Post Disaster Needs Assessment

Municipality of Kraljevo

Based on Workshop on

Recording Post Disaster Damages and Losses for March 2016 floods and Developing a Recovery Strategy using PDNA methodology

Arandjelovac, 21 – 24 June 2016

UNDP

Belgrade, 2016

ABBREVIATIONS AND ACRONYMS

BBB	Build Back Better
DaLA	Damage and Loss Assessment
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HRNA	Human Recovery Needs Assessment
NDRMP	National Disaster Risk Management Program
NEMH	National Emergency Management Headquarters
OG	Official Gazette
PIMO	Public Investment Management Office
PDNA	Post Disaster Needs Assessment
PUC	Public Utilities Companies
RNA	Rapid Needs Assessment
RSD	Serbian Dinars
WB	The World Bank

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EXECUTIVE SUMMARY

Serbia is highly exposed and vulnerable to natural hazards and ranks 87 on the world vulnerability list, with the highest score in the region. Serbia is vulnerable to a wide variety of natural hazards, including floods, landslides, droughts, earthquakes, and wildfires. Most frequently, excessive rainfall leads to floods and landslides along major and smaller rivers.

The Municipality of Kraljevo, with 82 inhabited settlements; organized in 66 communities, covers the territory of 1530 sq. km. and is the largest in the Republic of Serbia. Kraljevo municipality is also vulnerable to disasters, particularly floods, landslides and earthquakes. Exploitation and mismanagement of forest and agricultural land as well as uncontrolled urbanization have exacerbated the impact of natural hazards such as torrential floods and landslides. Flood protection and water infrastructure has deteriorated due reduced spending in the water sector over the last 25 years and poor maintenance. Lack of maintenance of riverbeds has weakened the embankments of waterways which are threatened under a torrential hydrological regime.

According to the findings of Kraljevo Municipality Risk Assessment majority of road network and bridges within the Municipal territory are at risk from landslides and flooding. Unplanned growth, lack of building codes and illegal construction practices have made the housing sector vulnerable to impact of the floods.

March 2016 Floods

The floods in Kraljevo municipality were a result of the cyclone which caused heavy yield rainfall. Up to 100 l/m2 fell during 6-8 March 2016, resulting in flash floods. Kraljevo declared an emergency situation due to a continuous threat of flooding and landslides. The most affected territories were in the basins of the first degree watercourses, as well as those in the territory of torrential watercourses. The landslides, erosions and rockslides were triggered in almost all the local communicates, particularly the municipal roads. About 200 houses suffered substantive damages; many were flooded so that people had to be evacuated. Overall, about 2,000 ha of arable land in the municipality were subjected to flood impacts representing 5.86% of total arable land in Kraljevo.

The efficient response by the Emergency Situation Staff of Kraljevo, in adopting the Order for Evacuation of People, Animals and Movable Property from the flood-affected territories of Kraljevo, was effective in evacuating people and livestock from the flood affected areas, placing them in temporary shelters, providing them with immediate relief and essential subsistence items. There were no records on casualties or injured persons and the town water-management system was regularly supplying drinking water to the residents.

Assessment Methodology

With aim to assess the damage and loss incurred due to March 2016 floods- UNDP in partnership with FAO, World Bank and PIMO organized a workshop on **Recording Post Disaster Damages and Losses for March 2016 floods and Developing a Recovery Strategy using PDNA methodology, Arandjelovac, 21 – 24 June 2016**. The overall aim of the workshop was to capacitate and equip concerned officials on how to conduct Damage and Loss assessments and plan for recovery in accordance with the PDNA Guidelines, by using the data provided by the local damage assessment commissions.

The participants for the workshop were both from the National and Municipal offices in Serbia who were involved in post disaster assessments. The facilitators for the workshop were from UNDP, World Bank and FAO. The participants were divided for assessments on Infrastructure, Agriculture and Housing and Environment sectors.

The figures and estimations in this report should not be considered as absolute but just a reflection of the practice exercises during the workshop. Given the time constraint, lack of data and various gaps in the

assessment reports from Kraljevo, assumptions were made, therefore this PDNA report will provide just an example for approximation of damages to assets, losses to the economic flows, and some inputs in summarizing the recovery needs,

Disaster Effects[1]

The assessment revealed that the total effects of the disaster in Municipality of Kraljevo amount to 1689,37 million RSD, of which 1462,52 million RSD (85.6 % of the total effects) represents the value of damage to physical assets, and 226,85 (14.4 %of the total) refer to losses in production. This is also reflection of the serious lack of data that could be accounted for losses during the table top exercises at the workshop.

The most affected sector due to the March 2016 floods was Housing, accounting to almost 50% of the total of damages and losses. Infrastructure sector, particularly damage to roads and bridges accounted for 36% of the costs. In the agriculture sector the losses were estimated to be 64,69 Million RSD which was much greater than the damages. The local assessment reports were found to be lacking on information on Environment and Water supply and Sanitation, therefore assumptions had to be made, wherever possible, after discussions with the participants from the Kraljevo municipality and estimations for damage and losses were limited.

Table ES 1: Disaster effects in municipality of Kraljevo Post March 2016 floods

Sectors	Disaster Effects RSD(million)		
	Damages	Losses	TOTAL
Agriculture	4,84	64,69	**69,53**
Infrastructure (Transport)	615	118,72	**733,72**
Housing	792,68	12,4	**805,08**
Environment +Water Supply and Sanitation[2]	50	26.01	**76.01**
TOTAL	**1462,52**	**221.82**	**1684,34**

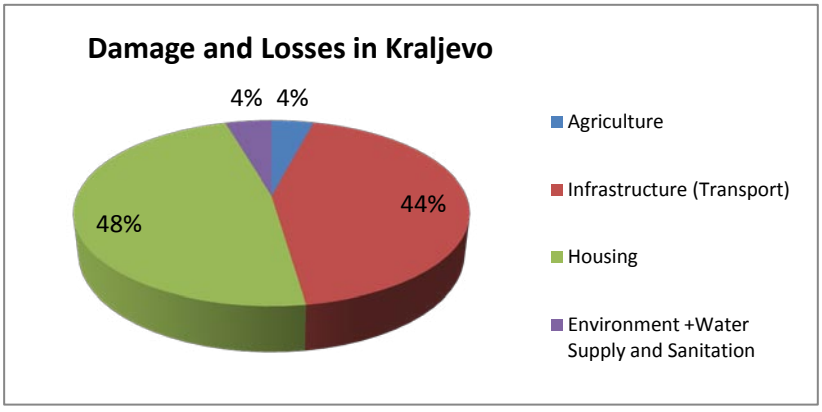


Chart ES1: Percentages of Damage and Losses by Sectors in Kraljevo

Post Disaster Recovery and Reconstruction

The aim of recovery activities is to restore the path to achieve sustainable socio-economic development, while that of reconstruction activities is to reduce disaster risk to more manageable levels, with full participation of public and private sector stakeholders under the general guidance and leadership of the Government**.**

[1] Largely based on the table top assessments by the participants for damage and losses during the workshop
[2] Required data not available for both Environment and Water supply and Sanitation in the assessment reports from Municipality of Kraljevo, therefore assumptions were used for estimations of economic costs for damages and losses.

Due to lack of data and time constraints a detailed review of Recovery and Reconstruction needs for the sectors under consideration could not be carried out during the workshop at Arandjelovac. Therefore, a more qualitative and descriptive analysis of the short, mid and long term strategic measures have been included under the sectors considered. The recovery and reconstruction needs estimates have been calculated, wherever possible and measures have been listed but cost estimates could not be indicated due to paucity of data. From the assessments that were carried out, transport sector under infrastructure had the largest share of recovery needs at 1016,72 million RSD, followed by Housing sector at about 819 million RSD. This indicated that a bulk of the investments would be needed in these sectors. For agriculture sector the short term measures for recovery and reconstruction required about 60,56 Million RSD. The other proposed recovery needs have been mentioned but cost estimates could not be undertaken for lack of data. Similarly for environment, water supply and sanitation the recovery needs indicated 101.6 Million RSD but the figure does not include all the recovery needs due to lack of data. The measures that could not be estimated have been mentioned in the recovery needs so that they can be e accounted for in future recovery plans.

