FLOOD RISK MANAGEMENT IN THE MENA REGION: CHALLENGES AND OPPORTUNITIES

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ABSTRACT:

Magnitude and impact of climate change will increasingly take new catastrophic dimensions under the current paradigm shift of our cities if disaster risk management actions and appropriate disaster policies are further delayed. Governments in the MENA Region (North Africa and Middle East Region) are aware that countries in the Middle East region are not an exception as translated by the recommendations made during the GCC summit in Kuwait 2010 to unifying efforts on issues related to climate change. In recent years, flash floods in many different countries of MENA region have caused loss of life, social disturbance of business and livelihood and large economical damages to private and public assets. The increasing frequency of floods in the region are clear indicators that urban flood management will have potential implications on the sustainable development of current and future urban infrastructures in the MENA region. This paper looks at the institutional deficiencies behind the current situation and explores various strategic measures in the direction of mainstreaming flood risk management high in the political agenda of MENA countries.

1. INTRODUCTION

Water related disasters are typically emphasized under three major aspects, namely water scarcity or "too little", water pollution or "too dirty" and water flooding or "too much" (WWDR, 2003). The increasing urbanization and concentration of population growth within the high risk areas mainly associated with inappropriate land management and institutional fragmentation are further pressurizing the already existing vulnerability of people and livelihood to water related disasters. The EM-DAT international disaster database reported that the 1073 flood disasters that occurred between 2000 and 2006 alone have killed more than 32,000 people, affected more than 650 million people and causing over US$ 95,000 Million worth of economic damage worldwide. As shown in Figure 1, the effectiveness of adopted risk management policies worldwide is hardly contributing to minimize the escalating figures of flood vulnerabilities at the global scale. The figure could also testify that the science and policy of water hazards risk management and its relation to the three multifaceted dimensions of managing people, land and water is still intractable. While water disasters are driven by hydro-meteorological phenomena the impact on people and property is very much sensitive to the states of the surrounding environment before the disaster, the exiting pressures at time of the disaster and resiliency of the society after the disaster. Therefore, building strategic risk management implies undertaking comprehensive risk assessment of the relevant factors to assess and formulate policy scenarios.

In MENA Region (i.e., North Africa and Middle East), among all water disaster issues, coping with water scarcity remains undoubtedly the primary focus of water managers and policy makers. This increasing concern is triggered by the vulnerability of the region to drought, the increasing water pollution and more seriously the depletion of groundwater resources due to

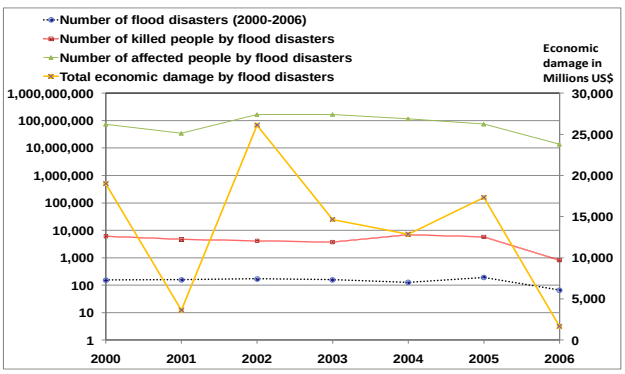

Figure 1. Number and impacts of flood disasters between 2000 to 2006 worldwide. (Data source: EM-DAT 2006).

the effectiveness of currently adopted policies to cope with exciting water scarcity in the MENA region is by far below the anticipated goals to achieve the Millennium Development Goals by the year 2015. On the contrast it is believe that climate change and climate variability are likely to accentuate flood disaster in the region. While north African countries are known to be vulnerable to both water scarcity and water flooding, the Middle East countries are not anymore an exception as translated by the recommendations made during the 31st GCC summit in 2010 to unifying efforts on issues related to climate change. The declaration stated that "…The strategy should examine the impact of global climate changes on local water resources in the region and look into ways to adopt with the negative factors," (Gulf News 2010). This paper investigates the current trends in water related disaster in the MENA region with some particular focus on recent flood disasters that occurred in the Middle East. Some discussion on the issues and

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future outlook on the regional water related risk management for the region and existing opportunities to mainstream water disasters management high in the political agenda is presented.

