The present supply and usage of water environmental sciences essay

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LETTER OF AUTHORIZATION

April, 08th 2013

To Whom It May Concern

Under the authorization of Mr. Aijaz Rasheed, Instructor for the course The Pakistan Economy at the Institute of Business Management, Karachi, we have been required to obtain all the possible information and material to prepare and conduct report on a " Is Water Crises issue in Agricultural Sector of PakistanThis report is about the " Is Water Crises issue in Agricultural Sector of Pakistan" This report is compiled, designed and submitted within the due date. Sincerely, Ashfaq Ahmed SolangiTalha Anjum

LETTER OF TRANSMITTAL

April, 8th 2013

Mr. Aijaz Rasheed

Instructor, Pakistan economy

Institute of Business Management (IoBM)

Karachi.

Dear Sir Aijaz:

Here is the report about " Is Water Crises issue in Agricultural Sector of Pakistan" As you will see, through research we have discovered that how " Is Water Crises issue in Agricultural Sector of Pakistan" took place and what

was the conclusion. To substantiate the report, both primary and secondary data were collected. Information from the Internet was gathered. The heart of our report is based on the findings from the internet. We have tried our best to present all the necessary facts and figures required in this report. It was a great challenge to work on this report, and we got plenty of hands on findings experience by participating in and accomplishing this report. Sincerely yours, Ashfaq Ahmed SolangiM. Talha AnjumContents

INTRODUCTION:

Water, simply put, makes the existence of the human race on this planet possible. With few exceptions, water has always been a natural resource that people take for granted. Today, the situation has changed. The World Bank reports that 80 countries now have water shortages and 2 billion people lack access to clean water. More disturbingly, the World Health Organization has reported that 1 billion people are unfortunate who lacks from this natural resource. Population growth and groundwater depletion present the two most significant dangers to global water stability. In the last century, the human population has increased from 1. 7 billion people to 6. 6 billion people, while the total amount of potable water has slightly decreased. Much of the population growth and economic development experienced in the last fifty years has been supported by subterranean water reserves called groundwater. These nonrenewable reserves, an absolutely essential aspect of the modern world, are being consumed at an unsustainable rate.

1. The Present Supply and Usage of Water

Humanity has approximately 11 trillion cubic meters of freshwater at its disposal. Groundwater aquifers contain over 95% of this water, while rain,

rivers, and lakes make up the remaining 5%. Approximately 1, 700 m3 of water exists for every person on the planet, an alarming low number. According to the Water Stress Index, a region with less than 1, 700 m3 per capita is considered " water stressed". The global supply is not distributed evenly around the planet, nor is water equally available at all times throughout the year. Many areas of the world have seriously inadequate access to water, and many places with high annual averages experience alternating seasons of drought and monsoons. Water usage differs highly between developing countries and developed ones. Developing countries use 90% of their water for agriculture, 5% for industry, and 5% for urban areas. Developed countries use 45% of their water for agriculture, 45% for industry, and 10% for urban areas. In the last century water usage per person doubled, even as the total population tripled, creating a situation today where many areas of the world are consuming water at an unsustainable rate.

2. Increasing Demand

The agricultural sector, by far the largest consumer of freshwater resources, accounts for 70% global consumption. Irrigation consumes most of the water in the agricultural sector, and has become an integral part of modern civilization because of access to groundwater aquifers. Once farmers were freed from relying on rain to water their crops, highly efficient commercial farming became increasingly common. This innovation also underpinned the Green Revolution, which dramatically increased crop production throughout the third world in the 1960s. Unfortunately, water is being drawn from many of these aquifers faster than it is being replaced. The industrial sector

accounts for 22% of global water consumption; this number will grow in the coming decades as the developing world industrializes. The needs of industry tend to take precedence over agriculture for simple economic reasons. 1, 000 tons of water will produce 1 ton of wheat, which is worth $200. 1, 000 tons of water in the industrial sector, however, will generate $14, 000 worth of goods. On a per ton basis, industry creates 70 times more wealth. Despite its economic benefits, intense water use by industry has led to serious pollution that is beginning to create problems worldwide. The residential sector uses the remaining 8% of the total water supply. Although this sector only accounts for a small percentage of overall use, it always takes precedence over industry and agriculture. In the last fifty years the world's urban population has exploded, and by 2010 50% of the people on the planet will live in cities. In addition to the simple increase in population, per person consumption of water has risen. As more people begin utilizing modern luxuries like flush toilets, showers, and washing machines, the demand created by the residential sector will increase dramatically. SOURCES OF WATERGod has blessed Pakistan with abandoned water resources, with water flowing down the Himalayas and Karakorum heights, from the world's largest glaciers, a free and unique bounty of nature for this land of alluvial plains. As a result of this natural resource, today we have the worlds marvelous and the largest irrigation system that irrigates over 16 million hectors of land, out of 34 million hectors of cultivable land available. Basically we have two major sources of water i. e. surface water & ground water. SURFACE WATERIn surface water we have three hydrologic units. First one is Indus Basin River.(a) Indus Basin RiverAt the time of independence, we had about 67 maf water available for diversion; this amount increased to

