Regional Analysis of Disaster Loss Databases in Arab States

Executive Summary

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PREFACE

The expected outcome of the Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters was to "substantially reduce disaster losses, in lives and in the social, economic and environmental assets of communities and countries". Acknowledging that timely and reliable data and statistics are critical to build long-term resilience through evidence-based policy making and to assess progress in achieving the HFA's expected outcome, the Framework's Priority for Action 2 requested stakeholders to "Record, analyze, summarize and disseminate statistical information on disaster occurrence, impacts and losses, on a regular basis through international, regional, national and local mechanisms" (HFA, 2005).

The expected outcome of the recently adopted Sendai Framework for Disaster Risk Reduction 2015-2030 is "The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries." The Sendai Framework also includes seven global targets that underline the importance of reducing losses. Furthermore, its Priority 1 on Understanding Risk states that it is important to "Systematically evaluate, record, share and publicly account for disaster losses and understand the economic, social, health, education, environmental and cultural heritage impacts, as appropriate, in the context of event-specific hazard-exposure and vulnerability information" (paragraph 24 d).

In order to strengthen accounting for disaster losses, UNISDR spearheaded an initiative called "Global Disaster Loss Collection Initiative" that is designed to assist in the establishment of national disaster loss databases in all regions of the world. This effort commenced in the Arab Region in 2010.

The purpose of this Regional Analysis of Disaster Loss Databases in Arab States is to contribute to a better understanding of the impact of disasters in terms of losses in the region. The main objectives are: 1) to share new disaster loss and damage data assessed through UNISDR Regional Office for Arab States' "Disaster loss database initiative"; 2) to draw a clear picture on the practices, methodologies and the processes used for assessing and managing disaster damage and loss data in Arab countries and; 3) to provide recommendations to improve existing practices. Beyond the assessment, interpretation and visualization of data on a regional level for the ten countries, additional statistics are provided in an effort to capture the region-wide impact of disasters beyond the ten countries with established national disaster loss databases.

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DISCLAIMER

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EXECUTIVE SUMMARY

Taking into account the importance of capturing the composition, spatial distribution, and impacts of disasters as the first step in addressing disaster risks and finding solutions to build resilient communities, UNISDR - the United Nations Office for Disaster Risk Reduction has embarked on the "Global disaster loss collection initiative". This initiative supports governments to develop disaster loss databases and encourages them to work with a variety of partners to share such data. The main tool for this was to develop and use a methodology entitled "DesInventar" for generating "National Disaster Inventories" and constructing databases that capture information on damages and losses resulting from disasters[1].

With increased understanding of disaster trends and their impact, better prevention, mitigation and preparedness measures can be planned to reduce the impact of disasters on communities. The establishment of disaster loss databases seeks precisely to serve this purpose. That is, to inform decision-makers and the public alike, and to draw attention to the importance of investing in disaster risk reduction to minimize losses and safeguard development investments through sound planning and resilient development strategies.

In 2010 UNISDR's Regional Office for Arab States (ROAS) rolled-out the Global Initiative in the region. To date, ten of the twenty-two Arab countries[2] established their national disaster damage and loss databases. As elsewhere, this initiative has aimed to strengthen the disaster risk reduction capacities of Arab States through the establishment of national disaster damage and loss accounting systems. The establishment of national databases was supported with the expectation that Arab countries will be able to improve understanding of the actual and potential impact of natural hazards, which will consequently help them to evaluate the risk of future disasters.

With the objective of presenting disaster impact results and to draw lessons from the disaster damage and loss data gathering process and the use of these databases, UNISDR-ROAS commissioned this first regional analysis of disaster risk impact in the Arab region, almost five years after implementation started. The study also attempts to provide a clear picture of practices, methodologies and processes in use for disaster damage and loss data management in the Arab region. The study's objectives were pursued on the basis of three methods:

Firstly, a literature review was conducted to study the available global, regional and national disaster damage and loss databases.

Secondly, disaster damage and loss data was extracted from national databases and the International Disaster Database "EM-DAT"[3]. The information was then analyzed using a Geographic Information System (GIS) in order to visualize updated statistics and to characterize the spatial and temporal distribution of disaster impact. Focus was placed on hydro-meteorological events on the one hand, and geophysical disaster related events on the other.

Thirdly, a survey was conducted in Arab countries which helped to analyze and shed light on damage and loss data collection.

An attempt to further analyze the economic damages caused by disasters and to use this information to sketch loss exceedance probability curves could not be completed, due to the lack of data needed to assess the economic impact of disaster events in several countries.

[1] "National disaster loss databases" referred to in this report were established by using the "Desinventar" methodology and tool following its criteria and characteristics in so far ten Arab countries with support by UNISDR's Regional Office for Arab States. The Desinventar methodology allows a systematic and homogeneous recording of small, medium and large disasters damage and loss data, based on pre-existing official data, academic records, newspaper sources and institutional reports. Once historical data is collected, it can be spatiotemporally analyzed. As software, it is an open source that can be freely downloaded and installed in different IT-platforms.

[2] The League of Arab States is comprised of 22 Member States.

[3] EM-DAT stands for "Emergency Events Database". It is maintained by the Centre for Research of the Epidemiology of Disasters. The database is available at: http://www.emdat.be/.

1. STUDY RESULTS OF DISASTER LOSSES AND DAMAGES IN ARAB STATES[4]

1.1 Availability of national disaster damage and loss databases

The study shows that openly available historical national disaster damage and loss databases follow exclusively the DesInventar methodology. Meanwhile the international disaster database EM-DAT is also often referred to in the Arab region. Thanks to the Global Disaster Loss Collection Initiative, ten Arab countries (Comoros, Djibouti, Egypt, Jordan, Lebanon, Morocco, Palestine, Syria, Tunisia and Yemen) implemented their national disaster damage and loss databases. Countries started to gather historical disaster damage and loss data to record events for at least the last thirty years prior to the beginning of the data collection exercise. The development of these databases has been a consecutive process. Available national databases in the Arab region cover varying timelines. Most of the support by UNISDR was provided in 2011-2013, which resulted in disaster loss databases mostly starting to account for losses as of 1982-83. Some countries have longer timelines as they included key events, mostly massive disaster losses that took place earlier on and were still well remembered. As such timelines start in 1970 for Comoros, 1944 for Djibouti, 1980 for Egypt, Lebanon, Palestine and Syria, 1981 for Jordan, 1960 for Morocco, 1982 for Tunisia and 1971 for Yemen. They end in 2009 for Syria and go up to 2014 in Morocco.

