

**INTEGRATED**  
**RIVER BASIN**  
**DEVELOPMENT**

**Report by a Panel of Experts**



**UNITED NATIONS**  
**Department of Economic and Social Affairs**  
**New York, 1958**

## CONTENTS

Chapter	Page
Secretary-General's preface .....	iii
Letter of transmittal to the Secretary-General .....	v
Foreword .....	vi
1. Scope and purposes of river basin development .....	1
The challenge .....	1
Early hydraulic works and some lessons of history .....	2
Origin of the concept of multi-purpose development .....	2
Technical considerations .....	3
Basic physical factors—Dams and canals—Consumptive and non-consumptive uses—Developing part of a basin only—New technical possibilities	
Opportunities for river basin development .....	5
Physical aspects—Economic aspects—Political issues	
2. Major aspects of integrated river basin development .....	9
Preliminary investigation and organization .....	9
Reconnaissance of existing conditions .....	10
Socio-economic factors—Study of development potential of water and other natural resources—Preliminary over-all plan of development	
Initial implementation .....	12
Supplementary studies—Small-scale water projects of local interest susceptible of immediate execution—“ <i>Avant-projet</i> ” for individual major water projects—Policies and socio-economic measures needed in anticipation of economic and social changes	
Construction and operation .....	15
Governmental approval and decisions—The changing rôle and status of the river basin authority—Engineering management—Labour problems—Readaptation problems—Utilization of new assets	
3. Some specific problems encountered in river basin development .....	18
Economic evaluation .....	18
Nature of benefits—Types of capital expenditure—Annual costs and benefits—Criteria of economic efficiency	
Problems of financing .....	23
Financing of the main river basin works—Reimbursement of public investments	
Organization and administration .....	26
Need for unified planning and administration—Form of organization—Specific problems	
Citizen participation and local projects .....	28
Basis for securing citizen participation—Local land and water use projects—Local industrial projects	
4. Co-operative action in developing an international river basin .....	32
Difficulties in co-operating .....	32
Inadequacy of relevant international law .....	33
Initial approach .....	34
Fostering co-operation .....	35
Permanent joint commissions .....	35
Examples of co-operation .....	37
Nile basin—Gash River—Shire basin—Jordan basin	

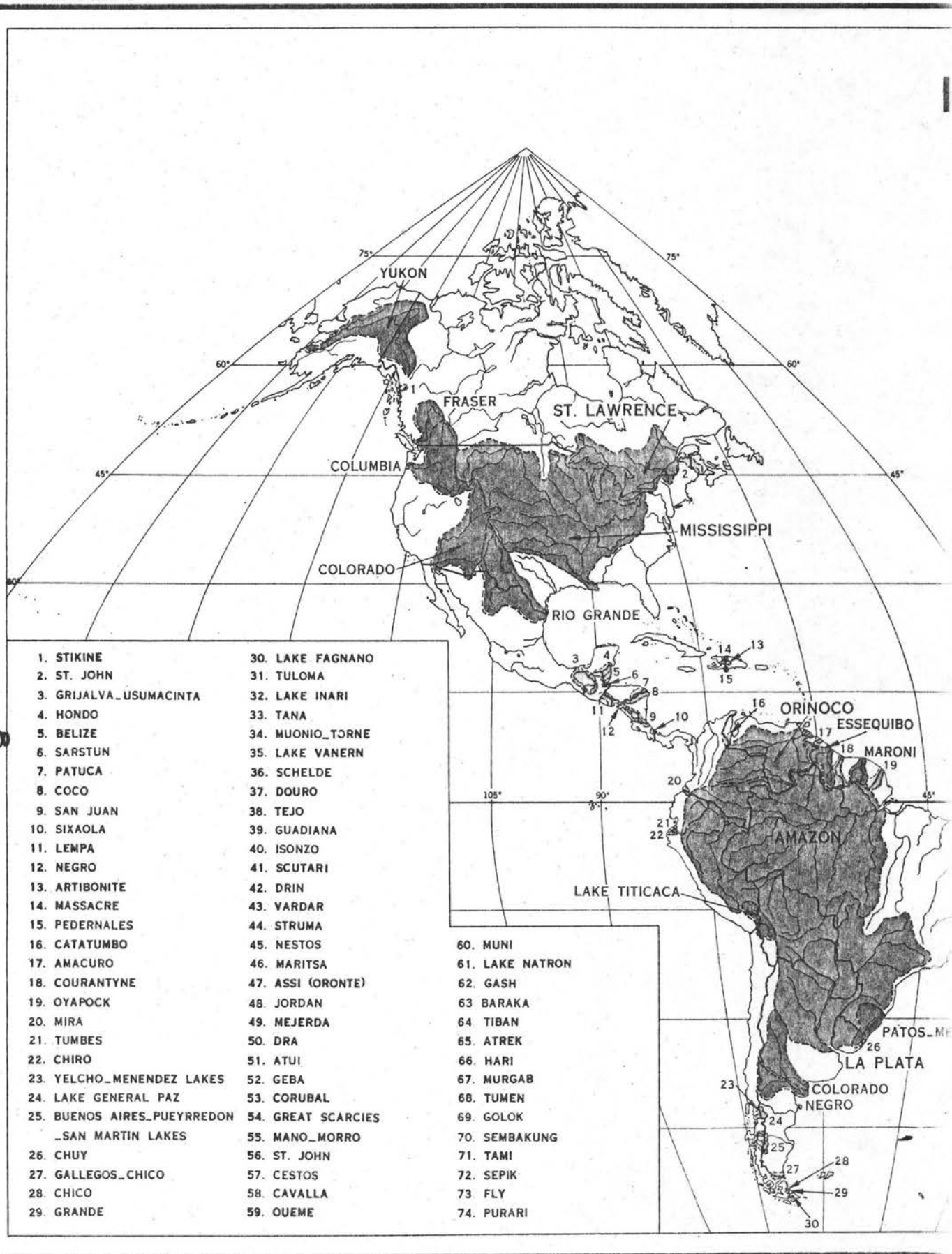
<i>Chapter</i>	<i>Page</i>
5. Lines of action.....	39
Common problems requiring international action--Administrative structure	
Improving basic services in hydrology.....	40
Sharpening the tools for analysis and for concrete action in water resource utilization .....	40
Encouraging scientific and technical investigations.....	41
Aiding countries in developing their river basins.....	42
Laying the groundwork for reconciliation of conflicting interests over river basins of an international nature.....	43

### *ANNEXES*

<i>Annex</i>	
I. Organization of basic surveys.....	47
II. Correlating measures of land improvement in the drainage basin with engineering works on the stream.....	50
III. Some illustrations of economic evaluation methods and tests.....	55
IV. Selected list of scientific and technical problems involved in integrated use of water resources .....	57
V. Saline and brackish water conversion.....	58

### *MAPS*

Figure 1. Major drainage areas of the world.....	61
Figure 2. International river basins.....	63