about 85 maf by 1960. In 1960 Pakistan signed a water treaty " Indus water treaty" with India, which brought major changes in the sources of water for Pakistan. In that treaty the right of three eastern rivers i. e. Beas, Sutlej and Ravi was given to India. Now the Indus river basin constitutes of the mountain basins Indus plain, Karachi plains and desert areas of Sind. Its principle rivers and tributaries are Indus, Shyok, Gilgit, Astor, Siran, Kabul joined by Jhelum, Chenab and Sutlej. It covers an area of 516, 600 sq. km. its source of water are snowing, glacier melting and rainfalls. From this annually 141. 67 maf of water is being received.(b) Closed basin Kharan desertIt consists of areas of mountain basins of Quetta and basins of tributaries draining in to Kharan desert. Its main rivers are Pishin Lora, Baddo Rakhshan, Mashkhel and many other streams. It covers an area of 120, 100 sq. km. its main sources of water are rainfall and nominal snow. Here we are getting approximately 4. 5 maf of water.(c) Makran coastal basinMakran coastal basin constitutes of streams of Malir, Hub, Porali, Kud, Hingol, Nai, Mashhai, Dasht, Nihing and Kech. It covers an area of 122, 400 sq. km and its main source of water is rainfall. From this basin 0. 78 maf of water. Now coming towards groundwater sources. Ground water:-The Indus plains constitute about 34 million hectors (over 85 million acres) of cultivable land. The recharge or absorption to the ground is around 72 maf, out of which about 48 maf is in the command of Indus basin irrigation system (ibis). Ground water is also found in some rain-fed (barani) lands and inter-mountain valleys at depths varying from 100 to 200 feet. After pointing out the main sources of water, let’s have a glance of the water available to us through them. We receive an average of 141. 67 maf of water from western rivers. Eastern rivers contribute 8. 47 maf of water. About 4 maf of water is

received from outside Indus plains. Water available above rim stations is 5. 28 maf whereas rainfalls below rim also contribute about 14 maf of water. Also about 66. 89 maf ground water is available to us. In other words a total of 240. 22 maf of water is available to us from the present sources. For controlling the water resources and for its effective utilization let’s have a glance at the present storages and its capacities. http://www. pakissan. com/english/watercrisis/images/water01. jpgWater reservoirs / capacities:- Pakistan is having three basic reservoirs, namely mangla dam reservoir, Terbela dam reservoir and Chashma barrage reservoir. more small reservoirs like Warsak, Baran dam hub, Khanpur, Tanda, Rawal, Simly, Bakht khan Hamal lake, Mancher lake, Kinjhar lake and Chotiari lake Arealso included as small storage. I shall be discussing only the major reservoirs.(a) Terbela dam reservoirWorld’s largest earth and rock filled dam was built at Terbela on river Indus in 1976 with a gross capacity of 11. 62 maf and a live storage capacity of 9. 68 maf. With the passage of time, due to silting, 24. 6% of the storage has been lost and now it has a live storage of 7. 295 maf.(b) Mangla dam reservoirMangla reservoir is the second major storage of Pakistan. It was built in 1967 on river Jhelum with a gross capacity of 5. 882 maf and live storage of 5. 41 maf. Again due to siltation it has lost 13. 2% of its storage and presently can store 4. 636 maf of water.(c) Chashma barrage reservoirChashma barrage is situated on river Indus and was built in 1972 with a gross storage of 0. 870 maf and live storage of 0. 717 maf. It has also reduced its storage capacity by 39. 3% and is left with a storage capacity of 0. 435 maf.

