

NATIONAL REPORT OF THE NETHERLANDS

1988 - 1992

on the occasion of the 17th international congress
of the International Society of Photogrammetry and Remote Sensing

ISPRS Washington

by

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ABSTRACT: The highlights of the activities in the field of photogrammetry, remote sensing, GIS and digital mapping for the period of 1988 - 1992 are described. The main scientific and professional organisations and their addresses are mentioned.

KEYWORDS: National Report

1. INTRODUCTION

This national report covers the highlights and the main developments of photogrammetry, remote sensing, GIS and/or digital mapping in the Netherlands during the period 1988 - 1992.

In 1988 the two societies, The Netherlands Society of Photogrammetry and The Netherlands Remote Sensing Society joined in The Netherlands Federation for Earth Observation and Geo-informatics which is now the official Netherlands representative at the 1992 ISPRS Washington congress.

This report contains the following parts:

- 1 Introduction
- 2 Development of photogrammetry, GIS and digital mapping;
- 3 Development of remote sensing;
- 4 Education and research;
- 5 Scientific and professional associations which contributed to this report.

2. DEVELOPMENT OF PHOTOGRAMMETRY, GIS AND DIGITAL MAPPING

In this part attention will be paid to the contribution of the developments by:

- the governmental organizations and
- the private companies.

The governmental organizations

The main activity of the Department of Photogrammetry of the Cadastral Service of the Ministry of Housing, Physical Planning and Environment is the photogrammetric production of the Large Scale Base Map of the Netherlands, contracting out and control of aerial photography, triangulation/block adjustment and mapping and production of mapping.

The major developments have been done in the field of 'Total Quality Control'. All kinds of procedures have been developed and implemented to improve the quality of work. This has been done successfully because now the department has a leading role in the Netherlands in the control of large-scale photogrammetric work.

The number of instruments decreased from 10 to 7, 3 instruments of the type Wild A8 have been removed. The remaining 6 analogue instruments are 4 Wild AMH and 2 Wild A8. The analytical plotter Kern DSR11 has been installed. The FOTEF block adjustment-package has been changed from 2D- to 3D-adjustment. Testing software for the analogue instruments has been developed and installed.

Research has been done on superimposition and the possibilities to use digitised cadastral maps in the large-scale mapping process and on the best ways to avoid gaps or double work between photogrammetry and field completion.

The Survey Department, Ministry of Transport, Public Works and Water Management, has a large range of activities, which can be summarized as follows:

- topographic data collection for different map scales:

| | |
|----------|------------------|
| 1 : 1000 | national highway |
| 1 : 2500 | coastal zone |
| 1 : 5000 | rivers |
- thematic data collection for water management and vegetation information;
- height determination to perform DEM's (spatial resolution 0,1 km²); and height profiles to assist in monitoring the Dutch coast;
- GIS consultancy for the Dutch Waddensea, Management Analysis of the North Sea (MANS), River-GIS, Coastal-GIS, etc.;
- other techniques as underwater inspection, navigation, etc.

The main developments are:

- Experiments with and application of GPS to reduce ground control for photogrammetry;

- Laser altimetry for monitoring coastal areas;
- Digital photogrammetry in practice:
 - . experiments on and implementation of digital Comparator Correlator System to automate aero-triangulation;
 - . experiments and evaluation on commercially available digital matching techniques for automatic DTM collection.

Topographic Service of the Ministry of Defense ('Topografische Dienst Nederland' - TDN), Emmen. TDN is a governmental organization and resorts under the Ministry of Defense.

The main goal of the TDN is to have all topographic information, digital (vector) by the end of 1997.

This means, that 3 main databases (1:10.000, 1:50.000 and 1:200.000) will be build up, from which all map series will be derived.

In the period of 1988 - 1992 the maps of approximately 60% of the Netherlands were revised. Furthermore the main database 1:250.000 was updated and a database 1:500.000 was derived from it.

Also the road database 1:500.000 has been updated and a start was made to extend this database to a full topographic database by adding other features (e.g. hydrography, built-up areas).

In 1991, the production of the third and largest scale database (1:10.000) was started.

The main source of information is black and white aerial photography at the scale 1:18.000. Every year 18% of the Netherlands is photographed and every three years there is a complete coverage (next in 1992).

