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Briefing Note

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Overview of the Societal Impacts of Floods in the Philippines

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Contents

Abbreviations Used

CRED	Centre for Research on the Epidemiology of Disasters
DILG	Department of the Interior and Local Government
DND	Department of National Defense
DOH	Department of Health
DOST	Department of Science and Technology
DRRM	Disaster Risk Reduction and Management
DRRMC	Disaster Risk Reduction and Management Committee
DSWD	Department of Social Welfare and Development
EM-DAT	Emergency Event Database
EOC	Emergency Operation Center
IMT	Incident Management Team
LDRRMP	Local Disaster Risk Reduction and Management Plan
LGU	Local Government Unit
NDRP	National Disaster Response Plan
NDRRMF	National Disaster Risk Reduction and Management Framework
NDRRMP	National Disaster Risk Reduction and Management Plan
NEDA	National Economic and Development Authority
OCD	Office of Civil Defense
OPLAN	Operational Plan
RDT	Rapid Deployment Team
UNDRR	United Nations Disaster Risk Reduction (formerly UNISDR - United Nations International Strategy for Disaster Reduction)

1. Introduction

Floods impact both individuals and communities in terms of outright casualties, health decline, and destruction of properties and livelihoods [1]. The gravity of impacts depends on the location, frequency, intensity and extent of flooding, vulnerability of the activities and population, and value of the natural and built environments they alter [2]. Despite meaningful disaster risk reduction initiatives, floods continue to persist as the most catastrophic natural hazards globally over the past decades [3]. In the Philippines, besides the severity of monsoon rains and typhoons causing destructive floods, poor community drainage and overloaded river channels due to rapid urbanization worsened the recurrent flooding [4]. In fact, when Typhoon Ketsana hit the country in 2009, about 21,700 hectares or 34% of the highly urbanized National Capital Region was inundated, affecting around 4.9 million inhabitants, and leaving behind 464 casualties and 37 missing individuals with some US$ 240 million worth of damage in property, infrastructure and agriculture [5].

2. Societal Impacts of Floods

Loss of lives and property are the most obvious and well researched impacts of floods as they can easily be quantified, reported and recorded. However, other consequences that cannot be assessed as easily in monetary values are equally important aspects of societal impacts that need to be recognized and integrated into the overall assessment [5]. Societal impacts of floods can be categorized into four categories of impacts. First, we can see *direct impacts* which "result from a direct physical contact between floodwater and humans, economic assets, or other objects" [2, p.3] and from *indirect impacts* which "occur outside of the flood event in both space and time" [2, p.3]. Then we can distinguish *tangible impacts* which "can be easily expressed in monetary terms and thus refer to goods, for which a market price exists" [2, p.3] and *intangible impacts* which "are difficult to quantify in monetary terms because no market price exists" [2, p.3]. A table with the four categories of impacts can be found in Table 2 of the Appendix. Additionally, disaster impacts can be expressed in quantitative terms based on four indicators developed by the Centre for Research on the Epidemiology of Disasters (CRED) for its Emergency Event Database (EM-DAT)[1] :

[1] Emergency Event Database (EM-DAT) is a global database on natural and technological disasters, containing essential core data on the occurrence and effects of more than 21,000 disasters in the world, from 1900 to present. EM-DAT is maintained by the Centre for Research on the Epidemiology of Disasters

(a) *fatalities* which is the number of people who died because of natural hazards;
(b) *injured* which refers to people suffering from physical injuries, trauma or an illness requiring medical treatment as direct consequence of a disaster;
(c) *affected* which is the sum of homeless people whose houses are destroyed or heavily damaged and therefore need shelter and those distressed people requiring immediate assistance during a disaster; and
(d) *damage* which refers to the amount of damage to property, crops, and livestock [6].

Nevertheless, the variety of damages and losses caused by floods have substantial negative impacts on the well-being of the affected individuals and their families [7].

2.1 Impact on Lives

The direct impact of floods on people's lives include fatalities, the partial or total destruction of shelters and the lack of food which is of paramount concern for the affected. The affected tend not to care as much about other sources of discomfort but rather, go to great lengths to access food aid fast [5, p. 48].

Based on the EM-DAT, from 1978 to 2018, floods have killed a total of 2,847 people in the Philippines. At least 25 percent of those were killed by floods between 2009 and 2018. Meanwhile, floods have rendered a total of 222,119 people homeless from 1978 to 2018, at least 16 percent of those were from 2009 to 2018. The total population affected by floods from 1978 to 2018 was 29.5 million people with more than 68 percent of those being between 2009 to 2018 (See Appendix Table 1, Table 1a, Figure 2, Figure 2a, Figure 4, Figure 4a, Figure 5, and Figure 5a) [6].

(CRED) at the School of Public Health of the Université catholique de Louvain located in Brussels, Belgium. Its main objectives are to assist humanitarian action at both national and international levels; to rationalize decision-making for disaster preparedness; and to provide an objective basis for vulnerability assessment and priority setting. EM-DAT includes all disasters from 1900 until the present, conforming to at least one of the following criteria: a) 10 or more people dead; b) 100 or more people affected; c) the declaration of a state of emergency; and d) a call for international assistance. *Source:* "EM-DAT: The OFDA/CRED International Disaster Database: www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium". [Online] Available at: https://www.emdat.be/frequently-asked-questions [Accessed 15 April 2019].

2.2. Impact on Health

Health impacts of floods may be direct or indirect. The direct impacts which arise from physical contact with floodwater include drowning, heart attack, hypothermia, forthright (i.e. direct) shock, wounds from submerged wreckage, electrocution, chemical contamination, and animal bites. Indirect impacts are related to flood damage of the natural or built environment and include infection ailments, starvation, physical and mental disabilities triggered or worsened by flood conditions, and diseases incidental to displacement and impoverishment [8, 10, 11, 12].

Based on the EM-DAT, from 1978 to 2018 floods have injured a total of 913 people in the Philippines. At least 33 percent of those injured by floods were recorded from 2009 to 2018. (See Appendix Table 1, Table 1a, Figure 3, and Figure 3a) [6].

Leptospirosis is a water-borne bacterial infection which is difficult to diagnose and can cause serious complications and even death if not treated immediately [13]. It surfaced as a significant wide-reaching infectious disease present in both urban and rural areas of industrialized and developing countries [14, p. 757, 15, p. e710]. Several epidemics of this ailment have been linked to floods [16, p. 631]. Given the escalating disastrous flood events, it likely that there will be an increase in this disease [15, p. e710, 16, p. 631]. After the 2009 floods in the Philippines due to Typhoon Ketsana, the National Epidemiology Center of the DOH reported that paddling in unprotected in flood waters raised the incidence of leptospirosis [8, p. 5]. An outbreak of this disease occurred in the National Capital Region that year and at least 471 patients were hospitalized and 51 died [9, pp. 91-92]. Hence, medical facilities faced a shortfall in the prevention and treatment of the disease [8, p. 6,].

In addition, those affected by fatalities and mass destruction faced psychological and emotional distress resulting in prolonged anxiety and mental anguish, thereby weakening their capacity to adjust to subsequent catastrophes [5, p. 51].

2.3 Impact on Livelihoods

In flood-prone rural areas, people are employed in various livelihoods such as rice farming, hired agricultural and construction laborers, self-employment in small retail stores, clothing

and processed food trade, and tricycle[2] transport operations [19, p. 69]. Recent floods have entirely demolished the livelihoods of affected people, who had no replacement strategies. Large tracks of lowland farms that have been covered with flood mud, debris and rocks rendered the land unfit for crop growing for many years. These conditions have led to challenging livelihood shifts in the affected communities [17, p.10]. Hence, affected individuals who were totally dependent on their primary livelihoods and had insufficient support network systems, encountered serious difficulty and uncertainty in obtaining incomes for their daily sustenance [20].

2.4 Impact on Assets and Services

Floods directly harm farmlands, aquaculture, buildings, roads, power supplies, and other infrastructure and assets. Recurrent floods also exacerbate existing loss of top soil, sand-settling problems for natural and artificial lakes, dams, hydro-electric power plants and other water systems and facilities, and lessen the deepness of canals and reservoirs. Many artificial lakes already have major sand-settling problems [12, p.19]. Floods also leave waste buildups in waterways and water bodies that lower the feasibility of these natural resources for profitable activities [12, pp.31-32].

Based on the EM-DAT, from 1978 to 2018, the economic damage brought about by floods in the Philippines totaled USD $3.5 billion (approximately PhP 180 billion). More than 73 percent of these damages were from floods that occurred from 2009 to 2018 (See Appendix Table 1, Table 1a, Figure 6 and Figure 6a) [6]. The Department of Agriculture reported that flood damage to rice farming from 2007 to 2011 totaled PhP 5,181.99 million [12, p. 28].

