactions between human and various components of the Earth system. Traditional means for collecting data and information about the Earth environment face a seriousl challenge, hence there is a shift of paradigm on the perception of the Earth system.

Advances in information and digital communication technology, along with space technology, including satellite remote sensing and geographic information systems coupled with wide range of modelling and decision-support tools could provide new opportunities for rediscovering the Earth through a digital perspective. Currently, there are some fifty Earth observation satellites in operation, collecting various data about the Earth environment and a few hundred communication satellites providing a global cov-

erage of communication networks. The number of such satellites could double in the new decade. With electronic networks of ground-receiving stations world-wide, the systems provide global digital coverage data in both spatial and temporal domains for scientific communities, operational users and decision-makers. Socialising information technology, including the digital Earth observation data, could change the way of living and revolutionalise planning and decision-making processes at all levels.

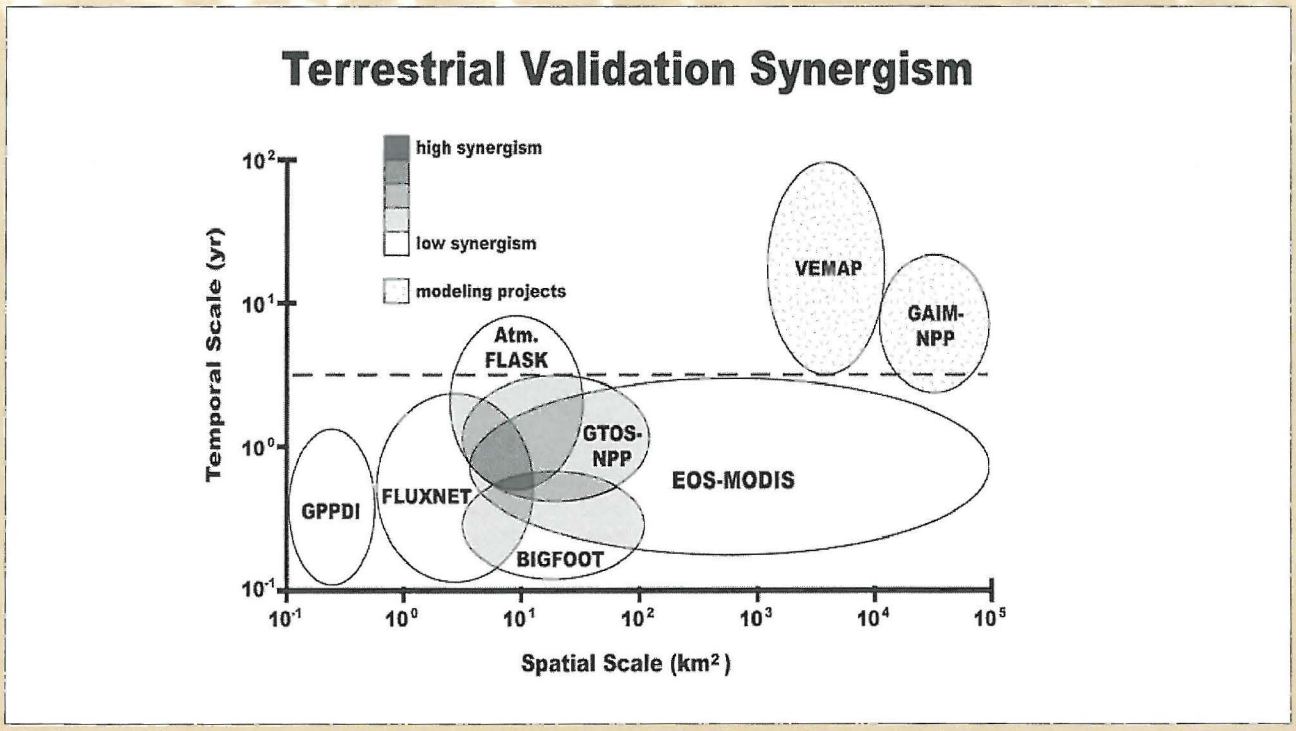
The digital Earth is to create a strong impact on society, contributing to socialising spatial information. On the one hand, pertinent data and decision support tools will be accessible on a timely basis to scientific communities for studying global issues, such as monitoring carbon, water cycles, climate changes; on the other hand, value-added information will become more easily accessible to all interested stakeholders, including planners and decision-makers at various levels, local communities and even individuals for monitoring physical, chemical and biological conditions of the eco-systems. Local farmers, for example, by modernising response farming towards precision farming, will improve their tactical decision-making based on the quantitative observation of local environmental factors, such as physical parameters of soil, nutrients, water stress and crop diseases. Real time monitoring and modelling of crops will enable decisions by farmers on optimum farming practices relating to irrigation, pesticide and harvesting, using centrally stored reference data, automatically collected weather data and rainfall estimation from satellite images, in combination with some key data of social and economic constraints. Precision farming will contribute to sustainable agriculture development by trade-off between productivity and pollution and efficient use of resources.

