

Water Scarcity from Problems to Opportunities in the Middle East

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Introduction

History and wisdom tell us that inventions and discoveries are mostly challenge driven outcome events¹. In fact, life threatening challenges, motivate and stimulate the creative thinking of the human brain. There is a popular Arabic proverb, “the need is the mother of invention”. Water scarcity problems in the arid regions, in general, and the middle east, in particular, have caused vital problems to human life. Conventional solutions, such as inhibition of controllable water losses, and enhancing water resources development, have become unsuitable with the uprising rate of water scarcity problems. Real breakthrough of creative ideas is urgently needed to present non-traditional, prompt solutions. It should always be remembered that chronic problems, if not resolved at the right time and with suitable means, will create conflicts, which in turn if not resolved, will develop crisis, violence and water wars. It has never been so important to join forces of politicians, water professionals, technologists, sociologists, economists, donors and others, as it is nowadays when water scarcity problems have already emerged to national, regional and international conflicts. Hence, solutions must fully recognize, consider and include measures to tackle the roots of problems based on water scarcity and not to focus on problems impacts and effects. Food shortage, pollution, low quality water are few examples of problems based on water scarcity and sever aridity. Indeed, there are some human caused problems namely, poor management, lack of vision, absence of clear water policies and others.

Governments and international organizations have realized the fact that water scarcity is not only every single government's concern, but in particular it should be the rich developed countries' responsibility to work hand in hand with poor undeveloped countries in order to secure their minimum humanitarian rights in clean water and sanitation. In view of this, the Rio convention “Agenda 21”, in 1992 came up with a number of reports, common understanding to the world water situation, recommendations and action plan. It was indeed an alarming signal and warning message to the world's leaders to seriously take into account the problems of water scarcity and the environment. However, after ten years (year 2002), the “Earth Summit Conference”, in Johannesburg revealed that very little was achieved from the “Agenda 21”. The obvious reason is, rich countries are not willing to be committed towards poor countries. It was agreed in 1992 that rich countries will increase their financial contribution from 0.3%, of their net economic return, to 0.7%, to help more than 1.2 billion people without access to clean water, and more than 2.2 billion, without sanitation², in poor countries. Facts indicate the opposite. Even the 0.3% has been reduced in some cases. Problems relevant to water scarcity are numerous and varies in nature and priority from one arid poor country to another. Accordingly, the author presented, in a technical paper to the world water council (WWC) in Turkey 2001, a proposal for developing a “World Water

Problems Map”³, after several maps have been developed for the world aridity, population density water potential ..etc. it is time, as well, to set priorities for the world water problems.

Another important scope of research, which has been given very little attention from rich industrial countries while it is of great importance to poor undeveloped arid countries and the environment as well, is the renewable energy. Realizing the fact that, the average number of hours per year that can feasibly produce solar energy in Europe is 100 hrs. while in the Arab countries and middle east it is about 3000 hrs/year, thus it is of top priority in the arid regions, but of less importance to rich wet countries. Therefore, in order to avoid multidimensional serious impacts resulting from water scarcity consequences, rich developed countries must recognize the sufferings of poor people and admit their human rights, hence dedicate budgets, efforts and technologies to allow all people on earth to share a decent peaceful life without hunger, epidemic diseases, illiteracy, hatred and envy. This is what all religious books call for, to address humanity, but man always forgets.

It may be appropriate to explore some background information and statistics about the water status in the Arab World before getting into the specific issue of this paper. The accompanying presentation illustrates an overview of the Arab water⁴.

Problems Identification and Statement

Decomposition of complex problems and clear transparent statements of its roots, are effective ways to face its challenges with the appropriate strategies and tools. In reality, water scarcity impact is among other factors leading to the uprising terrorism movement witnessed in several parts of the world. The author believes that there are four main reasons that cause the world turbulence.

Poverty, injustice, hopelessness and **non-humanitarian environment**, are the main corner stones causing the world troubles. Therefore digging deep to the roots may lead to the basic reasons for developing such problems of which water scarcity might have one role. Accordingly, it is strongly advisable to search for a road map of integrated solutions to the rooted problems rather than trimming the stem and neglecting the driving force generating problems. Diagnostic analysis to the predominant causes of the global problem may shed some light on the proper integrated solution. Accordingly, efficient tools, technologies and required budget can be determined and allocated. The integrated solution may be implemented in phases and Result Base Management (RBM) technique can be applied to follow the rate of progress according to specific performance indicators⁵.

