

Professional Training: an Integral Part of Capacity Development for Water & Wastewater Companies in Iran

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ABSTRACT

Training of professional staff, as an integral part of capacity development, is vital for preservation of the environment and sustainability of resources especially in developing countries where often skillful human work force for Integrated Water Resources Management (IWRM) does not exist at the required level.

Ministry of Energy of Iran has acknowledged the need for institutional capacity building in its water sector and established Power and Water University of Technology (PWUT) at Tehran in 1975 to provide specialized higher education programs and train professional staff required for planning, design, construction and management of water projects in this country.

In this paper, the importance of professional trainings in capacity development for water and wastewater companies of Iran has been discussed. The role of PWUT as an institution for capacity building has been mentioned. A need assessment, inspired by a training and capacity building project underway by the joint venture of UNESCO-IHE and PWUT for water and wastewater companies in Iran, is discussed. It is believed that the experience of providing demand-driven, multi-disciplinary trainings has been effective in strengthening the capacities of local organizations and can be replicated in some other developing countries.

Keywords: Capacity building, Human Resources Development, Water Sector, IWRM, Environmental Education, Professional Trainings.

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1. INTRODUCTION

The concept of “capacity building” appeared in the late 1980’s and since then several definitions have been given for it. Most recently, Alaerts & Kaspersma (2009) defined capacity as: “the capability of a society or community to *identify* and *understand* its development issues, to *act* to address these and to *learn* from experience and accumulate knowledge for future.” This involves not only individual capacities (human resources), but also effectiveness and flexibility of organizational processes (institutional capacity) and a stimulating management framework (the enabling environment). These three levels of capacity development are described in UNESCO-IHE (2006).

Capacity building is committed to sustainable development and attempts to overcome the shortcomings of traditional donor-led projects. Development within a capacity building-context allows developing countries to identify their own needs and design and implement the best suitable development strategy with the local context (Vincent-Lancrin, 2009).

Development of adequate capacity is a much more complex problem than the financial capital for infrastructure investments. Capacity constraints at individual, institutional and enabling environment levels have to be understood against a local background. Local stakeholders will require their capacities to be prepared for meaningful participation in development process (Blokland & Uytewaal, 2009).

Human resources development refers to a continuous process at imparting knowledge, developing skills and changing attitudes and behaviors which allow the maximization of the benefits of knowledge exchange and participation (UNESCO-IHE, 2006).

Professional training is an integral part of capacity building and human resources development. At the individual level, this should not be considered just as a one-time diploma course but also a continuous process throughout the active professional life of the recipient. High level skills generally can be acquired by trainings which can be accomplished through mentoring, workshops, classes or self-study. New blended learning approaches encourage active and participatory learning. The increasing availability of distance learning facilities expands the opportunities for life long [learning](#) and continued development of the knowledge and expertise of professionals.

Capacity development is absolutely necessary to challenges in meeting goals such as MDGs for the water sector. In this regard, Ardakanian & Aimard (2008) concluded that institutional and organizational capacity development needs to be focused upon more than individual capacity development. They also recognized Integrated Water Resources Management (IWRM) and, as part of this, water supply and sanitation, financing, social equity, and adoption to climate change as the priority themes for capacity development in this sector.

Training of professional staff is vital for preservation of the environment and sustainability of water resources especially in developing countries where often skillful human work force for IWRM does not exist at the required level. Results of a recent survey indicated that organizing training events (i.e. courses, seminars and workshops) has been the main type (>70%) of capacity development activity implemented by UN-Water members (Ardakanian & Aimard, 2008).

In this paper, the importance of professional trainings in capacity development for water and wastewater companies of Iran has been discussed. The role of PWUT as an enabling environment has been highlighted. A need assessment, inspired by a training and capacity building project for water and wastewater companies in Iran, is discussed.