Table 1. Disaster losses in ten Arab States with national disaster loss databases - period covered

National disaster loss databases in Arab countries	
Countries	**Covered period**
Comoros[5]	1970 – 2013
Djibouti	1944 – 2012
Egypt	1980 – 2010
Jordan	1981 – 2012
Lebanon	1980 – 2011
Morocco	1960 – 2014
Palestine	1980 – 2013
Syria	1980 – 2009
Tunisia	1982 – 2013
Yemen	1971 – 2013

1.2 Disaster loss and damage data from select Arab States based on available national disaster loss databases

The following table presents study results in ten Arab States with national disaster loss and damage databases. In these Arab countries with national disaster loss databases, the number of events that have occurred is 15,809. These events have had a large impact, causing the deaths 20,855 people and led to 140,570 damaged or destroyed houses.

[4] In this document the term “national databases” or “national disaster and loss databases” refers to damage and loss databases that were developed within the framework of the UNISDR supported Global Disaster Loss Collection Initiative, based on the “DesInventar” methodology and tool. The data used can be found on http://www.desinventar.net.

[5] Almost all the data for Comoros are recorded for the period 1970 – 2013, except some historical events that correspond to 1857. These have not been included in this analysis, as they otherwise would give the wrong impression of a recorded period of over 150 years, while all other events cover the last thirty years only.

Table 2. National disaster loss database for ten Arab countries

Summary of national databases for the ten Arab countries with national databases							
Countries	**Covered period**	**Number of events**	**Number of deaths**	**Number of affected**	**Houses destroyed**	**Houses damaged**	**Houses damaged & destroyed**
Comoros	1970 - 2013	90	99	83,794	463	1,724	2,187
Djibouti	1944 - 2012	377	947	5,236	N/A	N/A	N/A
Egypt	1980 - 2010	60	53	20	1,329	1,885	3,214
Jordan	1981 - 2012	626	152	332,148	91	596	687
Lebanon	1980 - 2011	2,508	142	561,870	178	1,342	1,520
Morocco	1960 - 2014	732	14,197	47,403	5,122	21,920	27,042
Palestine	1980 - 2013	411	63	12,235	67	798	865
Syria	1980 - 2009	7,326	679	809,681	468	1,311	1,779
Tunisia	1982 - 2013	1,943	350	91,206	17,821	24,728	42,549
Yemen	1971 - 2013	1,736	4,173	28,861	23,337	37,390	60,727
Total		**15,809**	**20,855**	**1,972,454**	**48,876**	**91,724**	**140,570**

The above data shows a significant increase in terms of number of disaster events and lives lost compared to previously available data from the International Disaster Database EM-DAT, as further explained in the following chapter. This table reveals that in the ten Arab countries, the total number of disasters for the whole period is 15,809 which resulted in 20,855 fatalities and destroyed or damaged 140,600 houses. These losses are not uniformly distributed over the ten countries. Syria is the country which experienced the most events (7,326 disasters), with most people affected by these events (1.9 million of citizens). In terms of casualties, Morocco has suffered the largest impact with 14,197 deaths, due mainly to the Agadir earthquake (12,000 deaths).

1.3 Disaster occurrence and impact as recorded in ten national databases compared with country profiles of the international disaster database (EM-DAT)

National disaster loss databases have the advantage of being able to store data on all events i.e. they include both major disasters and low intensity, high frequency events (so-called “extensive” disasters). The latter include a higher number of phenomena which have often important but underreported impact at household level. National databases also take into consideration the sub-national spatial distribution based on detailed administrative boundaries.

EM-DAT follows a different methodology. It only takes into account events that match at least one of the following criteria: i) Ten or more people killed, ii) 100 or more people affected, iii) A declaration of a state of emergency or iv) A call for international assistance. EM-DAT thus focuses only on major events and mostly excludes small and medium ones. In addition, EM-DAT does not consider all loss indicators included in national disaster loss databases. Only deaths, affected people and economic damages are recorded. Information at the sub-national location is also not provided in EM-DAT, whereas national disaster loss databases record the location at least by province. However, the EM-DAT database is able to refer back to entries as far back as the year 1900 and covers most countries, including all countries in Arab States.

The large discrepancy between the results obtained while using two different methodologies is expressed in the below table. It shows disaster loss and damage results for select Arab States, which have national disaster loss databases and others for which data is available in the EM-DAT.

Table 3. Comparison of study results for ten countries - national disaster loss databases results compared with EM-DAT data

Disaster impact: national disaster loss databases vs. EM-DAT databases (ten Arab countries)					
Countries	**National Disaster Loss Database (Different periods)**			**EM-DAT (Periods same as national disaster loss databases)**	
	Period covered	**Number of events**	**Number of deaths**	**Number of events**	**Number of deaths**
Comoros	1970 – 2013	90	99	12	67
Djibouti	1944 - 2012	377	947	8	231
Egypt	1980 - 2010	60	53	21	1,512
Jordan	1981 - 2012	626	152	8	50
Lebanon	1980 - 2011	2,508	142	5	45
Morocco	1960 - 2014	732	14,197	39	14,220
Palestine	1980 - 2013	411	63	5	6
Syria	1980 - 2009	7,326	679	4	118
Tunisia	1982 - 2013	1,943	350	8	222
Yemen	1971 - 2013	1,736	4,173	30	966
Total		**15,809**	**20,855**	**140**	**17,437**

The comparison of data for the same study period reveals that the number of disaster events recorded by national disaster loss databases is significantly higher (around one hundred times) than data recorded in EM-DAT. In the case of Morocco, it should be noted that the number of people killed according to the national disaster loss databases is not significantly different from those recorded in the EM-DAT. This is quite normal due to the fact that the number of people killed in both database is mainly influenced by Agadir's earthquake in Morocco that occurred in 1960. Indeed, the database of Morocco is referenced as ranging from the year 1960 to take into account the earthquake that occurred during that year. There is no other data around that time except this significant disaster that is still remembered and is registered in the database.

