

MINISTRY OF WATER AND IRRIGATION
Water Resource Policy Support
Groundwater Management Component

LEGAL ASSESSMENT OF THE GROUNDWATER
MANAGEMENT RECOMMENDATIONS
IN THE AMMAN-ZARQA BASIN HIGHLANDS

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EXECUTIVE SUMMARY

This report assesses the legal coverage of the the recommendations of the ARD report *Study of Water Use and Users in the Northeastern Amman-Zarqa Basin* (Jan. 2001) concerning groundwater management in the Amman-Zarqa Basin (AZB) to reduce over abstraction. This assessment is based on the following laws and regulations:

- Water Authority Law No. 18 of 1988;
- Agriculture Law No. 20 of 1973 and its amendments of 1985 and 1986;
- Groundwater Monitoring Regulation No. 26 of 1977; and
- Proposed New Regulations for Groundwater Monitoring.

The assessment was done by taking each recommendation and its options and determining the article(s) in the law(s) or regulation(s) that apply, either directly or indirectly, with respect to the ones that are not legally covered.

RESULTS

The directly covered recommendations consist of:

- Promoting well buyouts (Water Authority of Jordan [WAJ] Law);
- Limiting abstraction and/or cropped area (WAJ Law and proposed Bylaw) to achieve reductions;
- Curtailing illegal drilling and illegal water sales (WAJ Law and suggested Bylaw);
- Mandating of crop pattern (Agriculture Law);
- Managing an AZB-shared groundwater system (WAJ Law); and
- Monitoring abstraction and implementation of groundwater management option (WAJ Law, existing Bylaw, and proposed Bylaw).

The indirectly covered recommendations are as follows:

- Creating an Irrigation Advisory Service;
- Reducing municipal and industrial (M&I) pumping; and
- Supporting management at the basin level.

Recommendations not covered and need decisions to be taken by the WAJ Council or by the Ministry of Water and Irrigation (WAJ Authority) consist of:

- Modifying marketing practices;
- Creating an AZB Groundwater Management Fund;
- Forming a Groundwater Management Committee; and
- Exchanging groundwater with recycled water.

Current laws and regulations need to be amended to explicitly cover existing gaps such as:

- Irrigation Advisory Service IAS
- Exchange of Groundwater use with treated Wastewater.

- The role of private sector in water management.
- The incentives for compliance with law and regulations.

The legal assessment has also shown that there are overlaps of responsibility between the Ministry of Water and Irrigation and the Ministry of Agriculture in implementation of some the recommendations such as Irrigation Advisory Service (IAS), Abstraction Limit, and Exchange of Groundwater with Recycled Wastewater for irrigation purpose. Therefore, a decentralised management is recommended to avoid overlaps and promote integrated management efforts with contributions of relevant stakeholders, using the basin as a management unit.

Table 1, below, summarizes the different recommendations, the assessment of their legal coverage, and the institutional responsibility for their implementation.

1. LEGAL ASSESSMENT OF GROUNDWATER MANAGEMENT RECOMMENDATIONS FOR THE AMMAN-ZARQA BASIN

The *Study of Water Use and Users in the Northeastern Amman-Zarqa Basin* (ARD, Jan. 2001) includes recommendations for management of groundwater. This report is a legal assessment of those recommendations, which consist of the following:

- Options for reducing groundwater use;
 - Irrigation Advisory Service (IAS);
 - Buyout of wells;
 - Limiting abstraction and/or limiting cropped area;
 - Exchange of groundwater with recycled water; and
 - Reduced pumping for municipal and industrial (M&I);
- Curtailing illegal drilling and illegal water sale;
- Mandating cropping patterns and modifying marketing practices;
- Managing the shared Amman-Zarqa Basin (AZB) groundwater system;
- Creation of an AZB Groundwater Management Fund;
- Formation of a Groundwater Management Committee; and
- Support for monitoring groundwater abstractions and implementation of management options.

The legal assessment is based on the following laws and regulations:

- Water Authority Law No. (18) of 1988;
- Agriculture Law No. (20) of 1973 and its amendments of 1985 and 1986;
- Groundwater Monitoring Regulation No. (26) of 1977, based on the 1968 law that organizes natural resources affairs; and
- The Proposed New Regulations for Groundwater Monitoring that, once adopted, will replace the referenced Regulation No. (26).