Floods also directly hit the demand and supply sides of education in many ways. For example, floods result in the postponement of classes, create substantial damage to school buildings, and generate a variety of obstacles for teachers at work and at home. Teaching-learning interferences such as shorter class periods, low enthusiasm and attention of pupils, insufficient schoolrooms, unavailability of teaching resources and inconveniences in making lesson plans were among the serious obstacles the education sector is confronted with after a

[2] A common transport vehicle in the Philippines

flood on a daily basis. In addition, floods negatively influence learners' classroom attendance and active participation [21, p. 37, 22, p. 463].

3. National Disaster Risk Reduction and Management Framework (NDRRMF)

The Philippines is located in the typhoon belt and Ring of the Fire of the Pacific Ocean, associated with numerous volcanoes, tectonic plates, and warm seas, thus, the Philippines is disaster-prone. These geological and meteorological circumstances prompted the government to come up with sustained measures that will lessen the effects of disasters. For example, the Republic Act No. 10121 or "Philippine Disaster Risk Reduction and Management Act of 2010" was enacted to be the centerpiece of the National Disaster Risk Reduction and Management Framework (NDRRMF) to which the National Disaster Risk Reduction and Management Plan (NDRRMP) is anchored. Also, the initiatives of the UNDRR to provide international guidelines, e.g. "Hyogo Framework for Action 2005-2015"[3] and "Sendai Framework for Disaster Risk Reduction 2015-2030"[4], cannot be discounted in helping the country rationalize its disaster risk reduction strategy. The NDRRMF provides a comprehensive, all-hazard, multi-sectoral, inter-agency, and community-based approach to disaster risk management. Consequently, the NDRRMP specifies the strategies, organization, tasks of concerned agencies and local government units, and other guidelines in dealing with disasters or emergencies. The NDRRMP covers four areas, namely: (a) *Disaster Prevention and Mitigation*; (b) *Disaster Preparedness*; (c) *Disaster Response*; and (d) *Disaster Rehabilitation and Recovery*. The National Disaster Risk Reduction and Management Council (NDRRMC) was created to lead the overall implementation of the NDRRMP. Supporting the NDRRMC, is the

[3] The Hyogo Framework for Action 2005-2015 is a 10-year plan to make the world safer from natural hazards. It was endorsed by the UN General Assembly in Resolution A/RES/60/195 following the 2005 World Disaster Reduction Conference held in Kobe, Hyogo, Japan, from 18 to 22 January 2015. Source: UN/ISDR (2007). Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. Extract from the Final Report of the World Conference on Disaster Reduction (A/CONF.206/6). UN/ISDR-07-2007 Geneva. [Online] Available at: https://tinyurl.com/y4hceh2f [Accessed 30 May 2019].

[4] The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR). Source: UN/ISDR (2015). Sendai Framework for Disaster Risk Reduction 2015 – 2030. Extract from the Final Report of the Third United Nations World Conference on Disaster Risk Reduction, held from 14 to 18 March 2015 in Sendai, Miyagi, Japan. UNISDR/GE/2015 - ICLUX EN5000 1st edition. [Online] Available at: https://tinyurl.com/y3a4c354 [Accessed 30 May 2019].

Office of Civil Defense (OCD) which is principally tasked to run the day-to-day activities of the national civil defense and disaster risk reduction and management program of the NDRRMP. The organizational structures of the NDRRMC and the OCD can be found respectively, in Figure 7 and Figure 7a of the Appendix. Other national and local government agencies and institutional networks, both existing and new, are also tasked to formulate the Local Disaster Risk Reduction and Management Plan (LDRRMP) and administer their specific functions at their respective levels of operation [23, 24, 29].

While the NDRRMF is backed by a sound legal basis and precise functional structures for risk reduction and management, the intricacies of huge disasters normally challenge standing plans and protocols. A complex institutional arrangement with inclusive sectoral participation, network overlays (i.e. overlapping work done by different stakeholders), and a tiered (i.e. top-down) approach reduces response efficiency and effectiveness hence obstructing crucial disaster response, recovery and rehabilitation. The Republic Act No. 10121 and related laws have created specific mandates, but implementing mechanisms are often questioned regarding funding accountability and competence across layers of governance [24, pp. 39-40, 25, 26, 27, 28].

4. National Disaster Response Plan for Flood Hazards

The National Disaster Response Plan (NDRP) identifies the activities in disaster risk reduction and management (DRRM). It calls for judicious and successful government response in affected areas needing support. The Office of Civil Defense (OCD) is directed to formulate and administer the application of national standards in the disaster risk reduction program in collaboration with the appropriate agencies. This is to ensure that in the most severe situations, the most competent levels of government will respond accordingly. At present, there are NDRPs for: (a) *Hydro-Meteorological Hazards* (typhoons, monsoons, low pressure areas, *flooding*, storm surge, and rain–induced landslides); (b) Earthquakes and Tsunamis; and (c) Consequence Management for Terrorism-Related Incidents. The NDRP expects that all local government units (LGUs) have emergency plans for hydro-meteorological hazards and have Local Disaster Risk Reduction and Management Plans (LDRRMPs) in place with specific preparedness actions linked to the response. All other agencies are required to set up operational plans (OPLANs). The NDRP through its NDRRMC response group and

member-agencies normally functions at the emergency operation centers (EOC) from national down to the provincial levels while incident management teams (IMT) operate at the site. When there is no report coming from, and going to, the affected areas within 6-12 hours after an incident, NDRRMC will utilize prepositioned rapid deployment teams (RDTs) after 12 hours of no communication from the affected areas [30].

The NDRP creates partnerships to undo outdated rigid channels and accelerate knowledge sharing among local DRRMCs and appropriate security segments of government. These local partnerships and the sharing of information would facilitate the response operations after floods and might also improve the trust and confidence the people have in the government [30, pp. 7-8].

5. Policy Considerations

In light of the foregoing, it can be noted that there is still a need to revisit the law and strengthen legislation regarding operational mechanisms for disaster risk reduction and management. The following interconnected legislative proposals are considered relevant and could be considered in responding to flood hazards. They include:

a. Amending the Republic Act No. 10121 or the "Philippine Disaster Risk Reduction and Management Act of 2010" to highlight measures of accountability and competence throughout the levels of authority;
b. Mandating the establishment of a national flood research and education consortium to plan, coordinate, conduct, and share research on floods, anthropogenic flood prevention and flood risk reduction. This body could identify and recommend best practices in all aspects of flood hazard reduction, resilience and governance. With this centralized effort, the effects of floods could be studied and how best to prepare and respond to each flood event;
c. Enacting a law that will ensure immediate assistance following a flood disaster or any related incident of similar magnitude and expand relevant aid facilities to ensure continuity of support. This does not preclude the strengthening of social welfare and health agencies to effectively deliver basic services and emergency assistance;

d. Mandating the establishment and maintenance of rainwater harvesting and storage facilities in all new developments, both commercial and residential, to curb flooding by gathering rainwater instead of allowing it flow to waterways;

e. Mandating the creation of a quasi-public flood insurance corporation to ensure compensation and recovery from loss and damages caused by floods;

f. Enacting a law that will promote charity among establishments and individuals to donate in good faith, medicines, food products or supplies during calamities by exempting them from any form of liability arising therefrom;

g. Mandating the establishment of a National Livelihood Development, Enhancement and Recovery Assistance Council to formulate a comprehensive, integrated and sustainable livelihood development program for the advancement of small livelihood enterprises through affordable and convenient credit financing, and in cases affected by floods and other disasters, adequate funding assistance for livelihood recovery;

h. Regulating the manufacture of plastic bags to influence the behavior of consumers towards prudent use and thereby minimize, if not eliminate, plastic bags trash that clogs drainage and waterways, uses up a large portion of landfills and poses a threat to wildlife;

i. Studying the utilization of a "People's Survival Fund"[5] among local government units (LGUs) and how to access funds for local flood risk reduction programs. This measure establishes an institutional mechanism to track flood disaster funds including those coming from international sources;

j. Mandating the integration of compulsory disaster risk reduction and management education in all levels of school curricula as a proactive response to natural disasters; and

[5] The People's Survival Fund was created by Republic Act No. 10174 as an annual fund intended for local government units (LGUs) and accredited local/community organizations to implement climate change adaptation projects that will better equip vulnerable communities to deal with the impacts of climate change. It supplements the annual appropriations allocated by relevant government agencies and LGUs for climate change-related programs and projects. *Source:* NICCDIES (2018). National Integrated Climate Change Database Information and Exchange System. [Online] Available at: https://www.niccdies.ph/climate-finance/peoples-survival-fund [Accessed 12 June 2019]

k. Reexamining the programs and operations of disaster-related agencies as well as subsidiary organs of government (such as ad hoc bodies set up for special purposes) involved in the utilization, protection, and rehabilitation of water resources to correct overlapping and conflicting policies, jurisdictions, technical expertise, information systems and financing strategies.