2. WATER & WASTEWATER COMPANIES IN IRAN

2.1 Iran: A country with water scarcity

Iran, with an area of 1.65 million Km², is one of the largest countries in the Middle East (Wikipedia, 2009). It is located in the arid and semi-arid region of the world. The average annual precipitation in the country is about 250 mm which is less than one third of the world's average. Furthermore, the spatial distribution of the rainfall varies from more than 1500 mm per year on the coasts of the Caspian Sea to less than 50 mm per year at the central plateau (IWRMC, 2001). According to latest census (SCI, 2006), population of Iran is more than 70 million (about 1% of the world's population) but has access to only 0.2% of the world's fresh water resources.

The total renewable resources of Iran (precipitation and inflow currents across borders) are annually about 130 billion m³. The greatest amount of water (92.8 % of exploitation of the country), is used by the agricultural sector. The share of potable water in urban and rural areas is about 6% of the total water demand, from which about 68% is supplied by groundwater resources and the remaining from surface water (IWRMC, 2001).

In the last decades, the urban population in Iran has tremendously increased. This has happened not just because of the high population growth rate of about 1.6% on average (SCI, 2006) but mainly due to migration and transformation of some villages to towns. According to the latest census (2005), more than 46 million people (69% of the total population), live in the cities of Iran (SCI, 2006). Such a rapid rate of urbanization not only makes providing water services for the growing urban population very difficult but also poses environmental adverse impacts.

2.2 Organization of Water Sector in Iran

Nikravesht et al. (2009) considered that hierarchical order of water management in Iran can be divided into four following categories:

i) Policy makers:

- Water high council
- Parliament

ii) Executive-Administrative (Ministry of Energy):

- Deputy Minister for Water and Wastewater affairs
- Iran Water Resources Management Company (holding company comprising provincial water resources authorities)
- National Water & Wastewater Engineering Company (holding company comprising provincial urban & rural WWCs)

iii) Engineering (Private Sector):

- Consulting Engineering Companies
- Construction Companies

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iv) Other stakeholders:

- Ministries of: Jihad-Agriculture, Mines & Industries, Interior; Environmental Protection Organization, Deputy Presidency for Planning & Strategic Supervision
- Societies, etc.

They analyzed the most recent water resources management structure at national, basin and provincial level and concluded that although Iran has made some progress towards implementation of IWRM, but more institutional reforms are necessary to achieve an ideal system.

2.3 Water & Wastewater Companies

i) Organization of WWCs

Following a parliamentary act, the National Water and Wastewater Engineering Company (NWWEC) was established in 1990 as a governmental holding company with a general mandate of strategic management, supervision and technical support of its subsidiary companies in provision of urban water and wastewater services. Currently there are 43 urban Water and Wastewater Companies (WWCs) which operate in 30 provinces of Iran and some large cities such as Tehran which have their own independent companies. These publicly-owned companies in principle should operate act as non-profitable private companies but they still receive governmental loans and aids as full cost recovery is not possible due to imposed low tariffs. In 2002, rural water and wastewater companies became affiliated to the NWWEC of the Ministry of Energy. Currently there are 30 rural WWCs which operate in 30 provinces of Iran. These companies are governmental and receive public funds with an objective of serving the poor community in the rural areas (Namjo, 2007).

ii) Performance of WWCs

Table 1 provides some key performance indicators of the water services in Iran (NWWEC 2007). This table shows that almost everyone in urban areas (98.5%) has access to potable water while the rate of coverage in rural areas is 61%. The coverage of wastewater services in Iran is much lower. In rural areas there is practically no provision of water services; while in urban areas 29.5% has access to wastewater services. Table 2 presents the status of provision of wastewater services in urban areas (NWWEC, 2007). In this Table, great efforts towards design and construction of new wastewater system are evident.

