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EIGHTH UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR ASIA AND THE FAR EAST

Bangkok, 17-28 January 1977

Vol. I.–Report of the Conference

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Department of Economic and Social Affairs

EIGHTH UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR ASIA AND THE FAR EAST

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NOTE

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

The proceedings of the Eighth United Nations Regional Cartographic Conference for Asia and the Far East, held at Bangkok from 17 to 28 January 1977, are being issued in two volumes, as follows:

Volume I. Report of the Conference

Volume II. Technical papers

The proceedings of the previous United Nations regional cartographic conferences for Asia and the Far East were issued under the following symbols and sales codes: E/CONF.18/6 (Sales No. 55.I.29) and E/CONF.18/7 (Sales No. 56.I.23) for the First Conference; E/CONF.25/3 (Sales No. 59.I.9) and E/CONF.25/4 (Sales No. 61.I.8) for the Second Conference; E/CONF.36/2 (Sales No. 62.I.14) and E/CONF.36/3 (Sales No. 64.I.17) for the Third Conference; E/CONF.50/4 (Sales No. 65.I.16) and E/CONF.50/5 (Sales No. 66.I.3) for the Fourth Conference; E/CONF.52/4 (Sales No. E.68.I.2) and E/CONF.52/5 (Sales No. E.68.I.14) for the Fifth Conference; E/CONF.57/2 (Sales No. E.71.I.15) and E/CONF.57/3 (Sales No. E.72.I.20) for the Sixth Conference; E/CONF.62/3 (Sales No. E.74.I.7) and E/CONF.62/4 (Sales No. E.74.I.25) for the Seventh Conference.

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I. ORGANIZATION OF THE CONFERENCE

Opening and duration of the Conference

1. The Eighth United Nations Regional Cartographic Conference for Asia and the Far East was held at the headquarters of the Economic and Social Commission for Asia and the Pacific at Bangkok from 17 to 28 January 1977. The Conference was held in accordance with resolution 1838 (LVI), adopted by the Economic and Social Council on 15 May 1974, and with decision 189 (LXI), adopted by the Council at its 2032nd meeting on 5 August 1976.

Attendance

2. The Conference was attended by 221 representatives and observers from 40 countries, three specialized agencies, one intergovernmental organization and four international scientific organizations.

Official addresses

3. His Excellency, Admiral Sa-ngad Chaloryoo, Minister of Defence of Thailand, inaugurated the Conference. Mr. Princy H. Siriwardene, Deputy Executive Secretary of the Economic and Social Commission for Asia and the Pacific (ESCAP), delivered an address of welcome on behalf of the Commission. The representative of the Secretary-General of the United Nations delivered an opening address on behalf of the Secretary-General.

Adoption of the rules of procedure

4. The Conference adopted its rules of procedure (E/CONF.68/2).

Agenda

5. The Conference, at its opening meeting, adopted the following agenda:

1. Adoption of the rules of procedure
2. Election of officers
3. Adoption of the agenda
4. Report on credentials
5. Establishment of technical committees
6. Country reports and progress made by countries since the Seventh Conference*

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* Substantive item considered in plenary.

7. Review of the latest techniques and recent developments related to:

   (a) Conventional and satellite geodesy

   (b) Large-scale and medium-scale mapping (including topographical mapping and photogrammetry)

   (c) Small-scale mapping

   (d) Thematic cartography and national atlases

   (e) Preparation and reproduction of maps (including map compilation, geographical names, automation etc.)

8. Cadastral surveying and mapping (including urban mapping)

9. Hydrographic surveying and charting

10. Conventional and satellite remote-sensing applications and techniques*

11. Technical assistance (including training)*

12. Adoption of the report of the Conference

Technical committees

6. The Conference established four technical committees and allocated certain items to them as shown below:

Committee I	Item 7 (a) and (b)
Committee II	Item 7 (c), (d) and (e)
Committee III	Item 8
Committee IV	Item 9

Election of Officers

7. The Conference elected the following officers.

President:	Lt.-General Chumphon Kulkasem (Thailand)
Vice-President	Warren N. Hawkey (New Zealand)
Rapporteur:	Major-General K. L. Khosla (India)

8. The following officers were elected to the four committees:

Committee I

Chairman:	Bruce P. Lambert (Australia)
Vice-Chairman:	Bazlur Rahman (Bangladesh)
Rapporteur:	Jacub Rais (Indonesia)

Committee II

Chairman:	Andreas Christofi (Cyprus)
Vice-Chairman:	Phoonphon Asanachinta (Thailand)
Rapporteur:	Oon Song Low (Singapore)

Committee III

Chairman:	Paul Foo (Malaysia)
Vice-Chairman:	Amir Ahmad (Afghanistan)
Rapporteur:	Finauga Tiavolo Seumanutafa (Western Samoa)

Committee IV

Chairman:	Bunkichi Imayoshi (Japan)
Vice-Chairman:	Bhuwan Dutt (Fiji)
Rapporteur:	Commodore Jayme V. Presbitero (Philippines)

9. Chris N. Christopher, United Nations Secretariat, served as Executive Secretary of the Conference.

Report on credentials

10. The Conference received a report that the credentials of all participants had been submitted to the Credentials Committee and found to be in order.

Vote of thanks

11. At the closing meeting, the Conference adopted by acclamation a vote of thanks to the Economic and Social Commission for Asia and the Pacific and to the Secretariat of the United Nations for the excellent arrangements and services provided for the Conference and to the Government of Thailand for the hospitality extended to the participants.

II. SUMMARY OF PROCEEDINGS OF THE PLENARY MEETINGS

Items 1-6

12. The Conference considered agenda items 1 to 6 in plenary. Under item 6 (Country reports and progress made by countries since the Seventh Conference) 41 papers were reviewed.

13. At the final plenary meeting, an offer from the Government of New Zealand to act as host to the Ninth United Nations Regional Cartographic Conference for Asia and the Pacific was warmly received. In resolution 1 the Conference resolved to recommend acceptance to the Economic and Social Council. (For the text of the resolution, see chap. VII below.)

Conventional and satellite remote-sensing applications and techniques (item 10)

14. The Conference considered in plenary nine papers summarized below, on the topic of remote sensing. ESCAP also submitted for information a report on remote sensing and satellite surveying (E/CONF.68/INF/3), compiled in July 1976, to be discussed in detail at a subsequent meeting (see para. 24 below).

15. In the paper entitled "Application of remote-sensing techniques to the study of submarine volcanoes" (E/CONF.68/L.4), Japan described studies and experiments developed for the application of the techniques of remote sensing to marine phenomena such as the behaviour of submarine volcanoes, in which eruptions were rendered visible by the discolouration and variation of temperature of the water. The paper included a detailed description of the instruments and methods used for the analysis of data. A number of difficulties were reported, due particularly to the fact that it was frequently impossible to obtain a true picture of the sea: research was currently at the stage of data collection and problems concerning data analysis, the prediction of volcanic eruptions and the determination of their mechanism would be tackled later.

16. France submitted a communication entitled "Remote sensing at the Institut geographique national" (E/CONF.68/L.10), in which it outlined the problems of the environment, inventories of natural resources and more generally the problems encountered in studying the earth's surface and could not be solved by conventional methods of cartography and aerial photography. It then went on to describe the principle of thermal imagery and the equipment used for sensors, as well as possibilities for the use of airborne radar. It reviewed the various fields of application of those techniques for studies of the environment, geology, hydrology land use, agriculture, pollution, pedology and in conclusion recommended that they be developed further.

17. In a communication entitled "Earth Resources Technology Satellite No. 1 (ERTS-1) - applications in conventional mapping at 1:1,000,000 and 1:500,000" (E/CONF.68/L.11), France described an application in conventional cartography

of ERTS-1 imagery for the revision of small-scale maps. The method saved considerable time and reduced drastically the number of documents to be used, it also allowed greater homogeneity in dealing with large geomorphological complexes.

18. The paper entitled "Interpretation of dry-farming crops in tropical regions - an example in the Niger (crops in Bengou)" from the Département of Dosso (E/CONF.68/L.12), presented by France, contained a sample inventory of dry-farming crops taken by conventional photo-interpretation of photographic panchromatic aerial coverage realized at the scale of 1:20,000.

19. Australia submitted a paper entitled "The use of LANDSAT imagery in land-use mapping in Australia" (E/CONF.68/L.35 and Add.1), in which it reported that it was preparing land-use maps for the entire country at the 1:1,000,000 scale. LANDSAT imagery was the primary source of data, supplemented by other photography, maps and records. Maps of the International Map of the World (IMW) series were used as the base. Three overlays were being prepared, showing land use, land cover and land tenure. The classification system used was very similar to that adopted in the United States of America having the advantage of providing three different levels of classification with the possibility of further subdivision. The use of air photography at the 1:140,000 scale for more detail was being assessed.

