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REPORT ON THE SEMINAR  
ON THE ROLE OF METEOROLOGICAL SERVICES  
IN ECONOMIC DEVELOPMENT IN AFRICA  
Ibadan (Nigeria), 23-28 September 1968

M68-1659

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## ORIGIN AND PURPOSE

1. The Seminar originated from discussions between the secretariats of the United Nations Economic Commission for Africa (ECA) and the World Meteorological Organization (WMO) as a means for furtherance and strengthening of collaboration between the two organizations in fields of common interest. The Seminar was convened by ECA with the sponsorship of WMO.
2. The purpose of the Seminar was to highlight the ways in which meteorology can contribute to economic development in Africa. This was achieved by a series of lectures on the major applications of meteorology and on the requirements for meteorological information of the various branches of the national economy. Ample time was allowed for discussion. As the Seminar was attended both by meteorologists and economic planners, it provided an excellent forum for examining the ways in which they could collaborate more closely in plans for economic development.

### ORGANIZATION AND ATTENDANCE

3. The ECA assumed the major responsibility for the administrative arrangements, while WMO contributed mainly to the planning of the technical programme. Invitations were sent to all ECA member countries, to the United Nations Development Programme (UNDP) and to those specialized agencies of the United Nations most directly concerned with the subject matter of the Seminar.

4. Professor E.A. Bernard, Adviser to the Administrator of UNDP, served as Director of the Seminar, and Professor A. Ogunsheye (Department of Adult Education, University of Ibadan) as Co-Director. The Steering Committee was composed of the Director, the Co-Director, the lecturers and the representatives of ECA and WMO. The Seminar was held in the Conference Centre at the University of Ibadan.

5. The Seminar was attended by 19 participants from the following countries and organizations: Democratic Republic of the Congo, Dahomey, East African Community, Ethiopia, Ghana, Malagasy Republic, Malawi, Morocco, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, Tunisia and United Arab Republic. The Seminar was also attended by representatives of ECA, FAO, ICAO, WHO and WMO. For a complete list of the participants, see Annex II.

#### (i) Opening ceremony

6. The opening ceremony, held at 09.00 on 23 September 1968, was presided over by Mr. N.A. Akingbehin, Director of the Nigerian Meteorological Service and Vice-President of WMO. Participants were welcomed by the Acting Vice-Chancellor of the University of Ibadan, Professor G.M. Eddington. Following the addresses by the representatives of the Executive Secretary of ECA and by the Secretary-General of WMO and by the Director, messages were given by the representatives of the United Nations Food and Agriculture Organization (FAO), the International Civil Aviation Organization (ICAO) and the World Health Organization (WHO). The Seminar was then declared officially open by the Nigerian Federal Commissioner for Economic

Development, Agriculture and Natural Resources, Alhaji Yahaya Gusau. The ceremony closed with a vote of thanks by Mr. N.A. Akingbehin.

(ii) Closing session

7. The closing session was held on 27 September 1968, when a number of recommendations were unanimously adopted. The closing ceremony, under the Chairmanship of Mr. N.A. Akingbehin, included votes of thanks to all those who worked to make the Seminar a success and an address by Prof. T.A. Lambo, Vice-Chancellor of the University of Ibadan.

8. On 28 September, participants visited the forecasting office at Ikeja airport and the experimental agrometeorological station at Oshodi, both places being under the Nigerian Meteorological Services. After the visits, the participants were entertained at a luncheon given by Mr. N.A. Akingbehin.

## RECOMMENDATIONS

9. It was unanimously agreed that the Seminar had been most useful and that its objectives had been fully achieved. Participants considered that it was most important that the recommendations of the Seminar should be followed up by appropriate action both by the ECA member Governments and by the international organizations concerned. To this end, the following recommendations were adopted unanimously by the Seminar.

(i) Meteorology and Economic Development in Africa

10. The participants at the Seminar recognized that natural resources including human resources, plant and animal resources, agriculture and animal husbandry and hydroelectric resources are closely related to meteorological processes. It was stressed that as climate is one of the basic causes of other natural resources, it must be taken into account in the rational exploitation of these other resources. In particular, the intensive exploitation of the climate by agriculture would open the way to substantial socio-economic growth in Africa.

11. It was unanimously agreed that economic development in African countries depends on the proper use of their natural resources with the help of modern science and technology. Furthermore it was realized that all human activities are dependent on weather and climate. As the population in Africa will at least double in the next 30 years, the Seminar stressed the need for accelerating the exploitation of natural resources on the basis of sound scientific knowledge, especially in the field of meteorology.