2. GROUNDWATER USE REDUCTION OPTIONS

2.1 Irrigation Advisory Service

This option is not directly covered by the existing law and current/proposed regulations. However, since an IAS is intended to reduce irrigation water consumption and enhance water conservation, the following articles in the laws and regulations would apply to the IAS:

Applicable Legislation

1. Water Authority Law No. (18) of 1988:

- **Article (6):**

To achieve all the objectives intended by this Law, the Authority shall exercise the following responsibilities and tasks:

- One) Survey the different water resources; conserve them; and determine ways, means, and priorities for their implementation and use.
 - h) Regulate the uses of water, prevent its waste, and conserve its consumption.

2. New Proposed Regulations for the Monitoring of Groundwater:

- **Article (7):**

The drilling of public and private wells shall be supervised, the use of groundwater and the quantities abstracted shall be limited and monitored, and the consumption of groundwater shall be conserved on the basis of regulatory resolutions issued by the Council, based on the Minister's recommendation.

Article (7) above aims at rationalizing water uses in irrigation. From it we conclude that monitoring groundwater use is one of the duties and responsibilities of the Ministry of Water/Water Authority. As such, monitoring groundwater use has indirect legal coverage as discussed in the aforementioned articles of the laws and regulations.

Responsibility of Implementation

In addition to the Ministry of Water and Irrigation, the Ministry of Agriculture has some responsibility. Article (3) of the Agriculture Law No. (20) of 1973 and its amendments refer to the authority of the Minister of Agriculture as follows:

- **Article (3):**

The Minister is empowered with the following authority:

Item (G): The specification of crop-farming methods, ratios of sowing seeds, types and ratios of fertilizers, and other agricultural services of irrigation and fertilization.

2.2 Well Buyouts

This option is viewed as a measure to reduce over-pumping of the AZB groundwater basin owing to excessive abstraction for agriculture. The field survey determined that a number of

farmers are willing to sell their wells because farming is not profitable and their debts are accumulating. This in part is a result of low prices and problems with marketing crops, especially vegetables.

Applicable Legislation

As a measure meant for the public benefit, well buyouts from farmers have legal support. The Regulations for Groundwater Monitoring No. (26) of 1977 do not have an explicit text covering this option. However, it is covered in Articles 23 and 18 of the 1988 Water Authority Law No.18 and the proposed new groundwater monitoring regulation, respectively.

1. Water Authority Law No. (18) of 1988:

Article (23):

One) With regard to the contents of paragraph (b) of this Article, all duties, responsibilities, and obligations related to water and public sewerage, which were previously the responsibility of any government department, corporation, or any public commission or municipality, shall be transferred to the Authority. To fulfill these duties and obligations, the Authority shall be responsible for the following:

3) Purchase, acquire, or lease properties, land, and the related easement rights and the water rights required for the various projects of the Authority; and Provide a prohibited area as deemed necessary for its water and sewerage networks and the related buildings and construction.

3. The Proposed New Regulations for Groundwater Monitoring:

Article (18):

The Authority has the right to appropriate, rent, or immediately acquire any private well for the public benefit and to appropriate a suitable right-of-way and passage for the wells it is using in accordance with the provisions of applicable laws.

Responsibility of Implementation

The Ministry of Water and Irrigation/Water Authority is responsible for implementation.

2.3 Reduction by Limiting Abstraction and/or Cropped Areas

The field survey determined that the majority of farmers accept the need to limit cropped areas and to reduce abstraction to conserve the groundwater. This groundwater management option is to identify ways to reduce the volume of water pumped and to maintain a minimum irrigated area that is economically feasible. This option is covered in Articles 6 of the 1988 Water Authority Law No.18 and Articles 17 and 40 of the proposed new groundwater monitoring regulation.

Applicable Legislation

1. Water Authority Law No. (18) of 1988:

This Law addresses the limiting of groundwater abstraction and/or cropped areas. In addition to conservation, it opens the way for reallocation and prioritizing water use.

- **Article (6):**

To achieve all the objectives intended by this Law, the Authority shall exercise the following responsibilities and tasks:

- One) Survey the different water resources; conserve them; and determine ways, means, and priorities for their implementation and use.
 - h) Regulate the uses of water, prevent its waste, and conserve its consumption.

2. Proposed New Regulations for Groundwater Monitoring:

Since limiting groundwater abstraction and/or cropped areas irrigated by groundwater is not directly addressed in the Groundwater Monitoring Regulation No. (26) of 1977, text is introduced in Article (40) of the Proposed New Regulations for Groundwater Monitoring to enable better management. Among conditions for operating a new well, item No. (3) allows limiting irrigated areas.