The new technologies- satellite-based positioning systems, satellite remote sensing and geographical information systems - viewed as an important part of the digital Earth infrastructure, will facilitate much of the work related to detecting and measuring variables of landuse and land cover, soil, cropland, rangeland, forests and trees and fisheries resources, and monitoring and predicting environmental changes and sustainability. By "implanting" smart sensors in strategically selected vulnerable locations/objects, it will enable real-time detecting for early warning natural disasters such as landslides, forest fires and spreads of hazardous materials, or perhaps reporting the loss of critical biodiversities that are put under close surveillance. The information can be disseminated through world-wide digital Earth networks ready for on-line processing, analysis and utilisation.

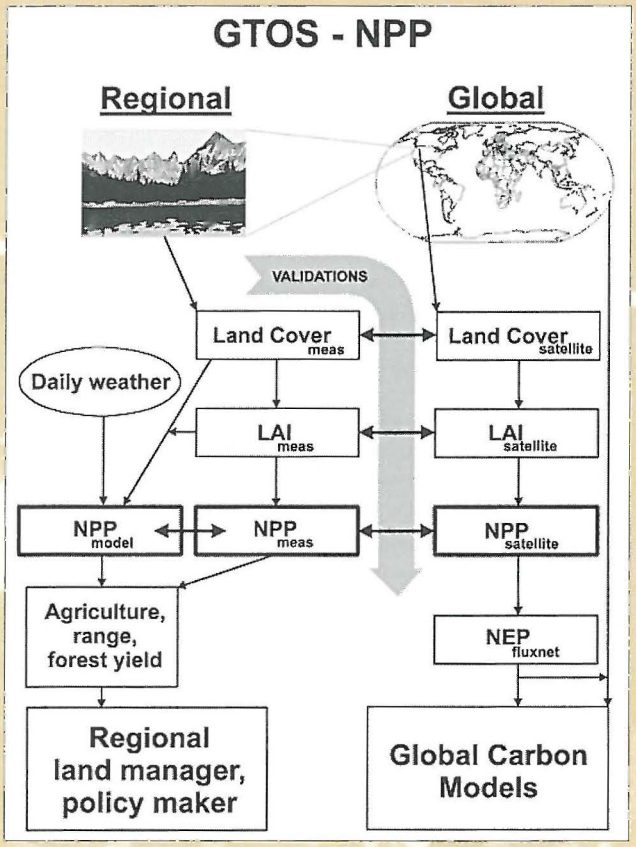
2. Integrated Global Observing Strategy

Identifying missions for the vision of the digital Earth will be a continual process. An Integrated Global Observing Strategy (IGOS) could be a prototype for such a mission. Several international research and development programmes, such as the International Programme on Geosphere and Biosphere (IGBP) and the World Climate Research Programme (WCRP) are other examples contributing to the missions of digital Earth. The objective of IGOS is to unite the major satellite and surface-based systems for global environmental observations of the atmosphere, oceans and land. As a strategic planning process, IGOS links research, long-term monitoring and operational programmes, as well as data producers and users, in a framework that delivers maximum benefit and effectiveness in addressing information needs in decision-making for sustainable development.