Methodology and Analysis

The first analysis phase is the branching tree formulation for each of the four reasons leading to frustration and sadism against the community.

The second analysis phase deals with the relationship between the impacts of the water scarcity problem on each of the four main reasons and the degree of influence on each using a judgmental causal scale.

The third analysis phase is the interrelation between the joint water scarcity impacts, on each of the four reasons, in order to identify the levels of importance for the integrated solution to relief pressures. The general ultimate objective is to set priorities and optimize efforts and techniques efficiently and effectively.

Regarding the first phase of analysis The author's perspective, in ranking the hierarchy levels of problems in a branching tree type configuration⁶ is bottom up from the root level for each of the four main reasons, see Fig. (1).

- **Poverty**, results from unemployment, low income, and causing insufficient food, which are the reason for malnutrition and health problems. Indeed poverty reflects the national economic strength of a country providing democracy exists. Poverty is the inability to satisfy the basic human needs.
- **Injustice**, is normally due to discrimination between, power and weakness, rich and poor at different levels. It is judging with double standards causing the feeling of inferiority which result from the lack of equity in rights due to weak laws that protect the poor, and the strong influence of capitalism on the policy at the national and international levels. Injustice is clear in shared river basins and groundwater aquifers, as far as water right's equity is concerned.
- **Hopelessness**, develops due to little hopes in the future, particularly, among young generations. Other aspects of hopelessness include the feeling of insecurity due to non existing social security system (health, unemployment, community, services .. etc.) and the feeling of mistrust in government's performance. Out of an estimated Arab population of 300 million, about 20 million of the young generation are unemployed.
- **Non-human environment**, the worst experience in life is to live without clean drinking water and surrounded by a sewage pond while the population density might exceed 2000/km², i.e. living in slums. We might have witnessed that scenery in several poor countries but indeed we didn't experience such miserable non-human life conditions. These conditions make the human inner feelings towards life worthless. The predominant factor of this dreadful problem is the lack of available funds and tangible plans for poverty alleviation.

After stating the above causes leading to poverty, in-justice, hopelessness and non-human environment, one may imagine why people blow themselves when more pressure is exerted or imposed on them. In other words, frustration is, indeed, will most likely happen, then consequently terrorism and