Table 1- Water services provision divided over urban and rural areas (NWWEC, 2007)

Water Services	Urban	Rural
Population covered (<i>in millions</i>)	48.8	14.2
Ratio of population coverage (%)	98.5	66.4
No. of covered towns (<i>urban</i>)/ villages (<i>rural</i>)	935	21 300
No. of connections(<i>urban</i>)/ households covered (<i>rural</i>)	10 640 807	3 093 272
Volume of produced water (<i>MCM per year</i>)	5 319	1 282
Total volume of reservoirs (<i>MCM</i>)	11.2	2 682 857
Length of water transmission line (<i>Km</i>)	19 120	67 854
Length of water supply network (<i>Km</i>)	110 600	119 446
No. of water quality laboratories	246	>87
No. of active water treatment plants	93	>184

Table 2- Wastewater services provision in urban areas (NWWEC, 2007)

Wastewater Services	Urban
Population covered (<i>in millions</i>)	14.4
Ratio of population coverage (%)	29.5
No. of connections	2 799 081
Length of wastewater collection network (<i>Km</i>)	29 802
Length of wastewater transmission line (<i>Km</i>)	3 299
No. of active wastewater treatment plants	94
Capacity of active wastewater treatment plants (<i>MCM per year</i>)	565
No. of wastewater laboratories	71
No. of towns with available wastewater system	221
No. of towns in which wastewater system under construction	222
No. of towns in which wastewater system is under study	261

iii) Capacity Development in WWCs

Table 3 provides an overview of the education level of the available human resources capacity in both the urban and rural water and wastewater companies. This shows that there is a continuous need for trainings of professionals to act at the frontiers of the engineering and management challenges of the sector. More importantly, technical and vocational trainings should be provided for the large number of low-level technicians, dealing with operation and maintenance of water and wastewater infrastructure, to improve their performance.

Table 3- Human resources in Iran's Water & Wastewater Companies (NWWEC, 2005)

Water & Wastewater Company	Number of employees in each education level				Total number of employees
	Masters & Ph.D.	Bachelors	Post Diploma	Others	
Urban	579	4152	2346	17365	24442
Rural	69	995	815	11762	13641
Total	648	5147	3161	29127	38083
Percentage	2	13	8	77	100

To address some important priorities of NWWEC, managing director of this holding company set three target values for the year 2008 in form of a slogan namely 10, 20, 30. This meant that he expected a reduction of amount of water consumption by 10%, an increase of research project by 20% and increase of training courses for personnel by 30% in comparison with the previous year. As far professional training is concerned, available data for the first half of year indicates that they have been successful to achieve the target by 50% in urban and 46% in rural water and wastewater companies (NWWEC, 2008a). This clearly shows the serious will in these companies to develop capacities.

Hashemi et al. (2007) highlighted the need for institutional reforms in urban water and wastewater companies in the frame work of IWRM. Several issues such as decentralization, public-private partnership, tariff level setting to at least cover the operation and maintenance costs, costumer-oriented services and capacity building measures such as trainings were recommended.

To address the capacity building challenges in the water and wastewater companies, four projects are currently underway by the NWWEC as the client and are financed through a World Bank loan to be paid back by the Government of I.R. Iran (NWWEC, 2008b). Two of these projects are related to institutional reforms in the sector and WWCs, one to wastewater financial and investment strategy and the last one is dedicated to capacity building and training of professionals of WWCs (see Section 4.1).

3. PWUT: A CAPACITY BUILDING INSTITUTE

Ministry of Energy (MOE) of Iran has acknowledged the need for institutional capacity building in its water sector and established Power and Water University of Technology (PWUT), also called Shahid Abaspour University, at Tehran in 1975. Mission of PWUT is three fold, education, professional training and applied research required for the water and power sector of Iran. Currently PWUT has more than 1200 students at B.Sc. level and about 120 full time staff in five faculties.