Conclusions

Due to limitation of data from the assessment reports, the full picture for damages and losses for the March 2016 floods could not be detailed in this report. Due to lack of data many assumptions needed to be made for estimations of damages and losses. Therefore, this report can be considered only as a template for PDNA report and the data should not be referred. The Socio Economic Impact of the floods were not elaborated in details during the workshop due to time constraints, however impact on livelihood and loss of income was evident. The need to take impact of disasters on socially vulnerable groups, marginalized communities and women, in the future, was stressed upon.

After an extensive review, the present 1987 Post Disaster Assessment Methodology was found to be very comprehensive but it needs to be updated in accordance to the present times, incorporating the use of available modern technologies, in line with the PDNA methodology. Municipality of Kraljevo would benefit from adopting Post Disaster Damages and Needs Assessments (PDNAs) and Recovery Frameworks (RFs) to guide the recovery process.

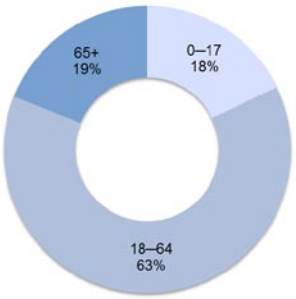
The Serbian Government is already taking steps towards integrating the PDNA methodology in line with the provisions of the draft National Action Plan to implement the National Disaster Management Programme, Component Six (6.1.1.). However, the lack of capacity of the municipalities to timely and efficiently react to disasters and to record damages and losses is a serious concern for future adoption and usage of PDNA like methodology. Enhanced communication, coordination and collaboration, between the national government and the municipalities as well as between the municipalities, are key factors for better and uniform assessments. Therefore, extensive capacity building activities for both the national and the municipal staff for adopting PDNA methodology is the need of the hour. Municipality of Kraljevo with support from the National Government, also needs to build its resilience and upgrade its DRM agenda.

1. BACKGROUND

1.1 PROFILE FOR MUNICIPALITY OF KRALJEVO

The Republic of Serbia occupies a territory of 88,407 km2. The Republic of Serbia is divided into 29 districts. In Serbia there are 150 municipalities and 23 cities, as well as the city of Belgrade – capital of the country. The Municipality of Kraljevo, with 82 inhabited settlements; organized in 66 communities, covers the territory of 1530 sq. km. and is the largest in the Republic of Serbia. By virtue of its position, Kraljevo serves as an important crossroad in the

Chart 1: Population of Kraljevo - Age Wise, 2014



country as well as commercial and administrative centre of Raska Region.

Population/demography: According to 2014 census results the overall population of Kraljevo is 122.782. Out of this almost 40% are in the age where they could be part of the workforce. Out of 42,028 households about 98 % are those with income. The level of education is relatively high with 64.1% of population having High school and above education. The median age of population is 42, 3 years (men 41; and women 43, 3 years. About 33.15% of the population represents vulnerable groups including children below 14 and the elderly.

Other valuable socio-demographic data are presented in the table below.

Table 1: Demographical Characteristics of Kraljevo

		TOTAL	GENDER		AGE		DEPENDENCY		MINOR. (ROMA)
KRALJEVO		POPULATION	male	female	15-64	0-14/+65	without	with	minority
	%	122782	49,1 %	50,9%	66,85 %	33,15%	98,66%	1,34%	1,01%

Source: Vital statistics, SORS

(Source- DevInfo Serbia)

The illiteracy rate is comparatively low and 3% of women are illiterate compared to 0.5 % of men in general. About 50 % of the population both men and women are computer literates which is very important in todays' world, especially during case of disasters as digital media is one of the most handy tools in those situations.

Climate: The largest part of the territory of Kraljevo is determined by the valleys of the West Morava River, which connects the south to the Ibar valley. In the Kraljevo area there are two main climatic types: lowland, temperate continental climate and altitude mountain climate. The influence of moderate continental climate of the Pannonian Plain, which is characterized by cold winters and warm dry summers (winter average 0 °C, summer average 22 °C, minimum -25,4 °C, maximum 44,3°C) . However, due to the proximity of the mountains it is quite modified. Altitude mountainous climate, even on the lower slopes is characterized by long, harsh winters with a large amount of snow, and summers with little rainfall. The warmer air from the south can sometimes cause rapid melting of snow in spring presenting potential risk for flooding. Rainiest seasons are summers with an average rainfall of 228.1 mm (30.2%), whilst winter seasons have minimum precipitation average of 157.7 mm (20.9%). Most rainfall is in June with an average of 90.6 mm, and 88.4 mm in May and lowest in February and March, 46 mm.

Chart 2: Share of illiterate population over 10 by sex and type of settlement

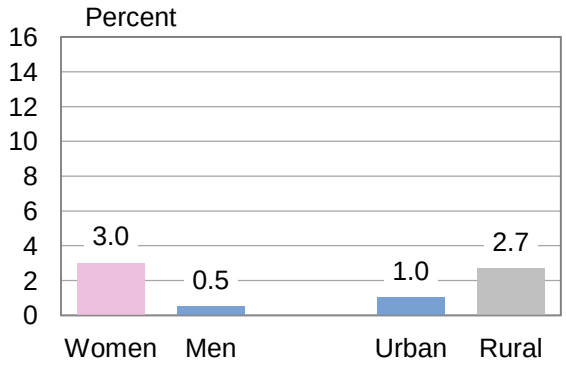
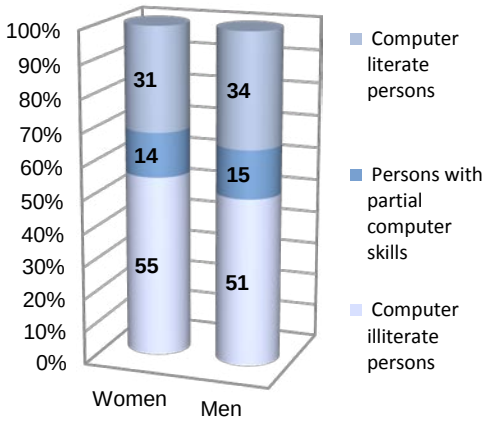


Chart 3: Population aged 15 and over by computer literacy



Source: Census of Population, Households and Dwellings, SORS

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The West Morava River is the biggest watercourse running through the territory of the Town of Kraljevo. The territory of the town is covered by its middle course from the village of Obrva till the village of Ugraljevo, in the length of 35 km with the riverbed width of 25m.

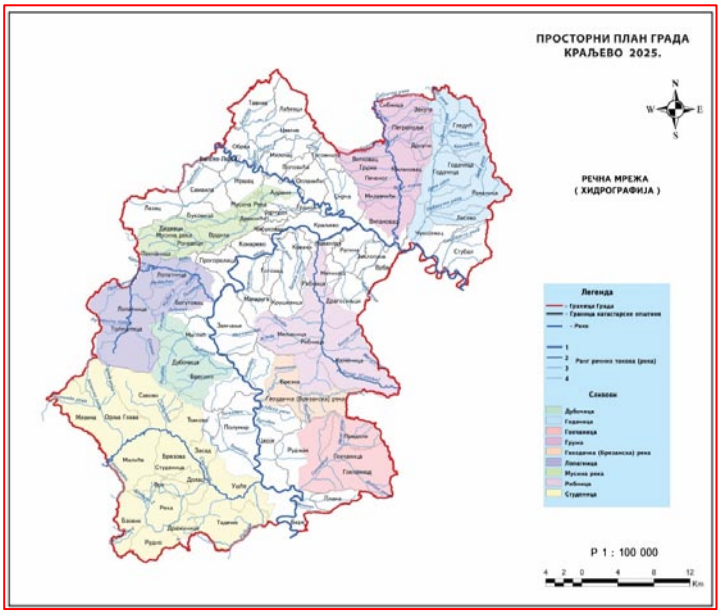


Figure 1: Landforms in Kraljevo

The Ibar River is formed of five wells and spring at the northern side of the Hajla Mountain (2400m), and it mainly runs through gorge valley with small inserted enlargement to the east to Kosovska Mitrovica, and then to the north to Kraljevo and to the east of Kraljevo where it mouths to the West Morava River. The lower part of that vivid watercourse belongs to Kraljevo, downstream of Biljanovac, in the length of approximately 70km. In general, the Ibar River is faster river than the West Morava River, particularly when running through the gorge between Biljanovac and Matagura, in the length of 50km. Its riverbed in that part is approximately 50m. Downstream of the village of Matagura, the Ibar River gets the shape of the lowland river, making small and huge curves running from one to another side of the wide valley and that is where its course becomes steady and is partially splits into backwaters between the riverbed alluvia.