- **Article (40):**

The owner of any well that has been licensed, drilled and tested in accordance with these Regulations must get, before using the well, an abstraction license issued by the Minister after the prior approval of the Water Authority Council. Such a license shall provide for the conditions that should be observed by the licensee. Such conditions shall specifically include, but not be limited to, the following:

Item (3): The limitation of the maximal area allowed to be irrigated from the licensed well for agricultural purposes.

In addition to the above, Article (17) of the Proposed New Regulations for Groundwater Monitoring give authority to the Minister of Water and Irrigation to specify the annual volume of water available from a well and to request the Minister of Agriculture to specify the area that can be planted.

- **Article (17):**

The Minister, in order to regulate abstraction from each groundwater basin within the safe yield, has the right to take all regulatory and field measures, to ask the Ministry of Agriculture to work out a crop pattern that is suitable to the specified quantities to be abstracted annually from each well, and to specify the area that can be planted.

Responsibility of Implementation

The Ministry of Water and Irrigation/Water Authority, in collaboration with the Ministry of Agriculture, is responsible for implementation.

2.4 Exchange Groundwater with Recycled Water

This option suggests using recycled water to reduce the use of fresh groundwater. It is not covered by WAJ and MOA Laws and regulations, but mentioned in the 1998 wastewater policy document.

Wastewater Management Policy Document of 1998:

This document has a chapter dealing with the use and specifications of recycled water. It considers recycled water as an integral part of the Kingdom's water balance and states that recycled water should be considered a water resource. As a resource its use is to be planned within adopted specifications. Priority is to be given to its careful use for irrigation purposes. The following is some of the content of the Document:

On Resource Development and Management

1. Wastewater is a perennial water source and shall form an integral part of renewable resources and the national water budget.
5. Treatment of wastewater shall be targeted toward producing an effluent fit for reuse in irrigation in accordance with World Health Organization and Food and Agriculture Organization guidelines as a minimum. Reuse of treated wastewater for other purposes shall be subject to appropriate specifications.
9. A basin management approach shall be adopted where possible. The use of treated wastewater in irrigation shall be given the highest priority and shall be pursued with care.

On Legislation and Institutional Arrangement

49. Legislation and institutional arrangements for the development and management of wastewater shall be periodically reviewed. Gaps shall be filled, and updating of the institutional arrangements with parallel legislation shall be made periodically to cope with varying circumstances.
50. The role of the government shall be fine-tuned, and its involvement reduced with time to be regulatory and supervisory. Involvement of the stakeholders in wastewater management and support shall be introduced and expanded.

Responsibility of Implementation

The Ministry of Water and Irrigation\Water Authority and the Ministry of Agriculture.

2.5 Municipal and Industrial Pumping Reduction

Applicable Legislation

There is no provision in the Water Authority Law No. (18) of 1988 or Groundwater Monitoring Regulation No. (26) of 1977. However, there is an indirect provision in Article 23 of the proposed new groundwater regulation, which refers to the reduction of over-pumping to restore the natural balance of the groundwater basin.

Proposed New Regulations for Groundwater Monitoring

· ***Article (23):***

The Authority has the right to declare certain zones as over-pumped or polluted and to take measures that can stop such over-pumping or pollution. These measures include the rationalization or reduction of abstraction so that the over-pumping or pollution can be stopped and the natural balance of groundwater basin can be restored.

Responsibility of Implementation

The Ministry of Water/Water Authority is responsible for implementation.

3. ILLEGAL DRILLING AND ILLEGAL WATER SALE

3.1 Illegal Drilling

Applicable Legislation

1. Water Authority Law No. (18) of 1988:

There is a direct provision in Article (30-a), item (4) that reads as follows:

- **Article (30):**
 - a) Anyone may be sentenced to not less than six months and not more than two years imprisonment or may be fined not less than JD1,000 and not more than JD5,000, or both, if he has committed any of the following deeds:
 - 4. Drilled unlicensed groundwater wells or violated the conditions of the license issued to him.
- *Paragraph (d)* of the same article defines the penalty for violating drilling unlicensed wells or violating the conditions of the license for water abstraction. The penalty, as stated in paragraph (d), will apply, based on a court decision about the violation:
 - d) If any person is found guilty of committing any of the deeds defined in paragraphs (a) and (b) of this Article, the Court shall convict him and make him pay the total of the damages caused by his violation and compel him to eliminate the damage caused and restore the conditions as they existed before committing such deeds within the period specified by the Court. If he fails to do so, the Authority shall have the right to carry out the necessary works and repairs and charge the convicted person with the total cost plus 50 percent.