2. ISSUES AND CHALLENGES IMPOSED BY RECENT FLOOD DISASTERS IN MENA REGION

2.1 Trend of flood disasters in MENA region

Within the MENA Region, the Middle East in particular, unprecedented flash flood disasters triggered by heavy rain and storms have recently caused loss of life, social and livelihood disturbance and large economic damages to private and public assets. Figure 2 depicts the trend flood disaster in MENA region between 1960 to 2006 as per the EM-DAT database (EM-DAT 2006). It is worth mentioning that under the specific scope of the OFDA/CRED EMDAT project, an event is classified as "a disaster" and entered into EM-DAT database if at least one of the following criteria is fulfilled (1) 10 or more people reported killed; or (2) 100 or more people reported affected; or (3) declaration of a state of emergency; or (4) call for international assistance. Therefore, the increasing trend of flood disasters in MENA region, as shown in Figure 2, is open to increase if all the disasters are accounted for. While at the global scale the trend of killed people by flood disasters is believed to decrease, Figure 3 shows that the facts in WANA region are likely to be inverted. As shown in Figure 3, a flood disaster affecting over 1000 people is occurring nearly every year in one of the MENA countries. The increasing trend in economic damage as shown in Figure 4, is believed to escalate in view of the massive urbanization development and lag of adequate infrastructures in many countries of the MENA region. It is worth noting that the value of economic damage should also be compared to the national Gross Domestic Product (GDP) to properly reflect the impact of flood disasters on the economic development of the countries in the region.

2.2 Hydrology of the Middle East region and flood disasters

Most of the Middle East region mainly GCC countries is known by its hot and dry climate. The GCC region observes few rivers

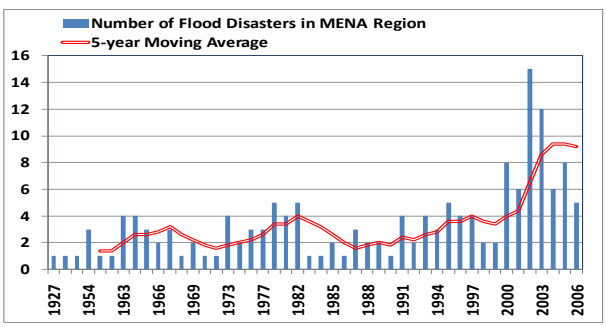

Figure 2. Reported number of flood disasters in MENA region between 1927 and 2006. (Data source EM-DAT 2006).

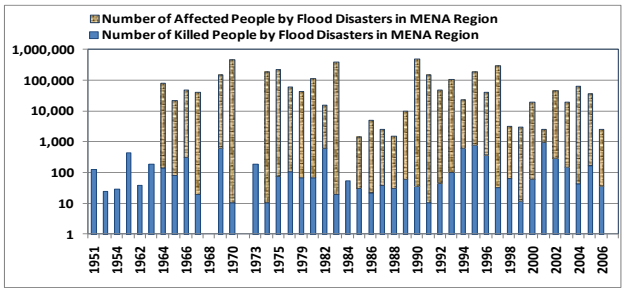

Figure 3. Reported number of killed and affected people by flood disasters in MENA region between 1950 to 2006. (Data source EM-DAT 2006).

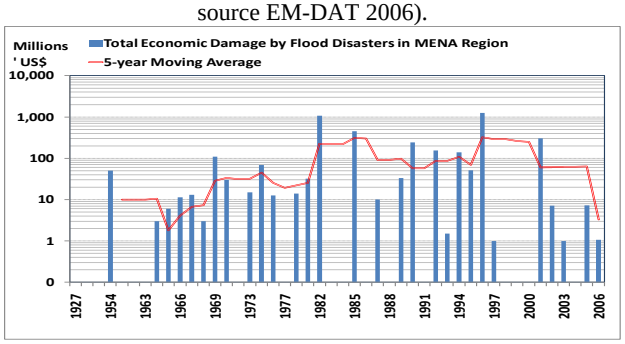

Figure 4. Reported total economic damage in Million US$ by flood disasters in MENA region between 1951 to 2006. (Data source EM-DAT 2006).