Nature of Water Crisis

Water crisis is a term that refers to the scarcity and quality of available water resources relative to human demand. However, nature of crisis can change from one context to other. In global context, the following symptoms are reported for water crisis: Inadequate access to drinking water for 1. 1 billion people; Inadequate access to water for sanitation and wastewater disposal for 2. 5 billion people; Groundwater excessive use leading diminished agricultural yields; Overuse and pollution of water resources harming biodiversity; andRegional conflict over scarce water resources sometime resulting into warfare. Internationally, an indicator is devised to see if a certain country can be classified as water stressed or water scarce country to determine the emerging seriousness of water crisis. This indicator is generally termed as quantity of water available per year per person. If this per capita annual water availability in a country ranges between 1000-2000 m3, this status is said to be water stressed and if this amount of water drops below 1000 m3, the locality in focus is considered to be facing water scarcity situation. As far as water availability per capita per year is concerned, sources like Amin Dadbhoy reports huge water distribution distortions in global context. For example, on one hand there those where water scarcity is too acute like Kuwait, Gaza and UAE where annual per capita water availability is around 10 m3, 52 m3 and 58 m3, respectively. Opposite to such water poor countries, there are some water rich countries, where annual per capita water availability is very high, for example: French Guiana (812, 121 m3), Iceland (609, 319 m3), Guyana (316, 689 m3), Surinam (292, 566 m3), Congo (275, 679, m3), Canada (94, 353 m3) and New Zealand (86, 554 m3). The reported uneven water availability results because of the

nature of regions. The ongoing climatic changes, it is predicted that humid regions will receive even more rain and arid and semi arid zones may get lesser and erratic rains in the future. According to an estimate, climatic change may cause another 20 % water scarcity in drought-prone areas. Because of the population growth and climatic changes, water crisis in many non-humid regions will aggravate. In case of Pakistan, water crisis is much more complex and multi-facet phenomenon. For example, per capita water availability that was 5, 300 m3 in 1951 is expected to drop to 850 m3 in 2013. This is mainly because of the population growth from 34 million in 1951 to 207 million projected in 2013. If population increase in 62 years is six times, the corresponding decrease in per capita water availability is a natural outcome as presented in Table 1.

Table 1: Past, present and future water availability per capita per year in Pakistan

Per Capita Water Availability

YearPopulation (millions)Per Capita

Availability(m3)19513453001961463950

1971

65

2700

1981

84

2100

1991

115

1600

2000

148

1200

2013

207

850

2025

267

659

Source: Draft State of Environment Report 2005

This reported water scarcity becomes even more serious concern when we look at the degree of control of water sources and percentage of water used in Pakistani context. As presented in Figure 1, the percentage of water originating outside of Pakistan’s territory is 75% or more. When viewed this status in a very hostile environment, this complication becomes even more complex. Added to this very low degree of control, this water crisis takes another boost when we look at water exploitation index. As shown in Figure2, Pakistan’s use of water as % of total renewable water resources, it is around 75 % plus. This high water exploitation index puts Pakistan in a category of severe water stressed situation. http://www. internationalhydropolitics. com/images/watercrisis/image1. jpg

Figure 1: Degree of water control in Asia

http://www. internationalhydropolitics. com/images/watercrisis/image2. jpg

Figure 2: Water stress status in Asia-Pacific

In addition to the above referred indicator of water availability per capita per year, those countries where overwhelmingly water consuming sub-sector is agriculture, there is need to consider annual irrigation water required or needed versus that is available. In the context of South Asian sub-continent, agriculture sector consumes 99%, 97%, 92% and 86% of total water available in Nepal, Pakistan, India and Bangladesh, respectively. Perhaps per capita water available may have to be complemented with additional indicators to identify the real nature of prevailing water crisis in this region. For Pakistan, therefore, it is important that we also look at the availability of water for irrigation. We had 9. 2 million hectares irrigated land in 1950-53 which has gone up to 18. 02 million hectares in 2000 -03; an increase of almost 100 % over a period of 50 years. As shown in Table 2, there has been an increase in water diversions to canals at different stages but not in the same proportion as horizontal expansion in irrigated land.

Table 2. Historical Canal Water Diversions in the Indus Basin of Pakistan

Key InfluencesPeriodCanal Diversions MAF / (billion m3)

Kharif

Rabi

Annual

Pre-Partition1940-194747. 6/ (58. 5)20. 2/ (24. 9)67. 8/ (83. 4)Partition1947-194846. 3/ (57. 0)22. 4/ (27. 6)68. 8/ (84. 6)Dispute1948-196051. 5/ (63. 4)24. 7/ (30. 4)76. 3/ (93. 8)Pre - Mangla1960-196760. 3/ (74. 2)27. 6/ (34. 0)88. 0 / (108. 2)Post - Mangla1967-197565. 3/ (80. 3)30. 2/ (37. 1)95. 5/ (117. 4)Post - Tarbela1975-198068. 1/ (83. 7)38. 2/ (47. 0)106. 3 / (130. 7)Post - Tarbela1980-198568. 4/ (84. 1)37. 3/ (45. 9)105. 7 (130. 0)Post - Tarbela1985-199066. 3/ (81. 6)37. 7/ (46. 4)104. 1/ (128. 0)Post - Tarbela1990-199566. 3/ (81. 5)38. 5/ (47. 3)104. 7/ (128. 8)Post - Tarbela1975-199567. 2/ (82. 7)38. 0/ (46. 7)105. 2/ (129. 4)

Data Source: Water Resources Management Directorate, WAPDA.