2. Groundwater Monitoring Regulation No. (26) of 1977

This Regulation does not deal directly with this problem. Instead, it establishes the necessity for procuring a drilling license. This indicates that unlicensed drilling is deemed as a violation of the Law.

Article (10) of the Groundwater Monitoring Regulation No. (26) of 1977 reads as follows:

- **Article (10):**

No person may start or resume drilling a well with the purpose of abstracting groundwater from it, introduce any change to a drilled well, or install a mechanical pumping device that may increase the quantity of groundwater pumped from that well without first obtaining a license from the Vice President (currently the Minister).

3. Proposed New Regulations for Groundwater Monitoring

- **Article (8):**
No person may start drilling a well for abstracting groundwater from it or introduce a change to the specifications of an existing well or drill a substitute well without first obtaining a license pursuant to the provisions of these Regulations.
- **Article (25):**
The Minister, on the basis of a recommendation by the Secretary General of the Water Authority, shall have the right to:
Item (3): Take all measures necessary to backfill any well that is unlicensed or that violates the provisions of these Regulations and to charge the violator with the costs thereof in addition to the penalties stated in the Law.

Responsibility of Implementation

The Ministry of Water and Irrigation/ Water Authority is responsible for implementation.

3.2 Illegal Water Sale

Neither the Water Authority Law No. (18) of 1988 nor the Groundwater Monitoring Regulation No. (26) of 1977 deal with illegal water sales.

1. Proposed New Regulations for Groundwater Monitoring

This Regulation deals with illegal water sales through the following provisions:

- **Article (13):**
No owner of any private well may irrigate or sell water for irrigating any land other than the land specified in the drilling license.
- **Article (14):**
No owner of any private well shall have the right to sell abstracted water unless he has obtained the approval of the Authority or any other competent party, together with meeting stipulated conditions. Tariff and prices of abstracted water shall be collected, and the portion of such prices that are payable to the Authority shall be determined based on a resolution taken by the Council of Ministers, based on a recommendation by the Water Authority Council.

Responsibility of Implementation

The Ministry of Water/Water Authority is responsible for implementation.

4. CROPPING PATTERN AND AGRICULTURE MARKETING

4.1 Cropping Pattern

Applicable Legislation

Authority to control the cropping pattern is not covered in the Water Authority Law No. (18) of 1988 or in the Groundwater Monitoring Regulation No. (26) of 1977.

1. Agricultural Law No. (20) of 1973

This Law and its amendments in Law No. (5) and No. (6) of 1986 delegates the authority of cropping patterns to the Minister of Agriculture as indicated the following article.

· **Article (3):**

1. The Minister of Agriculture is empowered with the following authority:

To determine some areas for farming certain crops, with the exception of the Ministry's farms and other fields allocated for agricultural experiments or the first-seed proliferations;

- To hold agricultural cycle at the level of the same village or at a different level;
- To define a successive system for crop plantations;
- To define the percentage of each crop allowed to be planted with respect to the total land area of the farmer or to the total land area of the village;
- To determine the dates for planting crops, harvest times, and settling violations;
- To define crop plantation methods, ratios of sowing seeds, fertilizers, servicing, irrigation, and fertilization.

2. The Minister shall specify the percentage of crops to be planted with respect to the total land area of the farmer or to the total land area of the village. He also shall have the right to exclude some parties and lands from such percentages from time to time for technical, economic, or supply considerations pursuant to relevant studies.

3. Anyone who violates the provisions of items (a, b, c, d, and e) of paragraph (1) of this article, the provisions of paragraph (2) thereof, and the resolutions issued by virtue thereof shall be liable to a penalty of not less than JD 25 and not exceeding JD 50 for each donum.