12. The Seminar accordingly recommended that ECA should draw attention to the contribution meteorology can bring to economic development in Africa at an appropriate meeting of African development planners, as well as at the next session of the Commission. It would, in particular, be very useful if ECA could urge its member countries to strengthen the implementation of the World Weather Watch in their respective countries, since this system will in turn assist in the improvement of Meteorological Services in Africa and hence in their contribution to economic development in Africa. An appropriate conference at governmental level for a further

exchange of views between development planners and the meteorologists in Africa should also be organized in future.

13. The Seminar discussions led to the concept of "economic meteorology", the branch of meteorology dealing with the study, from the point of view of economics, of the problems of meteorological applications to development. The Seminar recommended that meteorological training syllabi for all categories of meteorological personnel should include the subject of "economic meteorology".

(ii) Meteorology and Agriculture

14. The Seminar recognized that, besides other inputs, great economic benefits can be derived by increasing the agricultural production through the proper consideration of weather and climate. These factors should in particular be taken into account when expansion and change are being planned.

15. The Seminar discussed the application of agricultural meteorology to such matters as the water, heat and light requirements of plants and the control of diseases and pests. It stressed the need for agrometeorological services to be established or strengthened within the national Meteorological Services. It also stressed the importance of providing adequate training and agricultural extension in the efficient application of agricultural meteorology.

16. Considering that the best agrometeorological advice is to be derived from a collaboration between specialists in the agricultural and meteorological sciences, the seminar recommended that governments in Africa should:

- (a) Set up, where these do not already exist, national co-ordinating committees composed of representatives of meteorological, agricultural, animal husbandry, forestry, hydrological and soil sciences agencies;
- (b) Arrange for an exchange of personnel between meteorological and agricultural services;

- (c) Ensure that the study of weather and climate is included in agricultural training courses, including those of extension workers.

17. Noting the great difficulties in some countries in obtaining simple data such as dates of sowing, flowering and harvesting, the Seminar recommended that governments in Africa should take steps to ensure that such data are collected centrally and published in order to foster the expansion of studies on the interaction of climate and microclimate and plant growth and development. Meteorological Services should give guidance on data to be collected.

(iii) Meteorology and Water Resources

18. The Seminar recognizing the fact that the continent of Africa has immense water wealth in numerous great rivers and lakes, the development of which is vital to the economic development of the countries of Africa, was also of the conviction that meteorology can be of great service in the appraisal and development of the available resources of rivers and lakes in various stages of planning, design, construction and operation of water projects for multipurpose development, including irrigation, hydro-power generation, navigation, flood control, recreation and tourism. The Seminar therefore recommended that:

- (a) Systematic hydrometeorological surveys of river basins and lakes be conducted to yield an overall appraisal of the extent of available water resources in the countries of Africa to facilitate long-term planning;
- (b) Relevant studies be carried out to ensure the optimum regulation and co-operation of completed projects, based on scientific considerations;
- (c) Hydrometeorological sections be established in existing national Meteorological Services; and
- (d) Greater co-operation and institutional liaison be established between the meteorologists and authorities concerned with the development of water resources of rivers and lakes.

19. The Seminar noted that many large water resources development projects are being contemplated or studied. Some of these are of national interest only, but a number of them are situated in river basins which are shared by two or more countries. It was felt and stressed that Meteorological Services should be so geared as to be able to contribute significantly to a better understanding of certain problems, in order that optimum economic efficiency of these water resources schemes will be obtained. Some of these problems are: the correct estimation of rainfall on catchment areas, the evaporation to be expected from planned reservoirs; the relationship between land use practices and runoff characteristics; long-range forecasts of length and intensity of wet and dry seasons; forecasts of the probability distribution of rainfall and riverflow.

(iv) Meteorology and Surface Transport

20. After considering the role of meteorology in the various forms of land and water transport, including road, rail, ocean and coastal transport, as well as road, rail, harbour and airfield design, the Seminar recommended that the governments in Africa should note:

(a) That the use of climatological data and advice in the planning phases of transportation assists in the selection of the correct design or most economic course;

(b) That the use of accurate forecasts and warnings in the day-to-day use of transportation facilities permits of more efficient, economic and safe operation;

(c) That the full benefits of (a) and (b) cannot be realized unless:

(i) there are adequate climatological networks and consultative services;

(ii) there are adequate synoptic networks and efficient forecast services with the necessary communications support to enable expeditious service to the users;

- (iii) there is an arrangement for the inclusion of meteorologists and meteorological advice in the national and regional planning structure.