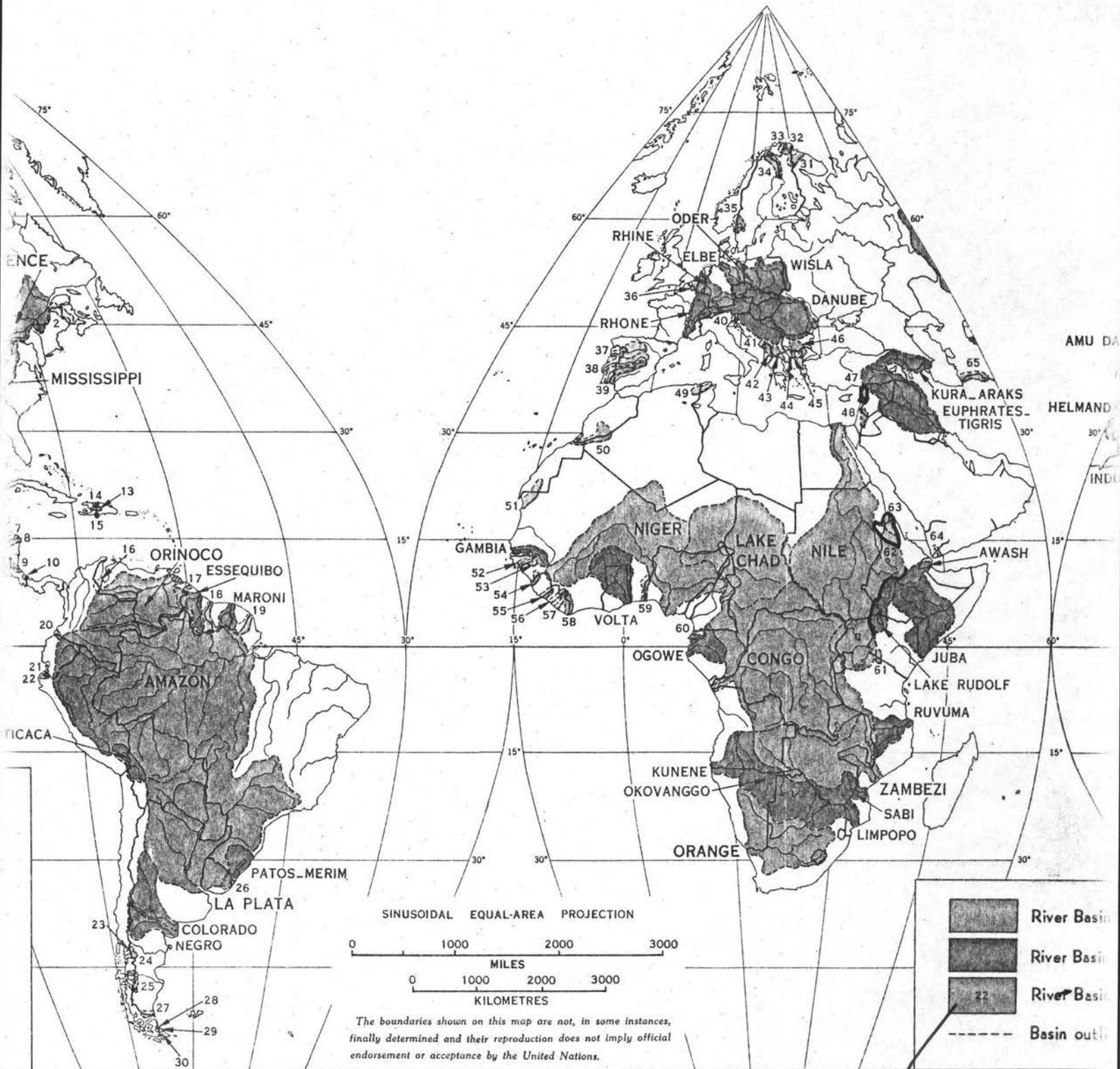


- |                             |                    |
|-----------------------------|--------------------|
| 1. STIKINE                  | 30. LAKE FAGNANO   |
| 2. ST. JOHN                 | 31. TULOMA         |
| 3. GRIJALVA_USUMACINTA      | 32. LAKE INARI     |
| 4. HONDO                    | 33. TANA           |
| 5. BELIZE                   | 34. MUONIO_TORNE   |
| 6. SARSTUN                  | 35. LAKE VANERN    |
| 7. PATUCA                   | 36. SCHELDE        |
| 8. COCO                     | 37. DOURO          |
| 9. SAN JUAN                 | 38. TEJO           |
| 10. SIXAOLA                 | 39. GUADIANA       |
| 11. LEMPA                   | 40. ISONZO         |
| 12. NEGRO                   | 41. SCUTARI        |
| 13. ARTIBONITE              | 42. DRIN           |
| 14. MASSACRE                | 43. VARDAR         |
| 15. PEDERNALES              | 44. STRUMA         |
| 16. CATATUMBO               | 45. NESTOS         |
| 17. AMACURO                 | 46. MARITSA        |
| 18. COURANTYNE              | 47. ASSI (ORONTE)  |
| 19. OYAPOCK                 | 48. JORDAN         |
| 20. MIRA                    | 49. MEJERDA        |
| 21. TUMBES                  | 50. DRA            |
| 22. CHIRO                   | 51. ATUI           |
| 23. YELCHO_MENENDEZ LAKES   | 52. GEBa           |
| 24. LAKE GENERAL PAZ        | 53. CORUBAL        |
| 25. BUENOS AIRES_PUEYRREDON | 54. GREAT SCARCIES |
| _SAN MARTIN LAKES           | 55. MANO_MORRO     |
| 26. CHUY                    | 56. ST. JOHN       |
| 27. GALLEGOS_CHICO          | 57. CESTOS         |
| 28. CHICO                   | 58. CAVALLA        |
| 29. GRANDE                  | 59. OUEME          |

- |                 |
|-----------------|
| 60. MUNI        |
| 61. LAKE NATRON |
| 62. GASH        |
| 63. BARAKA      |
| 64. TIBAN       |
| 65. ATREK       |
| 66. HARI        |
| 67. MURGAB      |
| 68. TUMEN       |
| 69. GOLOK       |
| 70. SEMBAKUNG   |
| 71. TAMI        |
| 72. SEPIK       |
| 73. FLY         |
| 74. PURARI      |