Based on meteorological data from 18 stations country-wide, annual potential evapo-transpiration varies from 1. 20 m in Muree to 2. 0 m in Jackababad. Similar estimates of irrigation requirements are made for each province of Pakistan. When we compare these annual irrigation requirements, based on areas irrigated, we observe, as shown in Table 3, another dimension of the water crisis. Since water use in agriculture sector in Pakistan is around 97%, the nature of water crisis becomes very critical for food security and livelihood of the people. If one province that the dominant source of agricultural production, overall water deficit per unit area irrigated is going to keep productivity down and consequently food security at risk.

Table 3. Comparison of Surface water allocations and Water Requirements

among four Provinces of PakistanDescriptionPunjabSindNWFPBaluchistanAnnual Irrigation Requirements (m)1. 261. 341. 161. 19Annual Water Allocation as per 1991 Accord in BCM (MAF)68. 81 (55. 94)59. 98 (48. 76)10. 80 (8. 78)4. 76 (3. 87)Canal Irrigated Areas (million hectares) in 2000-0311. 041. 960. 770. 55Annual water available per unit area irrigated (m)0. 623. 061. 400. 87Deficit (-) or Surplus (+) in m/ha-0. 64+ 1. 72+ 0. 24-0. 32Punjab has canal irrigated area about 11. 04 million hectares which constitute 77 % of the entire country. Almost same ratio holds for the cropped areas that are irrigated exclusively either by tube-wells or wells. Shortage of more than half of irrigation water required has caused deficit irrigation causing productivity concerns. Now, this crisis is not brought either by nature nor by India; it is home-made and we have no option except to find ways and means to face it off. Because of sever water shortages as presented above; tube-well irrigation got an exponential growth over a period of 50 years. Recent data suggest that over 1. 2 million tube-wells are installed in the country and more than one million these tube-wells are pumping about 35 MAF of groundwater only in Punjab to irrigate 7. 17 million hectares conjunctively with canals and 2. 74 million hectares exclusively by the tube-wells. Without getting into arguments and counter-arguments, this is clear and solid ground reality that there is huge water crisis in the food granary of Pakistan. It is interesting to note that 71. 1% irrigated area of Punjab receives either exclusive tube-well water or conjunctively surface and ground water are being used. In contrast to Punjab, the share of tube-well irrigation in other provinces is almost insignificant. On one hand, dependence on groundwater in Punjab is a blessing as quantity being used is almost three times that of

surface water storage that Pakistan has built. Moreover, this explosion of pumping technology helped to control the twin menace of water-logging and salinity in this region. Imagine a possible severity of water crisis in a scenario where there would have been no use of groundwater at all. It would have definitely flabbergasting and horrifying outcome. On the other hand, this practice of delaying its fatal impact has put the entire sustainability of irrigated of Punjab at risk. In an insane absence of institutional support system for groundwater management and due to shortage of canal water, farmers of Punjab are forced to use groundwater where almost two-third tube-wells are pumping sodic water for irrigation. As farmers are left on their own to decide about installation of tube-wells for groundwater extraction, they can only avoid pumping brackish water that gives tastes of excessive salinity but sodic / alkaline waters are, usually, assumed to be alright. This is why that more two-third tube-wells are adding slow poison to irrigated lands and this is becoming a significant factor for low yields in this region. This is another aspect of the seriousness of the emerging colossal water crisis. At present, on one hand, our entire focus is confined to either blaming India for stealing water or debating on building Kala-Bagh Dam. Sure, there is a lot of truth in it but should we opt a destructive way of war where there will be no-winners or look at the options that are still available to overcome such crisis? Obviously, war is NOT an option, period. To seek a constructive way out, we need to ask an honest question from ourselves: At present, are we really in position to abrogate the Indus Water Treaty and get even a half way decent agreement from an extremely hostile neighbor? Of course, NOT! Since Indus river systems became a trans-boundary flow case after the partition in 1947, we could have convinced India and the international community at large to