The Seminar, further, emphasized the importance of team work amongst the various scientific disciplines involved in transport problems, and called for closer co-operation and co-ordination amongst meteorologists, hydrologists, engineers, planners and financing agencies concerned with the development of methods of surface transportation in the countries of Africa.

(7) Meteorology and Civil Aviation

21. The Seminar noted with great satisfaction that, during the past few years, considerable progress had been achieved in Africa in the provision of meteorological assistance to civil aviation. It recognized in particular that aeronautical meteorology had developed much faster than other applications of meteorology, largely because aeronautical requirements are better known and procedures to meet them have been established internationally. It noted nevertheless that, even in aeronautical meteorology, further efforts are still needed if air transport is to continue to contribute to the economic development of Africa in a safe, efficient and economical manner, especially with the forthcoming introduction of supersonic transport aircraft.

22. Several participants were of the opinion that the part of the budget of their national Meteorological Service devoted to meteorological assistance to civil aviation was disproportionate, and that this situation had hindered the parallel development of other applications of meteorology essential to the economic development of their country. It was considered that this situation resulted mainly from inadequate recognition of the usefulness of meteorological services and, consequently, from the inadequacy of their overall budget. It was further considered that it would be a step backward to attempt to reduce the cost - and effectiveness - of aeronautical meteorology in an endeavour to promote progress in other branches of meteorology. It was therefore agreed that the only valid

solution was to advocate an increase of the resources of the Meteorological Services so that they may develop in an orderly manner the branches of meteorology which can contribute most directly to economic development and, at the same time, pursue their efforts in aeronautical meteorology to avoid any detrimental effect on the safety and economy of air transport. Paying attention to the need for achieving a better balance between the efforts devoted to aeronautical meteorology, the Seminar recommended that governments in Africa, while developing the various applications of meteorology which can most directly contribute to their economic development, should not slacken their efforts to meet aeronautical requirements and, on the contrary, should intensify these efforts where necessary, so that air transport may continue to contribute to economic development in a safe, efficient and economical manner, but without inhibiting the necessary expansion of the services of meteorology to natural resources.

(vi) Meteorology and other Activities

23. The Seminar felt that insufficient attention had been devoted to the sun and to wind as sources of energy, particularly in areas where natural fuels and hydro-electric energy are not available. The Seminar recommended that governments in Africa be made aware of the desirability of continuing research on wind and solar energy and of making the results known to other governments.

24. The Seminar noted that atmospheric pollution is becoming more and more harmful with the growth of urbanization and industrialization in Africa. It therefore recommends that the Meteorological Services in Africa should embark on programmes for observing this phenomenon.

(vii) Development of Meteorological Services in Africa

25. The participants (economists, meteorologists, geographers, agriculturists and civil engineers) were unanimous in recognizing the important role which Meteorological Services in Africa can play in the development of the continent, provided that they are provided with the manpower,

equipment and financial means necessary to enable them to realize their full potential and that they have a status in the Government hierarchy which is compatible with their responsibilities.

26. The Seminar, however, noted that in many African countries the status, structure and resources of the Meteorological Services are, for historical reasons, inadequate to enable them to play their full role in economic development now that these countries have attained their political independence. The Seminar therefore recommended that the responsible Ministers should request the Directors of the Meteorological Services in these countries to conduct a critical review of their Services in relation to the needs for national development and to propose a plan for the short- and long-term reorganization of their Services, taking into consideration the type of organization presented at the Seminar.

27. Furthermore, the Seminar considered that the following measures would help to ensure that Meteorological Services can play their full role in economic development:

- (a) The Meteorological Services in Africa should assess the assistance that can be given to the various branches of the national economy to which meteorology can be applied, and point out to all concerned the nature and scope of this assistance. They should endeavour to establish an exchange of views between themselves and other government departments;
- (b) The Meteorological Services in Africa should study the problem of costing the services they render to various users and subsequently consider the question of charging some of the users for these services, in particular those in the private sector;
- (c) To ensure that the meteorological advice is given at the pre-investment survey stage in the planning of various human activities, all governments in Africa should be invited to make arrangements for:
  - (i) The inclusion of meteorological advisers in the early planning stages of State-sponsored projects;

(ii) Meteorological Services to set up consultative services for users of meteorological information.

28. The Seminar, convinced that the availability of meteorological personnel, adequate in numbers and in level of scientific and technical training, is a prerequisite for any national Meteorological Service in Africa to play its full role in the economic development of its country recommended:

(a) That WMO should make a new survey of the requirements for meteorological personnel in Africa for the next 10 years, including the requirements for the personnel required for different specialized fields, especially in agrometeorology and hydrometeorology;

(b) That governments in Africa should continue to make every possible effort to encourage qualified personnel to join the Meteorological Services. For this purpose the following measures are suggested:

(i) To publicize meteorology, particularly among students at different levels of education.