The focus should be paid on the fact that the annual quantity of water running through the West Morava River upstream of the mount with the Ibar River is lesser that the water quantities the Ibar River brings. The water quantity that runs through the Ibar River varies from 1.5 to 2 billion of cubic meters on the annual level, and through the Morava River, downstream of the Ibar River approximately from 2.7 to 3.3 billion cubic meters. Therefore the quantity of water in the Ibar River is about 500 million cubic meters more that in the West Morava River upstream of the mouth of the Ibar River. That is the reason why the Ibar River can be considered as one of the most important tributaries in the whole Morava River Basin.

The Gruža River has a very unbalanced watercourse. The other tributaries of the West Morava River running through this territory are mainly short rivers and streams. On the left hand side, the bigger Suričanska River Basin lays, and it is developed in the southern parts of the Kotlenik Mountain and the lower part of the Čujkovačka River Basin, split into the south-west part of the Glećke Mountain. On the right hand side, a bit more pronounced **Musina River** Basin lays, which well is in the south-east part of the Jelica Mountain.

All tributaries to the Ibar River are rich in water. **The Studenica River,** runs into the Ibar from the left side along with **the Dubovička and Lopatnica Rivers**. **The Brezanska River** runs into it from the right side, as well as other smaller rivers running from the West Stolovi Mountains (the Premovac, Magaznica Rivers, Stolački Stream and others). All of them are rich in water and run through the valleys. Their riverbeds swiftly swell in the period of heavy rains and snowmelt, and then reduce in the dry period, even drain in the case of smaller watercourses.

The Ribnica River is the biggest river which flows through the territory of the Kraljevo Municipality. Its upper (the Sokolja River) and its middle watercourses are made in the mountainous terrain between the Stolovi and Goč Mountains, where it has a lot of tributaries with torrential waters. The lower watercourse of the Ribnica River is made from the lake sediments and huge river alluvia south of Kraljevo. The length of the river is approximately 26 km, and the area of the basin is 115км^2.

Thermal waters of the Mataruška Spa and Bogutovačka Spa are also significant for this territory. The municipality also has "Golija"- a protected natural park which covers total area of 75,183.00 ha in the mountains. Kraljevo also has a rich forested area with wildlife habitat and is popular for hunting.

1.2 SOCIO ECONOMIC PROFILE

The city of Kraljevo is in the nature rich West Morava area that provides economic possibilities to the area.. Agriculture of this municipality is characterised by differing resources for production, owing to good hydrologic conditions and fertile soils of different types. 47.4% of the land is used for agriculture. Most important agriculture and livestock activities are cattle breeding, poultry keeping, fruit production, vegetables production etc. The villages around Kopaonik mountain are majorly involved in fruit production (plums, apricots, and apples). Agricultural land in the municipality covers 72,032 hectares and is mainly privately owned. Owing to the resources, one of the largest agricultural products markets (everyday wholesale of agricultural products and cattle) is located in Kraljevo.

Unploughed upland on hillsides and river valleys covered by forest wealth and used for mountain stockbreeding. The forest resources cover 46.8% of the area. Of special significance are ore deposits, hydropower potential and tourist attractions of the area.

Geographic position of the municipality and the existing production capacities make good basis for further development of tourism. In the close vicinity of Kraljevo there are the well-known middle age monuments – monasteries Zica and Studenica, as well as middle age town of Maglic. The municipality territory comprises numerous springs of mineral waters enabling development of spa tourism – Mataruska Banja, Bogutovacka Banja, Lopatnicka Banja and Vitanovacka Banja.

Traffic location of the city of Kraljevo is very favourable. In the west-east direction, it is cut by the wide fertile valley of the West Morava. Major rail and land communications run through this valley. From Kraljevo towards the east, a railroad and a road lead in the direction of Kragujevac and further down the Great Morava valley. A railroad of international importance - Belgrde-Nis-Skopje, i.e. Nis-Sofia-Istanbul, goes through these valleys. In the west direction, towards Cacak, the city of Kraljevo connects to the main road and rail route Belgrade-Bar. In that direction, through Priboj and Rudo, leads a traffic connection with Bosnia and Herzegovina towards the west. The municipality also has 2 small airports, one military and other sport.

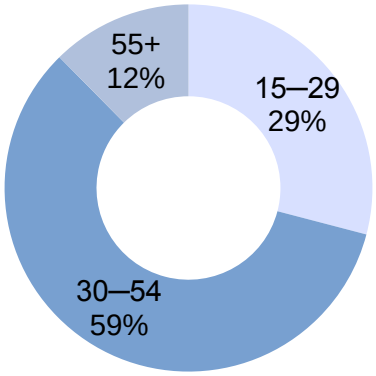
According to available data, the economy of the Kraljevo city makes up for 1299 companies and 3708 of shops, making a total of 5007 active business entities. These make a rational basis for future development of the municipality, however; small enterprises and handicraft production have been in stagnation. The most important economic activity is wholesale and retail with 34.20%, manufacturing industry with 24.25%, agriculture and forestry with 10% followed by transport and storage with 9.25% and construction with about 7%.

Presence of Faculty of Mechanical Engineering is important for development of mechanical and construction industry in Kraljevo, as it would help in linking all actors for local economic development and application of innovation and scientific advances to improve competitiveness of production.

Health Protection Centre Studenica is a regional centre also providing health protection services to citizens of Kraljevo, Raska, Novi Pazar, Vrnjacka Banja. They are under tremendous pressure as the doctor to patients' ratio is very high due to area which they have to take care of. There are only 342 registered doctors in Kraljevo and less than 1 doctor available per 1000 inhabitants of adult population for health care in Municipality of Kraljevo. There are about 20,000 retired people registered in the municipality, of which 50 % receiving below 100 EUR monthly. The most vulnerable categories are children, the old, the sick and the handicapped.

Economic situation of Kraljevo is characterized by a high unemployment rate, low living standards and considerable level of poverty in some pockets of the municipality. Unemployment rate has been steadily rising in Municipality of Kraljevo since 2007 and was assessed at 34,9% in the year 2013. In the municipality there is almost 59% unemployment in the age group of 30-54 and if delineated by sex almost 64.5% of women between 30-54 are unemployed. According to the data provided by the national employment service 46,7 % of men and 53,43% of women were unemployed in the city of Kraljevo.

Chart 4: Share of unemployed by age group in the total number of unemployed, 2014



Source: National Employment Service, NES

The economic situation in the country since the nineties, outdatedness of the technology, loss of markets for local production, and the unsuccessful privatization of large complex Wagon Factory and Magnohrom, which were once holders of Kraljevo economy, are the main factors for economic downturn. Facilitating the development of the economy imposes itself as one of the top priorities of local development.

Economic situation was further aggravated by IDPs from Kosovo who came in 1999. According to UNHCR Kraljevo data there are officially 22,000 IDPs and refugees at the territory of the Kraljevo municipality. The figure comprises 2,400 refugees from Bosnia and Croatia and 19,000 displaced persons from Kosovo, who came in 1999, which makes about 25% of the entire municipality's population and the highest percentage in Serbia. Roma community is also one of the marginalised communities in the municipality which has been impacted especially due to economic downturn.