20. The USSR submitted two papers on the subject of remote sensing, entitled "Exploration of the earth's natural resources by remote sensing" (E/CONF.68/L.98) and "Samples of multispectral photo-information obtained from the long-term space ship Saliut-4" (E/CONF.68/L.97), in which it stated that the use of remote-sensing methods opened up wide possibilities for complex investigations of the earth's natural resources and the environment. Photo images made it possible to obtain great quantities of descriptive and statistical information, which could be used in planning and forecasting, geological mapping, industrial and urban project planning etc. The samples of multispectral photography demonstrated the scientific and practical possibilities of selecting and synthesizing the needed information for different purposes.

21. The Indonesian representative presented a paper entitled "Experiments and applications of remote sensing by the National Co-ordinating Agency for Surveys and Mapping" (E/CONF.68/L.104). It described the experiments conducted in the use of the multistage survey system in conjunction with a natural resource inventory and evaluation project. In the first stage of the survey, an analysis had been made using small-scale aerial photography (1:100,000) with complementary data obtained from LANDSAT imagery for reconnaissance purposes. In the second stage a sample plot or strip had been selected and analysed on the basis of an interpretation of larger-scale aerial photography and airborne multispectral sensing imagery. The third stage was a ground-truth survey to find keys for the interpretation of the area under consideration. Experiments had also been carried out to update the 1:250,000 topographic base map employing an enlarged LANDSAT photomap of the same scale. The conclusion was that for a natural resource survey at reconnaissance level, particularly for land-use and land-system classification, useful information could be extracted by the visual interpretation of LANDSAT imagery. The interpretability in visual interpretation depended on the contrast in spectral reflectance between an object and the surrounding features. It had been shown that the multistage resource survey was an efficient and time-saving procedure.

22. In a paper entitled "Methods of remote sensing in data acquisition and processing and their potential for collecting environmental information" (E/CONF.68/L.115), submitted by the Federal Republic of Germany, it was shown in various tables quoting the status of mapping at small and large scales that progress by conventional methods was too slow with respect to needs. There was therefore justification for investigating remote sensing as a possible means to faster progress in thematic mapping. LANDSAT images had been used by the Federal Republic for the resource mapping of African regions but the LANDSAT ground resolution was too coarse for use within the Federal Republic, which was not therefore interested for the time being in operating its own receiving station. It would, however provide a metric camera for the first European Spacelab mission in 1980. The Federal Republic was currently concentrating on investigating the multispectral and multitemporal potential of remote sensing in a federal test programme involving multispectral scanner data from aircraft over four test areas (coast, urban environment, agriculture and forestry land use, ecology). Those areas were associated with four regional data evaluation centres and one national image-processing centre. For those centres, software had been developed to carry out image processing, geometric transformations and multivariate classification. While tests were still in progress it was already evident that thermal scanning was effective for the monitoring of water, the multispectral concept was of value in the determination of land use and the multitemporal concept was appropriate for the classification of vegetation. Digital processing yielded superior results for many applications, but it was still too costly except for special research. Geometric digital processing was a prerequisite for multitemporal analysis. The multistage approach to remote sensing, in which satellite data were calibrated by aircraft data and the latter by ground truth appeared to be the most suitable one. The training facilities of the Federal Republic were open to other interested countries.

23. Canada did not submit a paper, but the Canadian representative reported that satellite imagery had proved very useful for the addition of features such as major roads, power transmission lines and new reservoirs to small scale maps in wilderness areas. It had also been used to detect and position previously uncharted islands and shoals in remote areas. A new series of mosaics at the scale of 1:1,000,000, using LANDSAT photography, had recently been published for all of Canada.

24. ESCAP introduced a report entitled 'Remote sensing and satellite surveying: report of the study mission of the Economic and Social Commission for Asia and the Pacific", which was presented to the Conference as information paper E/CONF.68/INF/3. The report had been prepared by a study mission to assess the current situation and future plans for the use of resource satellite imagery in the region, and the role that international bodies and ESCAP in particular, might play in ensuring appropriate use of that technology. The report, which had been widely distributed in the latter part of 1976, would be the main background paper for consideration at an ESCAP intergovernmental meeting tentatively scheduled to be held at Bangkok from 7 to 13 June 1977. It was planned that papers would be submitted giving up-to-date information on plans for the provision and use of satellite imagery, but the main purpose of the meeting would be to consider possible intercountry and regional activities as follows:

(a) "Regionalization" of any proposed national facility;

(b) Research and development in interpretation and use of imagery-requirements, available facilities, current programmes and proposals;

(c) Training - requirements, available facilities, current programmes and proposals;

(d) Development of a system for exchange of up-to-date information in the region.

25. Representatives of two delegations, in commenting on the report, expressed the view that it was unduly pessimistic in its presentation of the value and potential applications of satellite technology.

26. The representative of the Federal Republic of Germany commended ESCAP on its excellent work in compiling the paper, which appeared, however, to be somewhat conservative in its views regarding the applications of remote sensing to thematic mapping. It should be remembered that remote sensing was generally still at the research stage and that at that stage its usefulness could only be determined by means of tests. Such tests should be initiated where conventional methods did not provide satisfactory answers. Even where it was available, current mapping information was usually years behind the times and did not depict all the features it would be desirable to know. There was particular potential for the use of satellites because of their repeated coverage, but only if sufficient receiving stations were available. While remote sensing by satellite might have possible applications for extended regions at a small scale, multispectral and multitemporal aircraft methods were essential for large-scale investigation of densely populated regions.

27. ESCAP, while welcoming the above comments, suggested that a conservative approach seemed desirable at that particular stage, particularly in considering the case for new receiving stations, since the justification for them depended particularly on being able to make effective use of the repetitive imagery, which seemed to entail problems requiring further research under the conditions prevalent in the region.

28. Three draft resolutions were submitted to the Conference and were subsequently adopted as resolutions 16, 17 and 18. (For the text of the resolutions, see chap. VII below.)

Technical assistance (including training) (item 11)

29. Ten papers were considered under item 11 and are summarized below.

30. Presenting a paper entitled "The Ecole nationale des sciences geographiques and its contribution to the training of foreign engineers and technicians" (E/CONF.68/L.13) the French representative described the various training courses which were provided, covering the fields of geodesy, topography, photogrammetry, remote sensing and cartography, as well as complimentary scientific disciplines. The various programmes and admission requirements were stated. It was explained that the courses involved both lectures and field work, and that students who successfully completed the courses were granted degrees.

31. The United Kingdom representative presented a "Report on full-time training facilities in the United Kingdom in land survey, photogrammetry and photo-interpretation, cartography and map reproduction which are available to overseas

students" (E/CONF.68/L.14), and briefly explained the procedures to be followed by Governments that wish to sponsor students.

32. In its paper "The Directorate of Overseas Surveys: technical co-operation in surveying and mapping" (E/CONF.68/L.15) the United Kingdom described the services provided by the Directorate within the framework of the United Kingdom's aid programme. In presenting the report the United Kingdom representative stressed that, while the Directorate could provide a comprehensive field survey and mapping service using its own resources, it increasingly preferred to take part in joint projects, since they provided the maximum opportunities for strengthening the organization involved. It was pointed out that the Directorate could provide technical advice and assistance along with the training. The British Government had sponsored two fundamental studies of land registration and cadastral surveying, which had since been published. Finally, it was mentioned that the United Kingdom aid programme had been extended to include hydrographic surveying.

33. In its paper entitled "International training in remote sensing" (E/CONF.68/L.43), the United States of America described the training programme offered at the EROS Data Center. The training consisted of a combination of class-room studies and the actual use of satellite and aircraft imagery in the laboratory and in the field. Training was also offered in advanced digital analysis systems. Attention was called to a four-week programme giving particular attention to LANDSAT imagery such as aerial photography, thermal infra-red imagery and radar imagery. It was reported that about 185 students, representing 55 countries, had attended the four-week programme, while an additional 500 had been involved in other programmes; that number included representatives of United States organizations as well as representatives of other countries.

34. Japan, in a paper entitled "International technical co-operation by the Geographical Survey Institute" (E/CONF.68/L.71), reported recent activities involving technical co-operation in survey mapping. In presenting the paper the representative of Japan also mentioned activities in the fields of hydrology and geology.

35. A paper entitled "The Regional Cartographic Institute" (E/CONF.68/L.75), submitted by Thailand, described the objectives of the Institute as being to encourage public interest in mapping techniques and their applications to regional development projects; to establish surveying and mapping as a profession; and to promote regional education, research and invention. The paper noted that, although several institutes in Thailand offered training in surveying, only the Survey School of the Royal Thai Army and Chulalongkorn University offered degree courses. The paper also described the curriculum of the Regional Cartographic Institute, and explained that training there was conducted at two levels.