(ii) To include meteorology in the courses at secondary and technical schools, and universities, particularly in the faculties which are most directly related to meteorology as well as in the faculties of economics;

(iii) To encourage research work in meteorology, both at universities and in the national Meteorological Services;

(iv) To ensure that, where this is not already the case, the salaries of the staff of the Meteorological Services are commensurate with their training and take into account the conditions of service.

29. The Seminar felt that the shortage of information on the heat-balance of Africa and of other climatic information seriously hampers the provision of the best service to planners and invites WMO to take the necessary measures to ensure the availability of this information.

30. The Seminar recognized the value of adequate climatological data for the planning stage of development projects and recommended that the attention of all governments in Africa be invited to:

- (a) The importance of the early installation or completion of adequate networks of climatological stations so that the necessary information will be available for future development;
- (b) The importance of maintaining archives for the safe-keeping of the past and present climatological data;
- (c) The importance of publishing these data or at least details of the location, extent and accessibility of the data;
- (d) The assistance which may be provided by WMO and ECA in their efforts to increase the amount of data and their availability.

FOLLOW-UP ACTION

31. The Seminar was strongly convinced of the importance of increasing the understanding of the role of Meteorological Services to the economic development in Africa and therefore recommended:

- (a) That ECA and WMO should sponsor a joint project for the preparation of a technical note on the subject of "Problems of Economic Meteorology in Africa". This publication should be prepared jointly by economists and meteorologists;
- (b) That the attention of the faculties of economics in universities in Africa be invited to the importance of the subject of "economic meteorology" and to the desirability of devoting some of their research work to this subject;
- (c) That the attention of the countries of Africa be invited to the vital importance of implementing Resolution 14 of the Fifth Congress of WMO regarding the inclusion of a representative of the national Meteorological Service in the national planning body for technical co-operation;
- (d) That the proceedings of this Seminar be published.

32. The Seminar commended the joint efforts by ECA and WMO for economic development in Africa and warmly supports the continuation of this fruitful collaboration.

ANNEX I

PROGRAMME OF THE SEMINAR

The programme of the Seminar was as follows:

23 September

11.00-12.30 Chairman : Prof. E.A. Bernard  
Remarks by the Director of the Seminar  
Presentation of participants

15.00-17.00 Chairman : Prof. Ayo Ogunsheye  
Meteorology and mankind  
WMO technical activities in Africa  
O.M. Ashford  
A.M. Elamly

24 September

09.00-12.30 Chairman : Mr. O.M. Ashford  
Economic development activities  
requiring meteorological data  
Some contributions of meteorology  
to the Economic Development of  
East Africa  
M.B. Gornung  
S. Tewungwa

15.00-17.00 Chairman : Mr. N.A. Akingbehin  
Organization of Meteorological  
Services  
E.A. Bernard

25 September

09.00-12.30 Chairman : Prof. E.A. Bernard  
Meteorology and agriculture  
Agricultural meteorology  
G.A. Ige  
J. Cochemé

15.00-17.00 Chairman : Mr. M. Ayadi  
Meteorology and water resources  
development  
Meteorology and water resources  
G. Dekker  
K.V. Krishnamurthy

26 September

08.30-12.30 Chairman : Mr. G. Dekker  
Meteorology and civil aviation  
Meteorology and transport  
Organization of Meteorological  
Services (cont.)  
B.L. Bedel  
D.J. Bargman  
E.A. Bernard

27 September

09.00-12.30

Chairman : Mr. A.M. Elamly  
Cost/benefit studies in development  
planning  
Cost/benefit studies in meteorology

A. Mullier\*  
O.M. Ashford

16.00-17.30

Chairman : Prof. E.A. Bernard  
General discussion  
Conclusions and recommendations

17.30-18.00

Chairman : Mr. N.A. Akingbehin  
Closing ceremony

19.00-20.00

20.00-21.00

21.00-22.00

22.00-23.00

23.00-24.00

24.00-25.00

25.00-26.00

26.00-27.00

27.00-28.00

\* Presented by G. Dekker

ANNEX II

LIST OF PARTICIPANTS

Director of the Seminar

E.A. Bernard Adviser to the Administrator to UNDP

Co-Director

Ayo Ogunshye Professor of Adult Education, Head of Department, University of Ibadan