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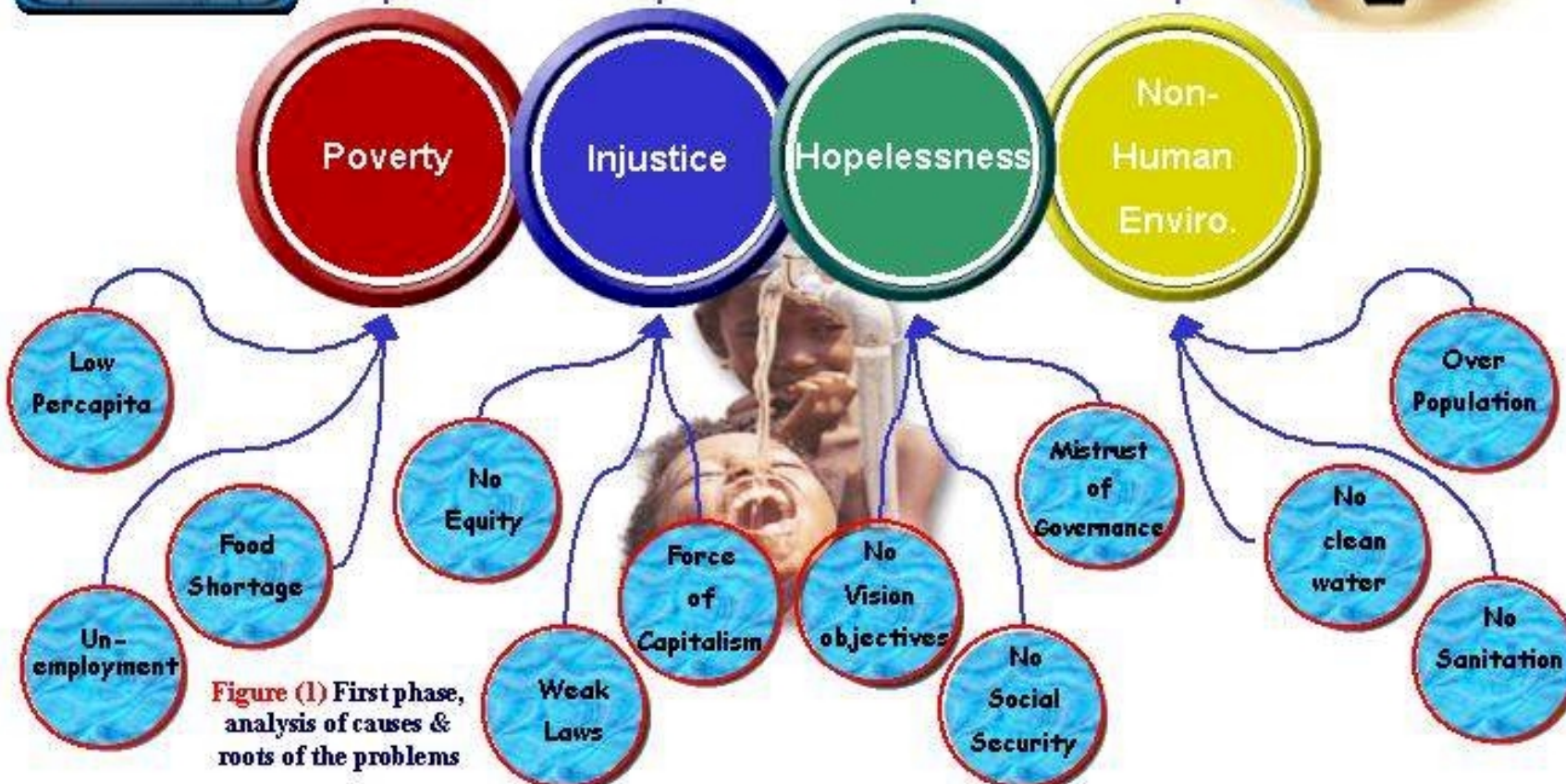


Figure (1) First phase, analysis of causes & roots of the problems

violence will find a fertile environment to emerge, grow and develop. It should be emphasized that a single discipline effort will not be sufficient, but it must be integrated, focused, and continuously monitored and measured.

The second phase of analysis deals with defining the relationship between water scarcity problems, and the different problems forming the roots of the four main causes of terrorism and violence movements.

Referring to the link between water scarcity and poverty, one may notice that water scarcity inhibits horizontal agriculture expansion, fish farming, animal husbandry and other development projects for food security that are based on water availability. This leads to food shortage, unemployment and consequently low per capita in most arid poor countries: Agriculture consumes more than 80% of the water, as well as intensive labor force employment, but still incapable to secure self-sufficiency, thus poor countries will remain food dependent on rich countries. The gap of food shortage will continue to increase and consequently more degradable living conditions will prevail. It is worth mentioning that water scarcity problems are directly linked to food shortage and indirectly linked to both unemployment and low per capita. It should be known that low per capita, food shortage and unemployment are interrelated, with water scarcity.

Regarding the relationship of injustice with water scarcity problems, two levels of mode connections must be considered:

- a) At the national level, mismanagement and poor quantitative and qualitative allocation of water policy among different users, create injustice. Also, pollution accumulation from upstream to the downstream, weak institutions and laws to secure water rights, equal chances including water quality and insufficient government support for water users associations and management participation of farmers and gender equity are additional factors⁷.
- b) At the regional level, the same is clearly true in some cases of shared river basins and/or joint abstraction of groundwater aquifers between neighboring countries. Examples from the middle east are:
 - The Israeli Lebanon conflict regarding rivers Leetani, Al Wazani and Al Hasabani in southern Lebanon. This problem started with the Israeli occupation to southern Lebanon and continued after liberation in 2000 until present. The main conflict is that Lebanon is unable to utilize its water right

from Al Hasabani river to provide some 30 villages with domestic water due to Israeli threats.