36. In a paper entitled "Special mapping work carried out in Hungary on South-East Asia and Cyprus" (E/CONF.68/L.102), 16 maps were listed, at scales ranging from 1:500,000 to 1:2,500,000, which had been compiled in the course of the work done by specialists from South-East Asia who were undergoing post-graduate training in Hungary.

37. The Federal Republic of Germany presented a paper entitled "The necessity for international co-operation in communication, education and documentation in cartography today" (E/CONF.68/L.107). The paper called attention to the need to

study the problem of communication through maps and charts, and the need to establish a better dialogue between the makers and users of such maps and charts.

38. In a paper entitled "Activities of the Federal Institute of Geoscience and Natural Resources in the ESCAP region" (E/CONF.68/L.108) the Federal Republic of Germany described the activities of the Institute. Reference was made to 26 projects, from which 5 map series had been made and published. It was also explained that additional maps were to be published in the future.

39. The Federal Republic of Germany submitted a paper entitled "Technical assistance in surveying and cartography provided by the Federal Republic of Germany" (E/CONF.68/L.114). The paper described the education and training opportunities offered by the Federal Republic of Germany, which included (a) scholarships to attend colleges and universities in the Federal Republic; (b) in-service training in cartography, photogrammetric plotting, land information systems and cadastre, control surveys and remote sensing; (c) seminars in the Federal Republic or elsewhere to which representatives of developing countries were invited; and (d) training in connexion with technical assistance projects. It was explained that a co-ordinating group for technical co-operation had been formed to foster technical assistance by the Federal Republic, with a view to providing assistance in the field of cadastral surveying and mapping, including land registration and land information systems.

40. The representative of the Netherlands drew attention to the education facilities offered by the International Institute for Aerial Survey and Earth Sciences (ITC). It was explained that courses were offered at various levels in such subjects as aerial photography and navigation, photogrammetry, cartography, and photo-interpretation (including remote sensing).

41. The representative of Switzerland called attention to the training offered at the Swiss School for Photogrammetric Operators.

42. The Hungarian representative called attention to the Budapest University of Sciences, at which post-graduate training was offered in English for students from developing countries. Special attention was given to thematic cartography and map reproduction.

43. The Indonesian representative reported that a school for photogrammetric operations had been opened in 1975, and stated his country's firm belief that medium-level personnel could best be trained in their own countries.

44. The representative of ESCAP stressed the importance of the concept of technical co-operation among developing countries. He agreed with the Indonesian representative that, as far as possible the training requirements of the developing countries should be met by institutes within those countries; he indicated that there were good precedents to support that view, and urged the formation within the region of a network of facilities designed to meet training requirements.

45. In reply to a question raised by the representative of the International Hydrographic Office (IHO), the representative of the United Kingdom explained that his country's future hydrographic aid would include both hydrographic surveys and the training of hydrographic surveyors and cartographers. He also expressed the belief that the training of hydrographic surveyors could best be provided in the

form of three short courses, each separated by periods of about two years of training at sea.

56. Four draft resolutions on the subject of technical assistance were submitted to the Conference and subsequently adopted as resolutions 19, 20, 21 and 22. (For the text of the resolutions, see chap. VII below.)

III. CONVENTIONAL AND SATELLITE GEODESY AND LARGE-SCALE AND MEDIUM-SCALE MAPPING (INCLUDING TOPOGRAPHICAL MAPPING AND PHOTOGRAMMETRY): WORK OF COMMITTEE I

47. Agenda item 7 (a) (Conventional and satellite geodesy) and agenda item 7 (b) (Large-scale and medium-scale mapping (including topographical mapping and photogrammetry)) were considered by Committee I. Twenty papers dealt with these agenda items and four draft resolutions were submitted to the Conference, which were subsequently adopted as resolutions 4, 5, 6 and 7. (For the text of the resolutions see chap. VII below.)

Conventional and satellite geodesy

48. The representative of France presented a paper entitled "Geodesy by Doppler satellite" (E/CONF.68/L.7), in which it discussed the potential of Doppler systems for establishment of geodetic nets. It summarized the principles of Doppler systems, instrumentation at the Institut géographique national, computational procedures and advantages offered by Doppler systems. The existing system would be modified in the near future, under the GEOLE project, by the combination of range and Doppler measurements from an orbital space network consisting of the trajectories of one or more satellites.

49. A paper presented by the representative of the Federal Republic of Germany entitled "Adjustment of the European Triangulation Network: present state of computation and future monitoring by satellite techniques" (E/CONF.68/L.20) gave an account of the stage reached in the adjustment of the European Triangulation Network (RETRIG). The first phase (geometric adjustment) had been completed in 1974 and the second phase (including distances and azimuths) would be finished in March 1977. The total area, excluding East Europe, was divided into national blocks and adjusted by a method of observation equations with co-ordinates as unknowns. The third phase would include refinements from the theoretical point of view as well as verification and support using satellite techniques.

50. At the request of the Chairman of the Committee, the representative of the Federal Republic of Germany also presented a paper entitled "Proposed satellite observations within Europe" (E/CONF.68/L.120) which summarized the activities to be undertaken by the Federal Republic in 1977-1978.

51. The Australian representative presented a paper entitled "Doppler satellite surveys in Australia" (E/CONF.68/L.28). The paper showed the results obtained from a comparison of co-ordinates determined for 54 junction points of the Australian Geodetic Survey Network by the Doppler satellite method. After transformation to provide the best mean fit, the average differences were $\pm$ 1.5 metres for latitude and longitude and $\pm$ 1.3 metres for elevation.

52. In its paper entitled "Transformation of Doppler geodetic point position to the local datum in the Asia-Pacific area" (E/CONF.68/L.45), the United States of America presented the formula of datum transformation. Dictated by the purpose of the survey, the number of parameters selected to determine the datum transformation would

depend on the number, accuracy and distribution of common points. Examples and accuracies of datum transformation for Thailand, the Philippines and Peru were given. The determination of mean sea-level elevations from satellite-derived ellipsoid heights was also discussed.

53. Another paper was presented by the United States of America, entitled "Doppler satellite positioning: application to geodetic control networks" (E/CONF.68/L.46), which reviewed the results obtained from a comparison of conventionally adjusted geodetic control networks with adjustment utilizing Doppler-derived co-ordinates. The results indicated that the Doppler positioning method was a powerful and accurate tool for strengthening existing networks and for establishing the fundamental framework in areas devoid of geodetic control.

54. In a paper entitled "The use of high-altitude photogrammetry in determining the true figure of the earth" (E/CONF.68/L.57), Thailand reported on a method of computing the co-ordinates of perspective centre (spatial camera position) from the control points identified on the photograph by analytical re-section, which in turn would be used to further compute other points on the surface of the earth by intersection. By using three-dimensional triangulation and bridging the photographs with a large overlap (75 per cent) it would be possible to determine the true figure of the earth without depending on geographical or astronomical co-ordinates.

55. Indonesia and Malaysia presented a paper entitled "Joint report on Indonesian and Malaysian activities in connexion with the survey and demarcation of the border between Indonesia (Kalimantan) and Malaysia (Sarawak and Sabah)" (E/CONF.68/L.61), describing the background, organization and surveying procedures for the demarcation of approximately 1,800 kilometres of international boundary. Geodetic control would be provided by major control points, at intervals of approximately 50 kilometres and Laplace stations at intervals of approximately 300 kilometres, which were themselves boundary markers. Additional control points were provided by subsidiary control traverses with a maximum 5-kilometre interval between stations. Four types of pillar were used for the demarcation of the boundary.

56. Japan submitted a paper entitled "Research of active faults under the alluvium layer by geodetic methods" (E/CONF.68/L.73). The field work described in the paper consisted of gravity and geodetic surveys. About 570 gravity stations had been established in 1975 with a density of one station per square kilometre. A Bouguer anomaly map had been drawn up and in addition a residual gravity map had been prepared for easier detection of active faults. The geodetic survey consisted of base-line measurements and the precise levelling of gravity stations. The research had practical applications for the forecasting of earthquakes.

57. A paper submitted by Indonesia entitled "Current geodetic activities in Indonesia" (E/CONF.68/L.79) described Indonesian efforts to unify the separate geodetic data into a single national datum by Doppler satellite observation techniques. The datum had been selected by the adoption of a spheroid having parameters of the Geodetic Reference System 1967 with orientation towards the CIO pole at the datum point, whose initial co-ordinates had been defined by Doppler fix.

58. The next paper submitted by Indonesia was entitled "The use of satellite Doppler surveying for medium-scale mapping in Indonesia" (E/CONF.68/L.80). It presented the results of a satellite Doppler positioning system for establishing

geodetic control for a project entailing the 1:10,000 photomapping of a marsh area. An independent point-positioning observation method based on approximately 20 satellite passes per point and the use of broadcast ephemeris yielded relative accuracies between 1:5,800 and 1:17,000, which was better than the level of accuracy (1:5,000) required for the purpose and resulted in savings in cost, time and manpower.