drained by short and steep watercourses (i.e., wadis) mainly dry except during the rainy season from December to April. Rainfall events can generate a great amount of surface runoff and many countries in the region have a well established policy for its utilization for irrigation or groundwater recharge. For instance, in the United Arab Emirates, over 130 dams and weirs are being constructed along the main active wadis. The purpose of these dams is mainly flood control and surface water collection for groundwater recharge. Figure 5 depicts the total yearly volume of surface water stored in seven major dams in UAE as well as the yearly surface water storage variation in two main dams namely Bih dam and Ham dam. The total volume of surface water stored in the seven majors dams of UAE between 1983 and 2001 was accounted for about 122 Million cubic meter (MOEW, 2011) with some active dams receiving as high as 5 million cubic meter a year. Nevertheless depending on the rainy season and different weather fronts the surface water storage can vary considerably from year to year. As shown in Figure 6, the average rainfall varies between 30 mm to 80 mm a year. Whereas, the figure depicts the aridity of the region, storms are about to bring heavy rainfall events of 120 mm a year.

Extreme weather conditions with rainfall between 200 mm to 250 mm a year are recorded in nearly every decade. Exceptional events were recorded in 1996 with a total rainfall of 390 mm year producing a great surface runoff of nearly 23 Million m^3, as shown by the water storage within the seven dams managed by MOEW, UAE. In the year 2009 many mountainous area and wadis in UAE have been flooded. It is reported that the maximum rainfall on the mountainous area was about 146 mm. In urban areas a record of 30 mm of rain was enough to create one of the worst flood chaos in the history of many cities of the United Arab Emirates. At least six people were reported killed and many more were injured on the

country's waterlogged roads. In many active construction areas driving condition was

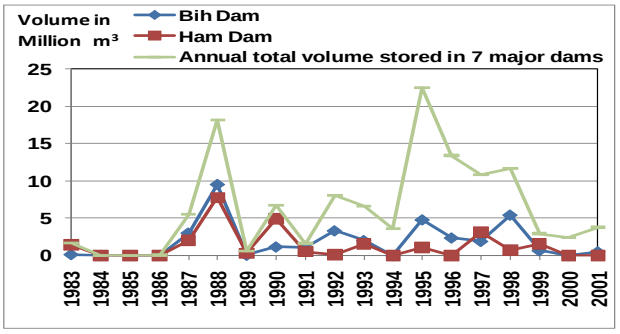

Figure 5. Annual surface water stored in 7 major dams managed my MOEW in UAE (data source MOEW 2011).

even more hazardous due to sand and gravel washed into the roads from construction sites. After the 2008 flood some cities in UAE have proposed actions and emergency measures to minimize flood disasters such as to build water retarding basin in the city. Nonetheless, The flash flood of February 27th, 2010, in the central and eastern region of the United Arab Emirates inundated many areas triggering loss of life and paralyzing the social and economical activity of over 5,000 peoples.

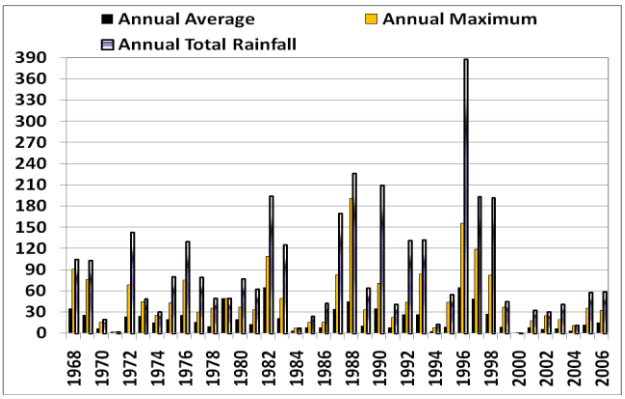

Figure 6. Sample of annual rainfall variation in UAE, between 1968 to 2006

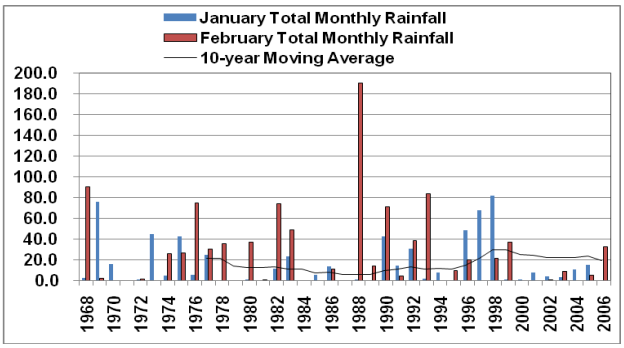

Figure 7. Sample of January monthly rainfall variation in UAE, between 1968 to 2006