Responsibility of Implementation

The Ministry of Water and Irrigation is responsible for controlling groundwater use, minimizing waste, and rationalizing its use. When it is necessary to limit cropping patterns, the Ministry of Water and Irrigation asks the Ministry of Agriculture to take measures to establish a cropping pattern in accordance with the water quantity licensed to be abstracted from each well, and it asks well owners to abide by this pattern. The Proposed New Regulations for Groundwater Monitoring address the gap of Water Authority Law No. (18) of 1988 and Regulation No. (26) of 1973. Article (17) of the Proposed New Regulations reads as follows:

· *Article (17):*

The Minister of Water and Irrigation has the right, with the purpose of organizing abstraction from each groundwater basin within the safe yield, to ask the Ministry of Agriculture to work out a crop pattern that is suitable to the water quantities annually abstracted from each well and to specify the area that can be planted.

4.2 Agriculture Marketing

Applicable Legislation

There is no legislative directive dealing with the sale of agricultural products irrigated by groundwater. Market factors determine conditions suitable for marketing produce. The marketing process is left to the private sector.

Responsibility of Implementation

The private sector is responsible for implementation.

5. MANAGEMENT OF AZB-SHARED GROUNDWATER SYSTEM

A significant part of the groundwater recharge area for the AZB is on the Syrian side of the Basin. The current increase in agricultural activity on the Syrian side will affect both the quantity and quality of groundwater in the future. This matter requires transboundary organization of groundwater use in the basin.

Applicable Legislation

1. Water Authority Law No. (18) of 1988

Article 10, item (a) provides for the following:

· **Article (10):**

The Board of Water Authority shall undertake the following duties and responsibilities:

One) Set forth a water policy that reserves the rights of the Kingdom in all its water resources, including the development, maintenance, and use of the resources.

The Groundwater Management Policy Document issued by the Ministry of Water in 1998 dealt with the issue of shared water. Under the item “On Shared Water Resources,” the Document provides for the following:

28. The right full shares of the Kingdom shall be defined and protected through bilateral and multilateral contacts, negotiations, and agreement.
29. Due respect will be given to the provisions of international law as applicable to water sharing, protection, and conservation and those applicable to territorial water.
30. Bilateral and multilateral cooperation with neighboring states shall be pursued, and regional cooperation shall be advocated, preferably within the provisions of a regional water charter.

Responsibility of Implementation

The Ministry of Water and Irrigation is responsible for implementation.

6. CREATION OF AN AZB GROUNDWATER MANAGEMENT FUND

Authority for administrative, organizational, and financial measures to manage groundwater are defined by the Water Authority Law. A resolution is required from the Council of Ministers to define management actions, such as the Groundwater Management Fund. The resolution is based on recommendations from the Water Authority Council as stated in Article (10) of the Water Authority Law No. (18) of 1988, paragraph (F).

Applicable Legislation

1. Water Authority Law No. (18) of 1988:

- ***Article (10), paragraph (F):***

The Water Authority Council shall undertake the following duties and responsibilities:
Recommend to the Cabinet of Ministers tariffs for connections, subscription, price rates, and deposit fees that should be collected for various water and public sewerage uses.

The Groundwater Management Policy Document of 1998, as well, pointed out in item (47) that tariff and fees will be used as a mean for controlling the overpumping of groundwater.

Responsibility of Implementation

The Ministry of Water and Irrigation and Water Authority are responsible for implementation.

7. FORMATION OF A GROUNDWATER MANAGEMENT COMMITTEE

Formation of a Groundwater Management Committee requires an administrative and organizational decision aimed at attaining the goals mentioned in the Groundwater Monitoring Regulations; the most important of which is to control abstraction from the groundwater basin. Consequently, the text stated in Article (28) of the Groundwater Monitoring Regulation No. (26) of 1977 or Article (53) of the Proposed New Regulations for Groundwater Monitoring would apply. It provides for the following: “The Minister has the right to issue the practical or regulational instructions and measures necessary to apply the provisions of these Regulations.”

Applicable Legislation

The Groundwater Management Policy Document of 1998 in item (64) provides for the following, when talking about the role of the private sector:

- 64) *The role of the private sector in the development of fresh groundwater resources shall be reduced when reduction of abstraction is sought. The private sector shall be encouraged to cooperate in the rehabilitation of aquifers where needed.*

The main duties of a Groundwater Management Committee would be to rehabilitate aquifers in the AZB through measures that restore the natural balance of the aquifers in the Basin. Thus, the formation of a joint committee from the public and private sectors comes under the concept of cooperation for the rehabilitation of aquifers and under the policies proposed in the referenced Document.

Responsibility of Implementation

The Ministry of Water and Irrigation/ Water Authority is responsible for implementation.