6. Conclusion

Floods are inevitable occurrences in the Philippines due to its geographical location. Persistent flood events result not only in loss of life and enormous damage to natural and built environment, but also in multiple disruptions of human activities and deterioration of people's well-being. This magnitude of societal impacts pushed the government to institute massive reforms in its disaster risk reduction and management strategy in tandem with its strong adherence to the UNDRR commitments. Learning to live with floods is central to the 4-tiered NDRRMP's strategies that comprise *disaster prevention and mitigation*, *disaster preparedness*, *disaster response*, and *disaster rehabilitation and recovery*. Nonetheless, the NDRP for hydro-meteorological hazards which details the overall response mechanism for such eventualities has more to do to be recognized as best practice.

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Appendix

Table 1 - Floods in the Philippines

	1978-1987	1988-1998	1999-2008	2009-2018	TOTAL
Occurrence	15	26	39	59	139
%	10.79	18.70	28.05	42.44	99.98
Fatality	534	978	598	737	2847
%	18.75	34.35	21.00	25.88	99.98
Injured	357	35	219	302	913
%	39.10	3.83	23.98	33.07	99.98
Affected (A)	560,724	3,440,680	5,096,287	20,189,478	29,287,169
%	1.91	11.74	17.40	68.93	99.98
Homeless (H)	357	124,074	61,624	36,064	222,119
%	0.16	55.85	27.74	16.23	99.98
Total Affected (A + H)	561,081	3,564,754	5,157,911	20,225,542	29,509,288
%	1.90	12.08	17.47	68.53	99.98
Total Damage (US Dollars)	34,102,000	826,303,000	98,771,000	2,610,428,000	3,569,604,000
%	0.95	23.14	2.76	73.12	99.97

Source: "EM-DAT: The OFDA/CRED International Disaster Database: www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Table 1a - 2009-2018 vs. 1978-2018 Floods in the Philippines

	1978-2018	2009-2018	%
Occurrence	139	59	42.44
Fatality	2847	737	25.88
Injured	913	302	33.07
Affected (A)	29,287,169	20,189,478	68.93
Homeless (H)	222,119	36,064	16.23
Total Affected (A + H)	29,509,288	20,225,542	68.53
Total Damage (US Dollars)	3,569,604,000	2,610,428,000	73.12

Source: "EM-DAT: The OFDA/CRED International Disaster Database: www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Table 1b - 1999-2008 vs. 1978-2018 Floods in the Philippines

	1978-2018	1999-2008	%
Occurrence	139	39	28.05
Fatality	2847	598	21.00
Injured	913	219	23.98
Affected (A)	29,287,169	5,096,287	17.40
Homeless (H)	222,119	61,624	27.74
Total Affected (A + H)	29,509,288	5,157,911	17.47
Total Damage (US Dollars)	3,569,604,000	98,771,000	2.76

Source: "EM-DAT: The OFDA/CRED International Disaster Database: www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Table 1c - 1988-1998 vs. 1978-2018 Floods in the Philippines

	1978-2018	1988-1998	%
Occurrence	139	26	18.70
Fatality	2847	978	34.35
Injured	913	35	3.83
Affected (A)	29,287,169	3,440,680	11.74
Homeless (H)	222,119	124,074	55.85
Total Affected (A + H)	29,509,288	3,564,754	12.08
Total Damage (US Dollars)	3,569,604,000	826,303,000	23.14

Source: "EM-DAT: The OFDA/CRED International Disaster Database: www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Table 1d - 1978-1987 vs. 1978-2018 Floods in the Philippines

	1978-2018	1978-1987	%
Occurrence	139	15	10.79
Fatality	2847	534	18.75
Injured	913	357	39.10
Affected (A)	29,287,169	560,724	1.91
Homeless (H)	222,119	357	0.16
Total Affected (A + H)	29,509,288	561,081	1.90
Total Damage (US Dollars)	3,569,604,000	34,102,000	0.95

Source: "EM-DAT: The OFDA/CRED International Disaster Database: www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium"

Table 2 - Aspects of Flood Impacts

	Direct Intangible	Direct Tangible	Indirect Tangible	Indirect Intangible
Lives	-fatalities -lack of food -discomfort	-destruction of shelters		
Health	-drowning -heart attack -hypothermia -direct shock -wounds from submerged wreckage -electrocution -chemical contamination -animal bites			-infection ailments (i.e. leptospirosis) -starvation -physical and mental disabilities worsened by flood conditions -diseases incidental to displacement and impoverishment -psychological and emotional distress -prolonged anxiety and mental anguish -weakening capacity to adjust to subsequent catastrophes
Livelihoods	-challenging livelihood shifts	-loss and damage to livelihood resources -income losses in rice farming, micro-enterprises and local transport operation	-loss of agricultural and construction jobs	-difficulty and uncertainty in obtaining incomes
Assets and Services	-exacerbate existing loss of top soil -build sand-settling problems for natural and artificial lakes, dams, hydro-electric power plants and other water systems and facilities -lessen the deepness of canals and reservoirs -leave waste buildups in waterways and water bodies -temporary closure or relocation of education services -postponement of school classes -generate obstacles for teachers at work and at home	-loss and damage to farmlands, aquaculture buildings, roads, power supplies and other infrastructure and assets	-shorter class periods in the education sector -insufficient school rooms -unavailability of teaching resources	-low enthusiasm and attention of pupils in the education sector -inconveniences in making lesson plans -negatively influence learner's classroom attendance and active participation

Compiled by author

	Direct Tangible	*Direct Intangible*
Lives	damage to human settlements or shelters	loss of human lives, lack of food, discomfort
Health Status		drowning, heart attack, hypothermia, forthright shock, wounds from wreckage, electrocution, chemical contamination, animal bites
Livelihoods	loss of and damages to properties, utilization and undertakings, loss of earnings, loss of rice farming, loss of self-employment in retail store, clothing and processed food trade, and tricycle transport operation	livelihood shift among the affected communities
Assets and Services	loss and damages to farmlands, aquaculture, private and public buildings, roads, power supplies, and other general service infrastructure	exacerbate loss of top soil, build sand settling problems for natural and artificial lakes, dams, hydro-electric power plants and other water systems and facilities, and lessen the deepness of canals and reservoirs; waste buildups in waterways and water bodies; loss/temporary closure/relocation of general services, postponement of classes, nuisances for teachers at work and at home.
	Indirect Tangible	*Indirect Intangible*
Health Status		infection ailments (i.e. leptospirosis), starvation, physical and mental disabilities worsened by flood conditions, and diseases incidental to displacement and impoverishment
Livelihoods	loss of agricultural and construction jobs	difficulty and uncertainty in obtaining incomes
Assets and Services	(education service): shorter class periods, insufficient schoolrooms, unavailability of teaching resources	(education service): low enthusiasm and attention of pupils, and inconveniences in making lesson plans, negatively influenced learner's classroom attendance and

		~~active participation~~

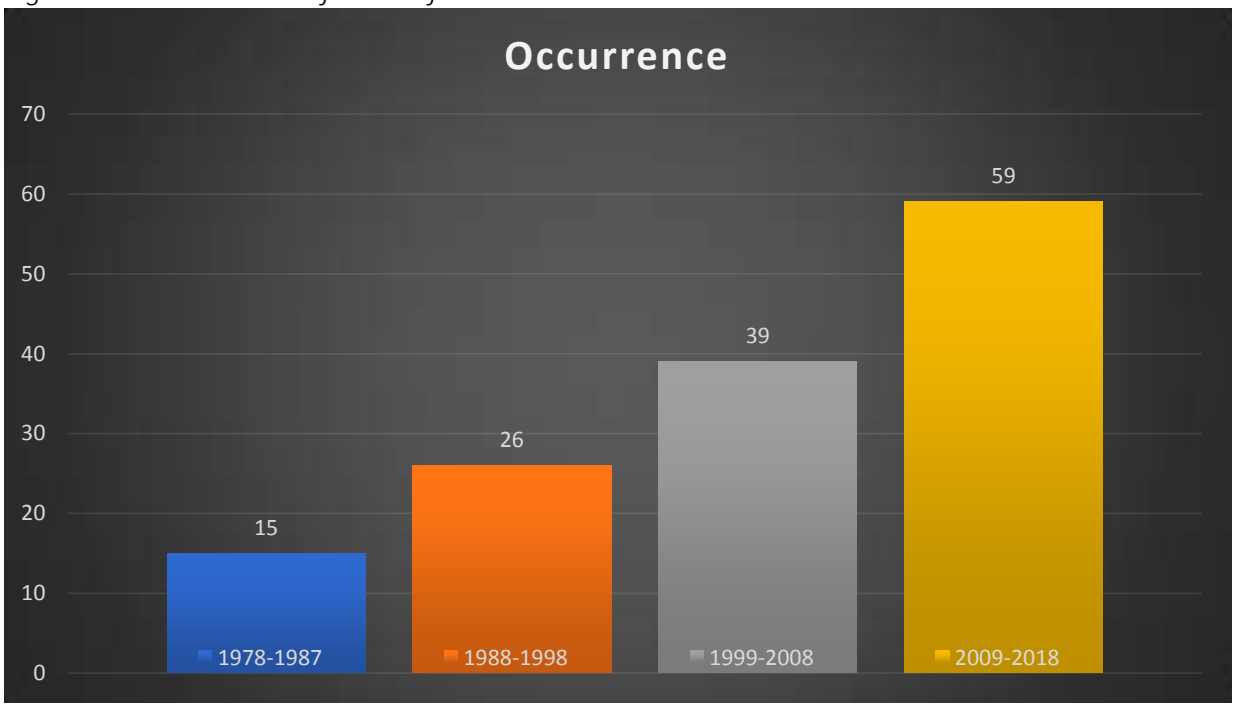
~~*Compiled by author*~~

Table 3 – Policy Consideration

1	Amending the "Philippine Disaster Risk Reduction and Management Act of 2010"
2	Establishing a national flood research and education consortium
3	Establishing exclusive flood disaster aid facilities
4	Institutionalizing rainwater harvesting and storage program
5	Institutionalizing flood insurance system
6	Institutionalizing emergency flood donation program
7	Establishing a National Livelihood Development, Enhancement and Recovery Assistance Council
8	Regulating the manufacture of plastic bags
9	Studying the utilization of "People's Survival Fund"
10	Institutionalizing compulsory disaster risk reduction and management education in all levels of school curricula
11	Reexamining the programs and operations of disaster-related agencies as well as subsidiary organs of government involved in the utilization, protection, and rehabilitation of water resources