- The Israeli – Jordanian - Syrian conflict regarding head waters of Jordan river, Golan heights rainy catchments, Lake Tabaria, the 50 million m³/year water quality of the Jordanian share.
- The equity shares of Turkey, Syria and Iraq from the Euphrates river basin.
- The Israeli – Palestinian groundwater (quantity and quality) abstraction problems, including their joint management.
- The Nile Water Initiative (NWI) is a unique model of initiating cooperation between ten Nile countries sharing its water potential. On the bases of WIN-WIN projects for the benefit of all. The general rule of thumb is no country loses. The World Bank is supporting the initiative⁸, yet political turbulence in southern Sudan may impose some constraints.

But, it should be admitted that Israel is also witnessing water shortage, yet **the justful water division policy through cooperation is the only way to reveal mistrust and build goodwill**. Water should not be used as a strategic political issue and donors funds must not be allocated to achieve political goals, rather than support water projects according to feasible needs in order not to get solutions in a vicious circle between politics and technicalities.

Hopelessness, is a result of many factors such as, the mistrust in government's promises about better future, degrading social , health and unemployment security, the uprising costs of living, housing and the lack of facts transparency.

The core of hopelessness in general, is that poor countries in arid regions are usually self centered because of their engagement in complex internal problems namely, scarcity of national tradable resources, high population rates, unbalanced import/export i.e. accumulation of debts, low man power productivity, unstable political regime and other diverse social and economic problems. While under these harsh conditions, they watch their limited head water resources being captured by military occupation. In the meantime no international law can protect them, and no international organization can save their human and water rights. This causes loss of self-confidence, vision and focused objectives, which lead to poor planning, that adds more complexity to unemployment problems. Water scarcity in this context have a minor impact role, compared to other tons of problems.

The non-human environment is in fact a great tragedy to the poor, and a big shame to the rich in this century. The reason is obvious and well known to us as water professionals and experts, it is the world population explosion. But if we imagine the amount of money spent during wars of the last century and what was spent on water treatment projects for the poor, one may notice the two extreme contradicting objectives. It is worth enquiring about the human rights of poor people who live without clean water and sanitation while wild life in conservation areas are enjoying healthy environment and protected by man for ecological

reasons. **If we stop wars for one year and direct its costs for water treatment and solving water problems, the world will change to a much better state.** The Gulf war cost in 1991⁹, according to press media was about 65 billion US Dollars, and the anticipated Iraqi war will cost about 200 billion.

Water reclamation projects, use of non-conventional water sources, desalination of brackish and sea water, water recycling, development of water resources at main river catchments, water harvesting (rainfall, fog, springs, flash floods ..etc), groundwater protection and safe use, are few examples to bridge the gap between demand / supply in poor arid counties, suffering non-human environment and became victims to water born diseases.

Relative Impacts of Water Scarcity

In order to illustrate the relative impact on the branching problems forming the main four reasons of terrorism, a conceptual judgment scale is used to differentiate between the mode and degree of water scarcity impacts. Four levels reflecting the degree of impact which are, very high, high, medium and low. The higher the level the stronger the impact in causing the problem. The schematic sketch of Fig. (2), shows in blue color the levels of impacts as indicated by the legend on the figure. It may be noticed that the greatest influence of water scarcity, is on the problems causing non-human environment and the least indirect influences are that on the problems leading to hopelessness. The main objective for judging and illustrating these differences is, to clarify to the poor arid countries decision makers the relative weights of the problems leading to main causes of frustration and ultimately terrorism. Also, setting priorities and ranking of the problems before formulating policies and strategies for feasible solutions. Scenario generation of possible alternative policies and strategies can be developed according to the targeted objectives for the solutions. The screening process of the feasible policies can be made to comply with the decision makers, political, economic, social vision ..etc.

It should be re-emphasized that the conceptual representation of water scarcity impacts, as part of the problems leading to the four main causes of frustration and terrorism, is based on judgmental estimates. However, the ranking and degree of water scarcity impacts may vary from one country to another. The objective is to clarify and explain a methodological thinking procedure to visualize the compatible effects with the most likely accumulated

problems leading to the four main causes. Also the degree of water scarcity which can affect the enhancement of each problem. Furthermore detailed analysis may be required to attain more accurate estimates and evaluation. This may suggest to run a “Delphi” exercise of several rounds involving professionals and experts of knowledge and experiences to act as the panel of experts in order to improve results and obtain logic relationships between water scarcity and the general frustration problems.