Analysis of industrial development of the city indicates that despite the significant results that have been provided in the context of economic development, its structure can be regarded as relatively unfavourable. Problems in the development and deployment of industry are associated with a lack of modern technology that supports the industry, legislation and tax policy. On the other hand, the education system does not comply with the needs of modern industry. Three key priorities that have been recognized for development of Kraljevo are the development of incentives to domestic and foreign investment, support the development of entrepreneurship and local economic sectors and support the development of knowledge-based economy, by linking the economy, science and local government.

1.3 DISASTER PROFILE OF KRALJEVO

Serbia ranks at 87 in the world vulnerability list, with evidently the highest score in the region. Serbia is vulnerable to a wide variety of natural hazards, including floods, landslides, droughts, earthquakes, and wildfires. Most frequently, excessive rainfall leads to floods and landslides along major and smaller rivers. Over the last 15 years, Serbia has been repeatedly affected by medium and large floods and landslide events.

Kraljevo municipality is also vulnerable to disasters. The regional road Kraljevo-Raska is at particular risk from flooding since there are numerous streams coming from the Ibar gorge and causing frequent traffic interruptions. Kraljevo has a total of about 300 kilometres of local roads, next to which there is dense network of unclassified roads and forest paths. Numerous sections of local and unclassified roads are in very poor condition as a result of poor quality of construction, excessive loads and very often, inadequate drainage canals.

In many locations, tree branches and other waste prevents free flow of torrential water under the numerous bridges. It is actually due to this reason that in the case of large water influx, waste starts to heavily collect around bridges forming a barrier which then impact overflow and spills within upstream sections, undermining the foundations of bridge piers and sometimes even causing their collapse. Besides this problem, it is also noticeable that in many sections of the riverbed torrential streams there is visible and significant reduction of flow due to overgrowing vegetation and illegal housing. Due to the May 2014 floods in Kraljevo, 300 houses were severely damaged, 1000 people were evacuated, 4.300 hectares of agricultural fields were flooded and the damages were estimated at 3 M euros.

While floods and landslides are the most dominant hazards, earthquakes and wildfires cannot be ignored. The 2010 earthquake caused 2 fatalities, 180 injured, 16.000 damaged buildings, 500 houses completely destroyed and damage of 20 M euros.

Drivers of Disaster Risk

Exploitation and mismanagement of forest and agricultural land as well as uncontrolled urbanization exacerbate the impact of natural hazards such as torrential floods and landslides. Over the years, torrential floods have occurred more frequently and have become more destructive mainly due to the transformation of the watershed from rural to urban land uses, as diminishing surfaces under forest vegetation and unsustainable agricultural practices.

Flood protection is the most important aspect of defence against the harmful effects of water. Dramatically reduced spending in the water sector over the last 25 years has contributed to the deterioration of the country's water infrastructure. Aging infrastructure and inadequate investments in the maintenance of public infrastructure puts many floods control structures at risk of losing their functionality. As result, due to lack of maintenance of riverbeds, embankments of waterways under a torrential hydrological regime are threatened. Similarly, drainage systems have not always received adequate attention and investments which has resulted in siltation and weed growth, as well as the break-down of associated structures and pumping stations. As climate patterns change, there could be increase in frequency of intense floods events.

While the impact of climate change on the overall intensity and frequency of hydrological hazards cannot be predicted with certainty, data suggests that extreme wet and dry episodes have increased in recent years in both frequency and in amplitude. This is likely to affect river runoff and lead to more frequent occurrence of floods, especially torrential floods. A substantial number of studies predict increase in intensity and frequency of flooding, particularly in the winter season.

Without climate-informed planning and investments, Kraljevo will become even more vulnerable to extreme adverse natural events.

1.4 INSTITUTIONS INVOLVED IN DRR, EMERGENCY RELIEF AND RECOVERY

1.4.1 INSTITUTIONAL FRAMEWORK

Effective Disaster Risk Management (DRM) requires collective action from a wide range of key stakeholders across ministries, departments, and agencies at all levels. This requires an institutional anchor and strong inter-sectoral coordination mechanism to ensure this action is sustainable. The Public Investment Management Office (PIMO) is a new body of the Government of the Republic of Serbia with one of the objectives of managing the projects of reconstruction and aid allocation following natural and other hazards, but primarily it looks after projects of reconstruction of thousands of preschool, school, health care and social protection establishments. PIMO uses its experiences in post-flood reconstruction to perform its duties in an efficient and responsible way, with active participation of all local communities, both in the process of decision-making and in the process of implementation.

Since 2011, the Ministry of Interior is leading the National Emergency Management Headquarters (NEMH) which functions as the National Platform for Disaster Risk Reduction. NEMH is mandated by law to coordinate and manage protection and rescue activities in emergencies and to mainstream disaster risk reduction policies. The NEMH is responsible for:

- coordinate activities in the protection and rescue system in terms of organization, planning, preparations and implementation of measures and activities related to disaster risk prevention and reduction, protection and rescue, including the exchange of information, knowledge and technologies
- coordinate activities and measures included in the Serbian National Strategy for Protection and Rescue in Emergencies
- deliberate and give its opinion on the Draft Long-term Plan of Protection and Rescue System Development
- monitor and coordinate the implementation of measures included in the Long-term Plan of Protection and Rescue System Development
- deliberate and give its opinion on the Draft Natural and Other Hazards Vulnerability Assessment;
- deliberate and give its opinion on the Draft National Emergency Protection and Rescue Plan
- take care of regular informing of the population about the risks and threats as well as about the measures for disaster risk reduction.

Within the Ministry of Interior, the Sector for Emergency Management (SEM) is the leading departmental entity which is organized along four key areas: prevention, fire and rescue, risk management, and civil protection. When an emergency is declared, the Serbian Army may contribute to SEM's relief and response efforts upon approval of the President.

The institutional mandate for floods protection lies within the Ministry of Agriculture and Environmental Protection (MAEP). The Directorate for Water (DW) under this Ministry combines the responsibility for water resource management and floods protection on "level 1" water courses, drainage, water supply and sanitation services. The water directorate is responsible for the three steps of flood analysis:

- Preliminary flood risk assessment for each river basin
- Flood mapping including flood hazard maps and flood risk maps
- Floods risk management plans, to be completed by 2015.

The water directorate is also responsible for the flood risk assessment and for preparation of the national plan for floods protection (each 5 years), as well as the annual plans in collaboration with other stakeholders. The plans identify the roles and responsibility of different actors in floods protection and management.

Three public water companies (PWCs) – Srbijavode PWC, Vode Vojvodine PWC and the Beograd vode PWC – are responsible for a wide variety of tasks, including operational management of water infrastructure, distribution of water to users, licensing of water resources, as well as hydrological monitoring and floods protection. They are also in charge with management of dams and reservoirs. Water and floods management on "class 2" water courses is the responsibility of local authorities on the territory under their administration.

Since 2003, the core responsibility for observations, forecasts, and warnings of extreme meteorological and hydrological events resides with the Republic Hydrometeorological Service of Serbia (RMHSS).

In the Municipality of Kraljevo, Department of Defence and Emergency situations undertake measures for the operation of the city in war and emergency. Its main functions are: implementing measures for preparedness; organization of protection against natural and man-made disasters, as well as in rescue, relief and recovery; adoption of plans and programs for emergency situations; educating and training staff for emergency situations; forming and equipping units for civil protection; classifying and identifying damage to the buildings in case of disasters etc.