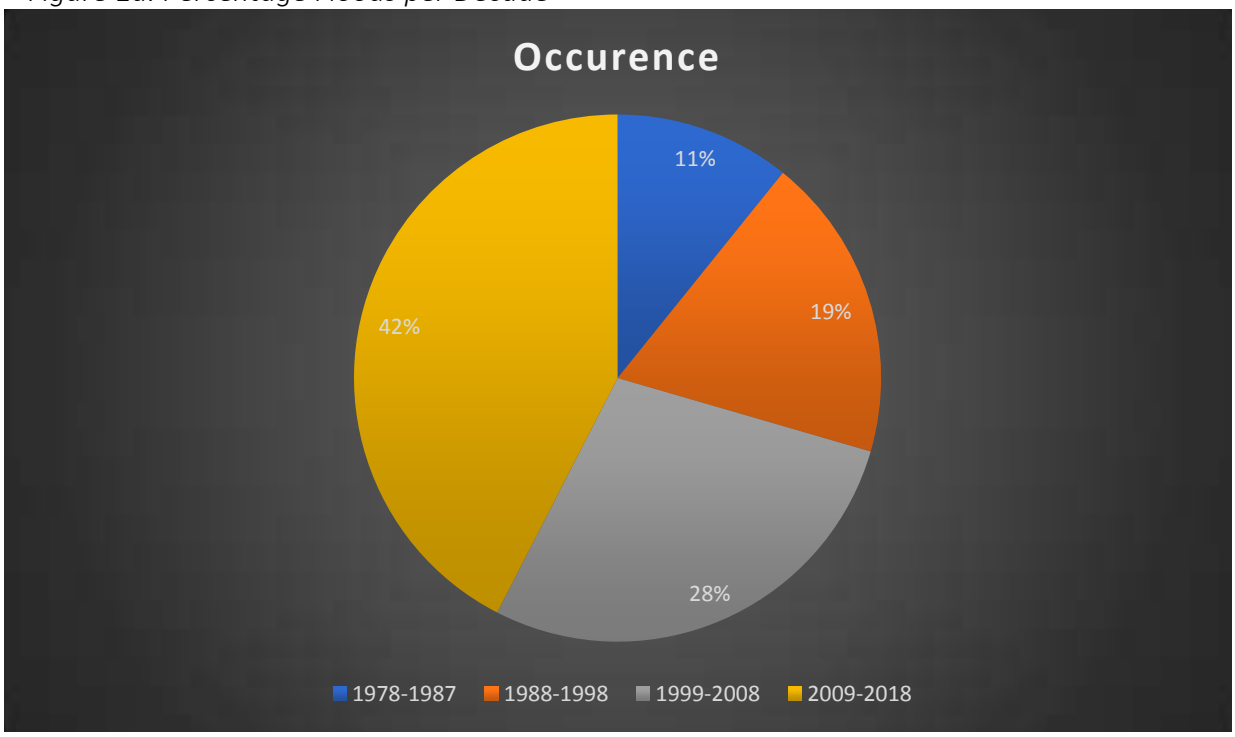
Compiled by author

Figure 1. Total Number of Floods from 1978-2018



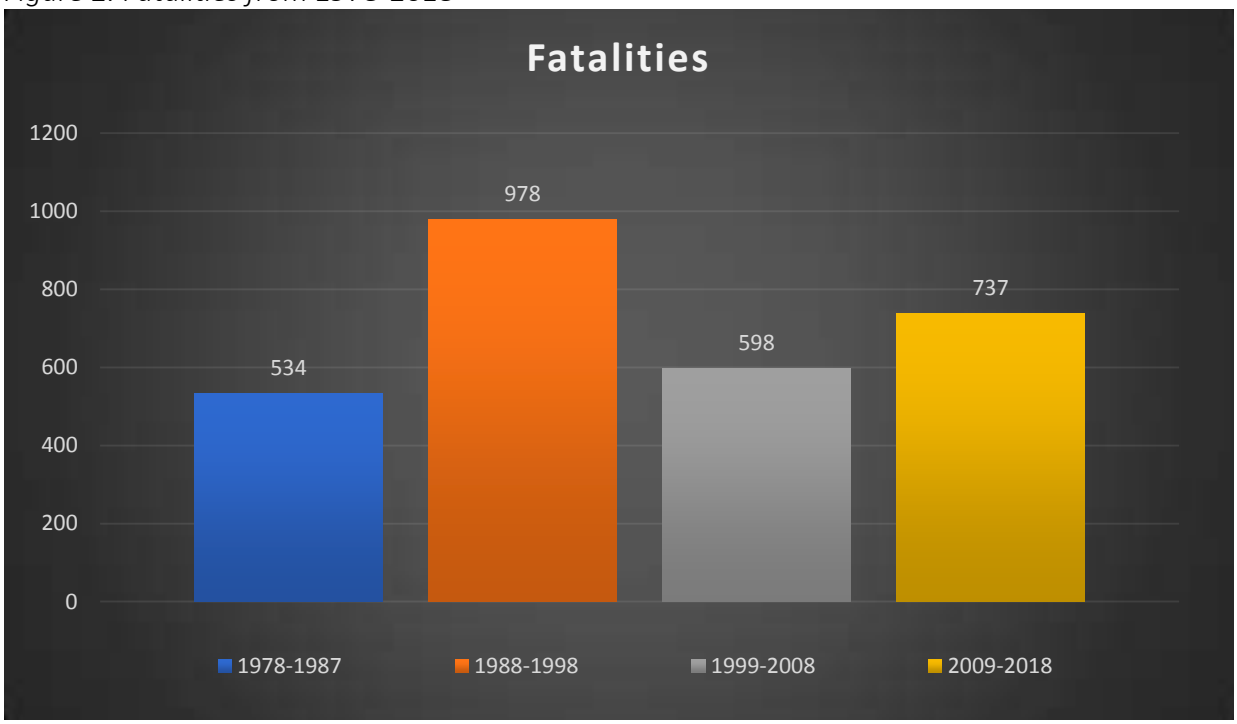
Source: compiled by author with data from EM-DAT

