



BASELINE ASSESSMENT DISASTER WASTE MANAGEMENT-NEPAL



September 2019

Executive Summary

1. Background:

The frequency of the occurrence of disaster events is in increasing trends globally due to geological and climatic phenomena along with human causes. Nepal is one of the most disaster prone countries in the world because of its young mountain geology and climate condition. It ranks 4th, 11th and 30th in terms of climate change, earthquake and flood risk. There are 16 kinds of active type of disasters listed in the Ministry of Home Affairs (MOHA) Data, which include: *Asinapani* (heavy rainfall with hailstones), Avalanche, Boat capsized, Cold wave, Drowning, Earthquake, Epidemic, Fire, Flood, Heavy rainfall, High altitude, Landslide, Lightning, Snow storm, Wind storm, and the “Other” category.

Such disaster not only takes the life of the people but leave numerous destruction and damages to the property and infrastructures producing huge amount of debris and waste materials behind as its footprint. The generation intensity of the disaster waste depends on the types and intensity of disaster event. The amount of disaster waste produced in small interval of time is equivalent to the amount which the town or metropolitan has been managing in more than a decades. Disaster Waste Management will be challenge in future for the government as the disaster occurrence is in rising trend. It also requires special skills and technology by the government to manage it efficiently.

2. Disaster Trends and its impact:

A review of last 45 years disaster data as published on the MOHA 2017 report indicates that the incidences of disasters are growing every year in Nepal. Drawn from the active dataset maintained by the MoHA, covering a period of 45 years (1971 to 2016) shows that a total of 21,856 disaster events have been recorded during this period. Annually, Nepal is exposed to approximately 500 events of disaster on average and fire is one of the most recurrent hazards. Number of fire incidences was recorded 8,721 times, followed by flood (3,950 times), epidemic (3,452 times) and landslide (3,246 times). The listed top five disaster events having greater impact to the economy include: Earthquake, Fire, Flood, Landslide and Lightning. The earthquake has severe impacts to the people lives and properties and produce huge amount of disaster waste in the country.

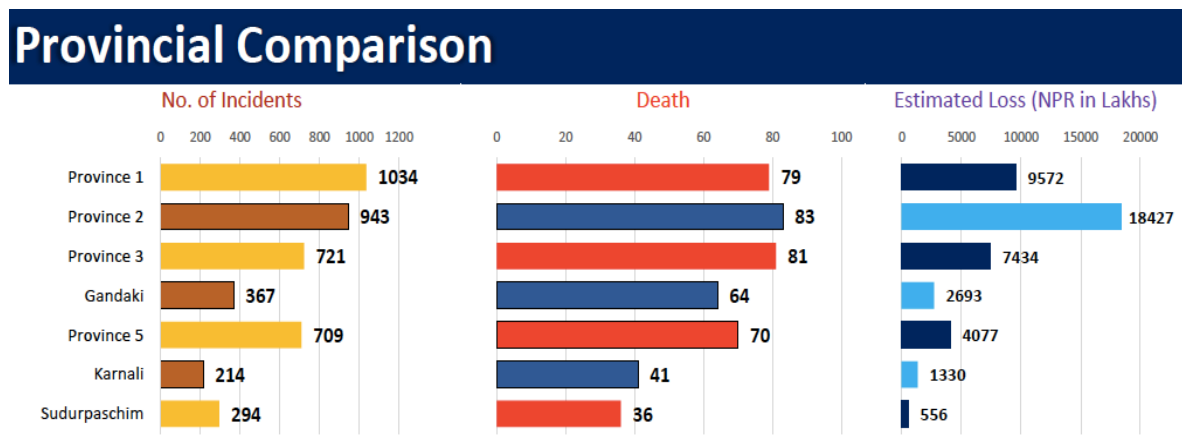
Considering the last four years from 2015 to August 2019, there were four significant disaster events occurred in Nepal, which has impacts to the lives and properties of the people. These events are: Earthquake (15 April 2015); Flood (August 2016 and July 2019); Tornado/ Storm and rain (31st March 2019).

The disaster data during April 2018-April 2019 published by the MOHA shows 4282 number of disaster incidence in which 454 reported death and 4188 injured and 11533 family affected in 689 local levels. This incidence has totally destroyed 3654 houses and partially damaged 3436 houses. The total worth of estimated economic losses in Nepalese currency is 4408.9 millions. The six major hazards, which have caused death of the people, include: Fire (89); Landslide (88); Thunderbolt (68); Windstorm (45); and Animal terror (27). These deaths are distributed in all provinces in which by death the districts affected are: Bara (29),

Province#2; Solukhumbu (21), Province#1; Dang (20) , Province#5; Myagdi (14) province#4; Parsa, Rasuwa, Chitwan, Banglung, Bajhang, (13 Each from Province#2,3,4,6); and Jajarkot (12), Province# 6.