1.4.2 POLICIES AND FRAMEWORKS

In recent years, Serbia has made progress in strengthening the legal and policy environment for emergency response and risk reduction. Key milestones include the adoption of the following:

- **Law on Emergency Situations and Civil Protection (2009) and the Law on Amendments to the Law on Emergency situations to integrate the concept of risk reduction (2011). These laws** prescribe roles of the local level bodies, the Local disaster management team (DMT), and of other organizations, including the civil protection trusties and citizens, - mainly covering rescue phase of emergency management. They also define the need to develop Risk assessment and, based on those, DRR plans for local government, provinces and republic level.
- **National Strategy in the field of emergency management and disaster risk reduction (2011) which in line with the Hyogo Framework of Action (HFA), 2005-2015, ensures that DRR** becomes a national and local priority with a strong institutional basis for implementation.
- **As a potential candidate country for membership with the European Union, Serbia has made efforts to harmonize its legislation with EU regulations.**
  - The Law on Water (2010) is largely consistent with the EU Water Framework Directive (EU WFD) as well as the EU Floods Directive (EFD). It regulates risks and threats to communities, arising from waters. It defines measures for protection of watercourses, as well as criteria for determination of flood prone and erosion zones. It recognizes "watercourses of first and second level", identifies responsibilities for their protection (public water management enterprises for first level and local government units for second level), and defines the two relevant documents to be developed at each governance level: general and operational flood protection plans.
  - The core responsibility for flood protection and water management at national level resides with the Ministry of Agriculture and Environmental Protection – Directorate for Waters, for level one watercourses.
- Flood defences are implemented by public water management companies, and companies entrusted with maintenance of flood defences. Water and flood management of watercourses of level two are within the mandate of local governments. The local governments, however, often lack the technical knowledge and the financial means to comply with the Law and take the necessary actions. This, in turn, contributes to the increase **of floods risk.**
- **The Law on Meteorological and** Hydrological activity (2010 provides the legal framework for weather forecasting, early warning, and the use of weather and climate related information for risk assessments. The Republic Hydro meteorological Service holds the main responsibility for monitoring, forecasts and early warning of extreme meteorological and hydrological events.

- In July 2014, **The Law on Post-Flood Rehabilitation** in the Republic of Serbia and several other legislations were developed in order to fasten the reconstruction of areas which have been affected by the floods and landslides in May 2014. Still, in terms of implementation of DRM related legislation, Serbia remains focused on emergency response, while the concept of preparedness remains to be operationalised.

1.5 GENERAL DESCRIPTION OF THE EVENT AND IMMEDIATE RESPONSE

The floods in Kraljevo municipality were a result of the cyclone which caused heavy yield rainfall. Up to 100 l/m^2 fell during 6-8 March 2016, resulting in flash floods. Kraljevo declared an emergency situation due to a continuous threat of flooding and landslides as well as interruption of electricity and water supply to households.

The most affected territories were those which territories were in the basins of the first degree watercourses, as well as those in the territory of torrential watercourses. The parts of some Local communities were the most affected by the effects of the underground waters. The landslides, erosions and rockslides were triggered in almost all the local communicates, particularly affecting the municipal roads. Threats of pandemic were intensively present in 3 local communities. Grdica, Adrani and Siča, and the whole territory of the town, but was successfully suppressed by preventive measures and water quality testing.

The whole town of Kraljevo was affected by the floods particularly the following Local Communities: Babsko Polje, Musina Reka, Samaila, Moločaj, Obrva, Adrani, Grdnica, Šumarice, Sirča, Oplanić, Popovići, Milakovac, Vitkovac, Pečenog, Vitanovac, Čujkovac, Stubal, Polumir, Ušće, Tolišnica, Bogutovac, Ribnica, Žiča, Jovac, Vrba, Ratina, Konarevo and Roćevići.

On 7/8 March 2016, due to the clogging of riverbeds and the flow of the wave, new floods appeared in in Kraljevo. Large parts of the arable land were rendered unarable. Over 2,000.00 ha of the agricultural land was flooded, primarily in the area of the West Morava Basin and its watercourse.

There were reports of a number of roads and bridges damaged in the municipality, which affected the access, potential for evacuation and livelihoods of people. Some mid-size businesses and many other smaller businesses were affected by the impact of the floods. About 200 houses suffered substantive damages; many were flooded so that people had to be evacuated.

On 10 March 2016 the Government of Serbia declared nation-wide state of emergency, because of constant reports of more rainfall, which lasted until 15 March 2016.

1.5.1 DISASTER RESPONSE

1.5.1.1 RESPONSE BY THE GOVERNMENT OF SERBIA

The Ministry of Interior – Sector for Emergency Management and local emergency HQs were able to cope with evacuation, without the need for international support. The emergency team used the operational flood protection plans for safety and security measures, deployed water pumping units, specialist water rescue teams and specialized civil protection water rescue units. The Public Investment Management Office (PIMO) requested, assistance from the United Nations Development Programme (UNDP) and Food and Agriculture Organizations of the United Nations (FAO) to assist with immediate damage/loss assessment. FAO was requested to conduct a rapid damage and needs assessment in agriculture sector. FAO has been already engaged in the assessment Serbia's agricultural DRM system and the role of the Ministry of Agriculture and other relevant institutions through a regional initiative. Red Cross of Serbia, 'Medicin Sans Frontier', UNHCR were also involved in emergency relief and aid.

1.5.1.2 RESPONSE BY THE LOCAL SELF-GOVERNMENT

The Emergency Situation Staff observed the situation in line with the Flood Defence Operational Plan for the Second Degree Watercourses and the report of the RHMI regarding the levels of the first degree watercourses and declared a state of emergency for the whole territory of Kraljevo. On the same day, observing the situation in the field, the Emergency Situation Staff for Kraljevo adopted the Order for Evacuation of People, Animals and Movable Property from the flood-affected territories of Kraljevo.

Protection and rescue forces involved were:

- Emergency Management Sector of the MoI, Department in Kraljevo
- Department for Defence and Emergency Situation and Engineering and Geological Affairs, the Administration of the Town of Kraljevo
- Communal Police Department, Town Administration
- Army of the Republic of Serbia, II Brigade of the Land Forces
- Gendarmerie
- PC "Srbijavode", RJ Čačak
- Centre for Social Work in Kraljevo
- Civil protection forces

The local self-governments' emergency departments evacuated around 300 persons from the flooded areas besides livestock. At Kraljevo, all available manpower and machinery of the Public Utility Companies of Waterworks, Roads and Cleaning, the Communal Police Department were involved in the activities led by the Town Emergency Situation Staff. "Zapadna Morava" – working unit of Kraljevo, Institute for Public Health in Kraljevo, Veterinary Specialist Institute Kraljevo and Health Centre Kraljevo were also involved in rescue and relief efforts. There were no records on casualties or injured persons and the town water-management system was regularly supplying drinking water to the residents.

Red Cross, Doctors without Borders, UNHCR were also involved in relief efforts for distribution of essential survival kits, food packages, drinking water etc. to the people affected by the floods.

The evacuation was organized protecting all values of the flood-affected local communities, in accordance with the evacuation plan, in line with the main evacuation elements. The following organizations were involved in the evacuation process in Kraljevo.

- Emergency Situation Staff for the Town of Kraljevo
- Technical and Operational Evacuation Team
- Technical and Operational Team for Reception of Population
- Technical and Operational Team for Protection from Animal Diseases
- Communal Police Division
- Police Administration of Kraljevo
- PUC Waterworks
- PUC Cleaning
- PUC Roads
- Emergency Management Sector
- Authorized Personnel
- School Administration
- Agricultural School
- Local Communities
- Citizens

Immediately before and in the course of the emergency situation, the Emergency Situation Staff was in permanent session. Prior to and in the course of the emergency situation, the staff formed additional technical and operational teams in order to control the situation in the field and to have accurate information so as to be able to organize adequate actions – technical and operational team for protection of assets of importance for survival – local water-management systems, technical and operational team for donation reception,

technical and operational team for technical support to damage assessment commissions and technical and operational team for fuel oil distribution.

The emergency staff organized a special joint meeting of representatives of all local self-government units in the West Morava Basin, representatives of the central government and Public Utility Water Management Company Srbijavode. The objectives of the meeting were adoption of the adequate decisions for both local self-government level and central level, for long-term resolution of the following issues: monitoring, alerting, response, investments and town planning. They proposed to develop the Strategy for the Improvement of the Flood Defence in the West Morava Basin

1.5 POST DISASTER NEEDS ASSESSMENT

A PDNA is a government-led exercise that estimates post-disaster damage and losses across all sectors of the economy, as well as the recovery, relief, reconstruction, and risk management needs.

A PDNA provides guidance to the government and international donor community on the country's short, medium, and long term recovery priorities.