All < 100,000  
Km<sup>2</sup>

# INTERNATIONAL RIVER BASINS



49/50/51/63/64/65  
 Ael #s < 100,000 Km<sup>2</sup>

# WORLD RIVER BASINS

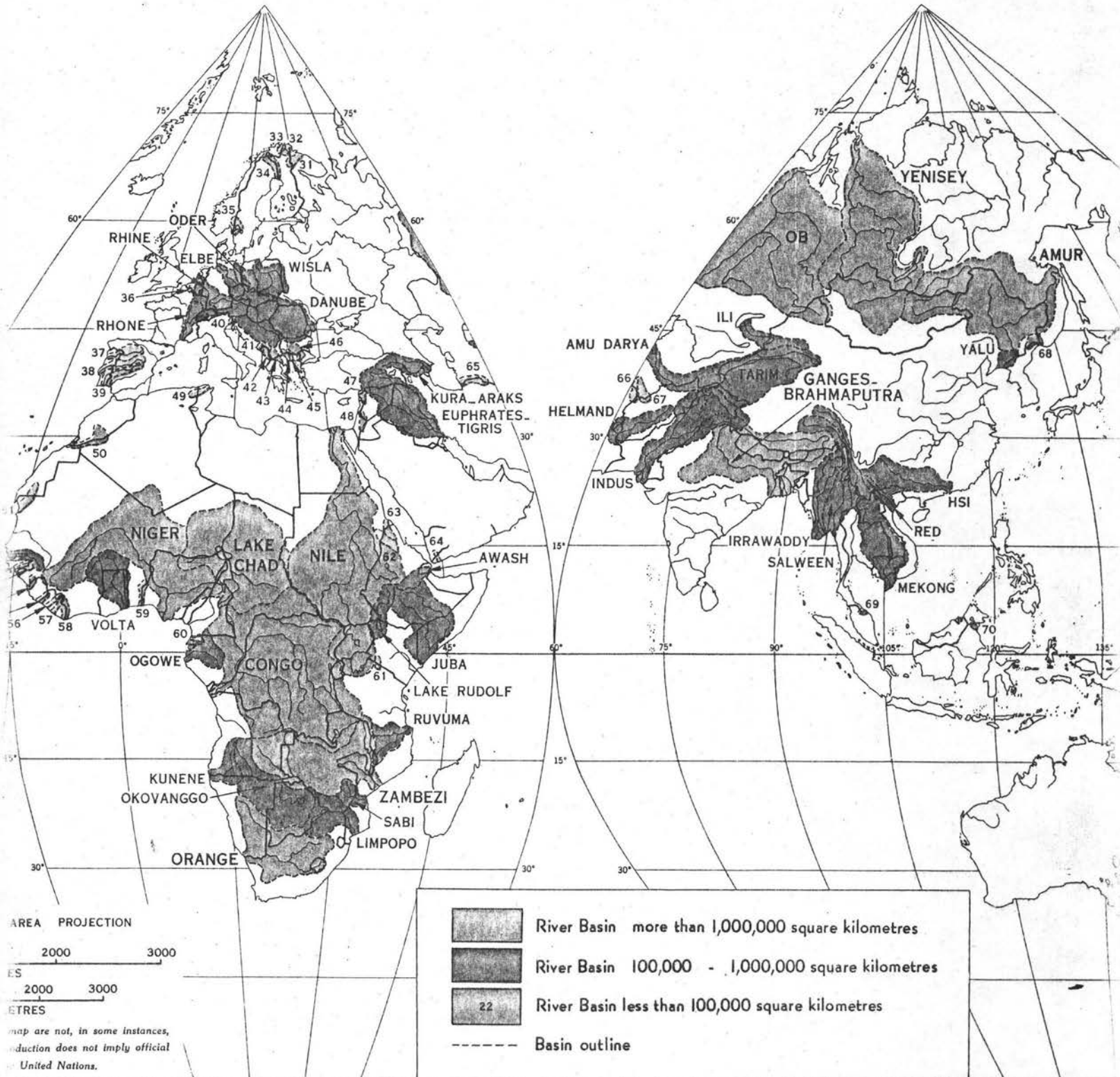
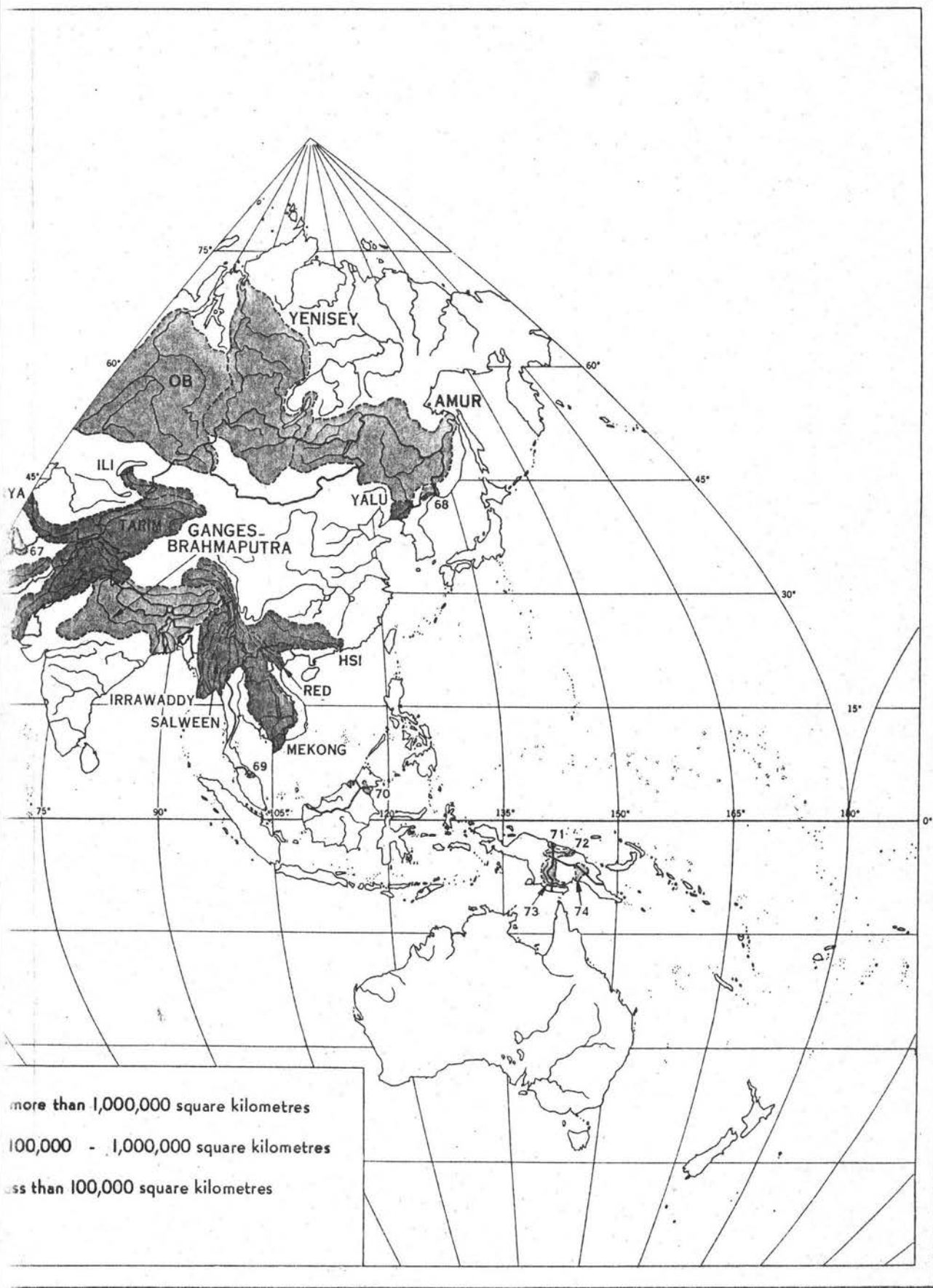


FIGURE 2



## CO-OPERATIVE ACTION IN DEVELOPING AN INTERNATIONAL RIVER BASIN

1. At first glance, integrated development of an international river basin might be expected to present problems similar to those encountered in dealing with national rivers, on the premise that a river basin is a coherent topographic feature and the waters therein should be developed to provide the optimum benefit to the community within the basin, whether or not it comes under a single jurisdiction. Though this concept may be correct in principle, political considerations often make it difficult to apply.

2. Even in the best of circumstances joint use of international waters can give rise to ill feeling and political tension. Although there may be on all sides a sincere will to co-operate, questions of accuracy of flow measurements and of the justice of water allocations may lead to difficulties. The steady growth in world population and a growing water consciousness have increased the demand for water and, consequently, its value, with every indication that the value will continue to increase. These factors, combined with the usual political differences arising in any international basin, tend to aggravate rather than ease the problem of integrated planning; in this respect it often differs from the planning involved in a national basin under the rule of a single government.

3. In a national basin the government of the country may have both the power and the facilities to deal with social, administrative and economic problems and can pass special legislation to meet a given situation. By wise administration, propaganda, demonstration schemes and other ways and means at its disposal, the national government can encourage and accelerate progress in a scheme of basin development, all internal differences, disputes and claims being settled by the law of the country.

4. In the case, however, of a basin falling within the territories of two or more countries, the situation is different. The governments, on whom it is incumbent to further their countries' interests or at least guard them, themselves become the claimants and disputants. Should they fail to agree, there is no supreme authority automatically available and mutually acceptable to whom they can refer. Moreover, the disputes—some of which may be quite minor—become political issues and often assume an exaggerated significance. It is clear, therefore, that the degree of success in carrying out any project for international basin development will be largely determined by the prevailing political atmosphere and the impact it has on the public will to co-operate.

### Difficulties in Co-operating

5. Having regard to the fact that any incentive to co-operate depends on the material and moral benefits derived from such co-operation, it is imperative that the benefits in quantitative and qualitative terms be clearly described as early as possible in the planning of any project and repeatedly stated throughout the process of planning. It is only by such means that the facts can sink into the public mind and engender a co-operative spirit in the international sense. Thus, in framing a plan, the psychological problem will often call for as much attention as that given to physical and economic questions, although the emphasis on each will vary with the circumstances.

6. In some parts of the world a relatively high standard of co-operation has been built up. Examples in Europe are the Rhine and Danube, where the emphasis is mainly on navigation and hydroelectric power and only to a minor extent on consumption uses. The Soviet Union and some adjacent countries such as Finland, Iran and mainland China are also co-operating in use of some international rivers. On the North American continent, water treaties between the United States and Canada<sup>1</sup> and the United States and Mexico<sup>2</sup> afford

examples of co-operation in the control and utilization of international waters for all purposes but with non-consumptive uses still the predominant feature, though irrigation is by no means unimportant.

7. But there are regions—particularly those where political changes have occurred since the Second World War and those where several young sovereign States have emerged—where water questions have been brought into sharp focus and bitter disputes prevail today. In the case of Pakistan and India, for example, the original water treaties and arrangements drawn up prior to 1947 and tending towards a global pattern rather than a restricted one, do not cover the new situation. Similarly, in other cases, various reasons for disagreement exist, some of which are valid and some distorted and aggravated by questions not concerned with water, such as territorial and boundary disputes.

8. One source of disputes concerning international river basins is the fact that international boundaries were often drawn without consideration of the requirements for sound water administration. Even when a canal system is located within a single country, uneasy relations may arise between the upstream and downstream executive officers if the division of responsibility for water measurement and other aspects of water

<sup>1</sup> Treaty of 1909 between the United States and Great Britain.

<sup>2</sup> Treaties of 1853 and 1944 between the United States and Mexico.



management is uncertain and complicated. When the administration of a canal system is not unified, each administrative unit will be tempted to achieve its own goals through its own efforts and works, irrespective of the needs in other areas and of the economies which effective collaboration would make possible. These problems are magnified in the case of international basins and it is important that, in regions where water is a vital economic factor, every facility should be provided for ease of control and co-operation.

