Water Governance Benchmarking Criteria

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A. GOVERNANCE FUNCTIONS

1. **Organizing and building capacity in the water sector**
   - 1.1 Creating and modifying an organizational structure
   - 1.2 Assigning roles and responsibilities 1, 2, 3, 4, 5, 6
   - 1.3 Setting national water policy 7, 8
   - 1.4 Establishing linkages among sub-sectors, levels, and national sub-regions 9,10,11,12,13,14,15,16
   - 1.5 Establishing linkages with neighboring riparian countries 17, 18
   - 1.6 Building public and political awareness of water sector issues 19
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   - 1.8 Developing and utilizing well-trained water sector professionals 20, 21, 22, 23
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   - 2.1 Collecting, managing, storing and utilizing water-relevant data 24, 25, 26, 27, 28, 29, 30, 31
   - 2.2 Projecting future supply and demand for water 32
   - 2.3 Designing strategies for matching expected long-term water supply an demand and dealing with shortfalls (including drought mitigation strategies) 33, 34, 35, 36, 37, 38, 39, 40, 41, 42
   - 2.4 Developing planning and management tools to support decision making 43, 44, 45
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   - 3.1 Awarding and recording water rights and corollary responsibilities 46, 47, 48
   - 3.2 Establishing water and water rights transfer mechanisms
   - 3.3 Adjudicating disputes
   - 3.4 Assessing and managing third party impacts of water and water rights transactions
4. **Developing and managing water resources**
   - 4.1 Constructing public infrastructure and authorizing private infrastructure development 49, 50
   - 4.2 Forecasting seasonal supply and demand and matching the two
   - 4.3 Operating and maintaining public infrastructure according to established plans and strategic priorities 51
   - 4.4 Applying incentives and sanctions to achieve long and short term supply/demand matching (including water pricing) 52, 53
   - 4.5 Forecasting and managing floods and flood impacts
5. **Regulating water resources and services**
   - 5.1 Issuing and monitoring operating concessions to water service providers
   - 5.2 Enforcing withdrawal limits associated with water rights 54, 55, 56, 57, 58
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   - 5.4 Protecting aquatic ecosystems 63
   - 5.5 Monitoring and enforcing water service standards

B. GOVERNANCE PROCESS CHARACTERISTICS

1. **Transparency.** 64

2. **Participation.**

3. **Accountability and Integrity**.

4. **Rule of law.**

5. **Coherency and Integration.** 65

6. **Responsiveness.** 66, 67

C. CROSS CUTTING CATEGORIES

1. **Water Sources**
   - 1.1 Surface water
   - 1.2 Groundwater 68
   - 1.3 Derivative water (reclaimed, reused, desalinated) 69, 70

2. **Water Uses**
   - 2.1 Irrigation 71, 72, 73, 74, 75
   - 2.2 Municipal 76, 77, 78
   - 2.3 Industrial 79
   - 2.4 Environmental
   - 2.5 Hydropower
   - 2.6 Fisheries, navigation, recreation
   - 2.7 Other uses (including social, esthetic, and religious uses)

GROUND WATER MANAGEMENT POLICY 68

Background

Groundwater in the Hashemite Kingdom of Jordan occurs in a renewable and nonrenewable form in 12 distinct basins. The exploitation of groundwater in ancient times was done through the exploitation of springs where groundwater emerges to the ground surface, and through the artificial means of tapping the aquifers by drilling shafts. Archaeological remains in the Jordan Rift Valley indicate the sinking of such shafts at different angles. They date back to the Nabatean era (300 B.C - 106 A.C) and the Roman era thereafter. Jordanians continued to harness the benefits of the use of spring water for different purposes. In the Ottoman era (1516-1916), the use of water was regulated and water rights were kept by the district administration in an official register. Legislation for water acquisition and use in the Hashemite Kingdom started in 1938, and due consideration was taken of the prior water rights recognized by the previous Ottoman administration.

Modern technology to access groundwater aquifers was introduced to the Kingdom in the late fifties; legislation to regulate the exploitation of groundwater resources and to have it supervised by government was soon introduced. The country had its population doubled as it hosted the first wave of Palestinian refugees in 1948. It united with the West Bank in 1951 in one Hashemite Kingdom. Free movement of people, goods, and services was normal and added more to the population. The increase in population occurred in and around urban areas, which intensified the demand for urban water. Springs that had been the source of urban water could no more cope with the increased demand. Streams that emerged from them dried up with adverse environmental consequences. Tube wells were drilled to pump more water from the aquifers for urban supply purposes.