59. The representative of Australia presented a paper entitled "A comparison between the Australian Geodetic Survey 1966 and NAVSAT geodetic observations" (E/CONF.68/L.93) in which it reviewed the development of the Australian Geodetic Survey (network) and the check on its accuracy provided by transfer Doppler satellite positioning. At 55 points, the average spread for latitude was $\pm$ 0.03", for longitude $\pm$ 0.06" and for elevation $\pm$ 1 metre.

60. In a paper entitled "Geodetic investigations on geodynamic test areas in the USSR" (E/CONF.68/L.99), the USSR described the investigation of recent crustal movements and its importance for earthquake prediction. Several geodynamic test areas were delineated for that purpose and were subjected to complex investigations, including precise geodetic measurements.

61. The following countries recorded the successful application of geodetic satellite techniques to geodetic surveying in their national reports: Australia (E/CONF.68/L.27), Canada (E/CONF.68/L.112), France (E/CONF.68/L.7), Germany, Federal Republic of (E/CONF.68/L.109), Indonesia (E/CONF.68/L.76), Japan (E/CONF.68/L.16 and Add.1), Libyan Arab Jamahiriya (E/CONF.68/L.95), New Zealand (E/CONF.68/L.36), Philippines (E/CONF.68/L.60), Sudan (E/CONF.68/L.67), Thailand (E/CONF.68/L.58), United Kingdom (E/CONF.68/L.18) and United States of America (E/CONF.68/L.95).

62. The Committee was advised by the United States representative, in connexion with the United States paper on the NAVSTAR Global Positioning System (E/CONF.68/L.119), of the launching of several NAVSTAR satellites for testing prior to conversion to the Global Positioning System (GPS), which would replace the current Navy Navigation Satellite System (NAVSAT). It was expected that the full array of 24 NAVSTAR GPS satellites would be in orbit by 1984. That development could be expected to have a considerable impact on geodesy, although a 10-year overlap of NAVSAT with GPS was planned.

63. Several countries reported that they were investigating the application of a number of simultaneous observations to the determination of relative positions and the United States representative reported that accuracies at the decimetre level had been claimed for that technique.

64. The United Kingdom representative drew attention to the urgent need for an unambiguous definition of seaward boundaries and for techniques to locate those boundaries accurately in situ, particularly in areas of economic importance. It would help greatly if boundaries were described in terms of a mutually acceptable World Geodetic Datum and the Doppler satellite technique appeared to provide the most practical method of undertaking survey in remote areas.

65. The representative of the International Hydrographic Organization endorsed the views of the United Kingdom delegation and stressed the practical benefits for satellite navigation of having nautical charts referenced to a generally accepted World Geodetic Datum.

66. The delegations from Canada and the United States of America reported on the development and practical application of an Inertial Positioning Technique, which, though expensive, could hold great potential for the rapid provision of control survey data.

67. Members of the Committee were extremely interested in reports on motorized levelling that were presented by the representatives of the German Democratic Republic and Sweden.

Large-scale and medium-scale mapping

68. France submitted a paper entitled "Digital photogrammetry and automated mapping application to large scales" (E/CONF.68/L.8). It gave an account of an experimental automatic mapping system at the Institut géographique national, which was designed for the production of 200 sheets (1:5,000 or 1:2,000) annually at an average cost of less than 20 francs per hectare. The anticipated time for the preparation of a complete sheet might be 5 to 10 days from the end of the photogrammetric operations.

69. In the paper entitled "Digicart - universal system of large-scale mapping" (E/CONF.68/L.26), the German Democratic Republic reported the development of a geodetic-cartographic information-processing system known as Digicart. The system was able to process data obtained from aerial photographs, geodetic-numerical surveys, maps or lists of co-ordinates. It seemed to be particularly useful for making cadastral maps in connexion with numerical operation. The broad use of the Digicart system made it possible to build up a current data base with a great variety of applications to reduce access time for the data required and to accelerate the whole process of large-scale mapping.

70. In its paper entitled "The MODBLOCK programme for photogrammetric block adjustment" (E/CONF.68/L.29), Australia summarized for practice of aerial triangulation and block adjustment using independent pairs. The Australian MODBLOCK Programme of the Division of National Mapping was described in more detail. Subsidiary programmes plotted the vectors of residuals at control points for visual interpretation of the quality of adjustment.

71. A paper entitled "Instrumentation and techniques for modern cartography" (E/CONF.68/L.42) was submitted by the United States of America. It reviewed the progress in automation of all stages of map production from field data recording, sorting and processing to the final display best suited to the various needs. Though automated map production currently represented only a small percentage of total production, a steady and substantial trend toward digitization was foreseen.

72. The Federal Republic of Germany submitted a paper entitled "Progress in aerial triangulation for medium-scale and small-scale topographic mapping" (E/CONF.68/L.90), in which it noted that, while the introduction of block adjustment into photogrammetry significantly reduced the requirements for horizontal control by allowing perimeter control for very large blocks, the effect on the reduction of vertical control was not as marked. That situation could be improved by incorporating the auxiliary data, particularly statoscope or data from the statoscope or airborne profile recorder (APR), into a simultaneous adjustment of block data. In particular, statoscope data was found to be highly effective for reduction of the field measurement of vertical control for mapping at scales

1:250,000-1:100,000. Further improvement of the statoscope resolution would allow its application to even larger mapping scales with contour intervals of up to 2 metres.

73. In a paper entitled "Special-purpose topographic plans in the USSR" (E/CONF.68/L.100), the USSR reviewed the use of the topographic map as a base for thematic mapping, noting that provision had been made to tailor the cartographic completion of the base map to a particular application such as land reclamation, geology and mineral exploration, urban planning etc. Requirements in terms of map scale, contour interval, map content, symbolization and annotation were also examined in the paper.

74. In respect of topographic mapping, the papers on block adjustments presented by Australia (E/CONF.68/L.29) and the Federal Republic of Germany (E/CONF.68/L.90) and reported on by Canada clearly showed that, with the inclusion of additional airborne elevation data, it was possible to derive air-triangulated heights of equal or better precision than that obtainable for horizontal co-ordinates based on parameter control.

75. The papers by France (E/CONF.68/L.8) and the German Democratic Republic (E/CONF.68/L.26) emphasized the usefulness of applying automated information processes to the mapping operations of well developed nations.

IV. SMALL-SCALE MAPPING; THEMATIC CARTOGRAPHY AND NATIONAL ATLASES; PREPARATION AND REPRODUCTION OF MAPS; GEOGRAPHICAL NAMES: WORK OF COMMITTEE II

76. The Committee considered 32 papers in all, covering the above subjects under agenda item 7 (c), (d) and (e). Five draft resolutions were submitted to the Conference and were subsequently adopted as resolutions 11, 12, 13, 14 and 15 (For the text of the resolutions, see chap. VII below.)

Thematic mapping and national atlases

77. In a paper submitted by France entitled "Publication by the Institut géographique national of a new Atlas of Relief Forms" (E/CONF.68/L.9) it was announced that the Institut géographique national intended to publish in 1977 a new Atlas of Relief Forms to replace the Atlas of the same title published in 1956. The paper also described the contents of the new Atlas.

78. The Federal Republic of Germany submitted a paper entitled "Systems approach to thematic cartography" (E/CONF.68/L.21), in which it showed how the application of systems theory to thematic cartography could help to decide rationally on the contents of thematic maps, on variations in design to serve the needs of different types of map users, on compilation and generalization and on the form of graphic composition that was likely to be most informative. It was emphasized that systems analysis should be further developed as a tool of cartography.

79. In the paper entitled "The continuing revision of Australia's National Atlas" (E/CONF.68/L.31), Australia reviewed the progress made to date and reported that the second series of the Atlas was on the point of completion. It also described the more recent maps in the series and provided information on the planning of the third series. The subject matter of maps for each series was also listed.

80. Australia's paper entitled "National and regional atlases" (E/CONF.68/L.33) provided a general description of the production of various atlases in Australia and of the advent of computer-drawn socio-economic atlases.

81. The New Zealand paper entitled "Integrated mapping - the scope and range of maps" (E/CONF.68/L.37) described the integrated topographical and cadastral map coverage existing in New Zealand and also referred to new matric map series that would supersede existing maps at Imperial scales. It stressed the logical build-up of cadastral mapping from larger-scale surveys to create medium-scale and small-scale cadastral maps in an orderly way and the benefits to be gained from having cadastral and topographical map coverage at the same scale and on the same sheet lines, for use in the planning and management functions of government.

82. In its paper entitled "Realignment of Pacific flight information products" (E/CONF.68/L.44), the United States of America described from conception to completion a realignment in the coverage of flight information products for the

Pacific area. Since those publications conformed to the standards and practices laid down by the International Civil Aviation Organization (ICAO), they were widely used by the public and by civil and military aviation organizations of other countries. Changes in the format of products, publication schedules and distribution methods, all of which had resulted in improved service at less cost, with no adverse impact on air navigation safety, were also outlined.