Cross Relations of Problem’s Impacts

Having determined the branching tree of the rooted problems by the first analysis phase, followed by judgmental estimates of water scarcity impacts on each problem, (second phase of analysis), cross relations deemed important

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to rank the priority problems from the national point of view prior to a suggested solution strategy. Also, common regional problems may be recognized and aggregated in order to optimize the use of the applied tools.

The schematic sketch of Fig. (3) shows the conceptual connecting arcs between interdependent problems relevant to water scarcity. Indeed, under diverse conditions of different countries concerned, the levels of impact varies, and consequently the priorities will differ, and suitable strategy could be determined. The cross relations between problems may be defined as a) enhancing mode relationship or, b) neutral mode, i. e. positive casual effect or indifferent, that is each problem occurs in separate mode from another. Therefore, the priority criteria for ranking consolidated problems, must capture all the roots of the different problems, meaning if it happened jointly will enhance the four main reasons leading to “Frustration” and “Terrorism” . If the water scarcity problems contribution from the whole pie chart of terrorism problems, is estimated its level of impact evaluated, (by the panel of experts), and its connecting mode and cross impacts are defined, then appropriate measures could be determined. Accordingly the tools and mechanism to deal with these problems can be applied and monitored. The targeted objective is to disintegrate the aggregate problems into fragment and maximize effective solutions results.

From Problems to Opportunities

It is top urgent to plan strategic and think creative towards non traditional solutions. It is also important to focus our future vision to practical plans and tangible implementation mechanism within a logical time frame. Monitoring and evaluation system is essential to ensure compatibility between plans and implementation. There are some facts characterizing the middle east, which have to be stated.

1. The majority of the population are Moslems.

Principal facts about the Islamic religion are Mercy, Justice, Purification of the sole and spirit, Cooperation for the good of humanity, Discrimination never exists, Help the poor, Depend solely on the mighty God “Allah”. If these facts are twisted or

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Injustice

Hopelessness

Non-Human Enviro.

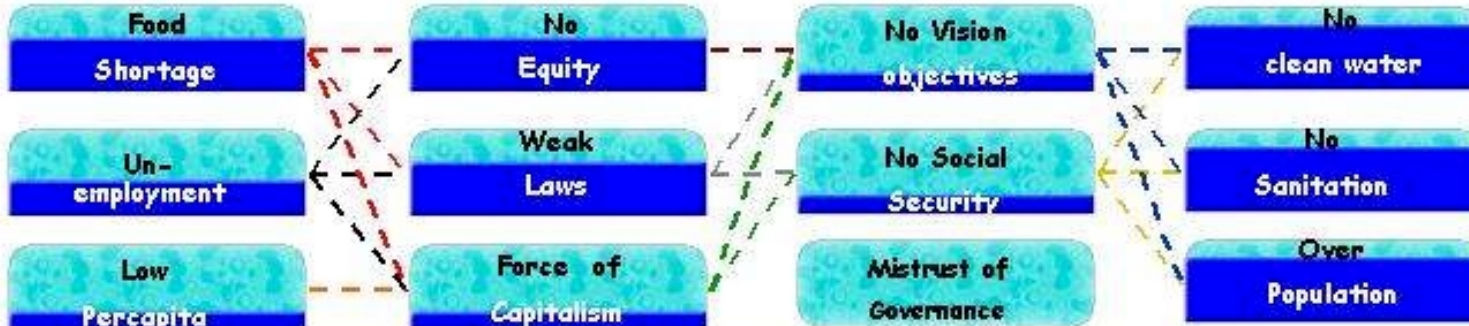


Figure (3) Phase three, relative impacts of water scarcity



miss interpreted it will be disaster for simple poor naïve people who might be misused for non-humanitarian anti Islamic action against the community. The spirit of Islam is “Peace upon everyone”.

2. Arid counties have to do more with little water to sustain basic human needs and relief misery of malnutrition. There is always considerable water waste which can be avoided.
3. Industrial development is slow due to the big gap between research and applications. Bridging the gap is a must.
4. Shortage of funds, rigid institutions and poor management skills¹⁰ are sever inhibiting factors to national economy and poverty alleviation.
5. High pollution levels and continuous surface and groundwater deterioration, are the environmental threats in future.
6. Insufficient trained manpower, awareness programmes and absence of appropriate technology adaptation policy.