1.4 Disaster loss statistics for ten Arab States with national disaster loss databases: Thirty years period (1982-2011)

In an effort to compare disaster losses in Arab countries with national disaster loss databases over the same time period, a "core period" of thirty years covering 1982-2011 was selected to summarize disaster damage and losses in those countries over a thirty year time span.

Table 4. Disaster losses in ten Arab States with national databases (thirty years period 1982 to 2011)

Disaster losses in ten Arab countries with national databases (30 years period from 1982 to 2011)						
Countries	**Number of events**	**Number of deaths**	**Number of affected**	**Houses destroyed**	**Houses damaged**	**Houses damaged & destroyed**
Comoros	13	75	27,201	-	1,614	1,614
Djibouti	360	896	5,229	-	-	-
Egypt	56	48	20	1,329	1,885	3,214
Jordan	593	152	332,148	91	596	687
Lebanon	2,407	135	561,810	177	1,331	1,508
Morocco	706	2,157	22,391	5,102	21,915	27,017
Palestine	337	53	57	9	450	459
Syria	7,295	675	808,181	468	1,311	1,779
Tunisia	1,670	385	20,730	17,792	24,639	42,431
Yemen	1,462	3,824	31,927	23,008	37,344	60,352
Total	**14,899**	**8,400**	**1,809,694**	**47,976**	**91,085**	**139,061**

This table reveals that in the ten Arab countries, the total number of disasters between 1982 and 2011 is 14,899 which resulted in 8,400 fatalities and destroyed or damaged 139,061 houses. These losses are not uniformly distributed over the ten countries. Syria is the country which experienced the most events (7,295 disasters were recorded during 1982 and 2011), with most people affected by these events (808,181). In terms of casualties, Yemen has suffered the largest impact with 3,824 deaths.

Further analyses highlight that during the 30 year period, on average, 500 disasters occurred per year (496 to be precise) in the ten countries. These events resulted on average in 280 deaths per year, while an average of 60,323 people were affected and 4,635 houses were destroyed and/or damaged.

1.5 Disaster loss statistics for the Arab region according to EM-DAT (thirty years period 1982-2011)

Table 5 below summarizes loss data stored in the International Disaster Database EM-DAT for all 22 Arab States for the same period, 1982-2011. The number of disaster events is 323, representing an annual average of 11 per year. The number of fatalities during the same period is 164,100 deaths, approximately 5,470 per year. The number of people affected by disasters in the same period is assessed as 51.69 million, with an average of 1.7 million per year. These events also led to economic damages evaluated to be US$ 19.30 billion. The number of fatalities in the EM-DAT database for the 22 Arab countries is much higher than the one presented for the available ten national databases. This is due to the high number of fatalities recorded in Sudan (150,807 out of 164,100)[6]. This country has not yet established a national database and the limited number of national disaster loss databases (10 compared to data for 22 countries in EM-DAT).

[6] Please note that disaster loss data on Sudan assessed prior to 9 July 2011 includes data for the newly independent State of South Sudan that gained independence that day.

Table 5. Disaster losses in the Arab region (22 Arab States – thirty years period 1982 to 2011 - EM-DAT database)

Summary of disaster losses in all 22 Arab countries from 1982 to 2011 (EM-DAT methodology)				
Arab Countries	**Events**	**Deaths**	**Number of affected**	**Total damages ('000USD)**
Algeria	58	4,193	245,912	6,543,846
Bahrain	0	0	0	0
Comoros	10	62	351,500	42,804
Djibouti	13	206	1,412,283	3,219
Egypt	21	1,512	173,470	1,342,000
Iraq	8	52	70,890	1,300
Jordan	10	50	348,000	401,000
Kuwait	1	2	200	0
Lebanon	6	46	119,000	165,000
Libya	1	0	0	42,200
Mauritania	22	50	3,126,985	0
Morocco	28	1,814	517,850	1,596,059
Oman	5	143	20,050	4,951,000
Palestine	2	0	0	0
Qatar	0	0	0	0
Saudi Arabia	12	327	13,535	1,650,000
Somalia	40	3,570	11,151,250	100,020
Sudan	42	150,807	32,122,602	526,200
Syria	6	118	1,629,000	0
Tunisia	9	222	215,500	332,800
United Arab Emirates	0	0	0	0
Yemen	29	926	181,565	1,611,500
Total	**323**	**164,100**	**51,699,592**	**19,308,948**

1.6 Combined disaster statistics for Arab region (national and international databases)

The research found that national disaster loss databases are significantly more complete than data assessed solely by EM-DAT. Table 6 presents combined disaster statistics for the thirty year period, 1982-2011.

Table 6 is an effort to improve internationally accessible statistics and enhance them with recent research findings to present combined disaster loss data for all 22 Arab States. It is based on statistics emanating from EM-DAT, which were blended with new findings from recently established national disaster loss databases. It is thus the result of the assessment of ten national disaster loss databases (for above mentioned countries) with data of the International Disaster Database for the remaining twelve Arab States.

Where both national disaster loss and EM-DAT data was available, the two databases (EM-DAT and National database) were compared and the maximum value of each parameter was retained. For example, the number of events was taken from the national database if its value was higher than the one in EM-DAT. For other countries that do not possess national databases, their national records were taken from the EM-DAT.