83. The United States of America, in a paper entitled "The circum-Pacific map project" (E/CONF.68/L.47) also reported on the preparation of the series of maps depicting the geography, geology, tectonics, energy and mineral resources of the Pacific Basin and bordering lands. The project was a co-operative international effort by individuals, commercial companies, private and public institutions, and agencies of the various countries bordering on the Pacific, which was expected to be completed by 1978.

84. In another paper, entitled "The land-use and land-cover map and data program of the United States Geological Survey" (E/CONF.68/L.48), the United States of America reported that such mapping had been undertaken to provide timely, accurate, and consistent land-use and land-cover data on a nation-wide basis. Remote sensing was providing the primary source of data for the project. It was emphasized in the paper that not only must land-use and land-cover area data be obtained efficiently over extensive areas, but the capability to manipulate large amounts of such data in a computerized, geographically oriented information system was also necessary for the effective use of such data for regional analysis, comparative studies and decision modelling. Work had been started in 1975 and should be completed by about 1982.

85. In the paper entitled "The population distribution map of the Regional Economic Atlas of Asia and the Far East" (E/CONF.68/L.53), Thailand outlined the work carried out in the compilation of the population distribution map. It was pointed out that the map could help to stimulate discussions on the causes of the existing distribution pattern, regional population movement trends, the possibilities for influencing population development as an integral part of the social and economic development of the whole ESCAP region.

86. Thailand submitted another paper, entitled "Development, content and design of the revised edition of the National Resources Atlas of Thailand" (E/CONF.68/L.54) in which it traced the history of systematic thematic mapping in that country, and outlined the content and design of the revised edition of the Atlas.

87. In its paper entitled "Considerations on the Regional Economic Atlas of Asia and the Far East" (E/CONF.68/L.55), Thailand outlined the efforts made in the preparation of that Atlas. It acknowledged the generous co-operation of survey institutions of Australia, Japan, and the Philippines, as well as the technical assistance of the Federal Republic of Germany in the preparation of the Atlas and the assistance of ESCAP. It urged that countries of the region should provide further assistance in the form of relevant data.

88. In its paper entitled "Complex thematic atlases as aids to economic planning" (E/CONF.68/L.64), Hungary described the preparation of complex thematic atlases for the six regions of Hungary with a uniform presentation and in uniform cartographic style and proposed a thematic atlas system in national mapping.

89. Indonesia, in its paper "Thematic cartography at the Geological Survey of Indonesia" (E/CONF.68/L.82), reported on the cartographic activities carried out at that institution during the First Five-Year Development Plan and the current Second Five-Year Development Plan. Such activities included geological, hydrogeological, engineering/geological and gravity mapping. Foreign aid, including expertise, equipment and on-the-job training of cartographic personnel, had done much to promote the quality and progress of the work.

90. The Federal Republic of Germany, in its paper entitled "Official map series as a base for thematic mapping" (E/CONF.68/L.89), reported an increased demand for thematic mapping. Where official map series existed at suitable scales, showing sufficiently dense and up-to-date detail, the authors of thematic maps should use such maps as a basis. It was stressed that the ideas of the authors of thematic maps could best be presented if reproduction material allowed maximum flexibility in the choice of elements to be reproduced.

91. The USSR submitted a paper entitled "Some characteristic features of the compilation of geological maps in the USSR" (E/CONF.68/L.96), in which it described the execution of a very extensive programme, including the preparation of geological maps of the whole country at 1:1,000,000, which had been completed, and at 1:200,000 scale, which would shortly be 90 per cent complete. It was stressed that the volume of operations and the range of maps on production in the field of geological cartography was greater than in any other branch of thematic cartography and was of great importance to the national economy.

92. In its paper entitled "The activities of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in the field of cartography" (E/CONF.68/L.105), UNESCO reported on the work of the Organization in the preparation and publication of small-scale scientific (thematic) maps and atlases.

Preparation and reproduction of maps

93. In its paper entitled "Orthophotography in combination with automatic restitution: the fastest and most economical method for small-scale topographic map production" (E/CONF.68/L.25), the German Democratic Republic reported that by using the orthophoto technique, map production could be accomplished much faster and more economically than by stereoplotting. It was stressed that, while the accuracy of orthophoto maps was comparable to that of the line map, the former was definitely more useful because it contained a wealth of information on such matters as vegetation, water, flooded areas, soils, geology etc.

94. In its paper "Computer mapping in the Division of National Mapping" (E/CONF.68/L.30), Australia described the application of fairly simple techniques to the digitizing of statistical boundaries and the preparation of a socio-economic atlas based on a combination of digitization and recorded census data. It reported the proposed application of microtechniques to the preparation of colour in-fills and the successful application of computer processes to type preparation and gazetteer compilation.

95. Australia reported in another paper, entitled "Standard for the exchange of topographic data on magnetic tape" (E/CONF.68/L.32), on a standard that had been adopted by the Federal Civil and Military Mapping Agencies and was currently being

considered for adoption by the State authorities in order that it might become a National Mapping Council standard. Complete copies of the standard would be made available upon request.

96. In its paper entitled "CONDOR: a computationally oriented national data optimum retrieval system for automated cartography" (E/CONF.68/L.49), the United States of America described how the system provided a capability for executing all computational routine in aeronautical chart production, as well as a capability to extract aeronautical data from the data base and to orientate those data to a specific chart area or function.

97. In another paper submitted by the United States of America, entitled "Building a national cartographic information centre" (E/CONF.68/L.50), a description was given of the National Cartographic Information Center, which had been established in 1974 to enable users of maps, air photography and geodetic data to obtain access to those produced by agencies engaged in surveying and mapping at several levels of government and in private business.

98. Developments in modern cartography, especially in the context of thematic mapping, were outlined by Hungary in its paper "New perspectives and tasks of cartography" (E/CONF.68/L.65).

99. The paper "The National Land Information Service" (E/CONF.68/L.72), submitted by Japan, described work done by the Geographical Survey Institute in connexion with the National Land Information Service set up in 1974. The work carried out included the execution of aerial photography in colour, the production of land-use maps and the digitizing of national land information.

100. In the paper entitled "Indonesian maritime and undersea features" (E/CONF.68/L.84), Indonesia noted that, as a result of the most recent deep-sea expeditions in Indonesian waters in 1929 and 1930, a number of undersea features had been assigned geographical names in the Indonesian language.

101. Indonesia, in a further paper, entitled "Geo-referencing within the framework of an information system" (E/CONF.68/L.86), demonstrated the use of grid cells as a reference system in the computer mapping of resource data.

102. The representative of the Federal Republic of Germany presented a paper entitled "Assemblage of cartographic fair draughts of selected elements by means of diazocopy" (E/CONF.68/L.91), in which it considered the use of special one-layer coatings with multiple exposures to obtain the combination of several fair draughts on one single sheet.

103. In another paper submitted by the Federal Republic of Germany, entitled "The necessity for international co-operation in communication, education and documentation on cartography today" (E/CONF.68/L.107), the Federal Republic stressed the importance of such co-operation, in view of the great need for communication between map-makers and map-users in the fields covered by the paper.

104. The paper "Activities of the Federal Institute of Geosciences and Natural Resources in the ESCAP region" (E/CONF.68/L.108), also submitted by the Federal Republic of Germany, enumerated the various projects carried out by the Institute in countries of that region.

Geographical names

105. In its paper "The dynamics of geographical names in Asia and the Pacific" (E/CONF.68/L.51), the United States of America called attention to the fact that changes in systems of romanization created cartographic difficulty and increased the cost of map production; it recommended that continued efforts should be made to achieve standardization and stability in geographical nomenclature.

106. In a paper entitled "Report of the United Nations Divisional Group of Experts on Geographical Names, Asia and South-East Division" (E/CONF.68/L.63), Malaysia, which had been the Divisional Representative since 1973, reported on progress made by the Division, with particular reference to the map of South-East Asia, the proposed course in toponymy, the preparation of concise and regional gazetteers and a regional atlas and the newsletter Geonames. The members of the Division recommended to the Conference that, for the sake of continuity and in view of the fact that there were several ongoing projects under way, Malaysia should continue to be the Divisional Representative.

107. Indonesia, in its paper entitled "Uniformity in the transcription of geographical names" (E/CONF.68/L.83), reviewed the efforts to standardize the transcription of geographical names in Indonesia. Factors that had to be taken into account in transcribing names were considered in the paper, including historical background, regional terms and dialects and the current orthography of the Indonesian language.

108. In a further paper, entitled "Preparation of gazetteers and national standardization of geographical names" (E/CONF.68/L.85), Indonesia reported that a National Committee on Geographical Names had been organized to deal with problems encountered in the preparation of gazetteers and the national standardization on geographical names. In 1974, an inventory had been made of the 13,667 islands in the archipelago. Of those islands, 6,044 had been given names. The list of names had subsequently been published in 1975.