The switch-over from analog to digital map production, which had a modest start in the 80's, puts its marks on the past four years.

New production methods have to be developed and implemented to start with the building of the main databases.

Core of the production method is the use of graphical work stations with integrated display of both raster and vector data.

All main databases are vector-type. The capturing of the data is done by on-screen digitizing using scanned aerial photos, maps or models as a raster background. The largest scale database (1:10.000) is build up using scanned non-rectified aerial photos. With TDN software the digitized vectors are rectified using a digital elevation model (DEM). The buildings, for which monoplotting is not suited, are captured by stereo plotting and added to the database.

All metric information comes from photogrammetry. Aerotriangulation supplies the necessary photo-orientation parameters for the digital rectification.

The private companies

Governmental organizations privatize drastically in recent years and photogrammetric activities are more and more taken over by private companies; as a consequence these companies expand in number and size. They concentrate their activities on different aspects. Only a general overview, without any quantitative data, can be given here.

The main aspects are:

- data acquisition; high qualified cameras with FMC (Forward Motion Compensation) are used for aerial photography and GPS receivers are used for navigation purposes and/or for the determination of the position of the camera at the moment of exposure.
- photogrammetric map production; analogue instruments are more and more replaced by analytical with superimposition systems, for there is a great demand for updating databases; the development of GIS/LIS production, especially related to large scale base maps, is supported by different companies.
- development software systems; bundle block adjustment and testing systems have been further extended and made more flexible for an efficient quality controlled execution of photogrammetric products.
- close-range photogrammetry; digital data-acquisition and data-processing are new tools in the field of close-range photogrammetry. A system is developed to search and identify marked points automatically and provide their spacial coordinates as output. The ultimate goal of this system is to find strategies for an automated object-oriented three-dimensional reconstruction.
- satellite maps; a large variety of satellite maps of the Netherlands and abroad are produced, mainly based on the use of Landsat-TM and SPOT satellite data.
- consultancy; high level consultancy is done all over the world and through that activities on foreign markets are increasing.

3. DEVELOPMENT OF REMOTE SENSING

The year 1990 was of prime importance for the Remote Sensing community in the Netherlands, since this was the year that the first five year's National Remote Sensing Programme (NRSP-1) which started back in 1986 was evaluated by an independent committee. During the NRSP-1 which was carried out by the Netherlands Remote Sensing Board (BCRS) a total budget of approximately Dfl. 30 M was spent on the stimulation and development of Remote Sensing applications and techniques in the Netherlands.

As a result from the evaluation, the year 1990 brought approval on the highest governmental level for the new National Remote Sensing Programme (NRSP-2) that is planned to last till the year 2000. The budget for the first five years is provided by seven governmental departments and amounts to Dfl. 33,1 M. This programme, which is mainly user driven, aims at target groups like: end-users, the research sector, industry and the services sector. It offers the opportunity to submit project proposals within the research outline of the programme and thus provides a backbone for Remote Sensing development in the Netherlands.

It is obvious that the NRSP has great influence on the development of Remote Sensing in the Netherlands.

The period under review, 1988 - 1992, was mainly dedicated to accomplish the objectives of the NRSP-1 e.g.:

- stimulation of the operational use of remote sensing techniques with the secondary aim to bring them on a viable commercial basis;
- preparing for the ERS-1 project;
- stimulation of research into new remote sensing applications also in view of the needs of developing countries;
- stimulation of RS technology development;
- improvement of the infrastructure with regard to the RS user community.

NRSP-2, which is to be mainly user driven, will be subject to the following four priorities:

- preparing applications of remote sensing techniques;
- developing commercial remote sensing products in the services sector;
- preparing for use of data emanating from sources such as the ESA Earth Observation Satellite Systems (emphasizing the research into world climate change and the environment);
- developing applications in forestry and environmental science within the framework of development cooperation.

One of the long term objectives, to be achieved within the ten year plan period is to establish a permanent infrastructure for remote sensing in the Netherlands in the interests of information provision, coordination of national activities and the institution of a point of contact for national and international use.

In the field of the BCRS 'technology paragraph' a number of industries were involved in the preparation of projects aiming at the development and construction of remote sensing instrumentation.

In 1988 consensus was reached with the Ministry of Defence on the mutual funding of a definition study for an advanced airborne polarimetric C-band synthetic aperture radar (PHARUS).