The result of this combination is presented in the following table. It reveals that the total number of events in Arab countries between 1982 and 2011 is 15,088. These events caused 169,008 fatalities and an economic damage of more than US$ 19.30 billion. Disasters affected 52.14 million people. Syria experienced the most disaster events (7,295 disasters). However, Sudan experienced most fatalities, with 150,807 deaths from a total of 169,008 for all 22 Arab States.

Table 6. Disaster losses in the Arab region combining national database and EM-DAT for the period 1982 to 2011

Summary of disaster damage and losses in all 22 Arab countries (30 years period 1982-2011)							
Arab Countries	**Events**	**Deaths**	**Affected**	**Damages ('000$USD)**	**Houses destroyed**	**Houses damaged**	**Houses damaged/ destroyed**
Algeria	58	4,193	245,912	6,543,846	-	-	-
Bahrain	0	0	0	0	-	-	-
Comoros*	13	75	351,500	42,804	0	1,614	1,614
Djibouti*	360	896	1,412,283	3,219	0	0	0
Egypt*	56	1,512	173,470	1,342,000	1,329	1,885	3,214
Iraq	8	52	70,890	1,300	-	-	-
Jordan*	593	152	348,000	401,000	91	596	687
Kuwait	1	2	200	0	-	-	-
Lebanon*	2,407	135	561,810	165,000	177	1,331	1,508
Libya	1	0	0	42,200	-	-	-
Mauritania	22	50	3,126,985	0	-	-	-
Morocco*	706	2,157	517,850	1,596,059	5,102	21,915	27,017
Oman	5	143	20,050	4,951,000	-	-	-
Palestine	337	53	57	0	9	450	459
Qatar	0	0	0	0	-	-	-
Saudi Arabia	12	327	13,535	1,650,000	-	-	-
Somalia	40	3,570	11,151,250	100,020	-	-	-
Sudan	42	150,807	32,122,602	526,200	-	-	-
Syria	7,295	675	1,629,000	0	468	1,311	1,779
Tunisia*	1,670	385	215,500	332,800	17,792	24,639	42,431
UAE	0	0	0	0	-	-	-
Yemen*	1,462	3,824	181,565	1,611,500	23,008	37,344	60,352
Total	**15,088**	**169,008**	**52,142,459**	**19,308,948**	**47,976**	**91,085**	**139,061**

*= countries possessing a national disaster loss database

It is important to keep in mind that this exercise serves primarily to enhance the available limited loss and damage data with further information from countries where it is available. The combined data is thus an attempt to augment the existing EM-DAT data. However, it does not yet provide a fully comprehensive overview of disaster losses and damages in the Arab region. This is because of the absence of detailed national damage and loss data for the remaining 12 Arab countries which have no national disaster loss accounts. Only through the establishment of these databases can there be an exhaustive picture of disasters and disaster losses including those resulting from extensive events.

1.7 Temporal evolution of disaster events in the Arab region (thirty years period 1982-2011)

1.7.1 Temporal evolution of disaster losses in ten countries with national disaster loss databases

The analysis below reveals that there has been a significant increase of 190%[7] in the number of events that occurred from 1982 to 2011. This could be explained by the impact of climate change and variability which resulted in more hazardous events in the Arab region. It was certainly also the effect of increased exposure of people and assets to natural hazards, which results from manifold factors including demographic changes (poorly planned urbanization, population growth), unsafe development practices and poverty. Similarly, the beginning of improved disaster and loss data recording in the Arab region also played a role in highlighting these developments. Factors for such an increase are varied and can be assumed to follow global disaster patterns, which provide evidence of more disasters due to increased exposure and reduced vulnerability to disasters, as well as changing hazard patterns, mainly of the hydro-meteorological nature (such as droughts, floods, storms, and sea-level rise).

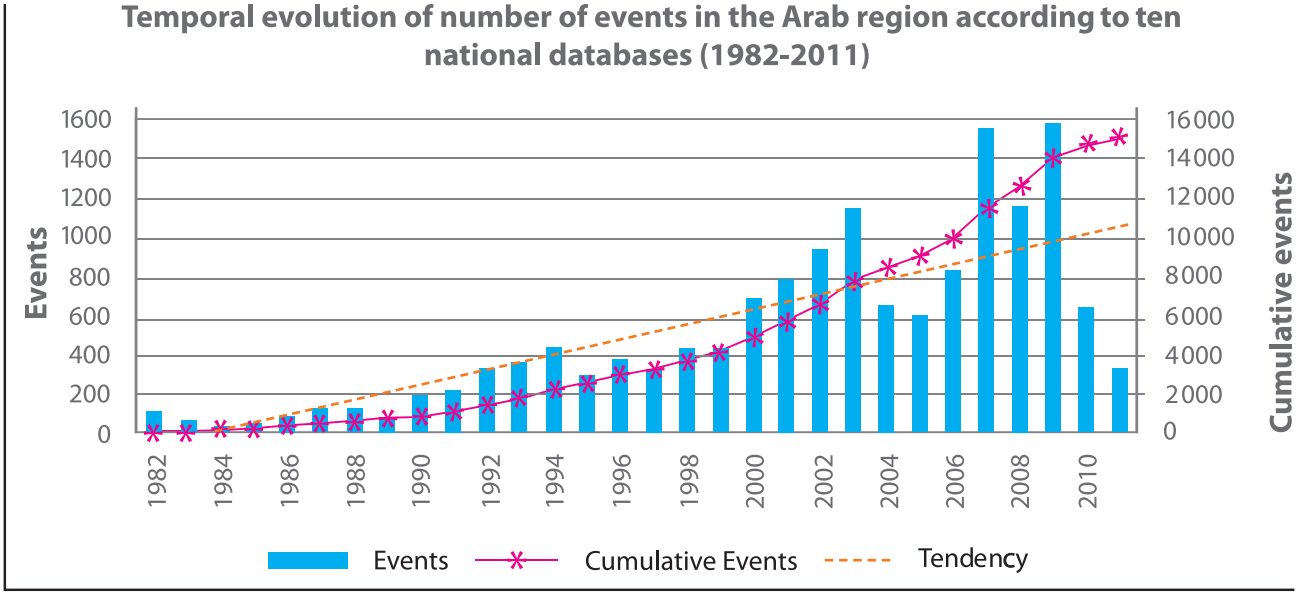

Fig 1. Temporal evolution of disaster events in ten Arab countries with national disaster loss databases