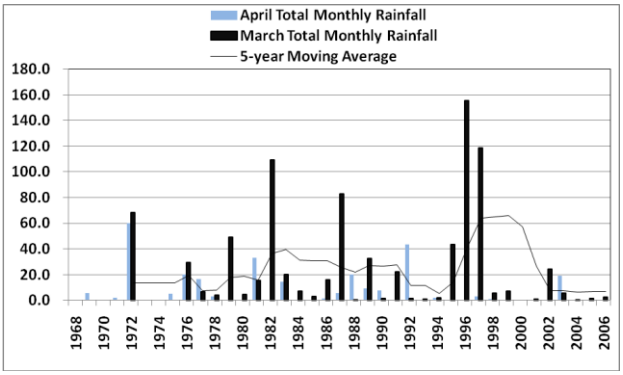

Figure 8. Sample of January monthly rainfall variation in UAE, between 1968 to 2006

During the same period most of the countries in the region also experienced wet weather condition, including Kuwait, Bahrain, Qatar, parts of Saudi Arabia, and northern Oman. The Jeddah flood of November 2009, in Saudi Arabia, drowned over 120 people, left thousands of others homeless and thousands vehicles destroyed in the city accounting for US$ 270 Million worth of economical damage. During the same period of 2010 an even larger disastrous flood again hit Jaddah to create an even more complex flood management chaos for the country.

2.3 Climate Change Impacts on the Middle East

According to the detected trends in observed climate variables presented in the Intergovernmental Panel of Climate Change (IPCC) reports, climate change is indisputable fact now. based on IPCC reports global average temperature increased by 0.4-0.8 °C for the period of 1860-2000. Moreover, IPCC predicted temperature increase between 1.4 °C and 5.8 °C by 2100 according to different greenhouse gases emission scenarios explained in IPCC reports.

Hydrological cycle and water resources are severely influenced by climate change. Induced temperature increase alters precipitation patterns over many regions in the world causing hydrological cycle alteration resulting shifts in streamflow regimes. Climate change and climate variability are causing increase in the frequency of extreme events, floods and droughts. IPCC reports expressed that drought frequency has increased in particular in the tropics and sub-tropics since the 1970s. Increased temperature leading to increased evapotranspiration and decreased soil moisture along with reduced precipitation are the main factor for more common drought events. On the contrast, in many other regions of the world more intense and frequent flood events have been also recorder during the last few decades.

One of the most affected regions over the world by climate change and climate variability will be the Middle East. Figure 7 and Figure 8 show an example of the monthly variation of rainfall for the months of January and February, and the months of April and March for the period between 1968 to 2006, in UAE. From the figures it is clear that the Middle East is among the most problematic regions in terms of climate variability. In addition to existing water stress, rapid population growth and economic development has been aggravating water limitation in the region (Bou-Zeid and Al-Fadel, 2002). Berkof (1994) stated that average annual renewable water resources for the Middle East is expected to decrease to 667 m^3 per capita under projected population growth by 2025. In MENA region, there are nine out of fourteen countries where water availability per person per year is less than 1000 m^3 (Berkoff, 1994). Thereby,

the Middle East will experience more severe water scarcity and any change in climate variables such as temperature increase or rainfall decrease will exacerbate the existing water stress in the region (Bou-Zeid and Al-Fadel, 2002). Figure 6 shows clear alteration in the rainfall pattern characterized by long period of droughts that are intercepted by extreme heavy rainfall events. Sowers et al., 2010, reported that alteration in hydrological cycle due to climate change in the middle east associated with population growth will affect the water availability and water quality leading to longer droughts due to temperature increase, more frequent and intense floods and larger desertification owing to change the variability and intensity of rainfall events.

Based on global climate model IPCC reports predict a rainfall decrease for the Middle East (IPCC 2007). Nevertheless, recent research based on regional climate change models (Evans 2009) revealed that while storm activity over the eastern Mediterranean would indeed decline, moisture-bearing winds would be channelled inland more often and diverted by regional mountains, bringing an increase of over 50% in annual rainfall to the Euphrates-Tigris watershed and other parts of the Middle East. As a probable consequence, more common and frequent flash flood events are expected for the Middle East. Although damage from river flooding is not expected to be significant in Syria, Israel, Jordan, and the Palestinian Authority due to limited rivers, the urban flooding in major urban areas will witness effects of climate change and floods may be serious for Lebanon, Iraq and Turkey (Bou-Zeid and Al-Fadel, 2002). Average precipitation in Lebanon is high and it has many rivers located close to urban areas. Thus, floods can cause significant socio-economic damages in Lebanon. Similarly in Iraq, most of the urban areas are located along the Euphrates and Tigris River basins, thus floods may affect urban areas substantially. Turkey with many rivers and high precipitation rate is also under flooding risk so it is imperative to study the relationship between climate change and flood events in MENA region.