8. MONITORING OF ABSTRACTION AND IMPLEMENTATION OF GROUNDWATER MANAGEMENT OPTIONS

The Water Authority Law No. (18) of 1988, the Groundwater Monitoring Regulation No. (26) of 1977, and the Proposed New Regulations for Groundwater Monitoring all contain articles that address this subject.

Applicable Legislation

1. Water Authority Law No. (18) of 1988:

· **Article (6):**

To achieve all the objectives intended by this Law, the Authority shall exercise the following responsibilities and tasks:

- One) Survey the different water resources; conserve them; and determine ways, means, and priorities for their implementation and use.
- Two) Develop the potential water resources in the Kingdom, increase their capacity, improve their quality, protect them from pollution, supervise them, administer their affairs, and put forth programs and plans to meet future water needs by providing additional water resources from inside or outside the Kingdom and through the use of water treatment and desalination.
- c) Regulate and advise on the construction of public and private wells; investigate groundwater resources; drill exploratory, reconnaissance, and production wells; and license well drilling rigs and drillers.

2. Groundwater Monitoring Regulation No. (26) of 1977

· **Article (3):**

The Vice President¹ has the full authority and ability to verify and explore groundwater resources in the Kingdom; monitor, quantify, and exploit such resources; issue instructions; and take measures that will help achieve these goals in accordance with such regulations.

· **Article (19):**

All required data and conditions shall be specified in the abstraction license, including the following:

- Size of the automatic meter that measures the rates and duration of water flow and abstraction. It is installed at the expense of the license applicant.

· **Article (20):**

The meter reading, mentioned in paragraph d) of Article (19) of this regulation, is a Proof of the quantity of groundwater abstracted. The meter will be sealed by the Water Authority.

¹ Vice President of the Natural Resources Authority. This power has been inherited since 1983 by the President of WAJ.

3. Proposed New Regulations for Groundwater Monitoring

- **Article (4):**
The Ministry undertakes, pursuant to the adopted plans and programs, full authority and powers to check and explore groundwater resources in the Kingdom; to monitor, quantify, and exploit such resources; to issue instructions; and to undertake measures that would help achieve such goals in accordance with the provisions of these Regulations.
- **Article (7):**
The drilling of public and private wells shall be supervised, and the uses of groundwater and the quantities abstracted shall be limited and monitored. Their consumption should be conserved based on regulatory resolutions issued by the Council, based on a recommendation by the Minister.
- **Article (11):**
No person who has been granted a working license (drilling) and who has completed drilling a well, tested it, and checked its productivity may abstract any quantity of groundwater unless, after obtaining an annual abstraction license in accordance with these Regulations, he specifies the quantity he is licensed to abstract annually in cubic meters and the area he can plant. He must fix a meter on his own account to measure the quantities abstracted.
- **Article (16):**
The Authority Council, on the basis of a recommendation made by the Secretary, shall specify the minimal and maximal amount of water allowed to be pumped annually within the safe yield of each groundwater basin. The Council of Ministers, too, following a recommendation by the Council of Water Authority, shall issue a decision in which it defines the tariff and prices of abstracted water for all uses.
- **Article (40):**
The owner of any well that has been licensed, drilled, and tested in accordance with these Regulations must get, before using the well, an abstraction license issued by the Minister after the prior approval of the Council. Such a license shall provide for the conditions that the licensee should observe. Such conditions shall specifically include, but not be limited to, the following:
 - Deciding the maximal quantity of water authorized to be abstracted from the well in any given period of time;
 - Deciding the purpose of the water use; and
 - Deciding the area that can be irrigated from the water of the licensed well for agriculture purposes.

The well owner shall undertake to install, at his own expense, a water meter before starting abstraction. Such a meter is to be approved and sealed by the Authority. The meter is considered, inter alia, a means of knowing and monitoring abstraction volume.

From the foregoing, we conclude that most options to regulate and monitor abstraction have a legal basis either directly or indirectly in the current or proposed laws and regulations.

CONCLUSION AND RECOMMENDATIONS

The legal assessment of the groundwater management recommendations revealed that the following proposed actions are directly covered by existing laws and regulations:

- Well buyouts (Water Authority of Jordan (WAJ Law);
- Limiting abstraction and/or cropped area (WAJ Law and proposed Bylaw) to achieve reductions;
- Curtailing illegal drilling and illegal water sales (WAJ Law and suggested Bylaw);
- Mandating of crop pattern (Agriculture Law);
- Managing an AZB-shared groundwater system (WAJ Law); and
- Monitoring abstraction and implementation of groundwater management option (WAJ Law, existing Bylaw, and proposed Bylaw).