follow international laws regarding the established water rights for lower riparian. Instead, we were forced to negotiate and accept the partition of the Indus valley and Indus River waters as consequence. In other words, we agreed to the law of jungle, might is right, instead of taking right stand based on relevant international law of established water rights. On the other hand, the entire canal irrigation system was designed, planned and implemented on a cardinal principle of equitable river water " disposal" / distribution per unit of irrigated area in the Indus Valley. Interestingly enough, in this intra-national context, our negotiations among four provinces revolved around the prevailing international water laws to satisfy established water rights because of inundation canals under lower riparian scenario. Although ground realities did change drastically after say independence, formation of one unit, Indus water treaty of 1960 and in spite of original design criteria opted for the use of 97% water use in irrigated agriculture; once an agreement signed with consensus, it should be accepted whole heartedly. As a matter of fact, we should still feel fortunate enough that all provinces signed on the Water Apportionment Accord in 1991. This brings us to ask one more honest question to ourselves: Without endangering the entire fabric of our federation, is there any possibility to get a better water apportionment accord among our four provinces? Answer is obvious; a big NO. In spite of the above two soul -searching questions and candid answers, fact remains that both of these agreements had a huge impact on the on-going water crisis. In both cases, as far as one can honestly feels, all stake-holders are sticking to these best possible agreements based on compromises made but only in letter sense. If these agreements are our best possible and last resort options, we can have way out only if we create

conditions that make all stake-holders to implement and follow these agreements both in letter and spirit. For example, India is allowed to develop hydro-power potential by constructing dams as long as this power generation is made to stay within run-of- the-river principle. If India tries to deviate, we negotiate and once issue is established and bilateral negotiations fail, there is provision to seek arbitration from a neutral expert by using the good offices of the World Bank. Such arbitration on Bughliar Dam is a recent case in point. Yes, there were few minor adjustments made but these alterations do not stop India to continue building dams across all three western rivers, allocated for supplying water to Pakistan, as long as these power generation facilities are kept confined to run-of-the-river flows. In letter sense, India could do so. However, in doing so, India is developing a capacity and capability to flood Pakistan when there is least water required for crops and can create drought conditions when there is dire need for crops in the Indus Valley of Pakistan. Since we do not have observers stationed at all such dam and control sites, India can start storage when there is very little rain or glacier water available. A delay of well-coordinated water stoppage for even few weeks can ruin our agricultural economy to a greater extent. Similarly, when there is not much need for crops, like wet season, a letter bound hostile India can flood the country to cause further damage to economy. This risk is further enhanced with acceptance of sluice gates to remove silt by the neutral expert appointed by the World Bank while arbitrating on Baglihar case. While doing all such manipulations, India will be hiding behind the letter sense of the Indus Water Treaty. But for Pakistan, water crisis will keep getting bad to worse as time progresses. At the national level, we created problems for ourselves by ignoring the basic principle of design for equitable

river water disposal; we generally term it irrigation, but started deviating to establish new rights for water use by increasing water allowance criterion followed in canal areas of the Pakistani Indus Valley. Like the famous gold rush in the US, just to establish water rights, all provinces tried to increase water allowances either by developing new irrigation systems or widening the existing facilities by authorizing and pushing more water than the original design of conveyance systems. This has caused rivalries and hot exchanges among provinces and stakeholders. Also, different lobbies used such deviations to seek political benefits by justifying extra water needs over and above the original water allowances. Because of an absence of proper water management essentially at secondary canal level, water crisis, particularly at the lower parts of these canals, is very evident. Coupled with flood irrigation, either irrigation by flooding basins or using old Punchoo system, water crisis keeps on increasing its intensity day by day. IRSA or no IRSA and telemetry system or no telemetry system; unless we decide to distribute water by going beyond letter sense and include the spirit of the Water Apportionment Accord of 1991, we do not see an end of this water crisis in Pakistan. In order to face this emerging serious threat to our main living source, we may have to revisit our perceptions and self-righteous claims about Indus Water Treaty of 1960 and the Water Apportionment Accord of 1991. If all stakeholders honestly decide to follow these agreements in letter and spirit, instead of getting stuck to the letter part only, there exists a real hope to face off such crisis effectively. On the other hand, if we keep playing drama of make-believe for appearing to be acting according to the letter part of such historic commitments, I am afraid that its potential consequences could be disastrous for all concerned. We all have to

move beyond blowing fire to get our self-claimed and perceived rights and show courage to openly take steps to shoulder relevant responsibilities both in letter and spirit. With that kind of stated paradigm shift, I am sure that there is nothing that we cannot face and manage.

Issues Associated with Water Crisis

For finding a way-out from the emerging water crisis within the stated ground realities, it is important that we identify issues to be addressed. These issues can be listed under different categories that include: Management of population explosion in view of the free fall of per capita water availability of water; Additional Confidence Building Measures (CBMs) to ensure that the Indus Water Treaty of 1960 is implemented by India and Pakistan both in its original letter and spirit; Additional Confidence Building Measures (CBMs) to ensure that the Water Apportionment Accord of 1991 is followed by all four provinces of Pakistan in its true letter and spirit; Agreed and efficient supply side water management; Agreed and enforceable demand side water management; Creation of conducive environment for effective water conservation practices; andGetting rid of ineffective water governance.