9. Though advances in science and technology have promoted integrated reservoir systems and many other improvements in the means of water control, they have, ironically, contributed their quota to the desire for isolation and independent action. Possibilities for storage and diversion of water are today far wider than they were fifty years ago. A large price may be paid for a scheme which gives independent control of some water resource though such control might be quite unnecessary in an atmosphere of true co-operation.

10. Another cause for dispute, mentioned above, arises in the terms of some existing agreements which were originally negotiated between certain powers on behalf of the States they administered, or between one administering power and a sovereign State. States which have gained their autonomy contend that the agreements in several cases do not apply in the changed circumstances.

11. Anyone not acquainted with the history of regions in which water disputes have been acute might

form the opinion that there was little law or order in the past where water was concerned. But research shows that vast schemes of development had been carried out in the past century, great programmes for river control—chiefly for single purposes—were in progress, and future water projects under close, vigorous study. All this involved negotiations on water matters based, for the most part, on the principles of European law. Moreover, these negotiations were mainly concerned with irrigation supplies, which present problems far more intractable than those for essentially non-consumptive uses such as navigation and hydro-power. Thus, examples of successful past negotiations are by no means lacking, but what is lacking today in many areas is the atmosphere necessary for negotiation.

12. In spite of the good offices of various impartial agencies, including financial agencies, the atmosphere in many cases is one of mutual distrust and hostility, which obviously retards and often precludes any real progress in co-operation. This is not surprising in view of the number of States that have only recently started to handle their own affairs in an environment which may still be suffering from the effects of a world war and, therefore, is far from normal. Nevertheless, the situation is one that could have serious repercussions and, in spite of what is being done, calls for further action. Against such a background the problem is not so much one of developing a policy of integrated use, but rather of restoring it and greatly increasing its scope under the new order.

### Inadequacy of Relevant International Law

13. Though the success of a plan of international basin development in the long run depends on good will and co-operation, it is obvious that many conflicting claims have to be balanced and reconciled. Some of these issues may raise questions of an international nature which are not adequately covered by recognized international law. For many years legal minds have been directing their efforts towards the formulation and systemization of legal principles applicable to users of international rivers, and much attention is being given to such principles at present by the International Law Association and the Institut du Droit International.

14. The International Law Association, at its meeting in August 1956 at Dubrovnik, Yugoslavia, unanimously adopted a statement of principles "as a sound basis upon which to study further the development of rules of international law with respect to international rivers". Acceptance of these or substantially similar principles by the parties to international water disputes might go far to aid adjustment and agreement. The principles are as follows:

"I. An international river is one which flows through or between the territories of two or more States.

"II. A State must exercise its rights over the waters of an international river within its jurisdiction in accordance with the principles stated below.

"III. While each State has sovereign control over the international rivers within its own boundaries, the

State must exercise this control with due consideration for its effects upon other riparian States.

"IV. A State is responsible, under international law, for public or private acts producing change in the existing régime of a river to the injury of another State, which it could have prevented by reasonable diligence.

"V. In accordance with the general principle stated in No. III above, the States upon an international river should in reaching agreements, and States or tribunals in settling disputes, weigh the benefit to one State against the injury done to another through a particular use of the water. For this purpose, the following factors, among others, should be taken into consideration:

- (a) The right of each to a reasonable use of the water;
- (b) The extent of the dependence of each State upon the waters of that river;
- (c) The comparative social and economic gains accruing to each and to the entire river community;
- (d) Pre-existent agreements among the States concerned;
- (e) Pre-existent appropriation of water by one State.

"VI. A State which proposes new works (construction, diversion, etc.) or change of previously existing use of water which might affect utilization of the water by another State must first consult with

the other State. In case agreement is not reached through such consultation, the States concerned should seek the advice of a technical commission; and if this does not lead to agreement, resort should be had to arbitration.

"VII. Preventable pollution of water in one State which does substantial injury to another State renders the former State responsible for the damage done.

"VIII. So far as possible, riparian States should join with each other to make full utilization of the waters of a river, both from the viewpoint of the river basin as an integrated whole, and from the

viewpoint of the widest variety of uses of the water so as to assure the greatest benefit to all."

15. Pending establishment of an accepted international code, it is suggested that the Dubrovnik statement of principles affords a sound basic philosophy for planning and executing a project for integrated river development in an international river basin. The fifth principle, in particular, should be useful in furnishing a guide for the solution of disputes with regard to the use of such waters, recognizing as it does the pertinence of all equitable and historical circumstances in the resolution of such disputes.

### Initial Approach

16. From the foregoing background, it is clear that co-operation must be fostered and nurtured if any real progress in international basin development is to be made. The question arises as to what might be the sequence of steps and who is to initiate and promote them.

17. Different situations will call for different detailed procedures, and much will depend on the prevailing political, social and economic conditions in the countries concerned. In some cases there may be an intense desire to co-operate in bringing about an integrated basin development while in others the feeling may range from a willingness to participate to vigorous opposition to any programme of collaborative action. The only point in common between the two extremes and the cases ranging between them is that in none of them are the countries concerned likely to be able to embark on a programme of integrated development without extraneous help in one form or another.

18. In view of the global nature of the problem it would appear that only an organization with such an international character as the United Nations can play a really influential rôle. This does not mean that this international organization would necessarily take an active rôle in the planning of integrated development of particular river basins; such a step would only be taken upon invitation of all the countries concerned. Nor does it mean that the United Nations should do nothing while awaiting the issuance of such an invitation. In fact, there is much that could be done to lay the foundation for prospective agreement among the interested countries.

19. The Panel believes that the United Nations has exceptional opportunities and facilities, either directly or through its subsidiary organizations, for gathering the information necessary to make a report on the *statu quo* of selected under-developed international river basins. This should be a factual statement, which gives an indication of what further steps are called for. It would be the basic report upon which future planning policy might be oriented. For ease of reference and comparison with basic reports on other basins, it should

be prepared on strictly standardized lines, using the same terminology and expressing the facts in terms of accepted standard units as well as local units. The report need attempt nothing more than a broad outline of the situation based on the information available as easily and quickly procurable. The main headings might be: Economy, Communications, Topography, Geology, Climate, Hydrology. The subheads would have to be decided in conference. The report should be accompanied by a map of the basin prepared on standardized lines and by other maps of the region that are relevant and readily available.

20. With the basic report available, the next step would be an appraisal of the physical possibilities of the basin. This report would take into account the physical and economic factors. It would appraise in particular the hydroelectric potential and, where necessary, the irrigation potential, as well as water surpluses and deficiencies in the various parts of the basin. The second report should present, both in descriptive and in statistical form, the salient features of any existing development, assuming the basin to be under unified control and without undue regard to present or historical patterns of use of land and water resources. This report, since it would be only a step in the preparation of a preliminary plan of development, should be considered a confidential technical report.

21. Having obtained information on the *statu quo* in all its aspects and a knowledge of the physical possibilities inherent in the basin, the next and third steps should be to embark on a preliminary plan of integrated development, giving full weight to human factors and to existing developments within the basin. The objective should be, of course, the optimum use of sites and water resources. To the extent that this may involve diversion of water from one sub-basin to another, or change of traditional uses, it may be necessary to incorporate provision for compensation or for offsetting benefits. The purpose should be to produce a plan that would provide a reasonable basis for discussion between the countries concerned. Whether their collaboration should be sought during this phase would depend on the circumstances of the case.

### Fostering Co-operation

22. For any further progress it is essential that the countries concerned be brought into consultation, for the next step will involve setting up a committee with members from each country presided over by a chairman and the necessary observers from the United Nations. The timing of this step would have to be judged in the light of political and other considerations, since the preliminary plan must now be put on the table for open discussion. The terms of reference of this committee should stress that the discussions imply no commitment of any sort, their object being to determine the areas of agreement and disagreement and to ascertain the reasons for disagreement. Does disagreement spring from economic factors or is it due to political or sociological considerations? If there is a disagreement over the appraisal of the basic facts of the case, joint technical teams might be appointed to attempt to achieve agreement on the factual questions in dispute.

23. Doubtless, each country will have its own idea of a national development plan determined by its socio-economic needs and by its natural resources (in water, raw materials, labour and capital), and its pattern of development will be governed by these considerations. These national projects will emerge in the course of the discussions, and the degree to which they may overlap or compete with one another will give a fair indication of the real sources of conflict and help to narrow them down. It is most important for the health of future negotiations that the differences in outlook and motive be brought to light, openly discussed and well understood by the parties concerned. The course

of those meetings will be determined by the progress made. They will furnish a testing ground and, it is hoped, a prelude to further discussions on a permanent basis.