Figure 1a. Percentage Floods per Decade



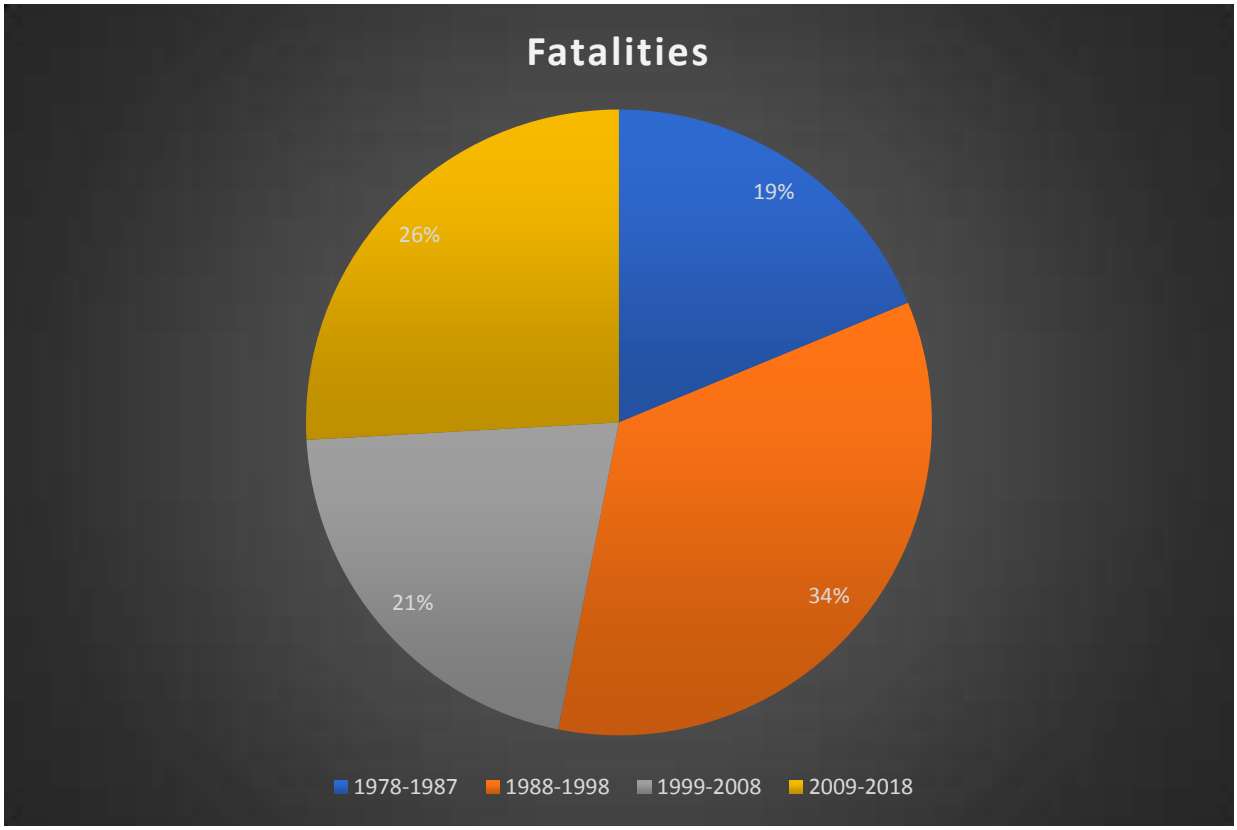
Source: compiled by author with data from EM-DAT

Figure 2. Fatalities from 1978-2018



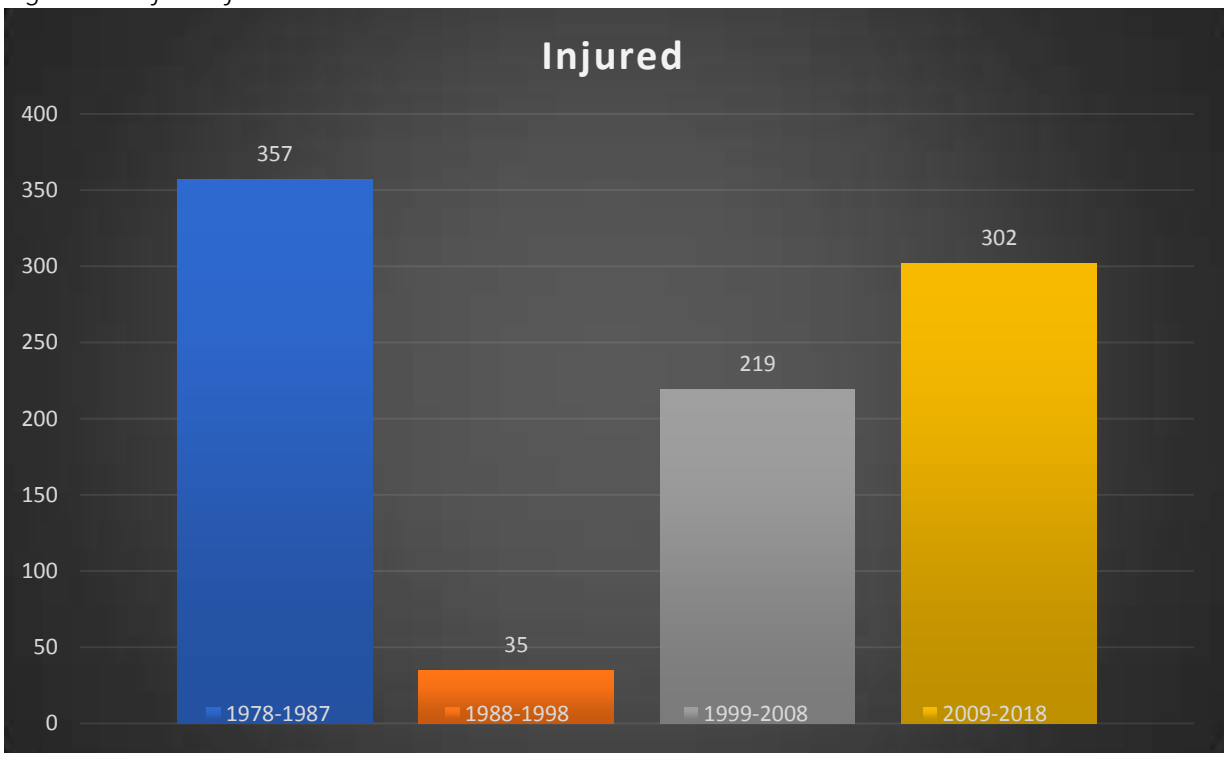
Source: compiled by author with data from EM-DAT

Figure 2a. Percentage Fatalities per Decade



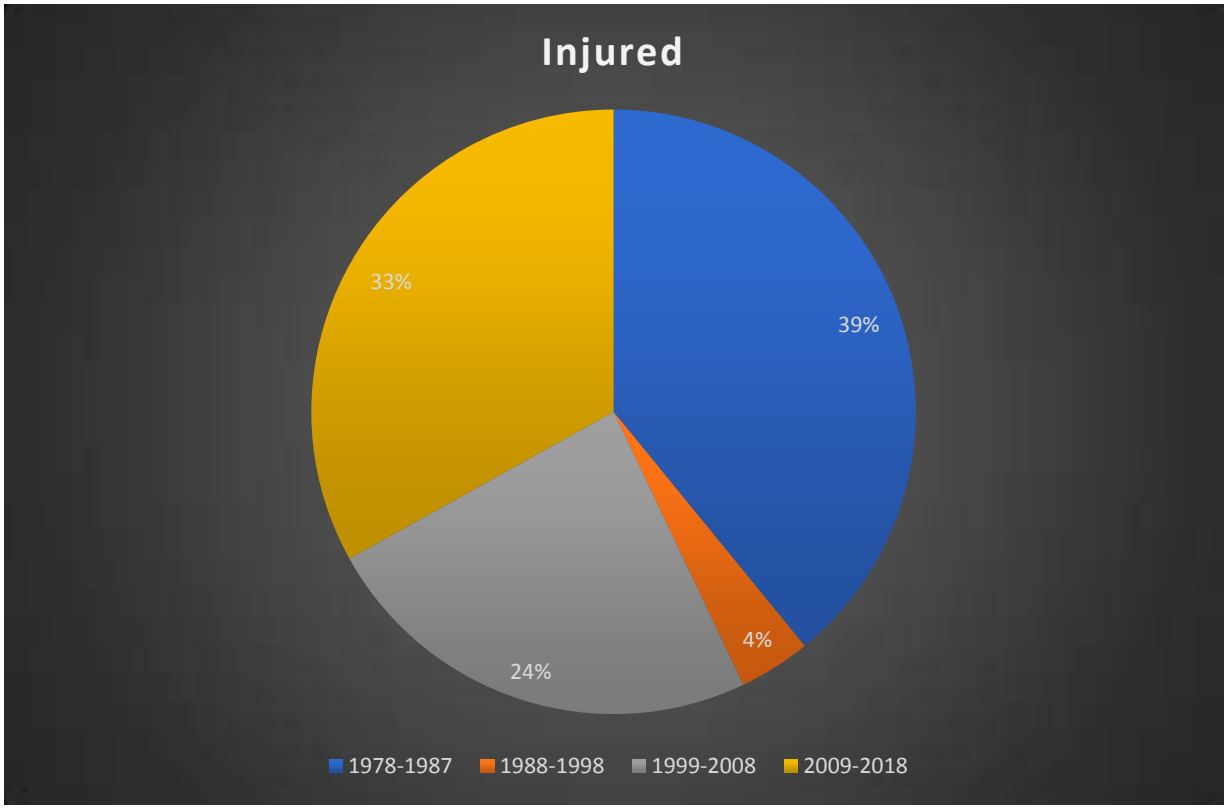
Source: compiled by author with data from EM-DAT