The analysis of the temporal evolution of deaths between 1982 and 2011 revealed no obvious trend in the number of deaths caused by disasters. The annual death toll is less than 500, with the exception of the years 1982, 1995 and 2004 where significant number of deaths was recorded mainly due to earthquakes, flooding and liquefaction resulting in, respectively 900, 496 and 484 fatalities. The year 1982 is the deadliest for concerned Arab States; this is mainly due to Yemen's earthquake that cost the lives of 900 people and two flooding and liquefaction disasters with caused the death of 482 people each. Moreover, the period 2004 to 2011 appears to have higher mortality per year on average. Despite this notable increase in the last ten years, the number of deaths in the concerned countries in the Arab region during the period 1982 to 2011 has a stable trend as the linear line in the following figure shows (Fig 2).

[7] ([Number of deaths in 2011] minus [Number of deaths in 1982] times 100) over [Number of deaths in 1982]

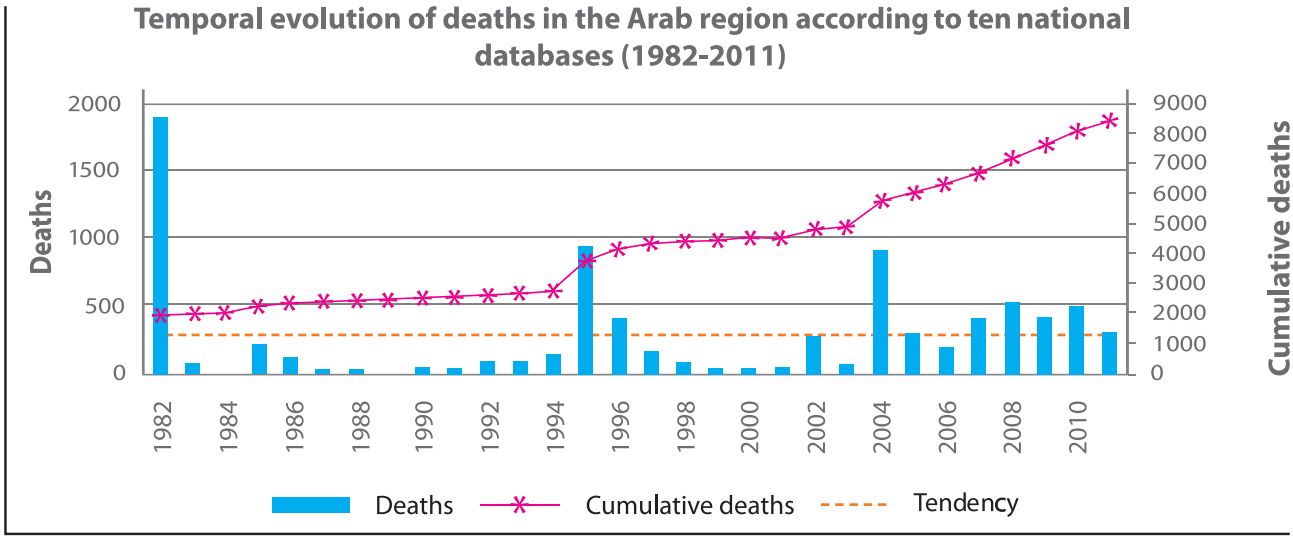

Fig 2. Temporal evolution of deaths in the Arab region according to ten national databases (between 1982 and 2011)

1.7.2 Temporal evolution of disaster losses in the arab region (22 countries – thirty years period)

The below table displays the temporal evolution of disaster losses for all 22 Arab countries. It combines disaster loss data from national disaster loss databases with that available from EM-DAT. This combination confirms the above mentioned trend that the number of disaster and losses are increasing.

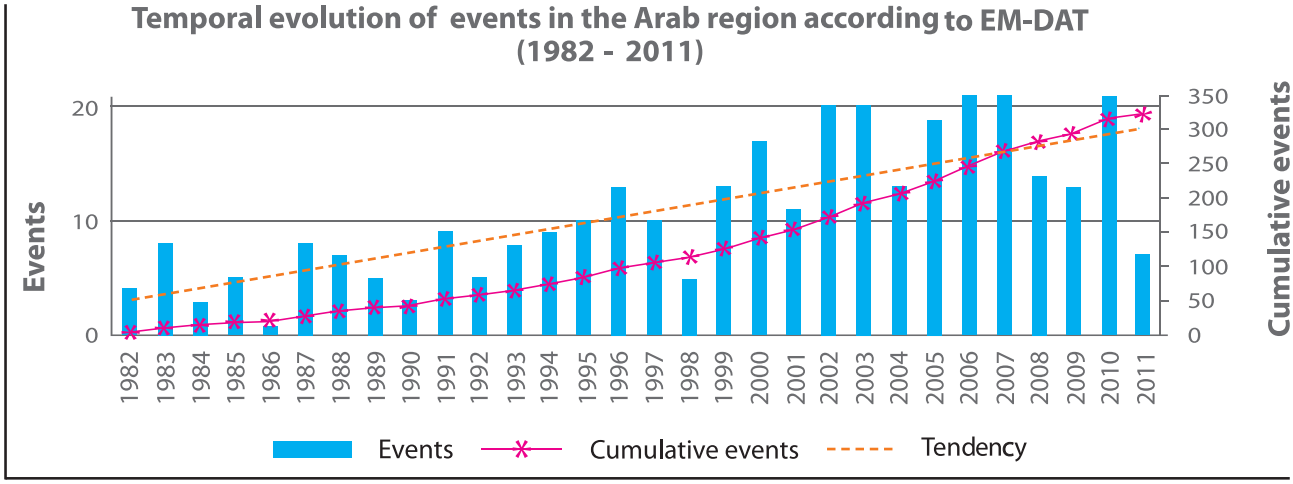

Fig 3. Temporal evolution of number of events according EM-DAT (1982 to 2011)