24. These preliminary meetings may result in any of the following situations:

(a) One or more of the parties decide that they cannot consider the preliminary plan owing to political difficulties. If this is a firm decision, it is obvious that no immediate progress can be made on the over-all plan, and the plan must be shelved "with regret" pending a more propitious time. It should never be dropped entirely. It may be that a part of the plan is salvageable without loss of substantial benefits and that this part does not require the participation of the dissenting parties. If so, this part of the plan could go forward.

(b) The parties decide that the plan lacks merit or that it is unsuitable for economic reasons, and therefore not worth pursuing further. This is hardly likely, in view of the way in which the plan has been prepared. Should this occur, however, discussion of an alternative plan should be encouraged.

(c) The parties express a desire to co-operate, with a view to implementing the plan in full.

(d) The parties agree in broad principle to the plan, subject to many reservations. It is this situation that is likely to arise most frequently.

25. As regards cases (c) and (d), measures should be taken towards appointing an *ad hoc* interim committee and, ultimately, a permanent international joint commission agreed to by treaty.

### Permanent Joint Commissions

26. Two good examples of joint commissions are the International Joint Commission of the United States and Canada, agreed to in the treaty of 1909 between the United States and Great Britain, and the International Boundary and Water Commission set up by the United States and Mexico. In the latter case, a treaty of 1853 made provision for regulation of the waters of the Rio Grande and Colorado rivers for the purpose of navigation only. A later treaty, ratified in 1945, made provision for wider collaboration "considering that the utilization of these waters for other purposes is desirable in the interests of both countries . . . *in order to obtain the most complete and satisfactory utilization thereof*"<sup>4</sup>. These joint commissions have international status. They are permanent bodies established to handle water questions that may arise from time to time, and to collaborate closely on all projects that are of concern to the contracting parties. Their activities cover the entire range of water matters: navigation, power, irrigation, flood control, drainage, domestic uses, sanitation, pollution, and others.

27. Though the duties of the commissions just mentioned may not cover as wide a field as that envisaged for true integrated development, they are ex-

amples of the kind of organization that eventually should be established. The effectiveness of joint commissions will depend upon the political maturity of the countries concerned. Lessons learned from experience to date should help guide other nations away from wasteful delays and controversies. In the younger States, such commissions would require time to put themselves on a sound basis and to gain the confidence of their countries in carrying out their responsible assignment. In the meantime it is probable that an outside agency will be necessary (and even welcomed) in the capacity of co-ordinator, adviser or mediator with a view to keeping the talks alive and steering the discussion along objective lines.

28. At this stage, effort should be directed towards developing the machinery of co-operation rather than attempting to achieve spectacular results in the field. Thus, the less controversial subjects should be tackled first. For instance, preparation of a scheme for exchange of information and the gathering of basic data would be a logical first step. The mere process of preparing and implementing such a scheme will afford practice in working together and tend to generate an atmosphere of collaboration. Then, in order to arrive at some indication of the extent of surveys necessary and the cost of various works, the technical character-

<sup>4</sup> Italics supplied.

istics of such works and their functions in the general scheme will have to be discussed. This discussion will include at least some of the following: flood control, river training, reservoirs, river gains and losses, silt charge, reclamation in the various aspects required, surface and subsoil conditions, drainage, farm cropping patterns, irrigation layouts, hydroelectric installations, domestic water supply, fish life, sanitation (especially anti-malarial measures), soil erosion and pollution.

29. Another subject will be the administrative aspects, involving the operation of the plan and day-to-day working arrangements. Some of the underdeveloped countries involved will be equipped with established and well trained technical services; others may not be so well off. In some countries, international development will be handicapped by the existence of private rights and concessions. The question of expropriation will have to be considered, at least to the extent necessary to put governments in a position to negotiate sound working arrangements. The extent to which such concessions should be recognized or others granted is of course a domestic problem for each of the countries concerned, but it is the view of the Panel that international developments are facilitated when all important water resources are nationalized or made subject to public control.

30. It is apparent that there is a wide range of matters which may be discussed and clarified by joint commissions. Many may be settled in principle if not in practical detail. It is only to be expected that some of the points will be controversial and will stimulate vigorous argument. But in a functioning commission such arguments will be conducted in an atmosphere of co-operation rather than dispute, with a view to arriving at the right answer in the light of integrated planning. The arguments may be recorded in the proceedings of the commission, but they will not form the subject of acrimonious official communication between the governments.

31. It is emphasized that the representatives would come together to co-operate in planning, not to settle international disputes. Thus, it might be unwise in some cases to attempt to settle the matter of water allocations as a first step because this question might be influenced by all kinds of other factors, with the result that the atmosphere would deteriorate at the outset. The policy should be to sidetrack major disputes and eventually approach them from a different angle so as to avoid, as far as possible, a head-on clash. Should it be of vital importance that a major difference be dealt with promptly, it should be handled by another body under different terms of reference. This is the general practice in settling difficult and controversial problems. Such negotiating or arbitrating commissions are of a temporary nature and are dissolved on completion of the task assigned to them.

32. The true concept of integrated planning in any major development calls above all for continuity of organized co-operation, and the only way to achieve this is by establishing a permanent joint commission which is not overloaded with difficult questions to begin with, though it must deal with them eventually. The composition of such a commission and the juncture at which it should be created would be dictated to a

large extent by the progress made at preliminary meetings of government representatives. In some circumstances the scope for integrated planning may not justify a permanent commission. At an early stage, the question of finance will come into the picture. The governments concerned—especially those of the smaller States—may agree in principle to having a permanent commission but raise objections on the grounds of cost. To meet this objection, part of the cost might be covered under the technical assistance programme. Conditions for granting this financial aid would have to be thought out, but it is felt that money spent in nursing these commissions to maturity would be a good investment.

33. Since joint planning will raise questions of general policy as well as questions in the purely technical sphere, it is only to be expected that the governments concerned will ask that others besides technical experts be included among the permanent officers when the formation of the commission is under consideration.

34. If there exists an organization similar to that of the United States-Canadian International Joint Commission, for instance, or the United States-Mexican International Boundary and Water Commission, it will hardly be necessary to create yet another commission on the ground that the existing machinery is not an integration commission in the true sense. In these circumstances the obvious step would be to change the framework and widen the terms of reference of such a well-proved and experienced organization. These commissions not only control waters in accordance with the agreed rules laid down in the articles of the treaty; they also make investigations<sup>5</sup> and take responsibility for the construction of new works. Moreover, they have the right of reciprocal inspection.<sup>6</sup>

35. In the case of the Nile Waters Agreement, responsibility for implementing the "working arrangements" does not lie with a commission but simply with the irrigation departments of Egypt and the Sudan. As the Sudan is the upper riparian State and the later organized irrigation consumer historically, most of the clauses in the working arrangements apply to it. In this case, the validity of the existing agreement has been questioned (by the Sudan) for the reason that the agreement was originally negotiated between Great Britain (on behalf of the Sudan) and Egypt. Whatever the situation is today, the Nile Waters Agreement has provided both countries with useful experience in the technique of co-operation in this field, and affords an example of how government technical services can work together in handling a complicated water control matter on a major international river.

36. The varied circumstances make it impossible to generalize as to the composition of a joint planning commission. The very nature of the problem, however, makes it certain that engineers must play a large part.

<sup>5</sup> United States-Mexican Treaty: article 6, "The Commission shall study, investigate and prepare plans for the flood control works where and when necessary"; article 7, "The Commission shall study, investigate, and prepare plans for plants for generating hydroelectric energy".

<sup>6</sup> *Ibid.*: "The Commission and its personnel may freely carry out their observations, studies and field work in the territory of either country".

Indications as to its type and composition, or whether the establishment of a permanent commission is necessary at all, should emerge from the preliminary report. Subsequently, rules of procedure and terms of reference will depend on the outcome of discussions at the preliminary meetings.

37. Stated simply, the aims of the permanent commission should be to continue the work of the preliminary committee with a view (a) to arriving at a comprehensive plan of integration in principle, (b) to implementing the components of the plan as circumstances permit, and (c) to making such revisions in the plan as may be thought proper from time to time in view of changed circumstances or technological advances. It is obvious that the rate of progress will be slow in most cases and can only accelerate as the commission gains in experience and stature, a process which takes time and cannot be short circuited if the psychological build-up is to be sound. But within limits

time should not be the primary consideration. What should be the primary aim is the creation of a sound and effective instrument of co-operation that eventually functions efficiently without outside intervention.