In 1989 the Minister of Education and Science transferred the management and consequently the maintenance of the sensors of two advanced data recording systems the DUTSCAT (Delft University of Technology Scatterometer) and CAESAR (CCD Airborne Experimental Scanner for Applications in Remote Sensing) to the BCRS.

Both systems were placed in an "instrumentpool". The Phased Array Universal SAR (PHARUS/PHARS) and the Laser Experimental Active Fluorescensor (LEAF) which is mainly intended to study the effects of air pollution on forests and is developed by EARS B.V., NEDINSCO B.V. and the Institute of Applied Physics TNO-TU, will also be added to this pool.

After the validation phase of the CAESAR scanner a number of operational missions were flown in different configurations both for land and sea observation. Further a special spectral filter set was developed for inland water observation.

A prototype SAR system called Pharus Research System (PHARS) was completed in 1990 and used for several missions including participation in the ERS-1 validation campaign in November 1991. The system was developed by a team in which the National Aerospace Laboratory NLR and Delft University of Technology work together with the Physics and Electronics Laboratory (FEL-TNO), which leads the development. The full system called Phased Array Universal SAR (PHARUS), which is now under development, is scheduled for its first flight in 1994.

The more research oriented Remote Sensing projects are performed within the governmental bodies and institutes.

In the following the main lines for this type of work are given.

At the Survey Department of the Ministry of Transport and Public Works, the research focuses on tidal, coastal and inland water monitoring, vegetation monitoring and processes at the land-sea interface. To fulfil this task a combination of remote sensing data and numerical models and integration of remotely sensed spatial information with other types of geo-information into GIS systems is performed.

The Winand Staring Centre is involved in land cover classification, evaporation/transportation modelling and the global mapping of the earth energy balance. In this context operational applications are developed, hydrological models and GIS are integrated in RS image processing in addition the WSC participates in international programmes like HAPEX and EPOCH.

At the Centre for Agrobiological Research (CABO-DLO), two major Remote Sensing themes have been pursued.

- Research was conducted on the growth monitoring of agricultural crops with optical and radar RS. Techniques were developed to link RS data with crop growth simulation models for yield estimation.
- The possibilities of radar techniques (multi frequency, -polarisation, -temporal, -incidence angle) for classification and characterisation of crops were investigated.

The Physics and Electronics Laboratory FEL-TNO is apart from the PHARUS development active in research on wind scatterometry, radar polarimetry and sea bottom topography using radar data. They also participated in the validation campaign of ERS-1 satellite in which a radar system for the monitoring of waves, currents and (oil)spills was used.

The Royal Netherlands Meteorological Institute KNMI operates a receiving station for meteorological satellite products. On an operational basis this produces apart from the use of remote sensing data for weather forecasts vegetation index and sea surface temperature maps. The research activities of KNMI are shifted from mainly meteorological research towards research on changes in climate and environment.

The National Aerospace Laboratory NLR offers Remote Sensing user support, acts as a satellite data distribution centre, is involved in the development of operational Remote Sensing data extraction systems and operates the national Remote Sensing instruments from its laboratory aircraft.

In the Netherlands a number of engineering and consultancy companies are active world wide. To support the tasks which are performed on contract basis, a general trend in research on the integration of GIS and Remote Sensing data can be noticed. This results in the marketing of improved land use classification results, cartographic products, evapotranspiration mapping and studies on methods to identify environmental problems. In the limited scope of this report it is not possible to mention their activities all individually, for further details the list of companies and institutes which contributed to this report should be consulted.

An exception is made for the recently developed EARS-PPM, a hand held field fluorimeter, which measures the photosynthetic quantum yield.

4. EDUCATION AND RESEARCH

In this section only the new developments in education and research for the period 1988-1992 will be summarized. The following acronyms will be used:

TUD: Delft University of Technology

WAU: Wageningen Agricultural University

ITC: International Institute for Aerial Survey and Earth Sciences

New subjects have been introduced in the university curriculum for geodetic engineer TUD concerning the subject photogrammetry and remote sensing. Still subjects as (analogue and) analytical photogrammetry with analytical instruments, triangulation by independent models and bundle adjustment are in the program. But more and more attention is paid to digital photogrammetry; in particular in the curriculum for senior students. A special course on remote sensing is introduced. A substantial number of engineer theses is related to digital photogrammetry and remote sensing.