V. CADASTRAL SURVEYING AND MAPPING: WORK OF COMMITTEE III

109. The Committee considered four papers in connexion with its discussion of agenda item 8 (Cadastral surveying and mapping (including urban mapping)). One draft resolution was submitted to the Conference and subsequently adopted as resolution 3. (For the text of the resolution, see chap. VII below.)

110. The Federal Republic of Germany, in its paper "The cadastral map as a basis for planning and statistics" (E/CONF.68/L.19), drew attention to the fact that cadastral maps were being used more and more by government organizations and other agencies to carry out various planning and statistical activities. It was noted in that connexion that the cadastral administration should provide only the cadastral data, i.e., geodetic control, cadastral planimetry, topographical and descriptive information, while the users could themselves add any additional special data in accordance with their specific needs. Two ways of adding such data were suggested:

(a) Overlays could be produced, which could be combined and assembled with the cadastral map and then reproduced as an integrated map;

(b) The special data could be stored with the cadastral data in a Land Data Bank and combined in varying forms to produce an automated map according to the special requirements of the user.

111. In another paper, entitled "A contribution to organization and legislation in the field of surveying and mapping" (E/CONF.68/L.22), the Federal Republic of Germany stressed the importance of good organization and practical legal regulations and technical directives. It also emphasized that the cadastral activities of a country should be controlled and supervised by one authority alone where possible. Where that was not possible, an advisory council or central co-ordinating body should be established to control all cadastral activities in the country.

112. The Federal Republic of Germany submitted a further paper, entitled "Cadastral surveying and land registry in the Federal Republic of Germany with special regard to the situation in Bavaria" (E/CONF.68/L.23), in which it gave a short history of the cadastral system in Bavaria and described the current situation in the country. The main task for the Federal Republic was to secure the ownership rights to landed property. All boundary corners were therefore marked by solid durable boundary marks and co-ordinated, and new cadastral maps of 1:1,000 were being produced. There had also been concrete proposals for the setting-up of a land data bank to store all data connected with the land, including co-ordinates of control points and boundary corners, descriptions of lots and buildings and ownership, which it was hoped would result in the eventual production of an automated land map.

113. The New Zealand cadastral survey system was described in a paper entitled "The integrated survey system in New Zealand" (E/CONF.68/L.38), submitted by New Zealand. It was pointed out in the paper that considerable benefits to economy and efficiency in all aspects of national survey endeavour could accrue

from the operation of an integrated survey system and the rationalization of functions and resource allocations required to support government survey and mapping activities.

114. It was noted in the course of the discussion that the operation of such a system required the establishment of one national survey control network, with standardized procedures and accuracies, and serviced by one organization for the integration and provision of data, as a basis for all cadastral, mapping, constructional and other measurement surveys.

115. The integration of all cadastral or land tenure surveys within the system required the provision of adequate legislation and regulations controlling survey procedures, standards and record integration; the training, examination and discipline of the professional body comprising surveyors from all sectors; and the continued implementation of only those actions that would sustain the integrated process.

116. The rationalization and co-ordination of survey and mapping activities within the nation could be implemented only through the logical centralization and amalgamation of organizations; the maintenance of communication, co-operation and goodwill; and the acceptance of appropriate leadership in the interests of effective survey administration and operation.

117. It was pointed out that another important aspect of cadastral surveying, namely the survey of multistoried buildings for strata titles, should receive more attention. In some countries that was a relatively new development, resulting from the advent of more and more multistoried shopping and office complexes and multistoried flats in cities and towns. Legislation to introduce strata titles could be quite complex and a lot could be learnt from the experience of other countries that already had well-established systems.

118. With the advancement of computer technology it was natural that many countries were thinking in terms of a land data bank to store all cadastral information relating both to land register and the cadastral map. Some countries already had a national integrated data system and here again, countries planning to set up similar systems could benefit from the experience of others.

119. Regarding resolution 24 of the Seventh Regional Cartographic Conference 1/ on the establishment of an advisory panel to advise the United Nations on action to be taken in respect of the conclusions of the Ad Hoc Group of Experts on Cadastral Surveying and Mapping, the Executive Secretary announced that the panel would be set up shortly and that countries invited to sit on the panel would have to bear their own expenses if required to attend meetings.

1/ See Seventh United Nations Regional Cartographic Conference for Asia and the Far East, Tokyo, 15-27 October 1973, vol. I, Report of the Conference (United Nations publication, Sales No. E.74.I.7), chap. VII.

VI. HYDROGRAPHIC SURVEYING AND CHARTING: WORK OF COMMITTEE IV

120. The Committee considered 10 papers in connexion with agenda item 9 (Hydrographic surveying and charting). Three draft resolutions were submitted to the Conference and subsequently adopted as resolutions 8, 9 and 10. (For the text of the resolutions, see chap. VII below.)

121. The first three papers were presented by the delegation of the United Kingdom. In the first paper, entitled "Some basic principles in the compilation of nautical charts" (E/CONF.68/L.1), a comprehensive report on chart construction at different scales was presented along with various technical criteria not normally found in textbooks but derived from United Kingdom experience.

122. The second paper presented by the United Kingdom, "Training of personnel engaged in nautical chart construction in the United Kingdom" (E/CONF.68/L.2) provided information on the type and scope of training given to civil hydrographic officers, cartographic draughtsmen and other personnel engaged in chart production. In commenting on the paper, the observer from the International Hydrographic Organization (IHO) expressed the view that the training of hydrographic personnel was a matter of great importance for countries in the region in strengthening their national hydrographic capabilities. The Conference might therefore consider making specific recommendations to the United Nations regarding the provision of financial assistance, in the form of scholarships, to personnel from that and other regions. The IHO observer also suggested that the Conference might like to give consideration to the creation of regional training facilities in hydrography and allied sciences.

123. The representative of Indonesia supported those suggestions, and strongly urged that the Conference give urgent consideration to the question of hydrographic training.

124. The representative of India informed the Committee that a hydrographic training establishment was currently being established in his country and was scheduled to be completed towards the end of 1977. He further stated that India was prepared to expand those facilities to cater for the requirements of the region, provided, however, that assistance in the provision of modern equipment was made through the United Nations Development Programme (UNDP).

125. The representatives of Thailand and the Philippines supported the proposals made.

126. The third paper presented by the United Kingdom, entitled "Application of automation to nautical chart compilation and production in the United Kingdom" (E/CONF.68/L.3), dealt with the experience of the United Kingdom's Hydrographic Office in automated systems used in chart production. The paper not only explained the advantages to be gained with automation but also brought out some of its limitations.

127. The Japanese representative presented the paper "What bathymetric charts should be like" (E/CONF.68/L.5). He illustrated some original and practical concepts

affecting the basic criteria for the construction of bathymetric charts. In that context, the IHO observer informed the Committee that a first listing of nomenclature and terminology used for undersea features had already been prepared under the auspices of the General Bathymetric Chart of the Oceans (GEBCO) and would be updated periodically.

128. The paper "Australian bathymetric map series at the 1:250,000 scale" (E/CONF.68/L.34 and Add.1) was presented by the representative of Australia. The paper described the techniques used in the collection of data for the construction of bathymetric maps over the Australian continental shelf, surveys which extended to a depth of 300 metres. The series of maps was being prepared for the purpose of scientific research and exploratory studies of the Australian continental shelf.

129. The paper "National Ocean Surveys (NOS) study of applied photobathymetry" (E/CONF.68/L.52) was presented by the representative of the United States of America. The paper dealt with the potential use of photogrammetric methods for the interpretation of depth measurement in shallow waters as a means of supplementing data collected through normal hydrographic surveys. In answer to a query raised by the representative of the Philippines, the United States representative informed the Committee that the application of remote-sensing techniques to bathymetric surveys was still in the experimental stage. The IHO observer expressed the view that LANDSAT imagery would be most useful in planning the hydrographic surveys of the South China Sea as envisaged in resolution 28 of the Sixth Conference. 2/

130. The representative of Thailand presented a paper entitled "Hourly tidal prediction by an electronic computer" (E/CONF.68/L.56), in which the Schurman formula for the prediction of tides, transformed suitably for FORTRAN IV language, was discussed. Good results had been achieved by the use of that method.

131. The representative of Indonesia presented two papers, the first of which entitled "Hydro-oceanographic activities in Indonesia in the period 1973-1976" (E/CONF.68/L.87), reported on the progress achieved in the development of hydrography during the past three years. The paper emphasized the need for the production of nautical charts of the straits of Malacca and Singapore based on a common geodetic datum.