Demand also increased for food. Permits were also issued to interested developers to drill wells for agricultural development. The drilling and abstraction of groundwater were monitored and controlled until the outbreak of the 1967 war and its aftermath. Government control weakened, and many wells were drilled without permits. The relaxation of Government controls thereafter continued primarily because of the institutional instability and the shifting of institutional responsibilities.

Today, each of the 12 water basins has wells sunk in it and pumps installed in them capable of abstracting more water than the safe yield of each. The average annual abstraction from all basins exceeds the renewable average of recharge and currently stands at 159% of that average. The over pumping ratio ranges between 146% in minor aquifers to 235% in major ones. This situation could not be tolerated, and decisions were taken to treat the situation and WAJ assumed the responsibility of groundwater administration, management and development. The concerned directorate of NRA and that of the JVA were transferred to WAJ in 1984. Both WAJ and JVA came under the umbrella of a newly founded Ministry, the Ministry of Water and Irrigation, MWI in 1988.

Currently, MWI/WAJ is in charge of groundwater administration and management in addition to its responsibilities in providing municipal water supplies to all population centers in Jordan, and the collection and treatment of their wastewater. MWI/WAJ receives application for drilling licenses and abstraction permits, and issues such licenses and permits in accordance with the effective groundwater legislation. MWI/WAJ also supervises the drilling, the abstraction, and makes arrangements for the lease of land and use of groundwater for agricultural purposes in remote arid areas. Recently, MWI has stepped up the activities of groundwater resources studies on a national scale.

Conditions of Groundwater Aquifers

There are eleven renewable groundwater reservoirs in the country. Their sustainable yields vary from one reservoir to another, and their combined sustainable yield is 275 million cubic meters per year. The majority of the reservoirs are being utilized at rates exceeding their sustainable yields. The important ones are of particular concern because they are the most over utilized aquifers. The combined abstraction rate of all renewable reservoirs approaches 437 MCM per year, a rate equal to 159% of their sustainable yield. The over pumping ratio varies from 146% in minor aquifers to 235% in major ones.
The over pumping from one aquifer in the 1960's and 1970!s caused its loss due to high salinity ratios. It is feared that this unpleasant experience will be repeated in some other aquifers if they are not rescued through proper management.

There are extensive non-renewable reservoirs in the sandstone formation underlying almost the entire area of the country. The water quality of these reservoirs varies and is known to be fresh in the Disi-Mudawwara area. Qualities elsewhere have been sparsely investigated and preliminary findings indicate brackish water qualities. More work is needed to investigate these reservoirs.

The use of fresh fossil waters from the non-renewable reservoir in Disi-Mudawwara started in the early eighties for municipal and industrial purposes in the city of Aqaba. This was followed by the use of the same aquifer (Disi) for agricultural purposes. Future use of this aquifer is earmarked for municipal purposes for the city of Amman, and pumping for agricultural purposes is being reduced.

The Policy

Objective

The objective of this policy is to outline in more detail the statements contained in the document entitled: "Jordan's Water Strategy". The policy statements set out the Government's policy and intentions concerning groundwater management aiming at development of the resource, its protection, management and measures needed to bring the annual abstractions from the various renewable aquifers to the sustain-able rate of each.

On Resource Exploration 24

1. Plans and implementation measures for the exploration of ground-water resources shall be prepared and updated. Theoretical investigation and field operations in the form of drilling, sampling and logging shall be conducted continually.
2. Assessment and re-assessment of the sustainable yields of ground-water reservoirs shall be made in light of the accumulation of data and information 32
3. Monitoring of each reservoir shall be conducted through a network of observation wells. Such crucial data as the groundwater table, the draw down as a result of development, the physical, chemical and biological characteristics and their changes will be collected.
4. Implementation of groundwater exploration will be conducted by MWI/WAJ personnel as a priority. The service can be out-sourced when deemed necessary or required by any partnership with others in this activity.
5. Equipment, hardware and computer software needed for groundwater investigation and exploration shall be maintained by MWI/WAJ. Drilling services can be out-sourced when needed and so will be the maintenance of software packages. 1
6. Advanced methods and tools for investigation including landsat imagery shall be employed, and co-operation with other countries in this field will be promoted. 17, 43
7. A comprehensive program to assess the potential of brackish groundwaters shall be conducted. Brackish groundwaters will be used to augment water supply for domestic uses

through desalination in due time and specified localities. They also may be used for agricultural purposes where appropriate. 33, 69, 71, 76

8. Compilation of oil and gas drilling data as well as geophysical data shall be made to gain better understanding of the potential of the deep aquifers.