Participants

E. Pini	Chef de la section de la climatologie et d'hydrométéorologie	Congo, Democratic Rep. of
Ibrahim Souoradjou	Directeur, Subdivision de programme	Dahomey
S. Tewungwa	Director, East African Meteorological Department	East African Community
Ato Godana Tuni	Chief, Climatological Branch, Meteorological Department	Ethiopia
N.A. Gbeckor-Kove	Deputy Director of Meteorological Services	Ghana
Rakotoarivony	Chef de Section, Commissariat	Malagasy Republic
T.W. Bieze	Planning Officer, Natural Resources Planning Unit, Ministry of Economic Affairs	Malawi
M. Madani	Chargé de la réorganisation des réseaux climatologiques, agrométéorologiques et hydrométéorologiques	Morocco
A. Boukari	Chef adjoint du Service météorologique	Niger
N.A. Akingbehin	Director, Meteorological Service	Nigeria
E.O. Ayo	Assistant Planning Officer, Primary Production	Nigeria
K.R. Rufek	Meteorologist	Nigeria

J.B. Babalola	Meteorologist	Nigeria
S. Muganza	Agronomist	Rwanda
D. Tall	Technicien météorologique, Chef du Bureau de la météorologie, Ministère des travaux publics et des transports	Senegal
S.J. Walters	Assistant Secretary, Ministry of Development	Sierra Leone
I.A. Daria	Economic Planning Officer	Somalia
M. Ayadi	Directeur du Service de la météorologie nationale	Tunisia
M.H. Gidamy	Assistant Director-General UAR Meteorological Department	United Arab Republic

Representatives of International Organizations

G. Dekker	Regional Adviser, Water Resources Development	ECA
M.B. Gornung	Science Officer Science and Technology Section	ECA
J. Cochemé	Agricultural Officer	FAO
B.L. Bedel	ICAO African Officer (Dakar)	ICAO
D.A.W. Nugent	WHO Representative (Lagos)	WHO
F. Sadek	WHO Statistician (Ibadan)	WHO
O.M. Ashford	Chief, Planning Division	WMO
A.M. Elamly	WMO Regional Representative for Africa	WMO

Invited WMO Experts

D.J. Bargman	Technical Assistance Expert
K.V. Krishnamurthy	Project Manager, UNDP/WMO Lake Victoria project

Invited lecturer

G.A. Ige	Permanent Secretary, Economic, Scientific and Education Division	Nigeria
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ANNEX III

LIST OF DOCUMENTS

NR/WP/1	Economic development activities requiring meteorological data (original English)	ECA, M.B. Gornung
NR/WP/2	Meteorology and water resources development (original English)	ECA, G. Dekker
NR/WP/3	Cost/benefit studies in development planning (original French)	ECA, A. Mullier
NR/WP/4	Some contributions of meteorology to the economic development of East Africa (original English)	East African Meteorological Department, S. Tewungwa
NR/WP/5	Meteorology and mankind (original English)	WMO, O.M. Ashford
NR/WP/6	Cost/benefit studies in meteorology (original English)	WMO, O.M. Ashford
NR/WP/7	Meteorology and water resources (summary) (original English)	WMO, K.V. Krishnamurthy
NR/WP/8	Meteorology and transport (summary)	WMO, D.J. Bargman
NR/WP/9	Meteorology and water resources (original English)	WMO, K.V. Krishnamurthy
NR/WP/10	Agricultural meteorology (original English)	FAO, J. Cochemé
NR/WP/11	Meteorology and agriculture (original English)	Nigeria, G.A. Ige
NR/WP/12	WMO technical activities in Africa (original English)	WMO, A.M. Elanly
NR/WP/13	Programme	ECA/WMO
NR/WP/13 add.1	Programme of opening ceremony	ECA/WMO
NR/WP/14	First list of documents	ECA/WMO
NR/WP/14 Add.1	List of documents (continuation)	ECA/WMO
NR/WP/15	Provisional list of participants	ECA/WMO

NR/WP/16	The organization of meteorological services (summary)	UNDP, E.A. Bernard
NR/WP/17	Meteorology and civil aviation (original English)	ICAO, B.L. Bedel
NR/WP/18	Information note for participants	ECA/WMO
NR/WP/19	Message to the Seminar, By Mr. R.K.A. Gardiner, Executive Secretary of ECA	
NR/WP/20	Meteorology and transport (original English)	WMO, D.J. Bargman
NR/WP/21	Agrometeorological activities in the UAR (original English)	UAR, M.H. Gidamy
NR/WP/22	Draft conclusions and recommendations	
NR/WP/23	Development in Africa and Organization of Meteorological Services (original French)	UNDP, E.A. Bernard

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