The Post-disaster Needs Assessment (PDNA

Damages

Damage is defined as total or partial destruction of physical assets existing in the affected area. Damage occurs during and immediately after the disaster and is measured in physical units (i.e. square meters of housing, kilometres of roads, etc.). Its monetary value is expressed in terms of replacement costs according to prices prevailing just before the event.

Losses

Losses are defined as changes in economic flows arising from the disaster. They occur until full economic recovery and reconstruction is achieved, in some cases lasting for several years. Typical losses include the decline in output in productive sectors (agriculture, livestock, fisheries, industry, commerce, tourism).

The PDNA is a synthesis of the Damage and Loss Assessment (DaLA) and the human recovery needs assessment templates. The PDNA has gained universal acceptance as the template for assessing net disaster impact. It typically includes a recovery and reconstruction framework that guides the post-disaster recovery strategy. A unique aspect of the PDNA is that it is led and owned by the Government of the affected country and assisted by a multi-disciplinary and a multiagency team. The main goal of conducting a PDNA is to assist governments to assess the full extent of a disaster's impact on the country and, on the basis of these findings, to produce an actionable and sustainable Recovery Strategy for mobilizing financial and technical resources. More specifically a PDNA sets out the following objectives:

- Support country-led assessments and initiate recovery planning processes through a coordinated inter-institutional platform integrating the concerted efforts of the UN system, the EU, the WB, other participating international donors, financial institutions, and NGOs;
- Evaluate the effect of the disaster on:
  - Infrastructure and assets
  - Service delivery and access to goods and services across all sectors, particularly the availability of basic services and the quality of service delivery;
  - governance and social processes;
  - assessing needs to address underlying risks and vulnerabilities so as to reduce risk and build back better (BBB).
- Estimating the damage and loss caused by the disaster to physical infrastructures, productive sectors and the economy, including an assessment of its macro-economic consequences;
- Identify all recovery and reconstruction needs;
- Develop the Recovery Strategy outlining priority needs, recovery interventions, expected outputs and the cost of recovery and reconstruction which would form the basis for a comprehensive Recovery Framework;

- Provide the basis for mobilizing resources for recovery and reconstruction through local, national and international sources.

The core of the methodology, the DaLA, was developed by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), based on its work in Central America in the early 1970's and the Caribbean in the eighties and nineties . The DaLA is quantitative in nature, and is used to value direct damages arising from a hazardous event, and the subsequent indirect economic losses caused by the event. The task of estimation of the damage and loss is one of the critical components of the assessment methodology. The second critical component is the impact analysis on the economy and the society, which is based largely on the estimate of losses and highlights the possible consequences on the growth of the national or local economy, the external sector and the fiscal balances, as well as the impact due to the decline of income and livelihoods of households or individuals .Its outcome can be used in planning for recovery and reconstruction. The value of damage is used as the basis for estimating reconstruction needs while the value of losses provides the means for estimating the financial needs for economic recovery. It is important to note that damage and loss have a temporal dimension, damage occurring at the time or immediately after an event and losses occurring from the time of the event for a period that could continue anytime from months to years, when full recovery and reconstruction take place.

The ultimate goal of the assessment is to measure in monetary and social terms the impact of disasters on the society, economy and the environment of the affected country or region and to enable the quantification of the financial needs for economic recovery and reconstruction, with risk reduction.

The HRNA focuses on the social impact of disasters, analysing how disasters affect local patterns of life, social structures and institutions. The human recovery is an important aspect of PDNA and is guided by the concept of human development, namely, measures to restore people's abilities to reach their full potential to lead productive, creative lives in accordance with their needs and interests**.** It also focuses on an enabling environment for women and girls, men and boys, communities as well as all sub-groups of the population, and governments to recover from the impact of disasters. It focuses on the affected communities and population; assesses the impact of a disaster on human development; and determines the activities of early, medium, and long-term recovery that are required to restore and, where possible, improve upon the pre-disaster status of human development.

The recovery needs for each sector outline the short, medium and longer term needs and priorities for the recovery process. The Recovery Strategy defines clear objectives, appropriate interventions to meet priority recovery needs, the expected outputs and overall intended outcome, and outlines the implementation arrangements.

1.6.1 WORKSHOP ON RECORDING DAMAGES AND LOSSES POST MARCH 2016 FLOODS IN KRALJEVO

With aim to assess the damage and loss incurred due to March 2016 floods- UNDP in partnership with FAO, World Bank and PIMO organized a workshop on **Recording Post Disaster Damages and Losses for March 2016 floods and Developing a Recovery Strategy using PDNA methodology, Arandjelovac, 21 – 24 June 2016**. The overall aim of the workshop was to capacitate and equip concerned officials on how to conduct Damage and Loss assessments and elaborate the recovery needs in accordance with the PDNA Guidelines, by using the data provided by the local damage assessment commissions.

In order to achieve the above-stated aim, the workshop was designed to:

- Provide an overview of existing post-disaster assessment systems in Serbia and the currently used methodology of assessments (1987)
- Highlight the differences between the present Post Disaster Assessment Methodology used and PDNA methodology

- Introduce the concepts of PDNA methodology and the key procedures involved
- Apply 'learning by doing' approach for Damage and Loss assessments using DaLa methodology
- Develop a Recovery Strategy, which will include the Recovery and Reconstruction needs and prioritize them, in line with PDNA guidelines

The participants for the workshop were both from the National and Municipal offices in Serbia who were involved in post disaster assessments. The facilitators for the workshop were from UNDP, World Bank and FAO.

During the workshop, case study was developed taking into account the assessments made by local self-government in Kraljevo. The participants were divided for assessments on Infrastructure, agriculture and housing and Environment sectors. The data available in the case study was then used to analyse and estimated damages and losses. Depending on the damage and loss estimations, recovery and reconstruction needs were drawn out for the sectors that were under focus.

The experts and resource persons from UNDP, FAO and World Bank guided the participants from National Sectors and representatives of various municipalities with the concepts, steps and procedures that underpin the PDNA methodology. The data obtained from the assessment reports from Municipality of Kraljevo was then used for estimations of Damage and Losses and recovery needs, wherever possible. This PDNA report will provide an approximation of damages to assets and loss to the economic flows, and some inputs in summarizing the disaster impacts and recovery needs.

1.6.2 SCOPE OF ASSESSMENT

The findings presented in this PDNA report, are aimed to quantify the effects of the March 2016 flood event for Municipality of Kraljevo to identify its recovery and reconstruction needs, and to provide recommendations for increase of the country's disaster resilience. The assessments are, to a large extent, based on the table top exercises carried out by 3 groups (see above) at the Workshop in Arandjelovac.

The assessment covers overall damages and losses caused by heavy rainfalls, rivers, floods and landslides post March 2016 floods in Municipality of Kraljevo. It includes data from the local assessment reports on Kraljevo, estimations and presentations made during the workshop, wherever possible. The figures and estimations in this report should not be considered as absolute but just a reflection of the practice exercises during the workshop. Given the time constraint, lack of data and various gaps in the assessment reports from Kraljevo, assumptions were made and they will be indicated in this report. In many instances, the data for estimations could not be procured till the time this report was produced, or the information gathered was still very unclear, therefore those estimations could not be made and have been indicated as X.

The data on agriculture sector was taken from the Rapid Needs Assessment for March 2016 Floods on agriculture sector in Serbia which was developed by FAO recently. The case study used by FAO experts for the practical exercises during the workshop entailed entire Serbia, therefore specific data and estimates for Kraljevo were not accessible from the table top exercises. The limitation of using the RNA for this report was that there was only very scant data available for Kraljevo.

There was almost no mention of the effect of floods on the environment in the available assessment report for Kraljevo. Due to lack of data, assumptions had to be made for the exercise on environment sector during the workshop. The assessments made were purely for practice purpose and they will not be included in this report, instead some data and indicators for environment which were inferred after discussions with the representatives of Kraljevo will be used as assumptions of disaster effects, wherever possible. For rest of the scenario, a qualitative assessment will be made.