In order to turn the pre-mentioned problems to opportunities there must be clear objectives to eradicate pandemic poverty, injustice, hopelessness and non-human environment. This can be achieved if the rich developed world will be committed to provide the necessary elements to accelerate developments towards the ultimate goals and objectives which consequently will lead to future stability.

Therefore, the suggested strategy for an action plan is a time horizon of 15 years to cover three successive phases, as follows:

- a. A short term action plan of 5 years for capacity building and establishing rural infrastructure at specific priority locations.
- b. A medium term action plan of 5 years for demonstrating technology adaptation models (pilot projects) for different water activities, targeted to specific objectives (industrial wastewater treatment for recycle, sewage treated for agriculture ...etc). If primitive local technologies exist it might be a good starting base to be developed.
- c. A long term action plan of 5 years for integrated water activities of water resources systems to secure future sustainability and open new

opportunities linked to industry. At this stage, the road should be paved to increase dramatically food production, full capacity reuse of marginal water in developments, and fading out the dependence on virtual water.

The three planning phases are complementing each other, however each phase should have its specific objectives, performance indicators and action plan, including the tools and elements required for implementation. For each phase an initiative mechanism will be developed to stimulate the human talent not only to solve problems, but also invent local technologies and new development areas. The context of optimum use of available resources, changing human behavior and attitudes towards water by changing habits, continuous upgrade of local technologies adapted to new areas of development, enhance regional cooperation and exchange of suitable technologies through pilot projects initiated by rich developed countries, developing team work spirit, and provide the appropriate training programmes to undeveloped countries are the principal element of sustainability.

Accordingly, the branching problems behind the four main suggested causes of frustration and terrorism, can be grouped in three main categories,

1. Human driven problems, such as wrong beliefs, illiteracy, misguidance, low productive outputs, rejection to changes towards improvements ...etc.
2. Governance driven problems, lack of institutional and legal reforms to comply with the world changes, nonrealistic ambitious plans and absence of monitoring and evaluation system, lack of knowledge and information dissemination mechanism, less attention to management training, misallocation of limited resources ...etc and waste of resources in some cases.
3. Non-governance driven problems, shortage of funds, highly expensive technologies, lack of technical assistance for upgrading and modernization of facilities to cope with new developments, worldwide political and economic instability impacts ...etc.

As far as the water scarcity problems impacts, the three successive action plans will focus on the mitigation measures, techniques and procedures, make

use of learned lessons from past problems to turn its impacts to opportunities, (providing the targeted objectives are achieved).

The first action plan phase, is in fact aims at laying the infrastructure for solutions and opportunities. The fundamental needs to make it successful are the integrated efforts of the governments, the external technical and technological support and NGO's (community and individual organizations), on addition to proper legal and institutional reform programmes.

Referring to capacity building and rural infrastructure¹¹, the governments role should be setting a priority map of the needs for skilled manpower, non-human or capital resources, (equipments, funds, land ..etc.), and the techniques of production relevant to the water scarcity issue (water treatment technologies, modern irrigation systems industry, monitoring and calibration instruments, maintenance and operation tools, groundwater development and protection techniques, use of non-conventional energy sources in non-conventional water (desalination ..etc.). The first action plan phase aims at providing different projects proposals in the scope of water scarcity mitigation and optimum water utilization. This should appraise the available local technologies and possible policies to upgrade and/or replace it by appropriate technologies. It is in fact, a self study and evaluation to the prevailing conditions surrounding the water scarcity problems. Results of this phase is spotting points of strength and weakness in the governments executive system, the national potential resources which are not efficiently used, and the stakeholders involved in the water scarcity problem.

The second action plan is the most crucial phase, since it deals with the answer to, "show me how"? Question. It heavily depends on the research and development, and the efficient capabilities to the role of a mediator between local technologies and external advanced technologies. The end result of this phase must be the implementation of a number of selected pilot projects emerged from the first phase, according to national importance and regional priorities. The driving initiative force should come from the advanced rich countries, which will provide technical assistance, technologies and supplement funds, if needed on the grounds.

These exemplary demonstrated pilot projects must educate, by hands on experience, the research teams, provide appropriate technologies to solve problems associated with water scarcity that can be transplanted and developed in country, and allocate funds to initiate and support national research organizations to take the role of continuation and dissemination.