Research subjects at the chair of photogrammetry and remote sensing of the Faculty of Geodetic Engineering were:

- Geodetic and semantic data collection from (stereo) digital images obtained by satellites of digital aerial photos.
 - Automatic GIS (Geographical Information Systems) updating from digital imageries using GIS knowledge.
 - (Semi) automatic extraction of roads from SPOT images and large scale digital aerial images.
 - Close-range photogrammetry; subjects such as:
 - . object surface measurements and replication by photogrammetry and computer aided design.
 - . motography, a method of determining position of moving objectives.
 - Connection digital mapping and filed completion.
- Several research projects are done in cooperation with governmental agencies and private companies.

At the Department of Land Surveying and Remote Sensing of WAU the main education activities are:

- Landsurveying, photogrammetry, digital mapping, remote sensing and geo-information systems (GIS). For remote sensing and GIS new lecture series have been developed ranging from the introductory level to the advanced level.

The Department gives courses at graduate and postgraduate level.

The Department is involved in research on remote sensing, GIS and their interaction.

Research in remote sensing concentrates on:

1. Model development for the integration of remote sensing data from different sensor types in the optical and microwave spectral regions (synergy) for agricultural applications.
2. The use of GIS data as a priori knowledge for land use monitoring with remote sensing.

Research in GIS concentrates on:

1. Data modelling and process modelling at different levels.
2. Contextual semantic object definitions and contextual transformations of geo-information.
3. Special attention is paid to the interrelationship of geometric and thematic data and handling uncertainty.

The main activities of the ITC are education, research and consulting.

In 1988, ITC decided to phase out technician and some technologist training in The Netherlands since government policy supported such training abroad. Also the proportion of one year Post Graduate Diploma and two year M.Sc. students was increased. In 1990, the policy was accepted to adjust the intake to yield a profile of 5% technologists, 75% post graduates and 20% M.Sc.

Apart from a few major research projects, e.g. the development of ILWIS (Integrated Land and Watershed Management Information System), research production at ITC has always been rather fragmented. In 1989, a formal structure for research production was implemented by setting up a programme for focusing research on the improvement of survey and environmental monitoring in support of planning and management.

In the period 1988-1992, the ITC continued to submit proposals to various sponsors and client organizations. Although it is not possible at this place to mention a small number of these proposals, one should be explicitly mentioned. An important new project awarded to ITC in 1990 by the Commission of the European Communities concerned providing support to RECTAS in Ile-Ife, Nigeria.