3. FUTURE OUTLOOK OF WATER DISASTER RISK MANAGEMENT IN MENA REGION.

Due to the impact of climate change and intensifying effects of climate variability in the MENA region it is imperative to develop adaptation policies to mitigate effects of flood through an integrated framework for water disasters management. To this end it is very important to perform accurate impact assessments for the purpose to identify future climate variables and hydrological conditions of the region. Once hydrological impact studies are available governments can develop sustainable adaptation policies tailored to each country of benefit to the region in general. Needless to remind that major adaptation policies must include holistic approach to improving sustainable integrated water management measures from water conservation to water utilization. In the middle east though surface water budget is considered as minor water source, the disastrous floods occurring in the regions over the past centuries dictates the need for more sustainable harvesting of flood water budget that is expected to increase with the increasing rate of urbanization in the region.

3.1 Mainstreaming water disaster risk management in the political agenda

Planning to cope with water disasters require an integrated management approach within a unified disaster risk management agenda and involving all water partners (i.e., policy makers, water professionals, academia, private sectors and the public). The immediate challenge that must be addressed by MENA countries is the institutional fragmentation of responsibilities and uncoordinated actions within the water development sectors that is directly or indirectly affecting policy progress in water disaster management. The way forward must be achieved by parallel actions at both national and regional levels with the creation of national and regional institutional bodies (i.e., a water commissions specialized on water disaster risk management) with a dual focus on water scarcity management and flooding.

At country level a specialized institutional body such as a water disaster commission is required to create the momentum for synergy between national water development sectors on adopted policies and implemented measures to cope with water hazards. It is furthermore expected to minimize the current institutional fragmentation of responsibilities through improved national information exchange, strengthening the coordination of local actions, and enhance the liability of the decision making processes to cope with water risk management issues. A national water disaster commission should create the platform to all water partners to engage in focused studies and actions that would identify the national specifics of the multifaceted dimensions of the water hazard issues in a way leading to mainstream water risk disaster management high in the political agenda of MENA countries and fill the existing void in the legal framework on water and socio-economic development.

At the MENA regional level a “regional water disaster management commission” will play a leading role as primary focus to identify the crosscutting regional strength and weaknesses in expertise as well as professional human capacities to cope with water disaster issues. Based on proper information and data sharing on adopted national policies it is possible to develop national and regional policy indicators that would promote regional mechanisms for funding as well as a platform for the public and the private sectors to engage in improving water services, explore opportunities to transfer national know-how, promote expertise and best practices in policies for water disaster risk management to other countries in the region. The national and regional water commissions will play leading roles to clear the current ambiguous and poor involvement of all stakeholders in policy formulation. Policy based on crisis management or “crisis driven” approach especially those undertaken by isolated water development sectors at the national level is a narrow vision of the dynamic challenges of water disasters. In other words, the debate about the advantages and disadvantages of proposed policy options can help lead to the most widely acceptable choices and pave the way for the creation of a road map for a water socioeconomic development. Therefore, governments must enable regulations that compel policy leaders and policy makers to involve all related entities from the public and private sectors in drafting new policies for water disaster risk management issues.

In order to draw valuable lessons that could bring water disaster management high in the political agenda of the MENA countries, there is a need to identify regional gaps in expertise, human capacities, management and operational weaknesses and deficiencies. Identification and development of regional water disaster risk management indicators will help explore and promote current strengths and capacities to adapt and evolve with the future challenges and implications of water disaster risk management in the region. The following subsection

presents a pioneer presentation in using policy indicators to improve professional and political liability in adopted policies.

3.2 Development of water disaster risk management policy effectiveness index

Poor definition and ambiguous categorization of water disasters in the mind of policy makers will hamper any tentative to re-think policies for coping and mitigating water hazards at country level and consequently slowdown any cooperative actions at the regional level. Currently exiting indices though provide adequate information regarding the general state of water scarcity and vulnerability to flood, their role to enhance policies is proven to be limited. To mainstream water disaster management in the policy agenda, it is never enough to provide policy makers with a general figure on the state of water disasters without detailed breakdown and assessment of the shortcoming of current measures and effectiveness of adopted policies.