The Water Supply and Sanitation Sector was not elaborated in the local assessment reports, and environment being a cross cutting sector, the limited assessments available on Water and Sanitation will be included under Environment sector.

During the course of the workshop, there was a very limited discussion on Disaster Impacts due to time constraints. Therefore, the section on socio-economic impacts contains a brief qualitative assessment based on the discussions during the workshop and data available from the RNA by FAO particularly for agriculture sector.

The recovery and reconstruction needs for each sector under consideration could also not be taken in elaborate details due to limitation of time and the report indicates the measures listed by each working group during the exercise in general.

This PDNA report at best represents a preliminary understanding of the impact of March 2016 floods, as an example or a template of PDNA which could be referred to develop PDNA reports for other municipalities here after.

1.6.3 ISSUES WITH PRESENT ASSESSMENT PROCEDURES IN MUNICIPALITY OF KRALJEVO

In the case of the 2016 floods the Government declared a national emergency situation, while PIMO sent a request to the Municipality of Kraljevo for assessments of disaster effects. After the review of the assessment report from Kraljevo several gaps were found. The discussions during the workshop highlighted the issues that the municipality faces regarding post disaster assessments.

- The municipality lacks capacity to timely and efficiently react to disasters and to record damages and losses is a serious concern for future adoption and usage of PDNA like methodology.
- The municipalities lack the capacity to use the 1987 methodology and find it complicated and wish to adopt a simpler methodology for post disaster assessments. They don't have enough experts to conduct the assessments and require help from National experts.
- After an extensive review of the present 1987 Post Disaster Assessment Methodology it was found to be very comprehensive, but it needs to be updated in accordance to the present times, incorporating the use of available modern technologies available such as social and digital media. Some of the guidelines and methods adopted by the 87 methodology are outdated and obsolete.
- Though the methodology is comprehensive- it is still not being used properly by the municipality. Implementation mechanism of the existing methodology is missing. It is important for the municipality to use standard procedures and produce standard assessment reports.
- The present methodology focuses mainly on damages which is reflected in the assessment reports. Some indirect damages are accounted for but losses are not taken into consideration at all.
- There is no provision of sector wise categorization of damages and losses in the present methodology which makes it difficult for the assessments to define the damages and losses in a clear manner and also does not reflect on which sector suffered the maximum damages and needs urgent attention.
- It is important to take into account gender, livelihood, marginalized communities and other social indicators in any assessment process. It was found that the social vulnerabilities were not addressed in both pre and post disaster scenarios.
- Macro and Micro Economic Impact of disasters are not addressed by the assessment reports. Another important factor that needs to be addressed is the impact on human development, employment, livelihood, poverty and vulnerable groups.
- The present methodology does not account for recovery needs which are important for restoration of conditions to pre-disaster levels. It also does not provide for any prioritisation of needs into short, medium and long term and does not refer to implementation arrangements.

- One of the main issues the municipality expressed is that they don't have enough experts for undertaking damage assessments. Sometimes they have to hire volunteers and only damages3 are listed out.
- Local commissions don't have a lot of human resources to conduct assessments. Many don't have young people who can perform strenuous physical work for assessments in post disaster situation. Some technical people involved don't know how to formulate the assessment reports.
- There is no mechanism of payments to people who are performing the post disaster assessments which results in lack of motivation.
- The assessment reports coming out from various municipalities do not follow any standard template (including the forms such as SH-1to SH-8 prescribed by the current 1987 assessment methodology) and there are lots of gaps in the reports in terms of contents and level of details.
- Most of the municipalities were not collecting comprehensive data on damages and losses for ex, assets and equipment in agriculture, and mostly used approximations and generalizations in the data.
- The data collected is not presented in a structured way in the assessment reports, therefore a lot of information has been just lost
- Making a decision to implement a full-fledged damages and losses assessment is a daunting task to most municipalities, due to the associated costs and the need to dedicate part (often sizable) of the municipal administration for processing of the damage claims.

2 DISASTER EFFECTS (DAMAGES AND LOSSES) BY SECTOR

2.1 AGRICULTURE SECTOR

Rapid need assessment (RNA) of agricultural sector was conducted following the March 2016 floods in the sixteen affected cities and municipalities in Serbia by a task team consisted of FAO staffs and local consultants from the 3rd week of March to 1st week of June 2016. The multi-disciplinary team worked closely with the PIMO, the Ministry of Agriculture and the local authorities.

As the largest municipality in the Republic of Serbia, constituting 82 settlements organized in 66 communities and covering 1,530 sq.km, Kraljevo serves as the commercial and administrative centre of Raska Region. The territory of Kraljevo enjoys abundant water sources rom three watercourses running through the area: the West Morava River, the Ibar River and the Gruža River, as well as a large number of smaller watercourses which are mainly characterized as small mountain rivers and tributaries.

The ample water sources and the fertile soils enable Kraljevo's agricultural industry and differing but related production activities (cattle breeding, poultry keeping, etc.) and makes it one of the largest agricultural products markets (everyday wholesale of agricultural products and cattle). In villages that are around Kopaonik mountain fruit production (plums, apricots, and apples) is specially developed. Agricultural land in the municipality can be divided into treated soil, pastures, fields and orchards. The land is mainly privately owned and development of agriculture is based on private sector (Forum NGO Kraljevo[4]).

2.1.1 DISASTER EFFECTS –DAMAGES AND LOSSES

Out of the 16 municipalities affected, the largest value of damage and losses was reported in Kraljevo, Cacak, Arilje and Trstenik, which collectively account for 88% of the overall damage and 49.4% of the affected households (FAO, 2016).

[3] Damages as per the current Methodology and PDNA are, sometimes, not compatible in their definitions.
[4] http://www.forumnvo.org.rs/kraljevo_eng.htm

Of approximately 10,000 ha of total arable land flooded in 16 municipalities, 3,720 ha had standing crops - out of which over 1,000 ha belongs to Kraljevo. Overall, estimated 2,250 ha of arable land in the municipality were subjected to flood impacts representing 5.86% of total arable land in Kraljevo. Given the timing of the floods (March), the main annual standing crops that were affected in the municipality were cereals: barley and what (520 ha), forages: alfalfa, clover, various grass mixes (540 ha) and to a small extent, crops in greenhouses (2 ha) (FAO, 2016). On average, 11% of farming households felt the negative consequences of the flood in the municipality (FAO, 2016). Table 1 below indicates the affected cropping areas in Kraljevo.

Table 2: Affected Crop Areas by Crop Types

Crop type	Cereals (ha)	Forages (ha)	Greenhouses	Total	Lost land
Affected area (ha)	520	540	2	1,062	2.5

FAO in its RNA report points out that although the overall affected area is relatively small, and the impacts on farming households is limited, a small number of households have lost a significant part of their high value production and their livelihoods (FAO, 2016).

2.1.1.1 DAMAGES

The total damage recorded in agricultural sector is calculated at 108,376,033[5] (FAO, 2016). Kraljevo's agricultural damages make up 4.4% (4,801,000 RSD) of that overall amount where damages concentrate mainly on infrastructure and agricultural land (FAO, 2016).

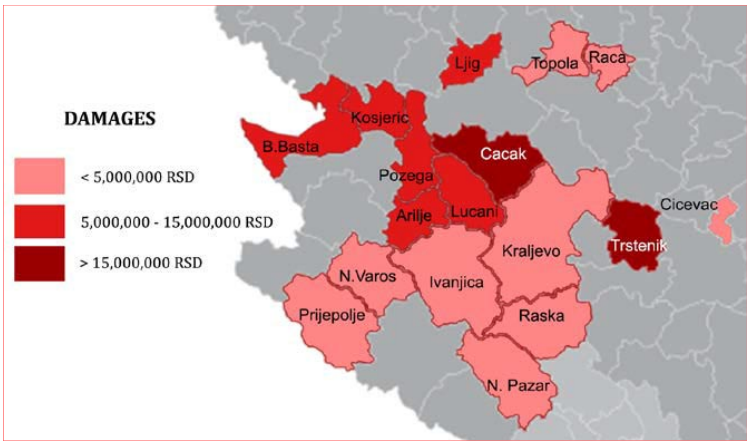


Figure 2: Damages in Municipalities in Serbia Post March 2016 floods
Source: FAO, 2016

Most of the flood waters did not reach the communities and flooded mainly agricultural land near to the riverbeds. There were no reported damages to agricultural inputs. Any damage to the small equipment and assets that are used by the farmers for agriculture was not reported by the municipal damage commissions.