38. The preparation of the comprehensive plan will naturally raise a great variety of issues, all of which have to be analysed and settled in a spirit of give and take. What must emerge is a plan that exhibits two main features, first, a fair deal for all rather than a good bargain for one, and second, obvious benefits, direct and indirect, to all, although the benefits can hardly be equal. In addition, the whole plan—and each phase of it—must be thoroughly understood, not only by the Governments of the countries but by all their peoples. Therefore, the human aspects of the plan must be made clear, for no matter how imposing the engineering works may be, the success of the enterprise must be measured by its effects in the homes, the fields, the factories, the mines and the offices.

### Examples of Co-operation

39. Although examples of co-operation in truly integrated development in the less developed countries are probably few, there are several instances of limited but useful co-operation. Some of these are referred to below.

#### NILE BASIN

40. There was, and still is, a great measure of co-operation on the Nile, though some controversy has arisen over water allocations since the Sudan has become an autonomous State. The situation on the Nile is peculiar, and a detailed explanation as to how it has arisen is not possible in a few lines. As already mentioned, liaison is effected through the respective irrigation departments. But while the Sudan irrigation department normally operates only within its own frontiers and draws its irrigation supplies from the Blue Nile, the Egyptian department has a strong detachment permanently stationed in the Sudan, whose field of activities covers hydrological and engineering surveys over a great area of the basin, especially the White Nile, including the Lake plateau.

41. The Sudan is concerned with these studies in so far as the works resulting from them would affect it as, for example, in the case of the projected Jonglei canal for reducing water losses in the Sudd region. Egypt already has a large dam on the White Nile, the operation of which affects both countries and calls for co-operation between them. The latest example of co-operation is the building of the Owen Falls dam at the outlet of Lake Victoria. This is a multi-purpose project to generate hydroelectric power for local consumption and store over-year irrigation supplies mainly for the benefit of Egypt. It should be mentioned that a large portion of the Nile basin has been under a single administrative Power, with the consequence that working arrangements have been greatly facilitated in all fields of river control and especially of survey and investigation. In the case, however, of the proposed Lake Tsana dam at the head of the Blue Nile, prolonged negotiations have been continually frustrated.

42. Further important storage works on the Lake plateau are planned, again mainly for the benefit of Egypt, which will have to depend on the co-operation of other countries to allow their construction. At present the countries involved are the United Kingdom and Belgium. In another ten or twenty years, however, the situation may have changed. If the proposed works on the Lake plateau and, in addition, the Jonglei canal can be built, it will be a fine example of progress in at least engineering co-operation. This might lead to similar co-operation all along the Nile, eventually including the Tsana dam.

#### GASH RIVER

43. This is a non-perennial stream which rises in Eritrea. A dispute arose in the early nineteen twenties regarding irrigation claims on the Gash in Eritrea and the Sudan. This was satisfactorily settled in a spirit of co-operation between the United Kingdom and Italian Governments. One of the clauses of the agreement was that if profits on the sale of cotton in the Sudan scheme exceeded a certain figure, Eritrea would be paid a percentage of this excess.

#### SHIRE BASIN

44. On the Shire, a tributary of the Zambezi, there is a multi-purpose scheme being carried out for power, flood control and irrigation. This has called for co-operation with the neighbouring Portuguese administration of Mozambique. It will also fit in with any plan for integrated development of the Zambezi.

#### JORDAN BASIN

45. In present circumstances, the Jordan can hardly be cited as an example of co-operation. Nevertheless, a measure of co-operation exists among the Arab States in connexion with the waters of the Yarmuk and what will remain of the Jordan. When the region came under the rule of Mandatory Powers, there was a tendency

to take a global view of the basin, and the French and British authorities collaborated in plans for hydroelectric and irrigation development. An obvious measure was to use Lake Tiberias as a storage reservoir for both the Jordan and Yarmuk waters, and this was taken for granted by various planners both during and after the Mandatory period. Political conditions now make it unlikely that the lake will be so used, with the result that a natural reservoir site will be lost unless the States can compose their differences.

46. International co-operation in all fields is essential to peace and progress, but no one will deny that some fields lend themselves to co-operation less readily than others, and in this category are international river waters, especially in relation to irrigation uses. This point, mentioned earlier, is worth repeating. The allocation of water on an international or interstate, or inter-communal river can never be easy either technically or politically. In some places irrigation is fundamental, and almost everywhere in under-developed areas it has enormous economic importance. "Historic uses" and "priority of appropriation" have, in many cases, come to have an almost sacred significance, irrespective of the actual benefits derived, or whether

the water is being put to the best use. In addition, there are often collateral factors that further accentuate the difficulties of allocation. Shorn of this thorny question of consumptive uses, co-operation becomes far less complex, though seldom a simple problem.

47. Thus, the magnitude of the obstacles inherent in the whole concept of integrated development of an international river basin is a measure of the fruits to be gained if they can be surmounted and a river can be made into a bond rather than a barrier between peoples. This is a challenge that calls for tackling the problem systematically and persistently. The process will be a long-term one, and some projects may be dropped, to be taken up again at a later date, so that systematic reporting and record keeping are essential to ensure continuity and avoid unnecessary repetition when fresh personnel handle an old question.

48. As to subsequent procedures in fostering co-operation, progress will depend so much on the attitudes of the nations concerned that no cut and dried formula can be laid down. Once co-operation is properly established, solution of technical problems and implementation of the plan will follow in the course of time, provided the money is available. If the plan and its phasing are sound in conception and timing, the Panel assumes that somehow capital will be found.

dition,  
mutuate  
ques-  
ar less

ent in  
of ar  
mits to  
er can  
n peo-  
g the  
process  
ay be  
te, so  
re es-  
sary  
stion.  
g co-  
titudes  
rmula  
estab-  
menta-  
pro-  
asing  
umes

## Chapter 5

### LINES OF ACTION

1. Specific problems which enter into river basin development long have been the concern of specialized scientific groups which have worked across international boundaries. In the nineteenth century international conferences and scientific congresses in such fields as geography, soil science, navigation and engineering dealt with segments of river basin use and development. In recent years the exchange of experience in irrigation and drainage, design of high dams, hydroelectric power development, navigation improvements, and related fields has increased. Conferences have multiplied, and scientists and engineers have come into closer contact through publications and travel.

2. Within the United Nations Organization and its specialized agencies interest has spread vigorously since the United Nations Scientific Conference on the Conservation and Utilization of Resources focused attention on river basin problems in 1949. At present international collaboration in the development of the world's rivers is more urgent and its importance more clearly recognized than ever before, and the opportunities and obstacles that lie in the direction of international action are more evident.

3. In the light of recent activities in this field, the Panel suggests in this chapter the major problems of river development that seem to cry for solution and the lines of action which international agencies might be encouraged to follow. What is needed is the pursuit of concrete action by both government and non-government agencies within a broad framework of United Nations policy. Much of that action hinges on exchange of experience looking to practical solutions of troublesome problems in countries which are emphasizing the effective development of their water resources in the public interest.

#### COMMON PROBLEMS REQUIRING INTERNATIONAL ACTION

4. Previous chapters have described a wide array of questions to which the administrator, economist, engineer and agronomist have no definite answers. In those chapters the Panel has suggested various actions to be taken at the national level. Many of the problems which have been considered, however, are common to many countries and lend themselves to international action. But great gaps in knowledge hamper action in the river development field. The steps which are suggested below are intended to help close these gaps and to assure the fullest application of the resources of studies, materials, people and funds that are at hand.

5. Suggested steps at the international level may be grouped in five classes:

(1) Improving basic services in hydrology

- (2) Sharpening the tools for analysis and for concrete action in water resource utilization
- (3) Stimulating scientific and technical investigations
- (4) Aiding countries in developing their river basins
- (5) Laying the groundwork for reconciliation of conflicting interests over river basins of an international nature

#### ADMINISTRATIVE STRUCTURE

6. A preliminary word must be said about the administrative problem. The Panel recognizes that allocation of administrative responsibility for carrying out water resource activities at an international level is similar to allocation of such work within a national government. It differs from national situations chiefly in that it is far more complicated.