Educational programs of PWUT at B.Sc. and M.Sc. levels have been accredited by the Ministry of Science, Research Technology of Iran. However, the curricula have been especially designed to meet the practical needs of the water and power sector, envisaged by MOE. For instance, the Water Engineering faculty of PWUT is the only department in Iran which offers specializations such as water and wastewater engineering, operation and maintenance of dam and irrigation schemes, hydraulic structures and water resources engineering at B.Sc. level. River engineering and wastewater engineering are among the unique M.Sc. programs which are offered by this faculty and thus distinguish PWUT from “academic universities” in the country. Graduates of PWUT have performed in their career in water industry and therefore some of them currently have been promoted to high level positions in the sector.

PWUT is the leading university for professional trainings in the country, offering equivalent of about 12000 man–month of short term courses per year. PWUT conduct a wide range of professional courses aimed at upgrading or refreshing the knowledge and skills of managers, engineers and technicians. Such trainings develop the candidates’ abilities to be well prepared to perform better in their positions. The content of the courses are designed in such a way to cover technical and managerial aspects in an integrated way which are required in real practice.

PWUT is now the largest professional training center in the region and plays an important role in capacity building for IWRM in Iran. To develop it own capacity, PWUT have benefited from the M.Sc. programs and capacity building projects, jointly carried out by international institutes such as UNESCO-IHE.

4. NEED ASSESSMENT FOR A TRAINING COURSE

4.1 Background

UNESCO-IHE together with the PWUT, has started a training and capacity building project for water and wastewater companies (WWCs), represented by NWWEC, in Iran from 2008. The objective of this component of Ahwaz & Shiraz water supply and sanitation project, financed by the Government of I.R. Iran through a World Bank loan, is to ensure that professionals working for the water and wastewater companies of Iran will be better prepared to face increasing challenges of the sector in this country.

This project is instrumental in the sense that it aims to train 2100 Iranian professionals through conducting 70 training courses at PWUT campus in Tehran within a limited time of 18 months. The assignment will conclude in 2009 with an agenda for continuous human resources development in the Iranian water and wastewater sector beyond this project.

Although themes and topics of the Water and Wastewater Training (WWT) Project had been finalized (UNESCO-IHE & PWUT, 2006), it inspired a training need assessment of the sector which was conducted on the occasion of the National Conference of WWCs held at Tehran in Sep. 2007. In the following sections, a brief description of this introductory survey which should not be considered as a rigorous need assessment for the WWT project is given.

4.2 Methods

To achieve some insights about training interests of employee of WWCs in Iran, a questioner was designed using typical resources in the Internet which were adapted to the local situation. The general topics of the training courses were adopted from proposal for the WWT project. The questioner was then reviewed and pre-tested by few local experts and top NWWEC managers.

These questioners were distributed among about 1000 conference attendees, mostly managers of urban as well as rural WWCs, who were representing provinces, cities and districts of Iran. This event provided a unique opportunity to collect data from all over the country within a very short time.

The questioner included more than 20 multiple choice type questions which were classified in four sections. The first collected basic demographic information; the second questioned respondents on their interests in training topics; the third explored method of training and the fourth examined method of evaluation. Respondents were asked to express their opinions about these matters. Data were compiled and analyzed at the PWUT using Microsoft Excel.

4.3 Results & Discussion

Three hundred eighty one individuals (approximately 38%) of the conference attendees completed the need assessment questionnaires. Results of compilation of data are summarized in the four sections below:

i) Demographic

Of the respondents 69% were working in the urban water and wastewater companies and 31% were employee of the rural water and wastewater authorities. About 16% of the respondents have a Masters degree, 68% Bachelors degree and the rest at least a post diploma. The majority of respondents (69%) were engineers and the rest had other backgrounds.

The respondents had a working experience of 12 years on average. Positions of the respondents in their companies were as follows: Managing Directors of the Companies (4%), Vice-Directors of the Companies (8%), Manager of Cities (31%), Manager of Departments or Rural Districts (53%) and others (4%).