The strategy of IGOS covers all forms of data collection concerning the physical, chemical and biological environments of the Earth, as well as data on the human environment, on human pressures on the natural environment, and on environmental impacts on human well-being. It



(Source: GTOS Secretariat)



Critical vegetation variables of LC, LAI and NPP are measured at the EOS-MODIS and regional scales, and used to validate the global satellite based estimates. NEP measurements provide a separate validation and translation of the carbon budget based NPP to commodity yields (with local weather data if available) local resource managers. (Source: GTOS Secretariat)

emphasises a user-driven approach, leading to value-added information products that increase scientific understanding and guide early warning, policy-formulation and decision-making for sustainable development and environmental protection.

The major thrusts of IGOS, as it is stated, will include: strengthening space-based/in situ linkages to improve the balance between satellite remote sensing and ground- or ocean-based observing programmes; encouraging the transition from research to operational environmental observations within appropriate institutional structures; improving data policies and facilitating data access and exchange; stimulating better archiving of data to build bench mark databases and the long-term time series necessary to monitor environmental change; and increasing attention to harmonisation, quality assurance and calibration/ validation so that data can be used more effectively by various users, particularly those from developing countries.

As it proceeds, IGOS encourages a modular approach in identifying and planning specific components, elements or programmes. In a co-ordinated and integrated manner, the IGOS Partners will plan the effective combining of space and ground observations and the effective utilisation systems for monitoring and managing the climate, terrestrial surface and oceans. Currently, the IGOS partners adopt a theme approach in the implementation of its strategy, with an intention to assure some systematisation and coherence in priority issues of global concern. In its rolling planning process, oceans, terrestrial, disaster management, carbon cycle, climate variability and change have been identified as potential theme areas which could have the potential to progress rapidly through joint planning and implementation.

IGOS represents the convergence of several processes and inter-governmental mechanisms that recognise the importance of systematic observation of the Earth environment and the value of synergising various space observation and in-situ programmes. The major partners of IGOS include: the Committee on Earth Observation Satellites (CEOS), the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP), the International Group of Funding Agencies for Global Change Research (IGFA), the Food and Agriculture Organisation of the United Nations (FAO), the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organisation (UNESCO-IOC) and UNESCO itself, the International Council for Science (ICSU), the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO), which jointly sponsor the development and implementation of the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS) to organise global-scale operational observations of the climate, oceans and terrestrial surface.

3. FAO Involvement in IGOS

FAO considers IGOS a strategic tool for addressing information needs in agriculture development, including the implementation of Agenda 21 and environmental conventions. FAO is a founding member of the Global Terrestrial Observing System, which plays a pivotal role in IGOS. The central mission of GTOS is to provide policy-makers, resource managers and researchers with a decision support tool and access to the data needed to detect, quantify, locate, understand and warn of changes, especially reductions, in the capacity of terrestrial ecosystems to support sustainable development. GTOS focuses on five issues of global concern: changes in land quality; availability of freshwater resources; loss of biodiversity; pollution and toxicity and climate change. This programme aims to provide guidance in data analysis and to promote integration of bio-physical and socio-economic georeferenced data; interaction between monitoring networks, research programmes and policy makers; data exchange and application; and quality assurance and harmonisation of measurement methods.

FAO hosts the GTOS Secretariat at its Headquarters. Under the guidance of the GTOS Steering Committee, the Secretariat is currently developing a Global Terrestrial Observing Network (GT-Net) and the TEMS meta-database. It plans for joint regional workshops with GCOS for formulation of regional activities. Closer co-operation is also envisaged with other parties in the framework priorities identified for IGOS, including in particular the theme on terrestrial - initially estimation of global net primary production (NPP) and the theme on carbon cycle - initially carbon sinks global mapping and monitoring.