On Monitoring 25

9. A network of observation wells shall be installed in each of the groundwater reservoirs or parts thereof for the purpose of monitoring the conditions and performance of the reservoirs in response to development and abstraction.
10. A groundwater reservoir can be divided into sub-units for the purposes of monitoring and control of abstraction
11. Advanced technology shall be employed in the monitoring processes including the installation of water meters, remote control devices, telemetry, automation and field central controls.
12. Data collected in the monitoring process shall be formatted for storage in and retrieval from computer files. Hard copies and computer back up copies shall be maintained at all times.
13. Analysis and interpretation of data shall be made by a specialized group of professionals and their aides, and results published in special reports by MWI/WAJ. 20, 64
14. Logistics for the field teams shall be secured, and their working conditions improved to the best affordable levels.
15. MWI/WAJ shall evaluate, update and redesign the groundwater-monitoring plan to cover all aquifers with emphasis on the overex-ploited and polluted aquifers. 2
16. A special monitoring network of industries and olive presses will be adopted and installed for those with potential pollution to groundwater.

On Resource Protection, Sustainability, and Quality Control

17. Recharge areas of aquifers shall be protected to the maximum extent possible. Conflicts arising out of urbanization shall be addressed, and mitigation measures specified for the urban planners to have them included in the urban planning process. 9, 59
18. Recharge areas shall be protected against pollution caused by whatever means including solid and liquid waste disposal, mining, land fills, brine disposal, agricultural inputs and the like. 10, 60
19. Drilling of wells and abstraction of groundwater from them shall be prohibited without a drilling license and an abstraction permit issued by WAJ. 46, 54
20. Withdrawal from wells shall not exceed the abstraction permit rate under penalty of substantial fines and / or revoking the abstraction permit and the closure of the well. Over-abstraction from aquifers shall be reduced to sustainable levels in accordance with a time-phased plan. 55
21. The laboratories of the Water Authority of Jordan shall be equipped with the latest technologies and equipment to match the requirements of good quality controls and assurance. Monitoring of groundwater qualities shall be made, hazards identified and mitigation measures specified and implemented. 26, 44
22. Withdrawal from non-renewable fossil aquifers shall be made carefully and after elaborate studies and investigations. A lifetime will be assigned for each of these aquifers and an abstraction rate specified accordingly. 34
23. The MWI will co-operate with planning and environmental authorities to have polluting industries and solid waste dumps located outside the protection zones of aquifers. 3, 11, 61

24. The MWI shall co-operate with the Ministry of Agriculture and its arm of extension service to regulate the type and application rate of fertilizers, pesticides, and sludge used within the area of aquifer recharge.

25. MWI/WAJ in liaison with other authorities will seek to restrict storage of chemicals, waste materials and sewage treatment works within the inner circle protection zone. 4, 12, 62

On Resource Development 49

26. Development of groundwater reservoirs shall be commenced only after careful studies are made of the potential of each, and observation wells installed in carefully chosen locations to monitor the reservoir during exploitation. Wellfields shall be distributed with a proper distance between wells to minimize sudden drawdown of water levels. 27

27. Development of deep groundwater aquifers shall be carefully made. Abstraction from them shall be gradual with periodic assessment of quality and quantity. 35

28. Potentials of reservoirs shall be based on the natural rate of recharge. These can be augmented through means of artificial recharge induced through proper designs. 45

29. Natural rainwater and treated effluent of wastewater are considered primary sources for artificial recharge. Monitoring of recharge facilities and their maintenance shall be made periodically. 51

30. Development of groundwater reservoirs shall not be allowed without a license issued by MWI/WAJ. Private developers and public entities shall all be required to apply for any development they intend to undertake.%25 47

31. Inflow into and outflow from each groundwater reservoir shall be determined as accurately as possible before any permit is issued for the development of that reservoir. 28

32. Artificial underground storage, especially in the alluvial fans of the Jordan Valley shall be investigated. 36

33. Groundwater mathematical models shall be developed or updated for all regional aquifers of the basins to predict their yield under various pumping scenarios. 29

34. New nonrenewable groundwater sources shall be allocated to municipal and industrial uses as a first priority. 7

35. MWI/WAJ shall encourage the use of groundwater conjunctively with surface water in places where such joint management has the potential for increasing the benefits of water use.