Nepal recently experienced 2015-mega earthquakes, 2016 and 2019 flood events affecting several districts in the middle part of the country. Nepal has witnessed new type of disaster events named extreme windstorm as scientific community identified as tornado incidence on 31st March 2019 in the Bara-Parsa Districts in the Southern plain taking lives of 28 people and destroying and damaging more than 1000 houses.

Figure 2: Provincial disaster comparison 2075 BS (April 2018- April 2019)



Nepal experienced a 7.8 Richter scale of earthquake in 2015 which killed nearly 9000 people, injured 30,000 and destroyed 800000 buildings. Nearly 14 million tons of waste was generated within a couple of days, four million tons of waste alone from Kathmandu, which is equal to waste generation in 11 year in normal conditions (PDNA 2015). This large amount of disaster related waste mixed with hazardous wastes was observed exposed to various infections, resulting in adverse impact to human health and environment (REA, MoEST, 2015). So there is pressing need to the country to address the disaster waste management issues as it has been observed that the disaster waste generated during 2015 Earthquake is still deposited randomly on roadsides and public places around the public places and private lands in the 14 earthquake affected districts.

3. Disaster Waste Management Perspective:

The disaster-generated waste is not mere waste, but it is resources, which can be recycled and reuse. Country like Nepal that is heavily dependent on imported goods ranging from daily household goods to building construction materials. Each materials imported to the country is transported from distant country using the fossil fuel. From the Environmental and climate change perspective the disaster waste is resource, which has left the carbon footprint behind each item imported to Nepal. Efficient management of disaster waste in the country needs good technical assessment to understand the pattern and amount of waste generated and its judicious reuse and reutilization using 3R(Reduce, Reuse & Recycle) principle.

Disaster waste management in Nepal need to include the prevention and preparedness in pre-disaster situation for effectively managing the post disaster waste generation management. This needs the technique to understand the pattern of disaster waste

generation to address properly. Generally the disaster waste generation and management period is divided into during and after the disaster response and rescue period. The composition of the disaster waste generation depends on the type of disaster events. During the relief and rescue period most of the waste is generated from evacuation camps and dead bodies of human and livestock. This kind of waste might expose people to risk of health hazard. The waste materials generated after the response and rescue period is very crucial and difficult to manage. The composition contains the destroyed buildings rubbles and the objects used inside the building by the resident for their day-to-day livelihood support.

3.1 Earthquake Disaster response and rescue period waste generation estimation:

Disaster waste generation during the response and rescue period is the crucial as the government institutions and professional people are in the state of shock and difficult situation and not being able to extend their expertise in collection and estimation of the waste generation and management. The priority during this period is to save the life of the people. The waste generated in this period is mostly the regular household waste, waste from the evacuation camps/center, dead bodies of human and livestock and excreta.

Experience of Earthquake 2015 estimated by the Ministry of Forest and Environment from the temporary relief camps using the assumption and thumb rule. The study findings of 103 camps in Kathmandu shows that the 12 % increment in plastic waste and 37.66 kg of waste generation per day. Bio-medical waste was increased during rescue and response period of disaster. There is no baseline data available to present the quantity of bio-medical waste generation. There is need to collect the biomedical waste produced during the period and link with the visit of injured disaster victims.

3.2 Earthquake Disaster waste estimation in Post disaster response and rescue period:

This kind of disaster waste includes the day-to-day used materials for support to livelihood. Destroyed and damaged Houses debris, kitchen utensils, furniture, electric electronic appliances, mementos valuables and textiles/cloth are the major items used by the household. The amount of disaster waste depends on the economic status of the household and the consumption pattern.

Estimation of debris & hazardous waste from destroyed & damaged houses:

Nepal is ecologically diverse in topography as well weather and climate, which allows people to construct houses adapting with the ecological topography and climate based on their economic strength. So far the Central Bureau of Statistics presented three types of houses in the 2011 Census, which includes: type of foundation; type of outer wall; and type of roof. There are no standard methods so far used in the estimation of the post disaster waste in Nepal. The PDNA team of Earthquake 2015 estimated the amount of debris from the damaged and destroyed houses of the districts based on the assumption. Similarly the team has estimated the harmful waste generated in the house debris is from the use of paints, CFL bulbs.