It should be strongly emphasized, that assistance of advanced countries to poor undeveloped countries, must focus on tools, techniques and HRD, rather than agriculture products and consumable goods (virtual water concept), i.e. “teach me the skills and give me the tools and show me how to produce and secure my food and water, instead of being always dependent”.

Biotechnology, tissue culture, genetic engineering, membrane industrial technology...etc, are a few areas to develop food production and cope with water scarcity conditions, particularly that climate change is a fact.

The suitable mechanism to sustain an efficient link of technology transfer and adaptation through efficient networking, connecting research organizations, concerned with water scarcity, in both developed and undeveloped countries. Pilot projects may thus be technically and feasibly proposed and studied among developed and undeveloped research bodies in order to reach regional consensuses about a priority group of pilot projects in different representative site specific conditions. The funding of the agreed programme may be covered jointly between regional and international sources. Results and findings should belong to the network administration which in turn disseminate any information, results and/ or advice from any of the experts and professionals forming the research team.

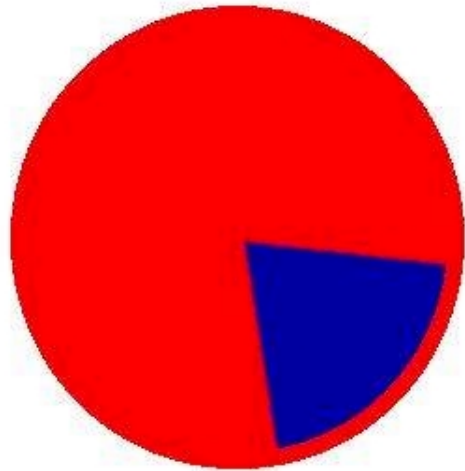
In this context, the author presented a proposal for an “ Arab Water Research And Learning Network” during this year, in two occasions, an international conference in Kuwait¹² and a ministerial meeting in U.A.E¹². The idea was highly appreciated and accepted.

The third action plan is the real target to turn problems into opportunities since it lies within each country's own desire to change and use all its capabilities

and potentials to attain self sufficiency, cope with water scarcity¹⁴, maintain active regional cooperation and optimize resources allocations. However, we should admit that reaching this target is a long term process which needs transition period where developed countries have to support undeveloped countries, since technology is dynamic. The role of the private sector is crucial to motivate and enhance continuous modernization of industries relevant to water activities. Regional trade-offs must be encouraged, in other words political boundaries should not be a brier to inhibit exchange of goods and services. There is no one country that could be totally independent in food production and trade, since trade requires producers and markets.

Therefore, monitoring and evaluation system for the work progress should be applied, following the pilot projects completion models demonstrating the efficient use for technology adaptation. Periodic self evaluation study (say on annual basis) must be conducted, according to specific performance indicators, to assure the targeted progress rate and direction. Technical auditing team for evaluation will be of great importance after pilot projects are converted to real national projects. Non-conventional water must be an integral part of the water policy. Also, both non-conventional water and non-conventional energy–developments and applications–must be an area of research supported by advanced developed countries. The expected achievements of the third action plan phase should lead to endless and progressive developments which means increased productivity and new opportunities.

Fig. (4) illustrate the conceptual mitigation impacts of the three proposed action plans which drives gradually down the overall trend of the uprising terrorism problem.