Regarding a previous educational and training need assessment having been conducted in their companies, 60% of the respondents were positive, 30% were negative and the rest were not aware.

ii) Training Topics

A total of 24 potential training Topics had been considered in the WWT Project. These were clustered in the following three Themes:

a) Technical & Development: These were courses that were focused on the technical aspects of the water and wastewater industry. The target audience would include engineers, consultants and operators. This Theme comprised of 4 Topics.

b) Operation & Maintenance: These were courses that were designed to assist water and wastewater operators in the operation of their facilities. A total of 11 Topics were considered in this Theme.

c) Finance & Management: These courses were designed for the people that manage and make decisions for water and wastewater facilities. The target audience would include utility managers, municipal politicians and municipal managers. This Theme included 9 Topics.

Respondents expressed their interest in potential Themes for training events as follows: Operation & Maintenance (71.4 %), Management & Finance (70.1 %) and Technical & Development (55.9 %). These results match well with the role of the companies of respondents which is a utility provider and not a consultant or construction engineering company.

In response to another question, respondents also identified their interest in Topics to be taught which are shown in Figs. 1-3.

Figure 1- Interest in course Topics of Technical & Development Theme

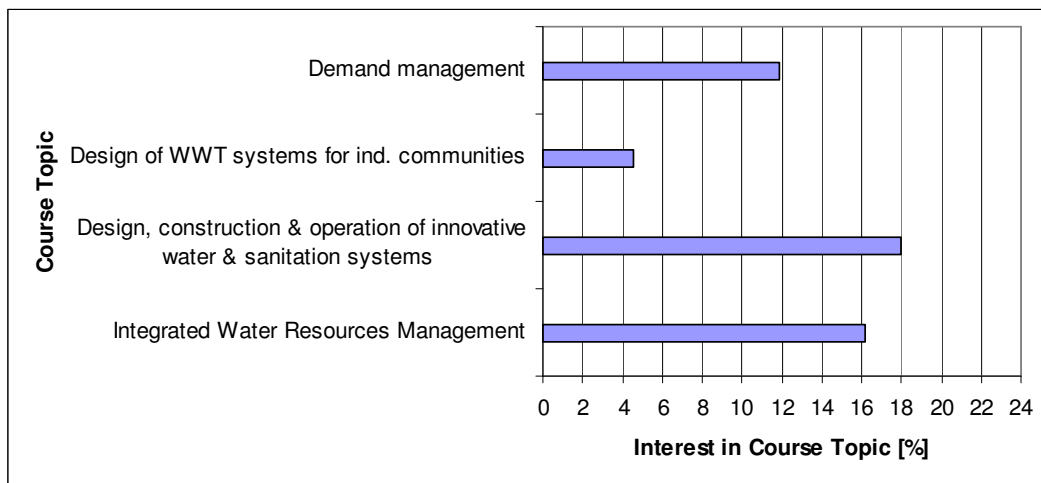


Figure 2 -Interest in course Topics of Operation & Maintenance Theme

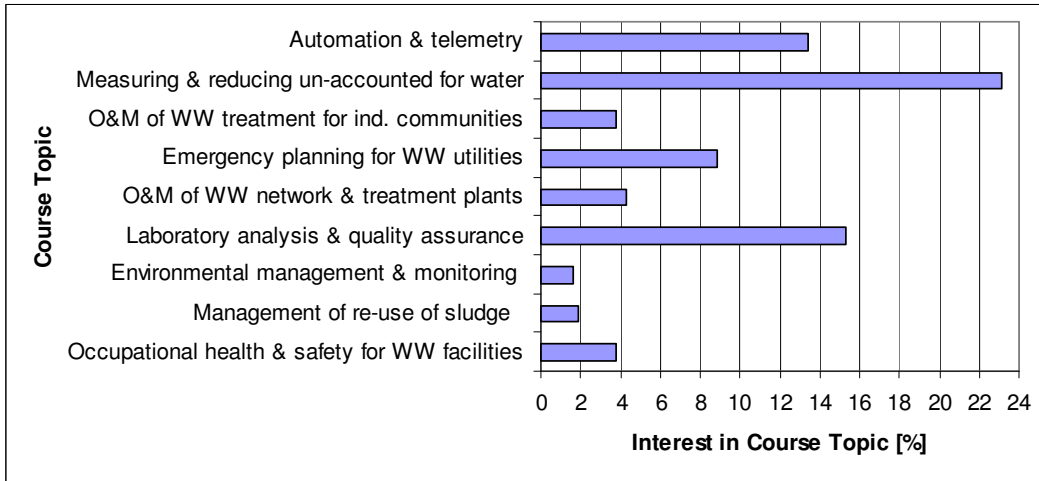
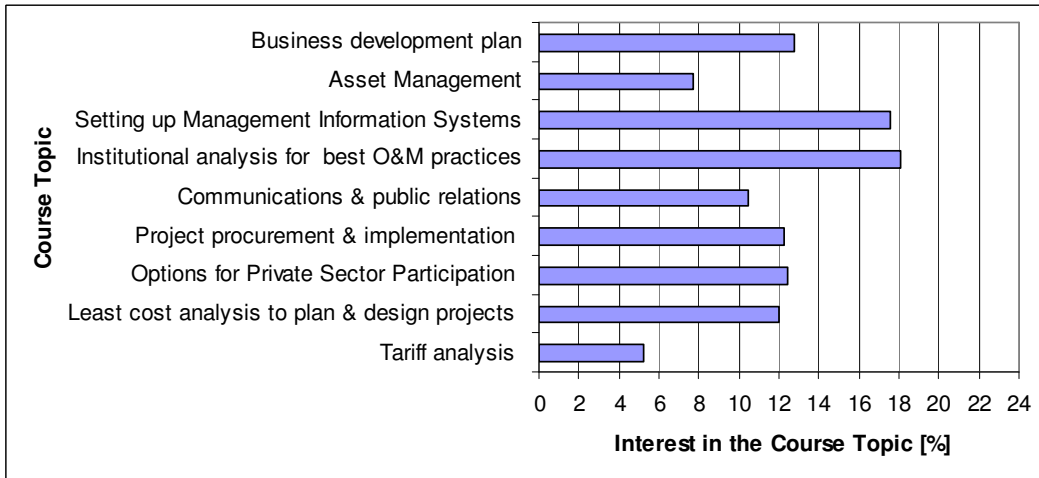


Figure 3- Interest in course Topics of Finance & Management Theme