7. Different countries have allocated the work of studying, designing, building and managing river development in different ways, but none has yet arrived at what appears to be a fully satisfactory solution. As indicated in chapters 1 and 2, the physical unity of a river basin lends itself to treatment of water management and related problems in one administrative unit, yet an integrated development raises difficult problems of correlation of policies in widely different fields, such as agriculture, water supply, education, health, forestry, power marketing and transport. Even if a government were to provide for such a development of each of its major basins by an autonomous authority there would remain the vexing question of how to co-ordinate the separate authorities within the aims of national policies. Moreover, much of the basic work already has been started by agencies of the respective countries having only limited and discrete objectives: precipitation data may be collected by an agency mainly interested in forecasting for aviation, and soil conservation promoted by an agency set up to support farm prices and family-sized farms. As integrated river basin development receives increased emphasis within individual countries it becomes necessary for them either to shift responsibilities from established agencies to new agencies or to co-ordinate the work of the established agencies. In either event some kind of co-ordinating machinery soon becomes necessary.

8. The same set of choices arises on the international level as the United Nations and its specialized agencies become more concerned with river basin development. No single specialized agency has complete responsibility for water and related problems, though the activities of the United Nations, including those of its regional offices, impinge on river development at many points. Some progress in co-ordination of their diverse activities has been made through the Inter-

Agency meetings on water resources held regularly during the past four years.<sup>1</sup> Further progress is essential.

9. The steps suggested by the Panel are intended to further constructive action by the United Nations

<sup>1</sup> Pursuant to resolution 533 (XVIII) of the Economic and Social Council, paragraph 6 (a), 2 August 1954.

and its specialized agencies as well as to ensure proper "promotion and co-ordination" by the Economic and Social Council and the Secretary-General of the United Nations.<sup>2</sup>

<sup>2</sup> Resolution 417 (XIV), paragraph 1 (a), 2 June 1952.

### Improving Basic Services in Hydrology

10. The systematic recording of basic hydrological data is a long-term task of high importance. Special efforts should be made to obtain adequate records for all river basins which are likely to be developed on an integrated basis. Furthermore, measures should be taken to ensure that more adequate use is made of available meteorological data in connexion with the planning and operation of water structures.

11. International standardization of hydrological instruments and of survey methods and criteria should be pursued, on lines similar to those long ago introduced in meteorology. It should be possible to look towards a time when data as to volume of water available, hydroelectric power resources, water quality and navigability of streams, to name only a few subjects, will be comparable among different countries. Although there may be special urgency in attaining such comparability within particular international basins, the benefits of standardization will be large everywhere because knowledge of experience in one area often will save time and cost in another similar area.

12. A survey of the status of hydrological services in the member nations is being made jointly by the United Nations and the World Meteorological Organization; its findings will point to some clear deficiencies. Without awaiting the final results of that survey a number of major needs may be noted. Methods of quantitative and qualitative estimation of surface and ground water discharge should be evaluated, and information on them should be exchanged. Measures looking to prediction of the size of great floods are vital to the efficient design of hydraulic structures. Basic data on the characteristics of river beds are necessary to a prognosis of bank erosion, and stream bed and reservoir silting. Surprisingly little information is available on local moisture and thermal factors as a basis for predicting evaporation and net water losses and surpluses on land surfaces. These deficiencies should be remedied as soon as possible.

13. Among its other duties, the World Meteorological Organization is responsible for facilitating

world-wide co-operation in the establishment of networks of stations which take meteorological observations, for promotion of standardization of such observations and for publication of data and statistics. Some of its data are of great value for river basin studies. However, there is at present no organization with responsibilities in hydrology similar to those of the World Meteorological Organization in meteorology. The Panel believes that it would be highly desirable if, by vote of its Member Governments, the World Meteorological Organization were to expand its activities so as to take in hydrology, including study of stream discharges and ground water.

14. Once this responsibility has been established, the enlarged organization should, among its tasks, take the lead in:

- (a) Promoting systematic recording of basic hydrological data;
- (b) Establishing standards for hydrologic measurement and publication of data;
- (c) Facilitating exchange of experience in the design of hydrologic networks and the conduct of river surveys;
- (d) Furthering river flood forecasting services.

15. At the same time, the regional economic secretariats in the Department of Economic and Social Affairs should be encouraged to make inquiries along the lines of the survey of hydrological data by the Economic Commission for Asia and the Far East and the World Meteorological Organization, or the study of hydroelectric power potential by the Economic Commission for Europe in Europe, and the Economic Commission for Asia and the Far East in the Far East. As indicated earlier, mountains of precipitation and river flow data will be of little value unless personnel are trained to make discriminating use of these. The recent World Meteorological Organization's training seminar on flood forecasting and water balance computation for government experts from the eastern Mediterranean area is an example of a type of service which might well be enlarged in co-operation with the regional economic commissions of the United Nations.

### Sharpening the Tools for Analysis and for Concrete Action in Water Resource Utilization

16. Any country's part in planning the joint development of an international basin can be only as effective as its ability to deal with internal problems of water resource utilization within its sector of the basin. However, there is among the nations no uniformity as to their forms of planning and administration, or

regulation of local and private interests, and in many nations the administrative structure is only emerging or is still experimental.

17. Here the United Nations may be of considerable help to its Members. For a number of years the Secretary-General has been calling to the attention of



Member Governments the importance of the manifold problems encountered. Various specialized agencies, particularly the Food and Agriculture Organization, the United Nations Educational, Scientific and Cultural Organization, the World Health Organization and the World Meteorological Organization, have been of aid in the fields of their special concern. Apart from their technical assistance programmes, to which the Panel refers later, they have made a commendable start on the job of disseminating information, by making exchange of experience easier among nations through publications, and in other ways. This work should be facilitated and expanded.

18. The Panel is aware that the various organizations of the United Nations family are active in many phases of river basin development. Vigorous interest in land management and the use of water in agriculture and fisheries is maintained by the Food and Agriculture Organization as a part of its operations and training programme. The United Nations Educational, Scientific and Cultural Organization, in its arid zone and humid tropics programmes, is active in making scientific studies and in spreading information. The World Health Organization helps establish standards and provide experience in water quality maintenance and in the provision of health services; the World Meteorological Organization is active in the field of meteorology and—the Panel hopes—soon, also in hydrology. This list of activities is only illustrative.

19. The regional offices are also active. The Economic Commission for Europe has for a number of years conducted systematic studies of hydro-power development. The Economic Commission for Asia and the Far East has for some time concerned itself with studies and surveys in its area, on flood control, hydro-power development, navigation and other aspects of river basin development. The Economic Commission for Latin America is currently engaged in a survey of water resources and their uses with special emphasis on their multi-purpose aspects.

20. The Panel believes that much more is urgently needed, both in expansion and in co-ordination of the programmes of all these agencies. There is no focus of interest on integrated river basin development. Continuing encouragement to Member Governments in these highly complicated and long-term matters is at present lacking.

21. The Panel discussed this state of affairs at length and concluded that nothing less than a special office or unit in the Secretariat of the United Nations can effectively carry out the heavy duties which the Panel believes it is necessary now to assume.

22. Such a unit would essentially have three inter-

related responsibilities in the field of integrated river basin development:

(a) Systematic collection and comparison of the most important data, and promotion of a flow of information on world-wide experience through staff studies, the advice of outside experts, and regional and world-wide consultations and conferences;

(b) Co-ordination and promotion of the work of the specialized agencies as well as of the regional commissions, having regard to their interests and terms of reference;

(c) Assistance to the various United Nations agencies in shaping a pattern of concerted action for making technical assistance available to Member Governments in developing river basins.

23. The Panel cannot list the precise tasks such an office should perform, but it is of the opinion that the unit should concern itself at least with methods, procedures and standards with respect to the following range of problems, working in close co-operation with governmental and non-governmental organizations in the field of water resources:

Evaluating water resources—surface and underground—their exploitability and the conditions (technical and non-technical) under which exploitation could be achieved;

Estimating prospective needs of water users in relation to available supply for entire basins and sub-basins, taking into consideration possibilities for curtailment of wasteful use;

Regulating and guiding national, local and private interests in the use of water resources;

Estimating alternative costs of individual projects considered in relation to, or in combination for, a multi-purpose scheme;

Cost distribution among various purposes of a water project;

Evaluating direct and indirect benefits, economic and social, which may originate from prospective hydraulic works in a project area;

Evaluating direct and indirect costs, and the needs and opportunities for capital investment in a project area;

Organization and administration of river basin programmes.