As shown in the national figures and maps hereafter, the most significant damages and losses were incurred between 1991 and 2011, during which roughly 90% of events occurred. The recorded damage and losses follow the same tendency. While the reasons for such tendencies are varied and have been discussed in the previous chapter, one of them is changing hazard patterns. Examples of these changing patterns include cyclone Gonu, which in 2007, struck the coast of Oman, a region previously not affected by such phenomena. Similarly Somalia experienced a cyclone in 2013 causing the death of over 140 people and massive losses of livestock.

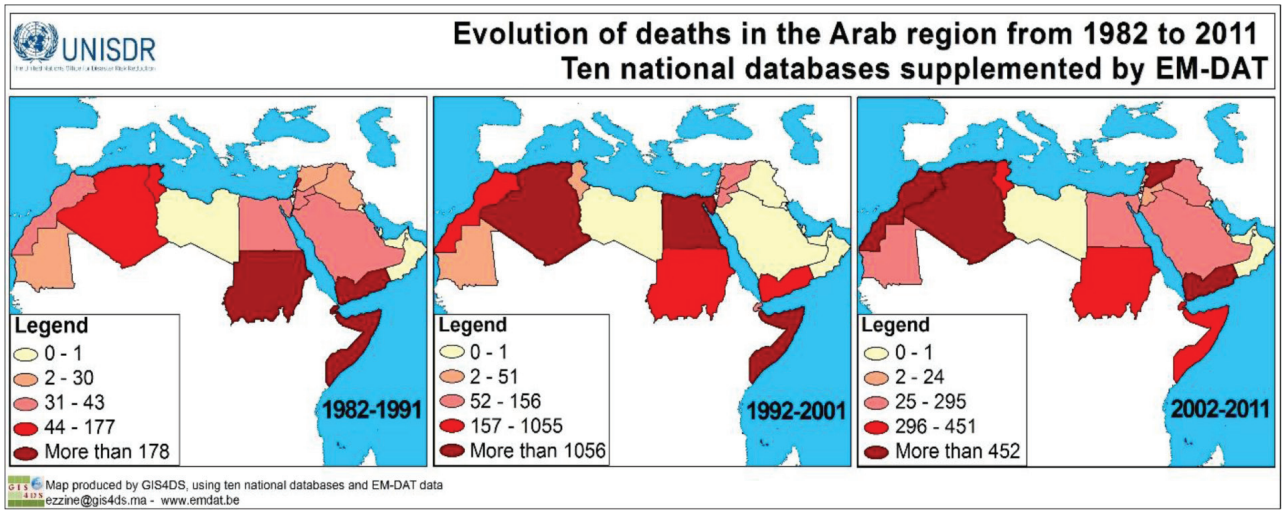

Fig 4. Evolution of deaths in the Arab region from 1982 to 2011

1.8 Comparison of the nature of disaster events in Arab States: hydro-meteorological versus geo-physical (thirty years period 1982-2011)

Over the last thirty years, hydro-meteorological events have been much more frequent and destructive than geophysical ones, with geophysical hazards more concentrated in space. An analysis of the nature of disasters in Arab States reveals that in the period 1982 to 2011 and informed by national databases, the region experienced respectively 14,477 hydro-meteorological and 422 geophysical events, i.e. 97% compared to 3%. The total number of destroyed and damaged houses by hydro-meteorological events is higher than those of geophysical events. The number of fatalities due to hydro-meteorological hazards is relatively low despite a higher number of events (6,535 deaths), affecting a relatively large geographical area concerning 17 Arab countries. These findings underline the increasing hazards that may be associated with climate variability and climate change, and reiterate the need for Arab States to strengthen climate risk management efforts.

It is worth noting that some geological events, such as earthquakes, have a long return period, i.e. they do not take place often. As such, and considering the limited timeframe of national disaster loss databases of mostly 30 years, fewer seismic events were registered in national databases. This aspect has to be taken into account in the overall analysis of the Arab region's exposure to seismic risk. Long-term statistics over periods of 500 years would be more helpful to approximate a better picture of losses due to earthquakes. This means that the timeline necessary to draw a proper country risk profile for such losses is beyond the timeline covered in this study and seismic risks should not be underestimated even where no earthquakes occurred for long periods of time.

Despite having a relatively lower number of events, geophysical phenomena can cause a tremendous number of deaths. For instance, during the limited reporting period considered here (1982-2011) only six geophysical events recorded in Morocco[8] caused 631 deaths while 1,865 deaths due to seismic events occurred in the whole Arab region. The Moroccan disasters represent one third of all deaths due to geophysical events in the Arab region during this period in the ten concerned countries with national disaster loss databases. Analysis of data from EM-DAT confirmed that deaths related to geophysical hazards are more concentrated in space and concern 11 out of 22 Arab countries, where earthquake risks should be particularly taken into account.

[8] It is important to recall that in 1960 Morocco experienced a large scale earthquake with the highest number of casualties of 12,000 lives lost. This is not included here, as this chapter only considers losses during the last thirty years.

2. DISCUSSION OF STUDY RESULTS: AVAILABILITY AND QUALITY OF DATA AND ITS USE IN ARAB STATES

2.1 The occurrence and impact of disasters through losses and damages has been largely underreported

It is important to further analyse EM-DAT data and compare it with findings from the ten national disaster loss databases. This reveals that:

1. The number of events by country is generally much higher in national disaster loss databases compared to those recorded in EM-DAT. In fact, the comparison of the same countries and same periods of national disaster loss data presented in Table 4 and that of EM-DAT presented in Table 5 shows that EM-DAT presents 323 events, while the national databases record 14,899 events, which is 46 times more than the figure reflected in the disaster statistics contained in the EM-DAT. This can be explained by the restrictive entry criteria for EM-DAT.