Estimation of the debris from the 2015 Earthquake destroyed houses: Earthquake of 2015 has destroyed total 773,095 numbers of houses, which are of different types. For the estimation of the debris generation from the destroyed houses, three types of most common houses area considered, which includes: *RCC framed structure building; Loadbearing Masonry Walls system; Load Bearing Random Rubble walls system (mostly in*

village). The generic method has been used to calculate the disaster waste from destroyed and demolished building is presented in chapter IV. Based on the estimation the three type of destroyed and damaged houses produced 115 and 12.8 million ton respectively. The reusable waste materials from these destroyed & damaged building produced 53.2 and 8.9 million tons. These reusable waste materials from the buildings are recovered and reutilize by the house owners.

Earthquake 2015 estimation of Lead and Mercury Concentration in Paints and Tubelight/CFL bulb: The team of environment for the preparation of PDNA used the thumb rule to calculate the Lead considering Nepali government standard which is *90 ppm or 90 mg per liter*. Estimation of total lead contain in the debris of the earthquake destroyed & damaged house rubbles in 31 districts is 181 kgs from the 2 million liters of paints used in the houses.

The estimation of amount of Mercury from the damaged and destroyed building was assumed that at least around 6 to 8 CFL or tube lights are used in a house and amount of Mercury (4 milligram) in each CFL/ tube light taken as unit. Total Mercury contain in the destroyed and damaged houses due to CFL bulbs for safe disposal come around 5.72 kg for 31 districts and 1.45 kg for 3 districts of Kathmandu valley

3.3 Estimation of the Flood damage and destroyed houses: The flooding incident is mostly happened in the Terai region where the houses made of the thatched and mud bricks wall are subjected to destruction. So far there are minimal case of destroying of RCC framed and load bearing houses unless it is on the bank of the river subjected to riverbank cutting. Most of the disaster waste yield is from the damage of the household items and electrical appliances. The experience of the Bangkok flood of 2011 shows 44 % of the total waste was wood furniture.

The recent flood in Kathmandu along the tributaries of Bagmati has damaged the household goods and some commercial places. The commercially stored goods at the ground floor are damaged by the floodwater. Several damaged household materials in Kathmandu were recovered which might be around 80 %. There is no such unit amount of flood waste found in the context of Nepal in estimating the flood-generated waste. So in the calculation it is assumed that average 50 kg of waste generated from each flood-affected household. There is need to have research on it based on the different geographic location and settlement type to estimate the waste generated from each flood damaged house

General estimation of disaster waste generation from the flood affected houses during flood of 2017 and 2019 in the southern plain of Nepal are 3800 and 1348 ton respectively. The estimation was also made on reusable waste generated by the flood of 2017 and 2019, which include 5700 and 2023 ton respectively.

3.4 DWM Treatment Practice:

The recent experience of the 2015 Earthquake shows that there was no such plan activities of the treatment of the disaster waste generated by the events. Most of the disaster waste used to fill the lower lands, and filling the road pothole and dumping on the river and stream and in the banks to reclaim the land. Kathmandu valley debris after some time used to fill the road to access the landfill site in the Okhar Pauwa to allow the movement of the

waste transferring trucks. The archeological debris generated from this metropolitan was an issue, for which the UN Park on the bank of Bagmati River was allocated with the security until the utilization of it. As the reconstruction of the historical buildings and temples are on going, so the useful materials and objects are reutilized from this deposited debris.

The disaster waste treatment situation is almost similar in outside the valley in the earthquake-affected districts the generated waste debris from the damaged houses were thrown in the river banks, to reclaim the road side private land to raise the level up to the road and to fill the pot holes of the graveled and earthen mountain roads.

Government has efficiently mobilized the available earthmovers and heavy machinery in the respective districts and localities for saving the lives and clearing debris from road to provide access to the emergency supplies and operation. The government during and post disaster situation realized the lack of number of heavy earthmovers for addressing the disaster situation. So far the total registered car/Dozer/ Excavator/ Truck under the Department of Transportation during 1989/90 to 2016/17 show 80,660 in numbers. Total registered heavy vehicle during 6 years (2011/12 to 2016/17) is 32,730, which is 41 percent of total 80,660 vehicle registered since 1989/90. The registration of the heavy vehicle is remarkably increased from 4,236 in 2014/2015 to 8,328 in 2016/2017 after 2015 earthquake.