● Global Terrorism Problem

● Water Scarcity Contribution

Problems Escalation

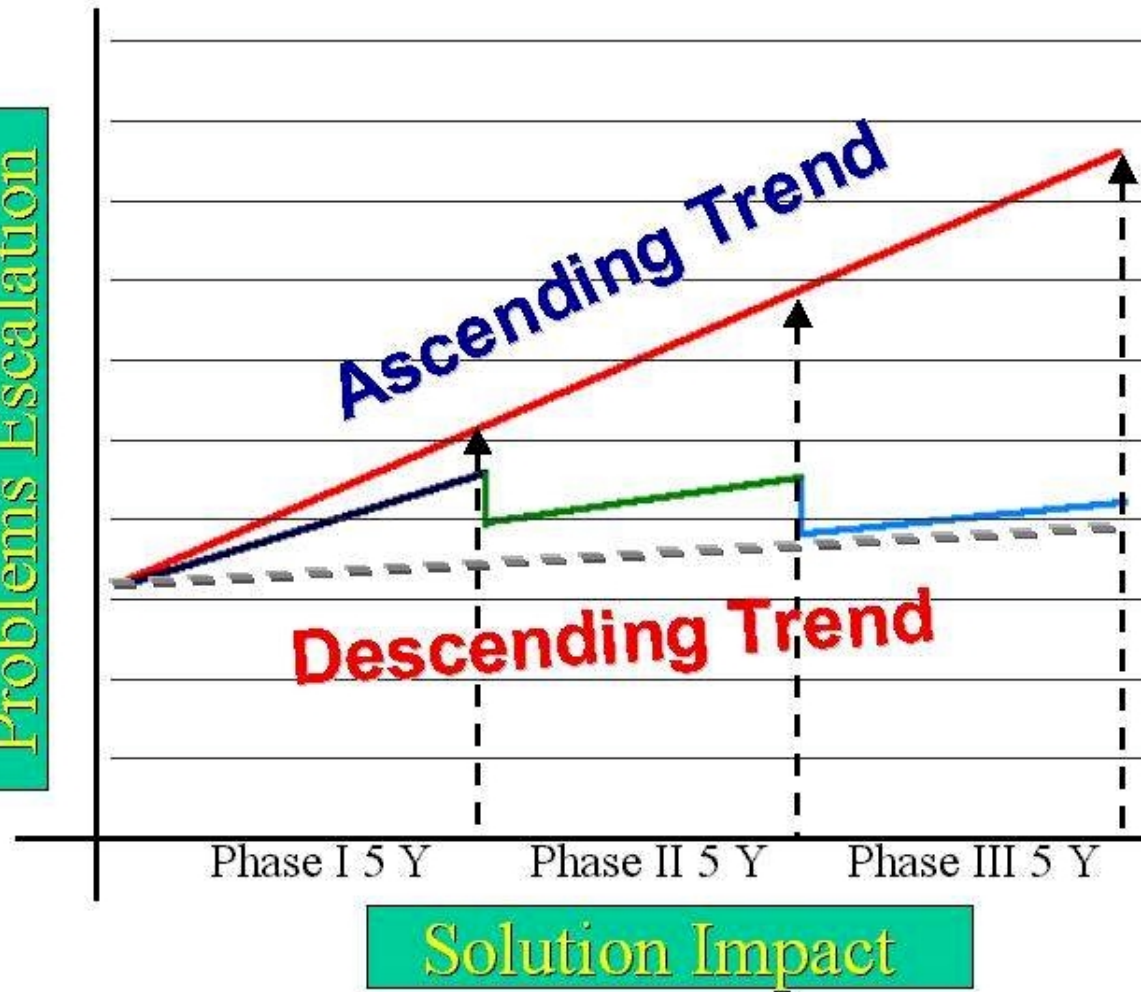


Figure (4) Conceptual mitigation impacts of the action plans

Conclusion And Recommendations

It is important to mention that some of the information appeared in this paper were gathered from the Arab media and reflects the general understanding about water scarcity problems by water experts and professionals in the region.

The analysis of the main motives to frustration and terrorism, revealed that Poverty, Injustice, Hopelessness And Non-Human Environment are the corner stones. However, there are rooted problems behind each, which are diverse and at different levels of seriousness for each country in the middle east.

Water scarcity, as one of the enhancing causes, has different proportion to each rooted problem, but it is not dominant. There are several other causes leading to the global problem which need to be analyzed by other disciplines experts concerned with social, economic, education, religion, national security, politics and others.

As far as the role of water scarcity mitigation, it has been proposed that regional cooperation in solving this common problem is a must.

The proposed action plan of three phases (infrastructure, pilot projects and real life national projects) needs full assistance and support from advanced developed rich countries to help poor communities lacking water and sanitation. In this respect, it is highly recommended to raise a special multinational contribution fund for “Water Scarcity Risk Management Fund”.

The essence of cooperation between developed and undeveloped countries suffering water scarcity are; knowledge, experiences and technologies. Non – conventional energy (solar and wind) and its role in solving water scarcity problem is very essential field of cooperation.

In conclusion, I strongly emphasize the importance of research and development (R& D) to be the main pillar, in a wide area network, between developed and undeveloped arid countries, to work very closely in solving the complex water scarcity problems. Long experience tells that solutions must emerge from tackling real conditions on the ground (not on paper) and can not be imported and transplanted in different environment.

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