Causes and Impact of Water Shortage in Pakistan

Pakistan is one of the 30 countries of the world, facing an acute water deficiency, which is likely to aggravate during the forthcoming decades. More than 80% of Pakistan lies in the arid and semi-arid zones, characterized by highly erratic, unpredictable and low precipitation, excessive evapo-transpiration and high summer temperatures. Coupled with uneven river flow, the climatic vagrancy has placed Pakistan in a critical water supply

environment. Presently Pakistan is undergoing the worst draught and water crises of its history which is likely to persist for few years. To understand the magnitude of the water shortage and its impact on future, some of the causes are listed below. Low Rainfall/Snow Fall Pakistan has entered into third lean period of precipitation. There had been no incidence of floods since last three years and dry spell is gradually at increaseReduction in Storage Capacity Live storage in the available reservoirs is depleting due to silting up. The existing storage reservoirs at Tarbela, Mangla and Chashma are losing storage capacities at a rapid rate. The storage capacity of these reservoirs shall continue restricting in the future years causing corresponding reduction in the available water resulting in serious shortages of canal water during the lean flow periods of October – June each year. As such construction of additional reservoirs would not only be necessary for development of irrigated agriculture but these would also replace the lost storage capacity of the existing reservoirsChanging Crops Pattern Rice and Sugar cane crops consume large quantity of water vis-à-vis cotton and other crops of Kharif. Good price and Mushroom of Sugar mills without any master planning encouraged farmers to grow these crops even in the Arid Zone thus increasing the demand of water manifolds. Water Allowance Higher water allowance in certain districts is even creating drainage/salinity problems. In Sindh, allocation of water per 1000 acres of canal command area, termed water allowances, is far greater than in Punjab. For Sindh Canals, perennial supply is 2. 7 to 9. 0 cusecs, and non-perennial supply 6. 0 to 15. 0 cusecs. In contrast Punjab has 2. 7 to 4. 2 cusecs and 3. 2 to 6. 4 cusecs, respectivelyEffects of Urbanization/ IndustrializationGrowing urban – Industrial use of water is also contributory factor. The Khanpur Dam

constructed for urban water supply to twin cities of Islamabad and Rawalpindi is becoming inadequate even before the supply could be started as population has increased in geometric proportions. Growth of industry/ mega industry has also increased the consumption of water at higher levels.

IMPACT OF WATER SHORTAGE

Reduction in Crops During 2002-2003, Ministry of Food and Agriculture has lowered the wheat target from 22 million ton to 19 million ton, which is being further lowered. Despite the fact that cultivated area has remained same, the crop size will substantially reduce. All Pakistan Textile Manufacturing Association (APTMA) asked for import of cotton during current season due to fewer yields. Ground Water Shortage of surface water has put tremendous pressure on ground water. The draw down phenomenon is being observed and water table has gone down. It is being affected on two accounts:-Over drawl by user to compensate for the shortage. Reduced recharging owing to less surface flows. Effect on National Harmony The worst impact of water shortage is that it is creating bitter controversy between provinces, which is affecting National integration and creating disharmony between provinces. UTILIZATION OF WATER IN PAKISTANIn Pakistan we utilize the water available to us for different purposes. The basic utilization is for irrigation and then used for power generation, drinking and also provided to some Industries.(a) IrrigationOut of 240. 22 maf, 172. 21 maf water is utilized for irrigation purposes as shown on the view foil. In this the canal diversions is 105. 23 maf; system loses are 144-40; rainwater is 6. 0 maf; ground water is 41. 30 and utility above rims is 5. 28 maf.(b) Power generationWater released by the hydropower plants returns to the river system. The

reservoirs are operated on priority bases only for irrigation. Recent increase in thermal generation has reduced the potential conflicts between water releases from reservoirs for hydropower generation and irrigation. Now most of the annual storage is utilized for irrigation and not for hydropower, but conflicts do arise at times.(c) DrinkingMost of the rural and urban water is supplied from ground water through tube wells and hand pumps except few cities like Karachi and Islamabad/Pindi. Total urban and rural (domestic and commercial) requirements estimated is 10-15% of the surface water, out of which 80% return to the system, however with degraded quality. Net consumption is normally about 2% of the total water available.(d) IndustryWater is also utilized in Industries basically for cooling purposes and also in manufacturing processes. This utility is less than 1%. Shortage of waterAs we all know that now a day’s our country is facing severe shortage of water. There are two main reasons, one natural due to prolong drought--- which is beyond the control of a man, and the other due to the gross negligence in the development and mis-management of water resources. The average annual inflow of the Indus and its tributaries is i41. 67 maf, of which 97% is used in agriculture and the remaining 3% for domestic and Industrial purposes. Out of 141. 67 maf, around 106 maf is annually diverted in to one of the largest but in-efficient irrigation system. The remaining 36 maf goes into the sea unused – a total loss --. Out of 106 maf, diverted into an extensive irrigation net work, more than 50% is lost during the changeling and the field application before it reaches the crop root zone. In the years when the rainfall is normal or above, the country generally does not face any water shortage, where as in below average rainfall period it does. This has happened just few weeks earlier. i was sitting with secretary irsa, in