4. Legal and institutional framework:

After the promulgation of the New Constitution of Nepal 2015, there has been restructuring of the country from centralized system to federal system in which the old acts and policies are not compatible to the present three tiers of Government as local bodies are empowered. Several existing acts and regulations are influencing in federal level and some are in local level.

There has been some awareness about the need of the disaster waste management, which is reflected in some of the legal documents of government of Nepal. Disaster Risk Reduction and Management Act 2017 is the one in which disaster waste is mentioned “removal of disaster generated waste” in the Clause#2 under the district disaster management committee’s roles and responsibilities. Similarly under the clause #20 under public and private commercial establishment roles and responsibility it was mentioned “ appropriate management of waste and pollution to minimize adverse impact to people”. This clause will greatly help in management of waste generated from the industrial and commercial establishment in the post disaster situation. There has also been absence of knowledge about the disaster waste management, which need to be addressed in the legal framework of Nepal.

The acts, rules & regulation, policy & plan are the strength for addressing the disaster waste management at the local level for preparedness before and after disaster event. Considering the existing available report on Disaster waste management: Policy, Strategy and Action Plan was prepared in 2015 with the technical and financial support in consultation with government stakeholders need to review to make it relevant with the current provision of institutional arrangement complying with the newly endorsed acts and policies of the government related to governance and disaster management

Waste management is the issues, which are crosscutting to the role and responsibilities several, line ministries and institutions under the constitution of Nepal. These major line ministries: Ministry of Forestry and Environment (MoFE); Ministry of Urban Development (MoUD); Ministry of Health and Population (MoHP); Ministry of Industry, Commerce and Supplies (MoICS); and Ministry of Agriculture Land Management and Cooperatives (MoALMC). These line ministries have some indirect roles in the waste management. The newly formed national Natural resources and Fiscal commission is a constitutional body also has part of its responsibility in recommend and support the central government to develop favorable business modalities in waste management sectors and support in establishing

In the past Institutionally disaster waste management was the challenge as the existing overlapping area under disaster management phases activities and the waste management activities by the municipalities. Municipalities with its resources are use to with the handling of the daily waste management operation from collection to transportation of waste to the landfill. So far in the case of post disaster event the amount of waste is enormous for the handling of municipalities. There is requirement for a special programme for preparedness and waste handling at the local level with support from the federal government.

As it has been clearly mentioned in by the Local Government Operation Act 2017, which authorizes local government to undertake the formulation of local level policies, legislation, and standards, plan implementation, monitoring and evaluation related to disaster management. The newly endorsed Disaster Risk Reduction and Management Act (DRRMA) 2017 has made new institutional set-up in which National Disaster Reduction and Management Authority is recommended to establish. The recommended authority is expected to establish soon. So this will be an institution might be the potential authority to develop expertise in handling and implementing the post disaster waste management in coordination with MOFAGA at the federal level and disaster affected local municipalities.

It is time for the relevant agencies to timely identify the gaps in key acts and policies to reflect the disaster waste management in the relevant legislative framework in timely addressing the issues to build a resilient local government and utilize the available resources efficiently following 3R waste management principle.

5. Conclusion Recommendation:

- Existing knowledge on the waste management structure and practices at the local municipality level and some supporting waste management acts will be synergy to the disaster waste management.
- There has been some initiation on reflecting some essence of disaster waste management in few legal documents like Local Governance Operation act 2017, Disaster Risk Reduction Act 2017, Fifteenth Development Plan (2019-2023). This has to be further strengthened with the reflecting text in several supporting acts and legal framework on disaster waste management
- There is need to have a specialized institution and good coordination mechanism among waste management and disaster recovery & reconstruction and environment actors/institutions including national and local governments, communities and the

- private sectors for addressing the disaster waste management issue in the country;
- The promotion of the construction products produced using recycled disaster waste materials in the “Build Back Better” principle in post disaster recovery and reconstruction in phase. This needs financial incentive and mechanism supporting the production process of the house construction products using the disaster waste materials and its promotion by government with require rules and regulation;
 - The lack of awareness about disaster waste management needs to address by raising the awareness among the disaster risk management and environmental management practitioner communities about the disaster waste management pre and post disaster situation.
 - To manage the disaster waste efficiently there is need to build the capacity of the planning and environment management section of the local government for understanding the issues of disaster waste management and prepare the preparedness contingency planning for handling the disaster waste generated by the local and regional disaster phenomena.
 - There is also need to let concerned section of local and federal government offices and disaster waste management experts know about the recent development of technology and practices in disaster waste management (debris, segregation, utilization and safe transfer to the landfill) to efficiently and timely address the issue in pre and post disaster recovery situation.