4. Moving towards a Digital FAO

Currently, FAO is developing a Strategic Framework of the Organisation. One of the five corporate strategies proposed for the period of 2000-2015 states "improving decision-making through the provision of information and assessments and fostering of knowledge management for food and agriculture". This strategy has a focus on developing an integrated information resource base, with current, relevant and reliable statistics, information and knowledge to be made accessible to the international community and all FAO clients.

Accordingly, efforts have been made to develop an environmental geo-spatial information infrastructure to facilitate services in the use of remote sensing, GIS and agrometeorology and GTOS as decision-support tools for the Organisation and its Members in monitoring of environmental changes and environmental impact assessment, crop modelling, agricultural disaster management and inventorying and management of natural resources at various levels for food security and sustainable agriculture.

Increasingly involved in information and communication technologies applications, FAO is progressively moving towards the digital age by developing a World Agricultural Information Centre (WAICENT) and various corporate digital spatial databases. Through world-wide networking, FAO aims to expand the outreaches of its products and services to reach the unreached, in order to help its Member nations to design and implement national policies and strategies on food security and sustainable agricultural development. A digital FAO will, no doubt, not only improve the availability, but also increase the accessibility of data and information for decision-making by various stakeholders, and greatly facilitate awareness creation among various end-users. In the long run, FAO will contribute, based on its comparative advantage, to the process of a digital Earth, in particular, in the context of the operational use of new and emerging information and communication technology for managing agricultural information for sustainable agricultural development.

Concluding Remarks

Agriculture in the 21st century will be an information-intensive sector of a global knowledge-based economy. Sustainable agriculture is of multi-functionality. As addressing sustainability issues normally starts with information, comprehensive agricultural information concerning physical, ecological, environmental, social and economic parameters, as well as human dynamics, are essential. Clearly, information technology, including tele-communication, computer and Internet technologies will revolutionalise the agriculture production and management systems. The use of spatial information and appropriate decision-support tools will be the keys in raising awareness, reaching consensus and decision-making and planning on wide range sustainability issues. The technology has become indispensable for evaluating conditions of ecosystems, monitoring trends and progress, assessing scenarios and planning policy responses to environmental pressures.

The international communities, UN agencies, NGOs and government agencies have already realised the importance of information and the power of decision-support tools. Some have made improvements in their ability to provide their stakeholders with an access to their information and service. Yet, many organisations still struggle with how to collect, transform and transmit information to their clients. It has also been recognised that policies, politics, budgetary and institutional restraints, as well as poor communication and co-ordination among various players have resulted in the isolation of information within the "silos" of individual organisations. The resultant negative impacts includes inefficient capacities, overlapping initiatives, unhealthy competition or conflict of interest between agencies with common goals and often, a waste of scarce resources. What is in urgent need is a collective response by the concerned organisations – UN, NGOs and governments, to map out a common agenda on information technology for all, in particular for those at the local level who are lacking in capacity, enabling institutional settings and adequate resources. The investment required to fully employ information technology, develop products and serve applications, is too great a challenge for any single organisation to realise from its own resources. As a way forward, there should be cohesive and coordinated policies and programmes on the development of spatial information infrastructure to narrow the information divide and improve service. It is time to call for a collective effort among various stakeholders to fill the "last mileage information gap" at the local level.

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Civic Reception at Maritime Museum
19 July 2000

Pirates' choir at Civic Reception

VOC ship 'De Amsterdam'

Martien and Juleke Molenaar

At the VOC ship 'De Amsterdam'

Guests at the Civic Reception

Presentation of map of Amsterdam to the City Council of Amsterdam

John Trinder with Saskia Tempelman and her partner

Aguirre, Brazil (INPE) (right) volunteer musician