On the basis of data shown in Figs. 1-3, the most needed Topics to be taught were identified and shown in Table 4.

Table 4- The most needed Topics for the training courses

Rank	Theme	Course Topic	Interest[%]
1	Operation & Maintenance	Measuring & reducing un-accounted for water	23.1
2	Finance & Management	Institutional analysis for best Operation & Maintenance practices	18.1
3	Technical & Development	Design, construction & operation of innovative water & sanitation systems	18.0
4	Finance & Management	Setting up Management Information Systems	17.5
5	Technical & Development	Integrated Water Resources Management	16.2
6	Operation & Maintenance	Laboratory analysis & quality assurance	15.3

Table 4 shows that the respondents have set their priorities with more emphasis on Operation and Maintenance and Finance & Management Topics while only the innovative design techniques among Technical & Development have attracted more attention. The most needed topic (i.e. reduction of un-accounted for water) is clearly in line with the challenge to reduce the high rate of UFW (about 30%) in old water networks of cities in Iran. Such a demand driven trainings will provide the competencies required for better management of scarce water resources in the country.

iii) Method of teaching

The overwhelming favorite selected by 67% was conventional class room, with semi-interactive learning (44%) and e-learning (5%) second and a distant third, respectively. Respondents were allowed to select more than one item, thus, percentages do not sum up to 100. These results show that the respondents still preferred the conventional methods despite the fact that these would require them to be more away from their working place. It seems that the e-learning is a new technique which has not been introduced widely in the country and thus respondents do not appreciate its advantages and flexibility.