Figure 3. Injured from 1978-2018



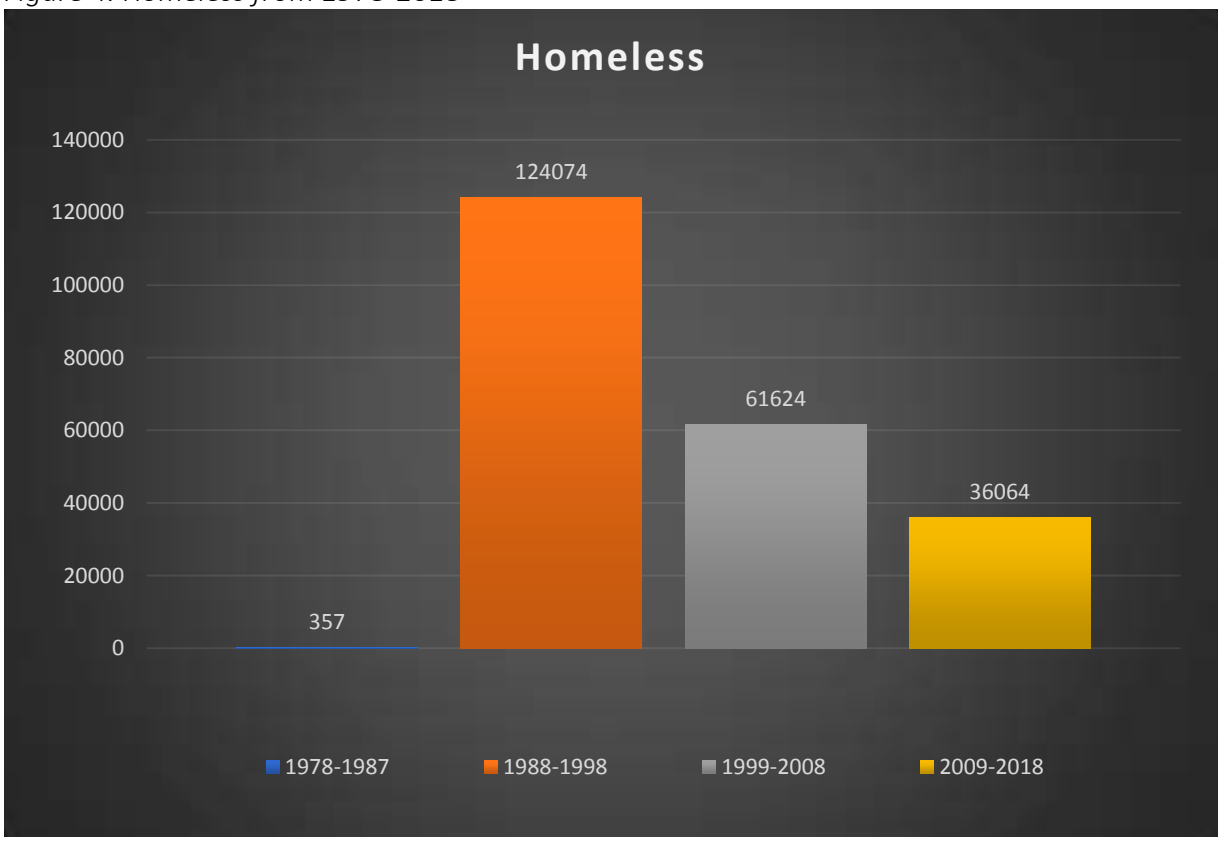
Source: compiled by author with data from EM-DAT

Figure 3a. Percentage Injured per Decade



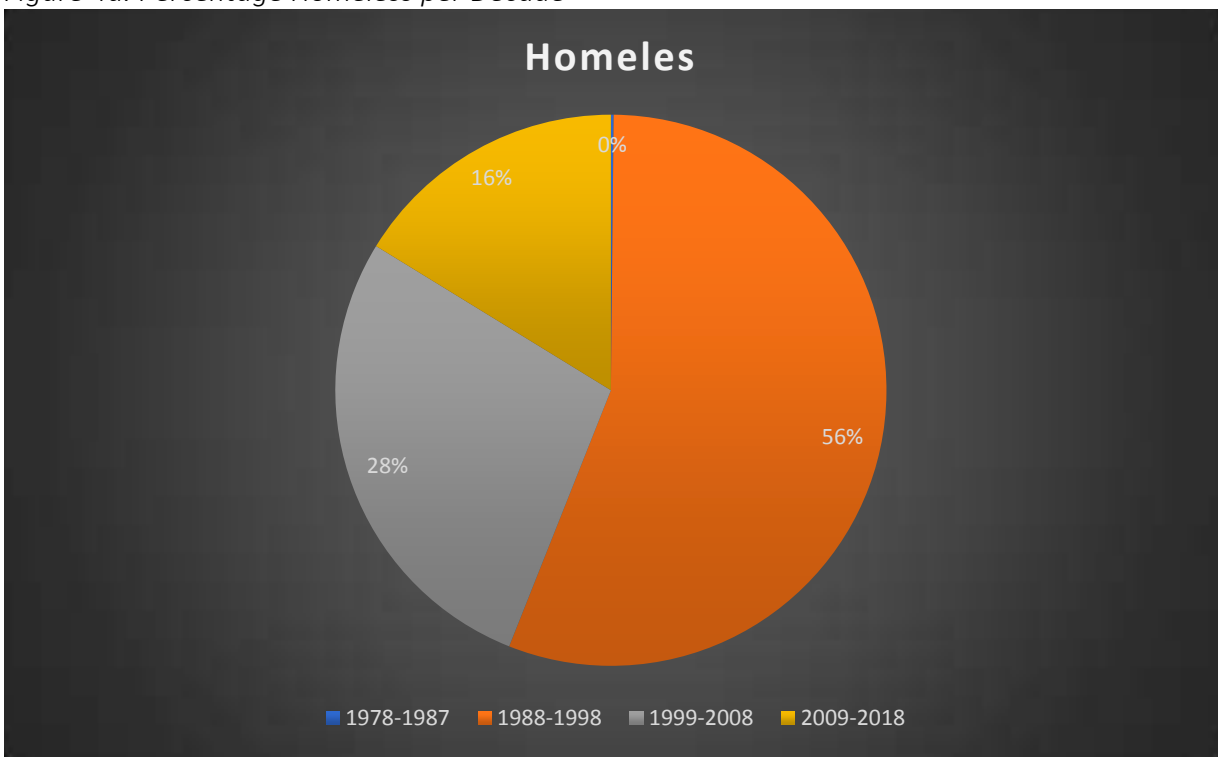
Source: compiled by author with data from EM-DAT

Figure 4. Homeless from 1978-2018



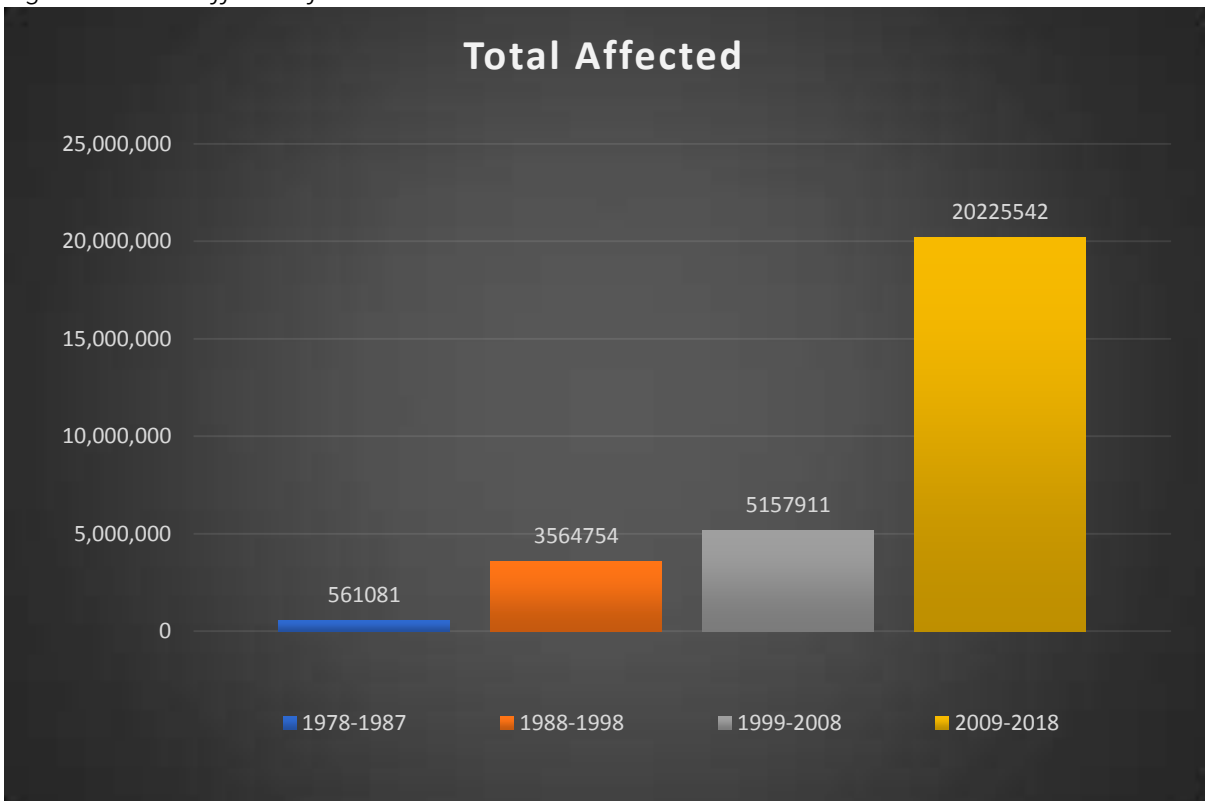
Source: compiled by author with data from EM-DAT