2. However, it is, nonetheless, of critical importance as data from EM-DAT is almost exclusively used in the international discourse to depict the impact of natural hazard related disasters in Arab States and as an argument for mobilizing support for DRR. As it is incomplete and underestimates the real impact of disasters, this impedes its utility for advocacy efforts needed to ensure increased support and investment for disaster risk reduction efforts.

3. Despite the limited number of national disaster loss databases focusing on low intensity, high frequency events (Ten out of 22 Arab countries), the study still provides critical new evidence on the impact of natural hazard related disasters at national and regional level.

4. EM-DAT usually provides more information on disaster damages than the assessed ten national disaster loss databases. However, EM-DAT proposes data without providing sources and methodology on their website. The assessment of damages in national disaster loss databases was challenged by difficulties to obtain verifiable data for small-scale events.

5. Overall data on fatalities and losses for EM-DAT for the Arab region as a whole are significantly higher for two reasons: They take into account large-scale events and large losses, which were observed in Algeria and Sudan, but also provide more statistics for Egypt, for example.

6. On the contrary when excluding data for these three countries (Algeria, Egypt, Sudan) from the EM-DAT database for 22 Arab States, the national loss accounts for ten countries provide far more precise details and higher impact of disasters on the population and to some extent their economy.

2.2 Impact of the (non-) availability of national disaster loss databases in all Arab States

The comparison of the datasets from national disaster loss databases and those from EM-DAT provide an argument of the need to expand national disaster loss databases to cover all 22 Arab States in order to improve data availability. Based on the findings presented in Table 3 depicting the increase of available loss data if national disaster loss databases are established, it must be assumed that the expansion of the national disaster loss databases to remaining Arab States would largely improve the availability of disaster loss data. It is indeed important to consider both intensive (major) and extensive (low impact high frequency) events for all 22 Arab States. This will allow for a comprehensive overview of the impact of disasters on Arab States and the region as a whole. It will also allow for a more accurate comparison of trends to fully acknowledge the impact of disasters and thus facilitate action to reduce or avoid new losses. It is important to further promote and facilitate the establishment of disaster loss databases in those remaining countries, to include countries like Algeria or Sudan and others.

2.3 National disaster losses data predating 1982

Another important element for further analysis of disaster losses, concerns the (lack of) access and availability of data prior to 1982. Though an extensive analysis was carried out for the period 1982 to 2011, the available national databases in the Arab region cover varying periods from one country to another with the first entries for Djibouti beginning in 1944. There are also some periods without reported disasters ("blanks") due to lack of data for large time spans before 1982. A temporal analysis of damage and losses reveals that national disaster loss databases showed a random distribution. Several gaps and discontinuities in the time series were detected in several databases (for example for Palestine, Syria and Tunisia).

In the ten Arab countries, the total number of events having occurred is 15,809. The number of deaths is around 20,855 and the total number of houses destroyed and damaged is 140,600. However, the recorded number of events only consider the last three decades, which represent around 94% of all disaster entries. Nonetheless significant losses and damages also occurred before 1982 and have been underreported. It would therefore be helpful to proceed with additional data collection exercises to improve existing loss data prior to 1982.

National disaster loss databases with a normal 30 years span cannot properly reflect important events with long return periods such as geophysical events. Earthquakes, but also other disasters, such as tsunamis, could repeat after periods of 100 years or several centuries, while countries will still remain earthquake and tsunami prone. This means the timeline necessary to draw a proper country profile is beyond the timeline covered in this study and by UNISDR's Global Assessment Report and more efforts are needed in the region to develop comprehensive national databases.

2.4 Quality and use of existing national disaster loss databases

Beyond expanding the establishment of national disaster loss databases to more Arab countries and efforts to expand the loss periods to include data prior to 1982, it is similarly important to improve the overall enabling environment and address existing shortcomings associated with the process of disaster damage and loss data management. The review of existing databases revealed several institutional, technical, logistical, legal and even political challenges that need to be addressed to improve the quality, completeness and usefulness of national disaster loss databases:

1. **Absence of a clear and agreed process for disaster damage and loss data gathering.** This process is more or less well defined for the initial establishment of a national disaster loss database, which in Arab States benefited from external funding. However, the process slows when funding ceases and sustainability becomes an issue.

2. **Absence of one regional and national institution responsible of disaster data collection, maintenance and data dissemination.** Most national disaster loss databases have been established by consultants or UN Volunteers on behalf of the Hyogo Framework for Action focal point institution. While appropriate in some cases – e.g. where the HFA focal point institution is the national civil protection service linked to the Ministry of Interior – it seems less obvious for other cases, where Ministries of Environment compile the data. While HFA focal point institutions have the advantage of their expertise in disaster risk management, they often are unable to influence political decision-making to effectively integrate DRR and disaster loss information in national planning and budgeting processes.

3. **Difficult access to loss and damage data.** Despite a very open and inclusive process of sensitization and training of stakeholders and focal points from all key line Ministries and technical services, some of these services did not later provide available loss data to data collection teams.

4. **Absence of clear validation mechanisms.** Beyond Morocco and Tunisia, which held regional reviews, no national workshops have been held to verify, correct and validate assessed data. This aspect is critical as information sources for national disaster loss databases need to be verified.

5. **Absence of a clear data archiving strategy.** UNISDR supported the initial process of storing disaster loss data. However, not all countries formally established data on a shared server that is openly accessible to line Ministries and technical services.

6. **Some databases do not contain all types of hazards** (e.g. drought), **while others included anthropogenic rather than natural hazards only** (e.g. road accidents in the initial database in Tunisia).