132. The second paper presented by the Indonesian representative, entitled "Hydrographic survey in the Lombok and Makassar straits conducted by Indonesia with technical assistance from Japan" (E/CONF.68/L.88), described the surveys made by Indonesia, with Japanese assistance, in the Lombok and Makassar straits. The Japanese provided the finance, modern survey equipment and technical assistance, including training, for the project and the work was carried out by Indonesian ships and personnel. The IHO observer stated that the project was an excellent example of a co-operative agreement entered into by two countries in the execution of a major hydrographic survey. He suggested that co-operation of that kind could be of substantial benefit in conducting surveys of critical areas in the region. He therefore urged that countries with well established hydrographic facilities should give favourable consideration to requests for assistance from developing countries. The representative of India supported the concept of co-operation

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2/ See Sixth United Nations Regional Cartographic Conference for Asia and the Far East, 24 October-7 November 1970, Tehran, Iran vol. 1, Report of the Conference (United Nations publication, Sales No. E.71.I.15) chap. VII.

between developed and developing countries of the kind successfully undertaken by Indonesia and Japan. The representative of India also supported the suggestion of the IHO observer that technical assistance should be provided by developed countries.

133. The representative of Australia presented a paper entitled "Bathymetric survey test of positioning accuracies" (E/CONF.68/L.94) and explained the different methods used to test the positioning accuracy of various systems employed in conducting bathymetric surveys of the Australian continental shelf.

VII. RESOLUTIONS ADOPTED BY THE CONFERENCE

List of resolutions

1. New title for future conferences
2. Ninth United Nations Regional Cartographic Conference for Asia and the Pacific
3. Cadastral surveying and mapping
4. Levelling
5. Photogrammetric triangulation
6. Geodetic techniques
7. World Geodetic Datum
8. Training in hydrography
9. Encouragement of bilateral hydrographic projects
10. Group of Experts on Hydrographic Surveying and Nautical Charting
11. Thematic mapping
12. Regional Economic Atlas
13. Terminology
14. Third United Nations Conference on the Standardization of Geographical Names
15. Linguistic/geographical divisions
16. Remote sensing by satellites
17. Remote sensing by aircraft
18. Development of remote sensing, research and training in its use
19. Technical co-operation
20. Education and training in cartography
21. Training facilities
22. Training in cadastral surveying and land registration
23. Vote of thanks

Texts of resolutions

1. New title for future conferences

The Conference,

Noting that the new name of the United Nations Commission for this region is the Economic and Social Commission for Asia and the Pacific (ESCAP),

Recommends that future conferences on surveying and mapping for this region should be named United Nations regional cartographic conferences for Asia and the Pacific.

28 January 1977

2. Ninth United Nations Regional Cartographic Conference for Asia and the Pacific

The Conference,

Appreciating the invitation of the Government of New Zealand to act as host country for the Ninth United Nations Regional Cartographic Conference for Asia and the Pacific,

Recommends to the Economic and Social Council that the Ninth United Nations Regional Cartographic Conference for Asia and the Pacific should be convened in New Zealand in February 1980.

28 January 1977

3. Cadastral surveying and mapping

The Conference,

Confirming that, since land has always formed the basis for the economic and social development of a country, the establishment of a sound cadastral system, and where applicable, the strengthening of such a system are continuing necessities,

Noting that the advisory panel referred to in resolution 24 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East 3/ will be established shortly,

Noting further that in several countries improvements and/or modernization of the existing laws covering the subject are being considered,

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3/ See Seventh United Nations Regional Cartographic Conference for Asia and the Far East, Tokyo, 15-27 October 1973, vol. 1, Report of the Conference (United Nations publication, Sales No. E.74.I.7), chap. VII.

Recognizing that such improvements should take into account the application of modern survey techniques, including photogrammetry,

Recognizing further that several countries have had considerable experience in the implementation of sound cadastral systems under a centralized authority, which other countries that are in the process of strengthening their systems could take advantage of,

1. Reconfirms resolution 24 of the Seventh Regional Cartographic Conference;

2. Recommends, in particular, that the advisory panel be charged with the task of making:

(a) A systematic collection of published and unpublished information on technical, legal and administrative aspects of cadastral survey systems;

(b) A systematic and critical assessment of this information;

(c) Proposals directed towards the implementation of these recommendations and intended, in particular, to ensure the effective dissemination of all relevant information to Member States;

3. Further recommends that Member States with adequate resources assist the advisory panel in carrying out its task as well as rendering assistance and training to other Member States that may require help in cadastral matters;

4. Urges that, in view of the obvious advantages of automatic data processing, Member States that have not yet done so should consider establishing a land data bank in their countries.

28 January 1977

4. Levelling

The Conference,

Noting that a basic levelling network is essential to all national survey and mapping operations,

1. Reaffirms resolution 16 of the Seventh United Nations Cartographic Conference for Asia and the Far East; 3/

2. Notes that levelling is an operation that is largely manpower-oriented and one in which the basic skills can readily be acquired;

3. Urges developing nations that have not already done so to develop the necessary competence and establish their own levelling surveys.

28 January 1977

5. Photogrammetric triangulation

The Conference,

Noting the successful development of new photogrammetric air triangulation processes and related computer programmes that, with the aid of perimeter survey control and additional airborne data, permit the adjustment of large blocks of models or photographs,

Urges that developing countries, and assisting countries and agencies, fully consider the application of these processes and programmes to ongoing and future national mapping projects.

28 January 1977

6. Geodetic techniques

The Conference,

Noting that several Member States have developed or are developing advanced techniques for relative positioning by geodetic satellite and by inertial positioning surveys,

Recommends that the capabilities of these techniques be fully explored and developed in the expectation that they may in future be successfully used for the rapid provision of survey control.

28 January 1977

7. World Geodetic Datum

The Conference,

Noting the successful application by many Member States of satellite techniques to geodetic survey since the Seventh Conference,

Noting also that the draft articles before the United Nations Conference on the Law of the Sea require coastal States to specify the geodetic datum used in defining their seaward boundaries,

1. Reaffirms resolutions 15 and 17 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East, 3/ particularly the portion of resolution 15 which recommends that the United Nations consider favourably the acceptance of a Unified World Geodetic Datum;

2. Recommends that the United Nations be asked to bring out in the discussions at the United Nations Conference on the Law of the Sea the extreme importance of relating these national geodetic data to a uniformly accepted World Geodetic Datum;

3. Further recommends that the International Hydrographic Organization be asked to do everything practicable and within its power to ensure that nautical charts and publications are related to a uniformly accepted World Geodetic Datum.

28 January 1977

8. Training in hydrography

The Conference,

Recalling resolution 11 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East 3/ on the establishment of training facilities on a regional or subregional basis,

Realizing that the most expeditious and economic means of providing such training facilities is through the expansion of existing national facilities,

Noting that such additional facilities would require financial support,

Appreciating the offer made by the Government of India to extend its training facilities to meet the requirements of the region,

1. Recommends that the United Nations should give favourable consideration to any request for financial assistance that may be received from India in this regard;

2. Further recommends that the United Nations give favourable consideration to requests for financial assistance in the award of scholarships to personnel from developing countries of the region for training in hydrography.

28 January 1977

9. Encouragement of bilateral hydrographic projects

The Conference,

Recognizing that a number of countries within the region do not yet have adequate facilities and are desirous of establishing full national capabilities to meet the growing need for modern hydrographic survey and charting programmes,

Noting that such countries will require assistance in the provision of equipment and training of personnel,

Further noting that co-operative projects such as those concluded between Indonesia and Japan in the survey of the Lombok and Makassar straits have met with considerable success,

Recommends that developed nations give favourable consideration to requests for assistance of a similar nature received from developing countries in the region.

28 January 1977

10. Group of Experts on Hydrographic Surveying and Nautical Charting

The Conference,

Noting the importance of hydrographic surveying and nautical charting to the safety of navigation, the economic benefits to be derived therefrom and the necessity of providing adequate charts for the exploration and exploitation of resources lying within the maritime zones of coastal States,

Further noting that developing countries require guidance and technical advice in the formation of hydrographic services and the conduct of operations,

Realizing that a group of experts could formulate such guidelines,

Recommends that the Secretary-General be requested to convene a second meeting of the Group of Experts on Hydrographic Surveying and Nautical Charting, not later than March 1978, inviting experts from Member States of the United Nations in consultation with the International Hydrographic Organization.