5. SCIENTIFIC AND PROFESSIONAL ASSOCIATION

- Faculty of Geodetic Engineering
Delft University of Technology
main activity: *Education and research*
Thijsseweg 11
2629 JA DELFT, The Netherlands
Telephone: (31) 15 - 782577
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- Wageningen Agricultural University
Department of Landsurveying and Remote Sensing
Centre for Geo-information Processing
main activity: *Education and research on remote sensing and GIS*
P.O. Box 339
6700 AH WAGENINGEN, The Netherlands
Telephone: (31) 8370 - 82910
Telefax: (31) 8370 - 84643
- International Institute for Aerospace Survey and Earth Sciences
main activity: *Education, research and consulting*
P.O. Box 6
7500 AA ENSCHEDE, The Netherlands
Telephone: (31) 53 - 874444
Telefax: (31) 53 - 874400
- Meetkundige Dienst van de Rijkswaterstaat (Survey Department, Ministry of Transport, Public Works and Water Management)
main activity: *Photogrammetry and remote sensing applications*
Kanaalweg 3B
2628 EB DELFT, The Netherlands
Telephone: (31) 15 - 691111
Telefax: (31) 15 - 618962
- Topografische Dienst Nederland (TDN)
main activity: *National mapping agency*
Bendienplein 5
P.O. Box 115
7800 AC EMMEN, The Netherlands
Telephone: (31) 5910 - 96911
Telefax: (31) 5910 - 96296
- Department of Photogrammetry, Cadastral Service, Ministry of Housing, Physical Planning and Environment.
main activity: *Photogrammetric production of the Large Scale Base Map of the Netherlands*
P.O. Box 9046
7300 GH APELDOORN, The Netherlands
Telephone: (31) 55 - 285320
Telefax: (31) 55 - 557709
- Beleidscommissie Remote Sensing (B.C.R.S.)
main activity: *Management of the National Remote Sensing Programme*
c/o Meetkundige Dienst
Kanaalweg 3b
2628 EB DELFT, The Netherlands
Telephone: (31) 15 - 691111
Telefax: (31) 15 - 618962
- Winand Staring Centrum, Instituut voor Onderzoek van het Landelijk Gebied
Ministerie van Landbouw, Natuurbeheer en Visserij
main activity: *Integrated Land, soil and water research*
P.O. Box 125
6700 AC WAGENINGEN, The Netherlands
Telephone: (31) 8370 - 74200
Telefax: (31) 8370 - 24812
- Centre for Agribiological Research (CABO-DLO)
main activity: *Remote sensing as input for crop growth modelling and classification*
Bornsesteeg 65
P.O. Box 14
6700 AA WAGENINGEN, The Netherlands
Telephone: (31) 8370 - 75700
Telefax: (31) 8370 - 23110
- DHV Raadgevend Ing. Bureau b.v.
main activity: *Services on geo-information and satellite imagery.*
Laan 1914 35
3818 EX AMERSFOORT, The Netherlands
Telephone: (31) 33 - 682500
Telefax: (31) 33 - 682601
- Ingenieursbureau voor Environmental Analysis and Remote Sensing B.V. EARS
main activity: *Advanced Remote Sensing R&D and application, operational evapotranspiration mapping*
Kanaalweg 1
P.O. Box 449
2600 AK DELFT, The Netherlands
Telephone: (31) 15 - 562404
Telefax: (31) 15 - 623857
- Eftas-Nederland v.o.f.
Teledetectie en Geoinformatica
main activity: *Consulting company on photogrammetry and remote sensing data interpretation*
Telgenkamp 1
7576 EG OLDENZAAL, The Netherlands
Telephone: (31) 5410 - 15544
Telefax: (31) 5410 - 30274
- Euroconsult B.V., IT Department
main activity: *Production of custom-made remote sensing and GIS products*
P.O. Box 441
6800 AK ARNHEM, The Netherlands
Telephone: (31) 85 - 577111
Telefax: (31) 85 - 577577
- Eurosense
Remote Sensing Department
main activity: *Aerial surveys, photo and satellite image interpretation, consultancy*
Mathenessestraat 43
4843 EA BREDA, The Netherlands
Telephone: (31) 76 - 658850
Telefax: (31) 76 - 655999
- Ingenieursbureau Geodelta B.V.
main activity: *Software systems for geodetic and photogrammetric use*
Oude Delft 175
2611 HB DELFT, The Netherlands
Telephone: (31) 15 - 158188
Telefax: (31) 15 - 158154

- Advies- en Ingenieursbureau Grontmij N.V.
Afdeling Landmeetkunde
main activity: *Land survey and mapping*
P.O. Box 1030
8200 BA LELYSTAD, The Netherlands
Telephone: (31) 3200 - 27470
Telefax: (31) 3200 - 21559
- KLM Aerocarto
main activity: *Aerial surveys, GIS/LIS products, map production*
Fruitweg 9
2525 KE DEN HAAG, The Netherlands
Telephone: (31) 70 - 3803311
Telefax: (31) 70 - 3897642
- KNMI (Royal Netherlands Meteorological Institute)
main activity: *Meteorological services, remote sensing support using meteorological satellites*
P.O. Box 201
3730 AE DE BILT, The Netherlands
Telephone: (31) 30 - 206911
Telefax: (31) 30 - 210407
- Nationaal Lucht- en Ruimtevaart Laboratorium
(National Aerospace Laboratory NLR)
main activity: *Airborne remote sensing, user application support, remote sensing system development*
P.O. Box 153
8300 AD EMMELOORD, The Netherlands
Telephone: (31) 5274 - 8444
Telefax: (31) 5274 - 8210
- Oranjewoud Fotodata B.V.
main activity: *Photogrammetric mapping*
P.O. Box 10044
1301 AA ALMERE-stad
Telephone: (31) 3240 - 96511
Telefax: (31) 3240 - 38189
- Fysisch en Elektronisch Laboratorium TNO
main activity: *SAR system development, radar remote sensing research*
P.O. Box 96864
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Telephone: (31) 70 - 3264221
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