Figure 4a. Percentage Homeless per Decade



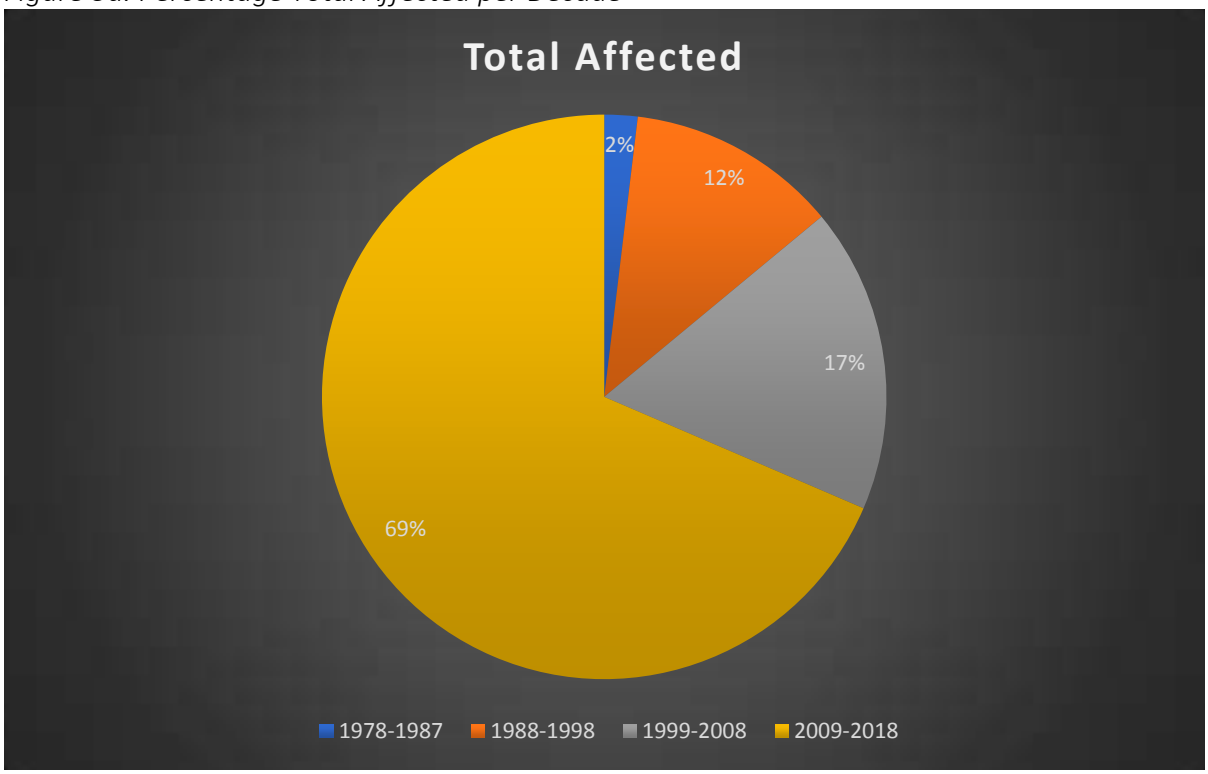
Source: compiled by author with data from EM-DAT

Figure 5. Total Affected from 1978-2018



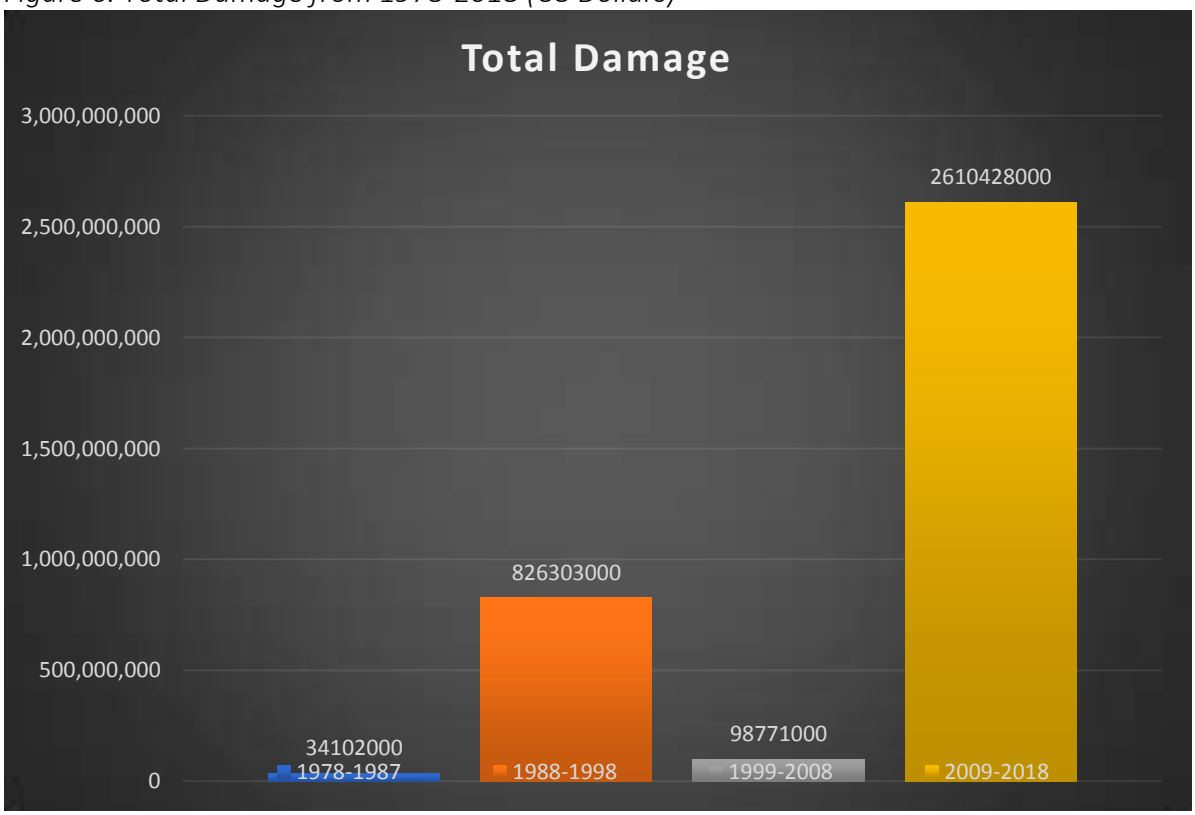
Source: compiled by author with data from EM-DAT

Figure 5a. Percentage Total Affected per Decade



Source: compiled by author with data from EM-DAT

Figure 6. Total Damage from 1978-2018 (US Dollars)