28 January 1977

11. Thematic mapping

A

The Conference,

Noting with satisfaction the progress made by Member States of the region in the preparation of thematic maps to promote social and economic development,

Further noting the publication of works in thematic cartography in the United Nations bulletin World Cartography,

1. Recommends that countries of the region should take advantage of the methods and techniques that have been developed by several countries and apply them when relevant to their own operations;

2. Further recommends that there should be a maximum interchange of information on thematic mapping technology and programmes in order to reduce duplication of effort and to maximize the benefits;

3. Invites all countries that have made advances in thematic mapping techniques to make these available to other countries;

B

The Conference,

Noting the establishment of the Map Information Centre of the Royal Thai Survey Department,

Recommends that countries of the region should each maintain a central index

of thematic mapping to facilitate the exchange of information within the region and that they should notify other countries of its address. 4/

28 January 1977

12. Regional Economic Atlas

The Conference,

Noting the progress made by Thailand in the compilation of maps for the Regional Economic Atlas for Asia and the Far East and in particular of the population distribution map as recommended in resolution 14 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East, 3/

1. Expresses its appreciation for the work undertaken by Thailand;

2. Urges that all nations in the region co-operate fully with Thailand and supply freely all relevant source material to the Royal Thai Survey Department,

3. Recommends that to expedite the completion of the Regional Economic Atlas project, countries of the region should seek financial assistance from the United Nations for the project;

4. Further recommends that countries or international scientific organizations from which technical assistance or expertise is sought for the project should provide such assistance as freely and rapidly as possible.

28 January 1977

13. Terminology

The Conference,

Considering the desirability of an exchange of cartographic information between the Member States of the region,

Further considering the importance of the use of a generally accepted terminology for this exchange,

Recommends that Member States should adopt, where possible, the terminology developed by international scientific organizations such as the International Cartographic Association (ICA), the International Federation of Surveyers (FIG) and the International Geographical Union (IGU).

28 January 1977

4/ For Thailand, the address is: Map Information Centre, Royal Thai Survey Department, Supreme Command Headquarters, Bangkok 2.

14. Third United Nations Conference on the Standardization of Geographical Names

The Conference,

Noting that all States Members of the United Nations and members of the specialized agencies have been invited to participate in the Third United Nations Conference on the Standardization of Geographical Names, to be held at Athens from 17 August to 7 September 1977,

Recognizes the necessity of standardizing geographical names for both national and international use;

Urges all member States of the Economic and Social Commission for Asia and the Pacific to participate in the above Conference.

28 January 1977

15. Linguistic/geographical divisions

A

The Conference,

Noting that the linguistic/geographical divisions representing countries of Asia and the Far East are:

Arabic Division

Asia, South-West Division other than Arabic

Indian Division

Asia, South-East Division

Asia, East Division

China Division

USSR Division,

Urges all Member States in these divisions who have not yet established a National Geographical Names Authority to do so and to support and participate in their respective divisional activities.

B

The Conference,

Recognizing the activities and accomplishments of the South-East Asia Division and its member States, particularly Indonesia, Malaysia, Philippines, Singapore and Thailand,

Urges all States of the division to support and participate in its efforts towards the standardization of geographical names in the Division as well as in

the compilation of maps and gazetteers and other related documents for national and international use.

C

The Conference,

Welcoming the offer by Indonesia to act as host country for a training course in toponymy for countries of the South-East Asia Division,

Strongly recommends that divisions and/or other countries should organize further training courses in toponymy as provided for in the report of the United Nations Group of Experts on Geographical Names at its fifth session. 5/

28 January 1977

16. Remote sensing by satellites

The Conference,

Welcoming the availability of remote-sensing data from earth resources satellites such as LANDSAT,

Noting resolutions 20 and 21 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East 3/ on the subjects of remote sensing and satellite imagery,

1. Recognizes that satellite images at present available are generally very useful for resource investigations in many fields and these images may be useful to some countries for the compilation or revision of topographic and thematic maps at very small scales (such as 1:1,000,000 and 1:25,000), but that their ground resolution and geometry do not at present satisfy the needs of topographic mapping at medium and large scales for planimetry and height;

2. Further recognizes that progress in topographic mapping is generally not meeting current demands;

3. Recommends to countries preparing resource satellite missions:

(a) That the development of higher resolution capabilities meeting geometric standards should be implemented in future earth resources satellite programmes;

(b) That co-operation between countries capable of providing and using this information be initiated;

(c) That the provision of such information be further extended through negotiations to establish additional receiving stations on a co-operative multilateral basis.

28 January 1977

5/ ESA/RT/C/GN/3, available upon request from the Cartography Section, Centre for Natural Resources Energy and Transport.

17. Remote sensing by aircraft

The Conference,

Noting the progress in the technical development of multispectral and multitemporal remote-sensing techniques (including thermography) from aircraft in several developed countries, with respect to sensors and the processing of hardware and software, and their local applications,

1. Recognizes the potential of such techniques for obtaining thematic information at medium and large scales;

2. Recommends that co-operation between countries currently testing or implementing such methods and countries in need of such information be initiated or further developed to provide for their local requirements.

28 January 1977

18. Development of remote sensing, research and training in its use

The Conference,

Noting the rapid development of remote-sensing techniques from satellites and aircraft and the value of such techniques for applications in many fields,

1. Recommends that countries having training facilities in these fields make them available on request to countries in need of such facilities;

2. Further recommends that countries having developed facilities for remote sensing or photographic interpretation, or for processing data obtained by such means, provide aid to countries that need to upgrade their existing facilities by furnishing expertise and equipment.

28 January 1977

19. Technical co-operation

The Conference,

Noting the success of bilateral and multilateral schemes for the provision of aid to all branches of surveys and mapping through technical co-operation,

Further noting that several co-operative projects have been reported to it by representatives,

1. Recognizes that such co-operative projects can serve both to carry out specific tasks and to strengthen the capacity of developing countries participating in such projects to carry out future tasks;

2. Recommends that such assistance be expanded by the United Nations, by individual countries and by other bodies;

3. Urges both developed and developing countries, when planning assistance schemes, to consider the advantages of this aspect of assistance.

28 January 1977

20. Education and training in cartography

The Conference,

Considering the urgent demand for education and training at all levels of cartography,

Having noted resolutions 11 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East, 3/ on training, and resolution 11 of the First United Nations Regional Cartographic Conference for the Americas, 6/ on education and training in cartography,

Having noted further that a multilingual manual on cartography is in preparation by the International Cartographic Association Commission on Education in Cartography,

1. Recommends that States Members of the United Nations should take advantage of this work to promote uniformity in levels of education; 7/

2. Also recommends that the Cartography Section of the Department of Economic and Social Affairs prepare a review, in co-operation with the International Cartographic Association and other interested organizations, of existing appropriate educational possibilities in and outside the region that could be used for solving immediate educational problems, and to ask the assistance of Member States in providing translations in their respective languages of the relevant textbooks important to cartography;

3. Further recommends that the United Nations should examine the possibility of holding a seminar on education in cartography in the near future in co-operation with the Commission on Education of the International Cartographic Association and the Deutsche Gesellschaft für Kartographie (German Society for Cartography) of the Federal Republic of Germany.

28 January 1977

21. Training facilities

The Conference,

6/ See First United Nations Regional Cartographic Conference for the Americas, Panamá, 8-19 March 1976, vol. I, Report of the Conference (E/CONF.67/3), to be chap. VII. The report is available upon request from the Cartography Section, Centre for Natural Resources, Energy and Transport, and will be issued in due course as a United Nations publication.

7/ For relevant literature on this subject see, inter alia, Ausbildungswege in der Kartographie (Bonn-Bad Godesberg, Deutsche Gesellschaft für Kartographie).

Noting the progress made by several countries in the region since the Seventh United Nations Regional Cartographic Conference for Asia and the Far East in developing training facilities,

1. Recognizes that training, particularly at the middle and lower levels, is most effective when carried out in the student's own country, or failing that, in a neighbouring country;

2. Recommends that countries of the region should consider how they can further develop training facilities;

3. Urges countries in the region that have established specialized training facilities to make these available to other countries of the region;

4. Requests the United Nations and those developed countries that are able to do so to assist countries establishing such training centres in staffing and equipping them.

28 January 1977

22. Training in cadastral surveying and land registration

The Conference,

Confirming the frequently expressed need for an adequate system of education and training in cadastral surveys and land registration,

Noting resolution 24 of the Seventh United Nations Regional Cartographic Conference for Asia and the Far East, 3/ in which cadastre is regarded as a basis for economic and social development,

1. Recommends that seminars on cadastral surveying and land registration should be conducted, by countries having experience in establishing and maintaining cadastral systems, for appropriate government officers from countries in need of such systems;

2. Also recommends that regional or interregional curricula or courses be established or further developed on the technical level in areas of need, with the assistance of Member States experienced in cadastral matters;

3. Further recommends that on-the-job training programmes in countries experienced in cadastral surveys and land registration be made available.

28 January 1977

23. Vote of thanks

The Conference,

1. Expresses its heartfelt thanks to the United Nations Economic and Social Commission for Asia and the Pacific and to the Secretariat of the United Nations for the excellent arrangements made by them for the organization of the Eighth

United Nations Regional Cartographic Conference for Asia and the Far East, and for the excellent work done to facilitate the functioning of this Conference;

2. Further expresses its deep appreciation to the Government of Thailand for the warm hospitality extended to each and every participant.

28 January 1977

Annex

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