Replies to the question "In which Theme there is a need for international lecturers?" were as follows: Operation & Maintenance (66%), Finance & Management (58%) and Technical & Development (57.5%). Respondents were allowed to select more than one item, thus, percentages do not sum up to 100. The results show that an acceptable level of local knowledge already exists in the country and respondents only require innovations and new techniques for water and wastewater systems to be thought by the international lecturers.

iv) Evaluation

All of the respondents felt that some form of evaluation is necessary to make sure that the participants attend at the course effectively. In this regard, 59% of them agreed that an evaluation test should be taken at the end of the course while 50% preferred a take away project for this purpose. 32% believed that checking attendance at the course would be just enough and no further evaluation is necessary.

5. CONCLUSION

In this paper, the role of professional trainings for in capacity development for water sector in general and in the case of Iran has been discussed. It is believed that the experience of PWUT for providing demand-driven, multi-disciplinary trainings have been effective for implementation of IWRM in water and wastewater companies of Iran and can be replicated in some other developing countries. Co-operations with the international institutes, such as UNESCO-IHE, has been considered an added value in strengthening the capacities of local organizations.

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REFERENCES

- Alaerts, G.J. & Kaspersma J.M. (2009). "Progress and challenges in knowledge and capacity development", *Capacity development for improved water management*, UNESCO-IHE & UNW-DPC, preliminary print copy, 5th World Water Forum, Istanbul, 3-30.
- Ardakanian, R. & Aimard, V. (2008). "Water-related capacity development: a survey of UN-water members' and partners' activities", UNW-DPC publication series, Mapping No. 1, UNU, Bonn, pp 55.
- Blokland, M. & Uytewaal E. (2009). "Capacity development for improved local water governance", UNESCO-IHE, WfWP & IRC, Case studies and supporting documents, Session 6.1.3, 5th World Water Forum, Istanbul, 3-8.
- Hashemi, M., Attari J., Amezaga J. & O'connell P.E.(2007). "Iran's urban water management: Need for institutional reform". *New directions in urban water management*, Proceedings of Int. Conference, Paris.

- Iran Water Resources Management Co. (2001). "Summary of comprehensive water plan of Iran".
- Namjo, M. (2007). "Review of urban water management challenges in Iran". National Water and Wastewater Company, Tehran.
- Nikravesh, M., Ardakanian, R. & Alemohammad S.H. (2009). "Institutional capacity development for water management in Iran", *Capacity development for improved water management*, UNESCO-IHE & UNW-DPC, preliminary print copy, 5th World Water Forum, Istanbul, 159-176.
- National Water & Wastewater Engineering Co. (2005), (2007). <http://www.nww.co.ir>. Last visited in March 2009.
- National Water & Wastewater Engineering Co. (2008a). Bureau for training and human resources development. <http://abfaz.gigfa.com>. Last visited in March 2009.
- National Water & Wastewater Engineering Co. (2008b). Bureau for procurement of funds & development of non-governmental participation. <http://bbf.nww.co.ir>. Last visited in March 2009.
- Statistical Center of Iran (2006). <http://www.sci.org.ir>. Last visited in March 2009.
- UNESCO-IHE (2006). "Enhancing knowledge and capacity", *Water a shared responsibility*, The United Nations World Water development, Report 2, Chapter 13, 424-462.
- UNESCO-IHE & PWUT (2006). "Training and capacity building for water and wastewater sector in Iran", *Technical Proposal for a component of Ahwaz and Shiraz water supply and sanitation project (P071191)*.
- Vincent-Lancrin S. (2009). "The role of education in capacity development", *Capacity development for improved water management*, UNESCO-IHE & UNW-DPC, preliminary print copy, 5th World Water Forum, Istanbul, 3-30.
- Wikipedia (2009). Free encyclopedia, <http://www.wikipedia.com>. Last visited in March 2009.