On the other hand, the proposed actions shown below, are only indirectly covered:

- Creating an Irrigation Advisory Service;
- Reducing municipal and industrial (M&I) pumping; and
- Supporting management at the basin level.

Whereas the following recommendations are not covered:

- Modifying marketing practices;
- Creating an AZB Groundwater Management Fund;
- Forming a Groundwater Management Committee; and
- Exchanging groundwater with recycled water.

Current laws and regulations need to be amended to explicitly cover existing gaps such as:

- Irrigation Advisory Service IAS
- Exchange of Groundwater use with treated Wastewater.
- The role of private sector in water management.
- The incentives for compliance with law and regulations.

The legal assessment has also shown that there are overlaps of responsibility between the Ministry of Water and Irrigation and the Ministry of Agriculture in implementation of some the recommendations such as Irrigation Advisory Service (IAS), Abstraction Limit, and Exchange of Groundwater with Recycled Wastewater for irrigation purpose. Therefore, a decentralised management is recommended to avoid overlaps and promote integrated management efforts with contributions of relevant stakeholders, using the basin as a management unit.

Table 1, below, summarizes the different recommendations, the applicable legislation used in the legal assessment of the recommendations, and the institution responsible for implementing the recommendations.

Responsibility of Implementation

The Ministry of Water and Irrigation is responsible for implementation.

TABLE I: SUMMARY OF LEGAL ASSESSMENT OF THE GROUNDWATER MANAGEMENT RECOMMENDATION

| Recommendation | Legal Aspect | Institutional Responsibility |
|--|--|-------------------------------------|
| Create an Irrigation Advisory Services | Indirectly covered in article (6) of WAJ law, article (7) of proposed Bylaw and article (3) of Agriculture law no 20, 1993 | MWI & MOA |
| Buyout of Wells | Directly covered in article (23) of WAJ Law, article (18) of proposed Bylaw, and NA in agriculture law or monitoring Bylaw 26, 1977 | MWI & WAJ |
| Limit abstraction and/or limit cropped area | Directly covered in article (6) of WAJ Law, in articles (17,40) of proposed Bylaw, and NA in Bylaw 26, 1977 or agriculture law no. 20 | MWI, WAJ, MOA |
| Exchange Groundwater with Recycled Water | Not covered either directly or indirectly in any applied law or Bylaw, but tackled in the wastewater policy document of the year 1998. | MWI, WAJ, MOA |
| Reduce M&I Pumping | Indirectly covered in article (23) of the proposed Bylaw | MWI & WAJ |
| Curtail: - Illegal Drilling - Illegal Water Sale | Directly covered in article (30) of WAJ Law, article (10) of Bylaw 26, 1977, articles (8,25) of the proposed Bylaw. Directly covered in articles (13,14) of the proposed Bylaw and NA in WAJ law, agriculture law and Bylaw 26 of 1977. | MWI & WAJ |
| Mandates - Cropping Pattern - Marketing | Covered directly in article (3) of Agricultural Law No. 20 of 1973 Not covered | MWI & MOA Private Sector |
| Manage AZB-Shared Groundwater System | Directly covered in article (10) of WAJ law 18, 1988, NA in other regulations. The Groundwater Policy document of 1998 tackled this issue. | MWI |
| Creation an AZB Groundwater Management Fund | Not covered in any applied laws or regulations it is an administrative action can be taken by WAJ Council as mentioned in article (10-F) of WAJ law. | MWI & WAJ |
| Form a Groundwater Management Committee | Indirectly covered in article (28) of groundwater monitoring Bylaw 26 of 1977, article (53) in the proposed Bylaw and NA in others. Needs administrative decision. | MWI & WAJ |
| Monitor abstraction and implementation of Groundwater Management Options | Directly covered in article (6) of WAJ law, articles (3,19,20) of groundwater monitoring Bylaw 26, 1977, and articles (4,7,11,16,40) of the proposed Bylaw. | MWI & WAJ |

NA: Not Available

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Arabic Version**

Water Authority Law No. 18 of the Year 1988

**Ground Water Monitoring Regulation
No. 26 of the Year 1977**

Proposed Groundwater Monitoring Regulation

Agriculture Law No. 20 of the Year 1973