7. In some databases different **languages** were used in the same database, which impedes their utility.

8. **Generally speaking, databases have been underused following their establishment.** They do not

yet inform decision-making processes. Even international organizations, which helped to establish those databases, do not yet extensively use the loss findings.

9. **Some databases are not exhaustive and lack a systematic national process of updating and follow-up.** Some national databases were updated only thanks to continued support by international partners in particular UNISDR (example of Morocco).

While considering the above recommendations, it is important to keep in mind that already available data is far more complete than what is recorded in otherwise available international loss databases. The importance of existing national disaster loss databases has been demonstrated above, and efforts to improve those databases continue to be more important for other internationally available disaster databases.

3. RECOMMENDATIONS ON NATIONAL DISASTER LOSS DATABASES

Following the analysis of the ten available national disaster loss and damage databases, including the process of arriving at their establishment and their current use, and reflecting further on the review of EM-DAT data, the following recommendations are made in order to improve the usefulness of loss data for development planning and action:

1. **Further institutionalize the national disaster damage and loss data management processes**. These should include the establishment, maintenance and use of comprehensive disaster damage and loss databases from data gathering to the dissemination of the derived documents.

2. **Deepen the understanding and ownership of disaster loss databases.** Various national institutions, in charge of disaster risk management and their partners must have ownership of these databases, and use them in the different phases of disaster risk management processes in order to inform decisions needed to reduce existing and avoid new risks.

3. **Integrate disaster damage and loss databases as part of the national disaster reduction system.** The establishment of a national loss accounting system should be integrated in national strategies for risk reduction and/or loss accounting.

4. **Technical and non-technical support and coaching is needed.** Continued regional support is critical to help remaining countries to setup, customize and effectively use their national databases a proposed diagram for technical and non-technical support regarding risk knowledge and especially disasters damage and loss databases in the Arab region is given in the following figure:

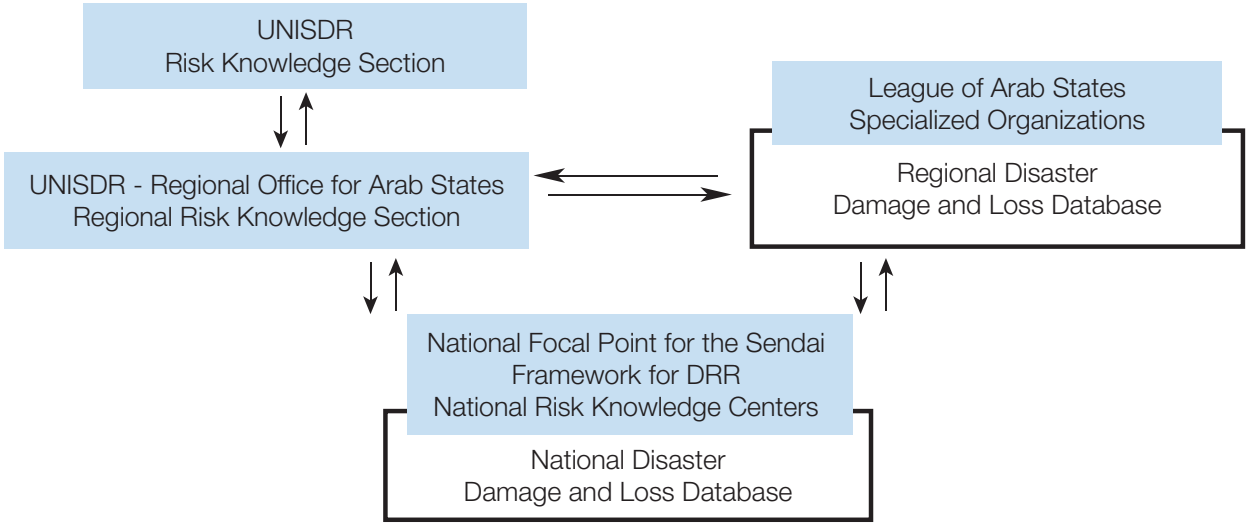

Fig 5. Proposed set up for Risk Knowledge and Loss Accounting in Arab States

The UNISDR Headquarters Risk Knowledge Section and the UNISDR-ROAS regional risk knowledge section will regularly share knowledge and expertise with the League of Arab States specialized organizations. The UNISDR ROAS regional risk knowledge section and the specialized organizations of the League of Arab States will ensure the strengthening of capacities of national Arab States institutions in terms of the risk-information and knowledge management cycle, including disaster damage and loss data gathering and analysis. the proposed National Disaster Risk Knowledge Centre is a national institution which has all the needed expertise in term of DRR. It should operate under the auspices of the national focal point (NFP) of the Sendai Framework for DRR. The above proposal is in line with provisions of the Sendai Framework for Disaster Risk Reduction 2015-2030 to stress the importance of "understanding disaster risk" as Priority 1.

5. **Improve and sustain the data collection process and perform quality control.** Elaborate a clear and detailed scheme for systematic data collection, interpretation and use.

6. **Perform an in-depth national analysis of disaster loss databases.** It is suggested to develop a guideline explaining clearly how to perform detailed analysis and how to produce indicators for use by decision-makers.

7. **Continue and expand training on national disaster loss accounting systems.** There is an urgent need to develop and implement capacity-building plans in order to strengthen regional and national competencies in terms of damage and loss assessment, and in terms of disaster damage and loss data management.

8. **Improve the existing tool promoted by UNISDR to arrive at national disaster loss accounting systems to include more risk analysis capabilities.** The use of the "DesInventar" methodology played a crucial role in terms of disaster damage and loss data gathering, archiving and analysis in the Arab region. In parallel to the promotion of the current version and efforts to widen its use, it is important now to examine how to improve the tool with more analytical capabilities. This could help to overcome the shortcomings in the Arab region and will contribute to the implementation and achievement of the new challenges of the Sendai Framework for Disaster Risk Reduction.

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