connection of my vision, and he said that they are reducing the quota of Punjab and Sind by 5% because of no rains and that the level of mangla has gone below dead level. After three days i was again with him and he said that now we are increasing the quota of all the provinces, because we are in happy situation due to present heavy rains and snowfalls. The planners, it is assumed, are responsible to foresee and carry out effective water resources development and management planning to meet the future challenges. However, sadly this is not practiced which ultimately lands the state into such uncalled situations. Impact on economy / societyAs I said earlier that agriculture is our backbone and the water flowing in the channels to the crops is its blood line—and if there is no or less water then we should be prepared for facing problems economically as well as socially. According to the estimates of federal government, the agriculture sector would suffer a loss of about Rs. 90 billion because of drought. Since agriculture has remained a major source of shouldering the already crippled economy, it has a vital role to play particularly in terms of food security and employment of the ever-burgeoning population of the country. It contributes around 35 % to the gnp and employs about 44% of labor force. It also contributes 65% of our export earnings. The adverse effects of water shortage on agriculture would have a spiraling effect on the prevailing level of poverty.(a) Less water means less agricultural yields and to fulfill the food requirements of the nation, we will be dependent on other countries.(b) Raising livestock is the main source of livelihood of rural areas. it is also an important economic activity, which contributes 9. 7% of gdp, will be affected due to shortage of water.(c) Orchards of pakistan bring home a healthy amount of foreign exchange, which can be affected due water shortage.(d) Due to less

production of main crops, which are wheat, cotton, sugar cane and rice, the Industries related to them will suffer adversely.(e) Then due to drought and more dependency on ground water for irrigation, the water table will go down, and this will cause water constrains to the population.(f) Less agricultural outputs will compel people to head towards urban areas for jobs, which will increase the unemployment further.(g) The distribution of water is controlled from the center by irsa (Indus river system authority) as per 1991 agreement between the provinces. Now the shortage of water will cause disputes between the provinces, which may cause harm to the national integrity. AnalysisPakistan is one of the poorest countries of the world, where as on the other hand it is one of the richest in its population increasing capabilities. Our population has surpassed the 140 million mark by now and is still increasing at an alarming rate of about 3%, which definitely needs to be checked. On the other hand the growth rate of agriculture is decreasing due to water shortages. To keep up the pace of agricultural growth comparable to population growth, we must bring additional lands under cultivation. in order to achieve the required growth targets in agriculture, we needed an estimated amount of 149 maf in 2000 and will need 215 maf year 2013 and about 277 maf by year 2025. this scenario warns that Pakistan has already has slide from a water happy country to a water scarce country in 1994 and already shortage of over 40 maf persists, which may increase to a shortage of 108 maf and 151 maf by years 2013 and 2025 respectively. This water shortage has been threatening the federal structure of the country. Our reluctance to treat water as an economic good and inadequate recognition of the environmental concerns associated with current practices has led us towards this catastrophic situation. Furthermore its remedy is an

urgent one; otherwise it could trigger water riots and finally lead to social, if not political, catastrophe. Since no additional water is available, it is the time to recognize our responsibilities and start taking steps in the right direction. SolutionsThe oceans contain 97% of the world’s water. Desalination technology transforms the vast amount of salt water in the Earth’s oceans into freshwater fit for human consumption. There are approximately 7, 500 desalination plants in the world, 60% of which are in the Middle East. The global desalination industry has a capacity of approximately 28 million m3, less than 1% of global demand. Desalination is an expensive and energy intensive technology, and currently only wealthy countries with serious water shortages consider it a viable option. However, a recent innovation using nanotechnology has the potential to decrease the cost of desalination by 75%, making it a more viable option. While irrigation accounts for approximately one third of all global water consumption, numerous studies have shown that approximately half of the water used in irrigation is lost through evaporation or seepage. Drip irrigation technology offers a far more water-efficient way of farming. Drip irrigation techniques involve using a series of pipes to distribute water in a very controlled manner. By using this method farmers have the ability to give their crops the exact amount of water needed. Despite its many benefits, drip irrigation is not being widely implemented. While the technology is not sophisticated or expensive, it is beyond the means of the poorest farmers who need it most. It is also not being used by many farmers in water-rich countries because the potential savings are less than the cost of implementing the technology. In many countries water shortages are exacerbated or even caused by governmental mismanagement, political infighting, and outright corruption. International