Source: compiled by author with data from EM-DAT

Figure 6a. Percentage Total Damage per Decade

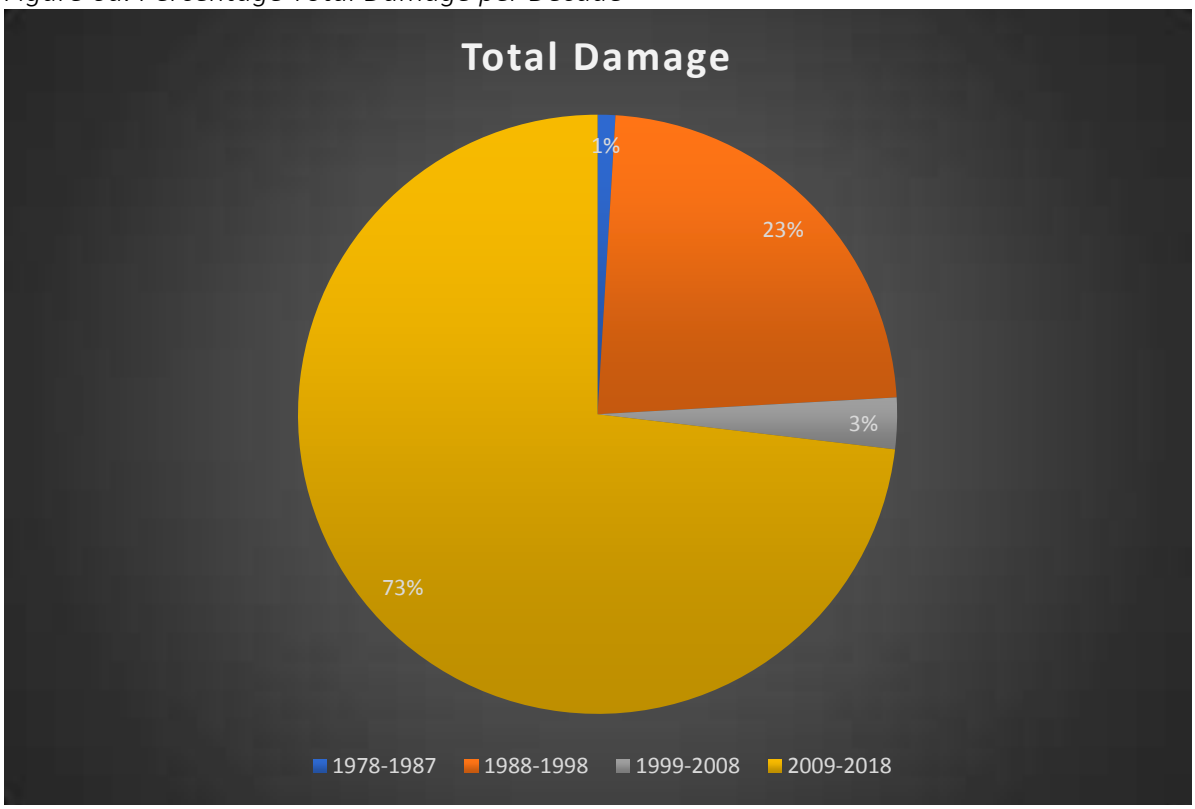
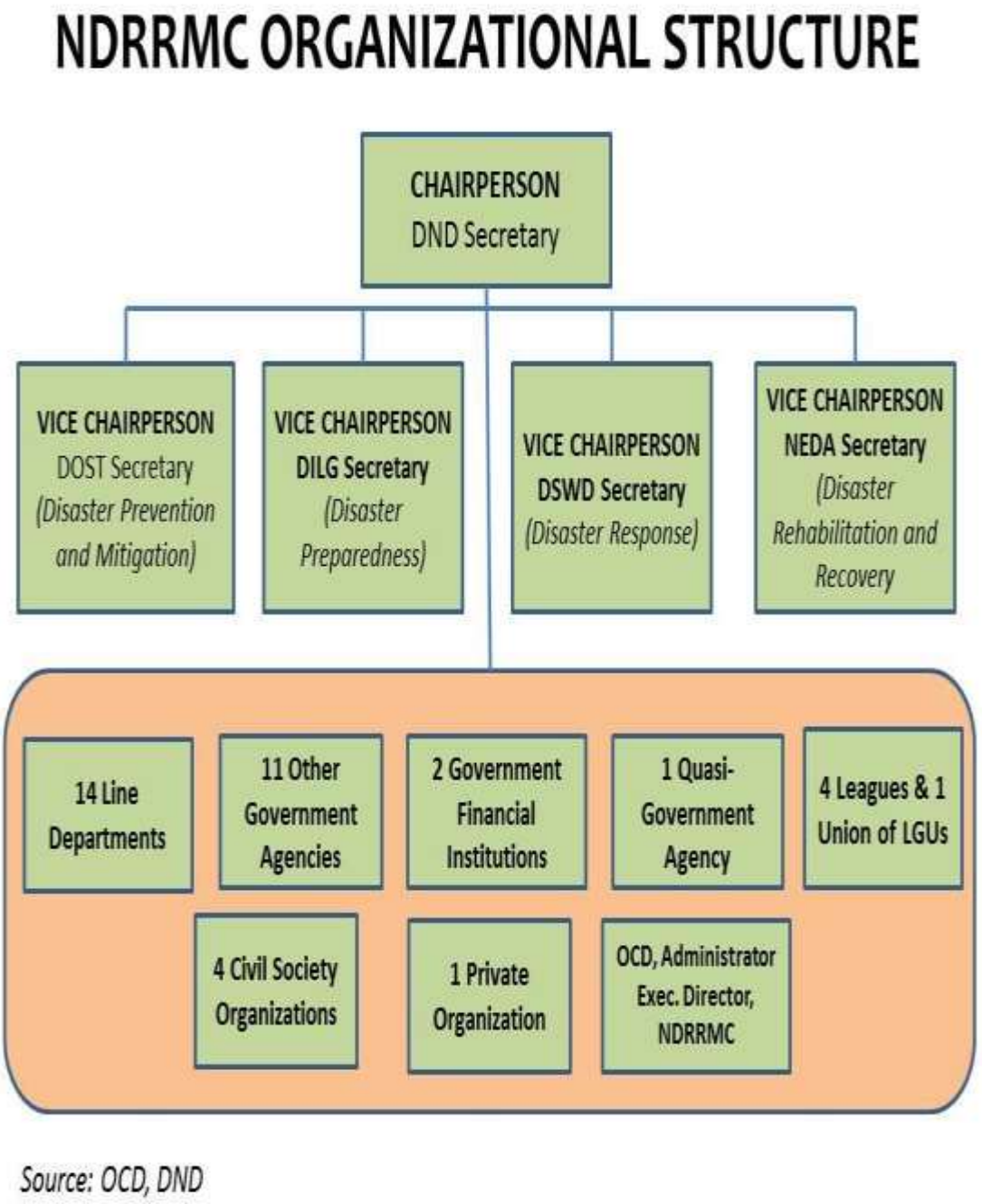
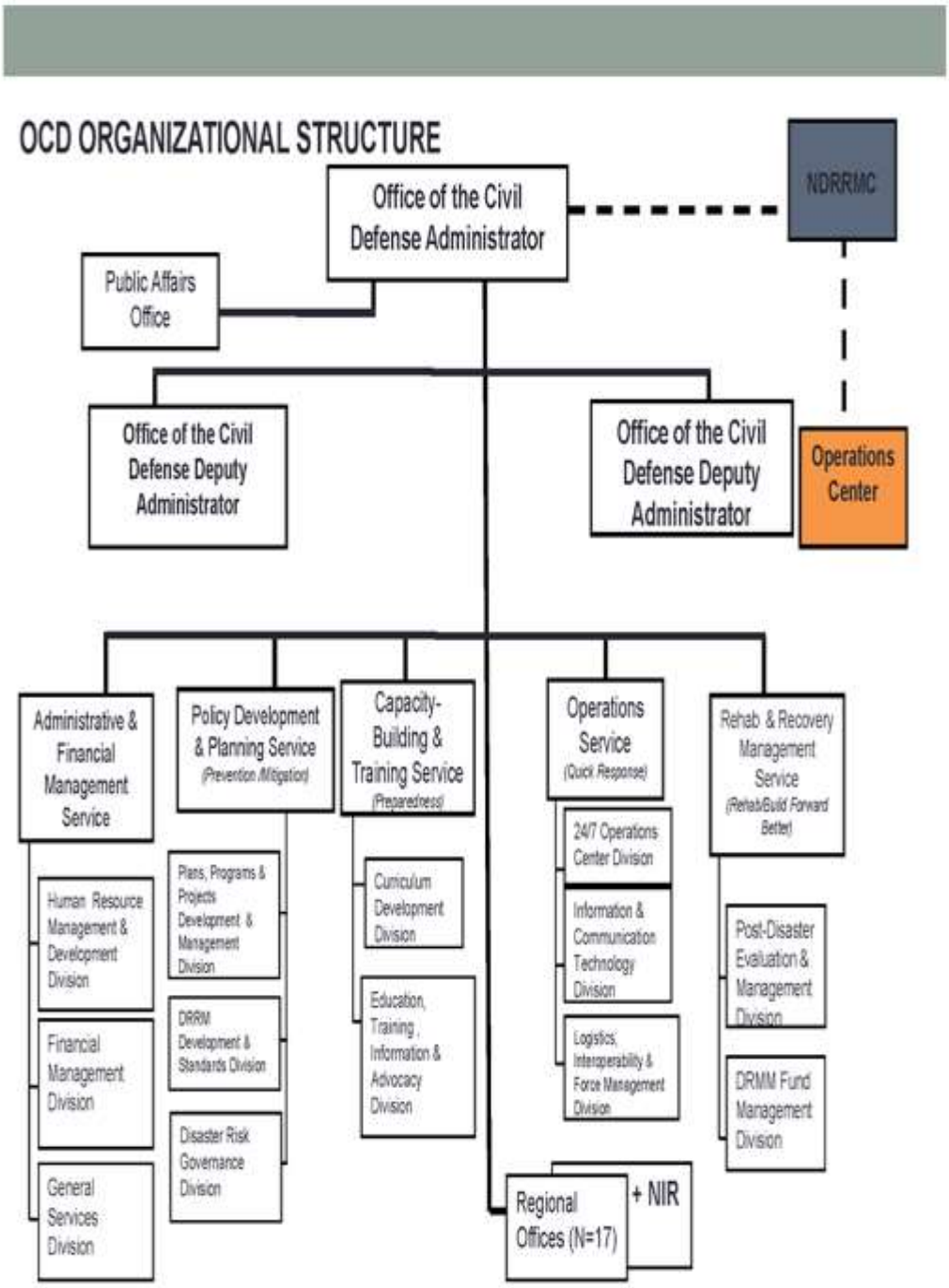


Figure 7. NDRRMC Organization



Source: Office of Civil Defense (OCD), Department of National Defense (DND)

Figure 7a. OCD Organization



Source: Office of Civil Defense (OCD), Department of National Defense (DND)