Among all the water disaster risk management issues, water scarcity management and flood risk management in particular requires greater efforts to create innovative holistic processes that are able to drive a dynamic step changes toward social equity in the water context. It is therefore essential to continuously improve our knowledge on these interplaying factors hindering governments and communities to formulate and implement synergic and sustainable water management measures. At the centre of these impediment factors is the weakness of water disasters risk policy, particularly policies to cope with water scarcity and flooding. Unfortunately, in most countries the weaknesses in existing policies are only recognized after catastrophic events strike in view of the fact that there is no proper system in place to evaluate the effectiveness of adopted policies.

The concluding recommendations of the WANA (West Asia North Africa) Forum 2010 held in Jordan, advised on the need to develop a breakthrough index "to capture reality on the ground and document best practices for knowledge sharing". The way forward can be achieved through the development of a water disaster risk policy index to assess the effectiveness of adopted policies and efficiency of implemented measures in water disaster risk management. Such a policy effectiveness assessment index shall be developed based on clear regional targets backed by clear set of relevant indicators that can be adapted and tailored to national conditions with regards to local realities and future dimensions and challenges of water disaster issues. A primary target that would be achieved through such policy index is the assessment of the effectiveness of national and regional investments and budget allocations to cope with water disasters. It is believed that the policy index implementation will have tangible impacts to (1) improve transparency and instill political and professional accountability for implemented measures to cope with water hazards; (2) ensure better engagement of stakeholders and policy makers in the funding process of water disasters risk management issues and the creation of key regional infrastructures;(3) initiate the momentum of trust to support the creation of a "Cohesion Fund" as basic funding platform to promote political and technical cooperation as recommended by the WANA Forum 2010 (WANA 2010).

Figure 9 depicts a practical example on the use of tangible flood policy indicators to assess the effectiveness of investment policy in water disaster management, herein the investment and budget allocation for flood control and mitigation in Japan. The public expectation from the government investment and budget allocation for flood control is to mitigate the three social dimensions of flood impacts, namely impacts on society (e.g. death and affected people), impact of livelihood (e.g. inundation of land, business and properties), and impacts on national economy (e.g. economic flood losses). From the figure there is a clear political awareness on the importance of sustainable investments for flood control and mitigation measures as shown by the increasing trend of the budget allocation for flood control. A direct consequence is the decreasing trend in the number of casualties, death and affected people by flood. This indicator clearly shows that the investments policy for budget allocation and measure to reduce the impact on the society has been effective to some acceptable risk threshold. The impact on livelihood is shown by the decreasing trend of inundated area and dwellings. However due to increasing pressure from urbanization and consequently concentration of public assets within the flood plains, the economic damage is still high though showing a slight decreasing trend. While these indicators witnesses for the effectiveness of the investment policies to mitigate damage on society and livelihood the analysis of the economic flood damage to public and private assets that is exponentially increasing reveals the need to revise the investment and budget allocated to minimize this particular dimension of flood disasters.

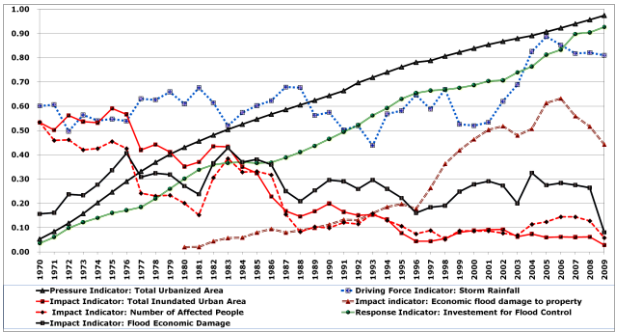

Figure 9. flood risk indicators to assess the effectiveness of flood investment policy based on Japan disaster database.

CONCLUSION

Climate change and climate variability will continue to alter the hydrological cycle of the MENA region. Recent catastrophic flood disaster in the middle east and MENA region in general dictates the need for new paradigm shift in managing water disasters in the region. MENA countries need to surpass the current institutional fragmentation and re-think the options to cope with water disasters prevailing to the region under a unified framework for action and unified institutional body such as a water disaster management commission.

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