organizations like the World Trade Organization (WTO) often suggest that privatization of water management services would alleviate many of these problems. It has been shown that privatizing utilities frequently increases efficiency, innovation, and maintenance. However, privatization rarely has an effect on corruption, and often disadvantages the poor. Other technical solutions like rainwater capture, water-free toilets, and water reclamation offer people the possibility of effective conservation. Market-oriented solutions such as water tariffs, pricing groundwater, and increasing fines against industries that pollute could be adopted. There are also a number of viable trade solutions. Freshwater could be traded internationally by using pipelines and enormous plastic bags. Despite this plethora of potential solutions, there is no substitute for simply consuming less. RecommendationsThe national water strategy must be based upon two essential elements covering

Water developments

Water management

The water development strategy is largely based upon construction of new storage reservoirs where as the water management strategy will help in reducing the present losses. Water developmentIn this, construction of following dams should start immediately:-(a) Chasha damIt would be located 200 miles upstream of terbela on river Indus. its gross storage capacity would be 7. 3 maf and live storage 5. 7 maf. Its power generation capacity would be 3360 mw.(b) Kalabagh damKalabagh dam site is located 132 miles downstream of Terbela. Its gross storage would be 6. 1 maf. It would have a power generation of 3600 mw. Here I shall further suggest that the

construction of Kalabagh be under taken only, once all the provinces are convinced and willing to cooperate.(c) Thal reservoirIt would be located on the right bank of Chashma – Jhelum link canal, along the western bank of river Jhelum. Its reservoir would have gross capacity of 2. 3 maf.(d) Raised Mangla damin this the present Mangla dam would be further raised by 40 ft and thus increasing its gross capacity to 9. 5 maf. In addition, its power generation capacity would be increased by 15%.(e) Mirani damThe dam is located on Dasht River about 48 km of Turbat town in Mekran division. Its main objective is to provide water for irrigation. Its gross storage is 0. 30 maf.(f) Gomalzam damIt is located at Khajori Kach on Gomal River in South Waziristan, about 75 miles from Dera Ismail Khan. Its main objective will be to irrigate 132000 acres of land, power generation of 17. 4 mw and flood control. From these projects we shall be able to store additional 20maf of water. Water managementmanaging water resources is the need of time, and we in Pakistan already short of water, must chalk out a strategy. In this endeavor can be made to save around 1. 3 maf of water from existing losses. Following is recommended in this regard:-

Presently the losses occur due to seepage, infiltration and leakages etc. seepage results in water logging and these losses can be reduced or eliminated by lining the canals. In addition, people should be educated to conserve water by cooperation. Further more government should make laws on water conservation, like many western countries. The second largest contribution to the total water available comes from the groundwater sources. This source has been exploited and very well used by public and private tube wells. It can still provide over nine maf of water. This source can

be exploited and judiciously used for irrigation purposes. However in some areas ground water is rapidly depleting due to excessive pump age, authorities should take control in such areas to save them from depleting. Efforts are made to convert the present rotation based irrigation system to demand oriented system. The modern irrigation techniques, that is trickling, sprinkling etc, which have a potential to improve water distribution and its utilization. Authorities should take appropriate steps to curb the illegal extraction of water and ensure its equitable distribution. Presently irrigation department has failed to stop the illegal theft and extraction; thus irrigation distribution system needs to be privatized through water user associations. In addition, water, now-a-days is supplied to farmers at a very negligible cost and that is why they do not treat water as a precious resource; therefore there is a need to increase the water prices to make irrigators realize the importance of this asset. Farmer’s organizations, water user association, and private sector are involved in construction, operation, and maintenance of the irrigation system. Such associations are conceived as a mechanism for creating a cooperative frame work for improvement of watercourses. ConclusionYes, water crisis exist in agricultural sector of Pakistan the problems faced by the water sector in the country are many, acute and serious and it is also known that we can generate about 83 maf of more water. Therefore, building of more reservoirs and an effective management strategy are the needs of time. Also implementation of the recommendations will enable the country to meet the challenges, and achieve the objectives of integrated, efficient, environmentally and financially sustainable development and management of limited water resources. At the same time it will enable us to utilize every drop of our water for our bright future.

REFRENCES:

Source: Draft State of Environment Report 2005

Data Source: Water Resources Management Directorate, WAPDA.