36. MWI/WAJ shall encourage the use of marginal groundwater quality for agricultural uses especially when such use may relieve pumping from fresh groundwater aquifers. 5, 37

On Priority of Allocation 8, 48

37. Priority of allocation of groundwater shall be given to municipal and industrial uses, to educational institutes and to tourism. These purposes are deemed to have the higher returns in economic and social terms . 77, 79

38. Priority shall also be given to the sustainablility of existing irrigated agriculture where high capital investment had been made. In particular, trees irrigated from groundwater shall continue to receive an amount sufficient for their sustainability with the use of advanced irrigation methods. 72

39. Expropriation of use rights arising from legal use of groundwater, or of water rights established on springs rising from groundwater reservoirs shall not be made without clear higher priority need, and against fair compensation.

40. Priority shall be given to the use in irrigated agriculture of the reservoirs whose water quality does not qualify them for use in municipal and industrial purposes. 38, 73

41. Priority for use in agriculture shall also be given to the cases where supplementary irrigation from the groundwater reservoir is possible. 74

42. A contingency plan shall be made and updated for the purpose of allocating the water from privately operated wells for use in the municipal networks. 78

On Regulation and Control

43. Campaigns shall be waged against illegal drilling of tube wells, and wells thus drilled shall be stopped, rigs confiscated and legal action taken against violators. 56

44. Comprehensive groundwater basin management plan for each aquifer shall be developed as part of the National Water Master Plan. 39

45. Water meters installed on groundwater wells shall be read on quarterly basis to make sure that abstraction from the wells do not exceed their allocations, specified in the permits. 57

46. Prohibition of well licensing for agricultural purposes will be sustained. Only high priority purposes shall be entertained for licensing. 52

47. Fees and charges will be used as an instrument to control ground-water over-pumping. 53, 58

On Legislation and Institutional Arrangements

48. Legislation and institutional arrangements for the development and management of groundwater resources shall be reviewed from time to time. Shortcomings shall be addressed and institutional arrangements shall be updated, adjusted or restructured. 66

49. Effective laws shall be reviewed from time to time with the intention of updating their provisions to match the requirements of changing times. By-laws issued under the applicable laws shall also be updated to serve the purpose of performance efficiency. Institutional set-up shall be reviewed in parallel, updated, adjusted or restructured to improve performance. 67

50. Close co-operation will be maintained with the other organizations whose activities may directly impact the performance in the water sector. 13, 65

On Research, Development and Technology Transfer

51. A study and research activity shall be entrusted with a specialized unit within MWI. The unit will be entrusted with technology transfer responsibilities. 6

52. Due emphasis will be made on the efforts targeting human resources development. 21

53. Training centers will be reinforced and upgraded. Cooperation with outside centers and agencies will be promoted. 22

54. International and regional cooperation shall be pursued in the fields of research, development and technology transfer in ground-water exploration, management, quality control, and economics shall be promoted. Exchange of information and experience shall be maintained with regional and international parties. 14

On Shared Groundwater Resources 18

55. Legal research shall be made on the sharing of groundwater aquifers and their protection. 30

56. Efforts shall be made and sustained to establish Jordan's rights in shared groundwater resources through international agreements.

57. Regional data exchange on shared groundwater resources shall be encouraged.

58. Cooperation with neighboring countries for the optimal and sus-tainable use and management of the shared groundwater resources, shall be sought.

59. Special attention will be paid to the monitoring, assessment and development of shared groundwater resources. 31, 40

On Public Awareness 19

60. Workshops and seminars for well owners will be organized to promote groundwater conservation and raise efficiency of groundwater use.

61. Training programs for Ministry staff shall be conducted to build capacity for public awareness campaigns related to groundwater use and protection. 23

62. MWI/WAJ in cooperation with other concerned agencies shall maintain a program to educate farmers on the importance of groundwater protection and shall promote technology transfer related to groundwater use in irrigation. 15

63. Cooperation with other concerned agencies shall be maintained to encourage the reuse of groundwater in beneficial purposes. 16, 41

On Private Sector Participation 42, 50

64. The role of the private sector in the development of fresh ground-water resources shall be reduced where reduction of abstraction is sought. The private sector shall be encouraged to co-operate in the rehabilitation of aquifers where needed.

65. The Private sector shall be encouraged to develop aquifers of marginal water quality for use in irrigation. It shall also be encouraged to develop fossil and renewable aquifers in remote areas for agricultural uses with the intention of promoting technology transfer and the creation of job opportunities. 75

66. Desalination of brackish groundwater by the private sector shall be promoted. Care shall be given to the environmental impacts of such activities, particularly the safe disposal of brines. 63, 70