24. The Panel recommends that a commensurate strengthening of the efforts of the various specialized agencies and the regional offices accompany the setting up of the proposed unit in the United Nations Secretariat. It commends the regular convening of inter-agency meetings on this subject and expects that, as the work progresses, these consultations will gain in importance.

### Encouraging Scientific and Technical Investigations

25. Universities, government laboratories and other research institutions play a decisive rôle in advancing the several frontiers of knowledge encountered in river basin development. In most fields of knowledge there is at least one international agency or organization that

concerns itself with research and exchange of scientific information.

26. Several important scientific and engineering groups periodically bring together workers from many countries to discuss methods, techniques and results

affecting important aspects of river management. Chief among them are the World Power Conference, the International Association on Large Dams, the International Navigation Congress, the International Commission on Irrigation and Drainage, the International Association on Hydraulic Research, and the International Union on Geodetics and Geophysics, especially its Association of Scientific Hydrology, not to mention a number of prominent national organizations.

27. These international bodies study respective cross-sections of scientific and technical knowledge, with but little overlap. Although some are concerned with several purposes, none can be considered as covering the whole field of multiple-purpose river basin development, even in its scientific aspects, although their work may be of paramount importance in certain problems here considered.

28. The Panel wishes to reiterate that many technical and scientific aspects of river development still are lacking elaboration. Some elementary questions of how water moves through unsaturated soil, of how it is evaporated, and of how soil finds its way into small

watercourses are not fully answered. A selected list of scientific and technical problems involved in integrated water utilization will be found in annex IV.

29. The Panel does not recommend any organizational changes affecting research at this time. It believes that steps should be taken to stimulate the exchange of information as to methods and results. New international publications may be needed. The Panel emphasizes that the specialized agencies, and the United Nations Educational, Scientific and Cultural Organization in particular, should pay special attention to ways of stimulating the international flow of information on research methods and results through means that already are in operation or generally authorized.

30. An international conference of a general nature such as suggested in resolution 559 (XXI) of the Economic and Social Council does not have high priority at this time in the Panel's thinking. Conferences, no doubt, will in time be desirable, and the United Nations unit should advise on the calling of such conferences according to circumstances.

### Aiding Countries in Developing Their River Basins

31. The United Nations and its specialized agencies offer to their Member States more than an opportunity to exchange information. Technical assistance may be obtained under the Technical Assistance Programme of the United Nations, from the Food and Agriculture Organization, the United Nations Educational, Scientific and Cultural Organization, the World Health Organization and the World Meteorological Organization. Loans may be obtained from the International Bank for Reconstruction and Development.

32. Technical assistance from these various agencies now includes the following types:

Technical advice and assistance by experts and consultants in organizing and carrying out inspections, surveys, and programmes;

Training of individuals, by means of fellowships, training trips and on-the-job training;

Staffing of institutions, training centres and training seminars;

Dissemination of information;

Provision of equipment, apparatus and supplies for experimental laboratories, teaching centres and field surveys.

33. This activity, widespread as it is,<sup>3</sup> seems, in the Panel's opinion, to fall short of meeting existing and emerging needs in various respects.

First, although there exists a measure of co-ordination of a general nature, the operations of the various specialized agencies in the domain of integrated river basin development are far from integrated. This applies to the timing as well as the scope of the assistance given to various countries, and to over-all national programmes as well as to work in specific

river basins. In this respect, however, the Panel noted a few commendable examples of concerted action.

Second, there appears to be insufficient co-ordination of action in aiding adjacent countries in various regions. The Panel recognizes the difficulties arising out of limitations both in qualified personnel and in funds.

Third, it appears that the funds at the disposal of the United Nations and its agencies for carrying out this work are far short of needs.

Fourth, there is frequently a lack of necessary engineering and socio-economic studies, and the resulting gaps in the presentation of projects cause serious delays in their consideration by governments and may well limit the International Bank for Reconstruction and Development and other lending agencies in their operations.

34. If an office of the type suggested above were to be established within the United Nations, it probably could, given adequate staff, aid the Member States and the specialized agencies in eliminating the more glaring gaps in knowledge, in expanding technical assistance programmes wherever feasible and in correlating existing programmes and projects to a higher degree. Strong leadership in this field is not only needed in the widely ranging efforts of the United Nations and its specialized agencies but also within nations.

35. Every year of delay in exercising such leadership means increased dispersion of activities, increased resistance to correcting difficulties and unnecessary delays in much needed concerted study and action.

36. The Panel has not attempted to cover the problems of providing funds either for the strengthening of technical assistance or for carrying out river basin projects. The latter forms but a part of the much wider problem of general economic development.

37. The Panel, however, recognizes the financial implications of the need for strengthening certain as-

<sup>3</sup> *Official Records of the Economic and Social Council, Twenty-first Session, Annexes, agenda item 7, annex: "Technical Assistance Activities of the United Nations Organizations in the Field of Water Resources".*

pects of technical assistance by the United Nations and its specialized agencies to provide timely help to governments in planning and implementing river basin programmes.

38. Among the activities requiring special attention are hydrologic investigations, mapping, including aerial photography, soil surveys and soil fertility studies, research in the field of water quality improvement and studies of water requirements, sediment control and watershed treatment. Reconnaissance surveys of entire river basins by joint teams of the United Nations and its specialized agencies can also provide valuable help to countries contemplating river basin development projects. Such surveys would, of course, include problems of development of human resources.

39. Pilot schemes of various types undertaken in various parts of river basins with the help of the United Nations and the specialized agencies could provide valuable information and training facilities needed for the implementation of major projects. Likewise, training programmes should be continued and expanded, and wide dissemination of information on multi-purpose programmes envisaged.

40. Large amounts of money will be needed over a long period for implementing river basin programmes. Integrated river basin development is urgent in many countries because a growing population on limited land leads to the feeling that any sound irrigation project

must be undertaken. The urge to immediate action is strong in many depressed areas. Development of hydro-power also has high importance in view of the rapidly expanding demand for electrical energy.

41. The magnitude of the task ahead as broadly indicated in chapter 1 is large. If substantial progress towards this goal is to be achieved, methods of financing integrated river basin development in countries where capital resources are scarce must be further studied and developed.

42. Of primary importance in these studies are:

- (a) A realistic appraisal of physical possibilities;
- (b) An equally realistic appraisal of the economic, social and political consequences both of action and of failure to act;
- (c) Development of concrete proposals for action;
- (d) Provision of adequate funds to carry out worthwhile programmes.

43. The Panel feels that ill-advised or hasty action could be avoided if a financial programme were devised on an international scale under which adequate assistance for basic surveys and the development of feasible designs were made available to interested countries with the prospect that—where and to the extent necessary—loans also would be forthcoming for later construction work.

### **Laying the Groundwork for Reconciliation of Conflicting Interests over River Basins of an International Nature**

44. The vital character of current and impending disputes on international streams has been shown in chapter 4 where it is pointed out that lack of accepted international law on the uses of these streams presents a major obstacle in the settlement of differences, with the result that progress in development is often held up for years, to the detriment, not only of the countries concerned, but of the economy of the world in general. A number of organizations are now engaged in an effort to clarify and secure general adoption of principles of international law applicable to the development of international river basins. The Panel recommends that the United Nations lend its support and encouragement to this effort to formulate principles as a basis for agreements between countries in order to avoid controversies and settle disputes between them. It also has been demonstrated that the earlier there can be agreement upon basic data and upon general plans the greater the likelihood of reaching an understanding on schedules for regulation and use of the flowing waters. Typically, the most intense friction arises over disputed data or over specific projects which are put forward before there has been discussion of broader aims.

45. The Panel believes that the United Nations can play a constructive rôle by offering to any nations that are interested the services of an office or unit which would act to bring together the parties concerned, to resolve fundamental factual questions before disputes have reached the stage of acrimonious political debate. The steps which might be taken by such an office or unit are outlined in this chapter. Their importance is clear. They cannot be taken without the consent of the affected countries, but it would be a mistake to await the independent initiative of all such countries before beginning an exchange of views. If we wait until the problems clamour for settlement, the precious time for data collection and tentative programming will have been forfeited. United Nations leadership is required.

46. The large international<sup>4</sup> basins which still are largely undeveloped promise a great opportunity for such leadership to promote sound and harmonious programmes.

<sup>4</sup> See map, page 63.