2.1.1.2 LOSSES

The estimated total losses for agricultural sector amounted to RSD 209,786,903 covering all flood affected zones (FAO, 2016) and that of Kraljevo is evaluated at 64,694,000 RSD that constitutes current reduced yield at 55.5% and and increased production costs at 44.5% (FAO, 2016).

The effect on service delivery was very limited and confined to the duration of the floods. The structure for provision of services was in principle undisrupted.

[5] Taking in account that the floods were announced with sufficient reaction time, the damage is concentrated mainly on immovable property (FAO, 2016).

The supply chain in the immediate aftermath of the disaster operated with no difficulty and interruptions. Availability of agriculture related inputs and services were evident, enabling the farmers to recover. No slowdown in the total turnover of input suppliers and service providers is expected, as farmers will channel their resources towards recovery and replanting of the affected plots. Access to markets for agricultural products is unaffected.

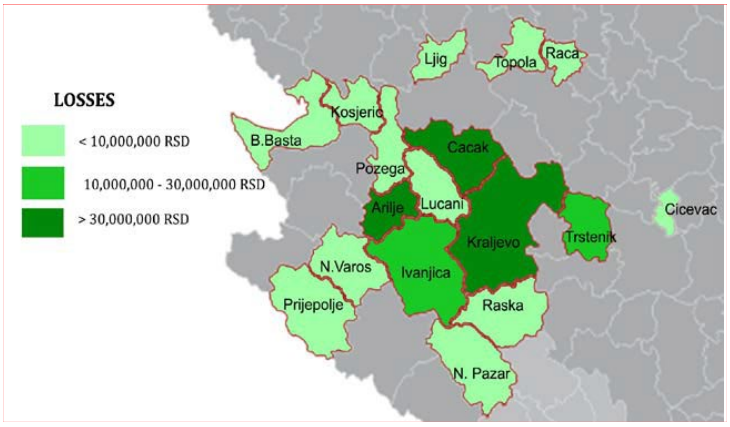


Figure 3; Losses in Municipalities of Serbia Post March 2016 Floods
Source: FAO, 2016

The effects of the floods of the agricultural production largely depended on the type of flood waters and their retention time. In areas where the water receded within 24 hours, damages to crops were limited to sediments and potentially reduced yields (direct inundation and follow-up fungal and bacterial diseases). In a limited area where the water remained for 24 – 48 hours, some annual crops were lost, and yields reduced. In areas where the water remained for more than two days, there was complete loss of annual crops.

Due to turbid inundation of water in many areas significant quantities of silt, trash and stones were deposited on the plots. The topography of the individual parcel/field played a significant role in the quantity of sediments and deposits. Based on field inspections and feedback from the municipality officials and other stakeholders, the overall share of damage and loss to crops is assessed was “mild to moderate” in most instances, and “severe” in a limited number of affected farmers/communities.

No significant changes in the disruption of governance were noted in relation to the agricultural sector.
The government reacted rapidly to the crisis. Animal evacuations were timely conducted. Damage assessment teams were on the scene.

The table 2 underneath summarises the damages and losses suffered by the agricultural sector in Kraljevo.

Table 3: Damages and Losses for Agricultural sector in Kraljevo Municipality

Damages and Losses	Estimated Value RSD (million)
DAMAGES	
Infrastructure	1,40
Land	4,66
Total	**4,80**
LOSSES	
Current reduced yield	35,87
Future reduced yield	X-
Increased cost	28,82
Total	**64,69**

2.2 INFRASTRUCTURE SECTOR - TRANSPORT

Due to its central position within the Serbian territory, Kraljevo Municipality is considered as crossroads of South-Easter Europe. In the area of Kraljevo Municipality most important communication links are road, railway and air transport. Kraljevo, due to its geographic position have a very convenient traffic position since there are vital road routes crossing the Municipality territory. Furthermore, transport plays an important role in terms of overall economic and social wellbeing of Kraljevo Municipality in fact presenting a critical infrastructure since a disruption in one of its components (particularly road transport due to ever-present flooding risk in Kraljevo area) can significantly impact overall safety and security.

Figure 2: Geographic position of Kraljevo Municipality (source: Kraljevo Municipality Development Strategy)

Road transport

Two most significant roads that are transiting the territory of Kraljevo Municipality are:

1. the "Ibar Highway" that leads from Belgrade via Preljine and Kraljevo with routes to Novi Pazar and then further on to Montenegrin coast, and the other direction towards Kosovska Mitrovica, Skopje and further to Greece;

2. the "West-Morava Highway" which is through Kraljevo linking Bosnia and Herzegovina and Western Serbia (Uzice, Cacak) with European Corridor X.

These two road transport routes are also connected with the road that connects Kragujevac and Kraljevo which actually represents the shortest travel link of the Kraljevo Municipality with Trans European Network (TEN-T) i.e. European Corridor X.

Table 3: Length of Roads in Kraljevo Municipality

	KRALJEVO MUNICIPALITY
	(in km)
Road Length - TOTAL	570,047
Modern asphalt roads	416,872
1st category state roads - TOTAL	126,90
Modern asphalt roads	126,52
2nd category state roads - TOTAL	116,95
Modern asphalt roads	94,65
Municipal roads - TOTAL	326,197
Modern asphalt roads	195,702

(source: Republic of Serbia Office for Statistics, 2014 data)[6]

Road characteristics:

- 1st category state roads in Kraljevo Municipality consist of network of main roads namely state roads number 5, 22 and 23 with a total length of 128,34 km. In terms of their importance and vulnerability to disasters it is important to note that these roads are characterized by large traffic load, excessive urbanization (commercial and/or residential buildings by the side of the roads) and intersection with roads of 2nd category and railways. M22 road is notable vulnerable to the effects of landslides though as a general conclusion these roads in total are all covered with asphalt and of better quality when compared to 2nd category and municipal roads hence less vulnerable to disasters.

- There are 7 roads of 2nd category in Kraljevo Municipality namely roads number 116, 217, 224, 225, 225a, 226 and 227 in the total length of 139,91 km. These roads are characterized by "average condition" of asphalt with regular maintenance mostly consider to be merely partial replacement of the wear layer. Also notable is the insufficient bearing capacity of the base of the roads, inadequate system of surface water channeling and a large number of, mostly illegally constructed access roads.

- Total length of the municipal roads in Kraljevo Municipality is 326,197 km. these municipal roads are of lower quality and therefore most vulnerable to disasters. They are characterized by building without project documentation, insufficient width of the roadway, common occurrence of damage to the road surface and very poor visibility due vegetation all pointing to a very poor maintenance policy.

According to the findings of Kraljevo Municipality Risk Assessment majority of road network within the Municipal territory are at risk from landslides and flooding.

Furthermore, a total of 6 bridges are at risk of flooding namely bridge at Ibar river (Kraljevo-Vrnjacka Banja road, bridge at Tovarnica river, reinforced concrete bridge over Ibar river, bridge at Ibar river in Matruska Banja, Bridge at Tovarnica river in Vrba/Zaklopaca and bridge at Stubal Podunavci road.

[6] http://webrzs.stat.gov.rs/WebSite/repository/documents/00/01/99/50/15_2015.pdf

Railway transport

The railway network of Kraljevo Municipality, with a total length of 125.1 km is made up of single-track main railroad Lapovo - Kosovo Polje with a length of 80.4 km, single-track regional railway Stalać - Pozega in a length of 36.7 km and industrial track length of about 8 km.

Even though the railways and railway infrastructure facilities are in poor condition according to the findings of Kraljevo Municipality Risk Assessment they are at no risk from flooding. Consequently, neither the railway bridges nor overpasses are at risk from flooding.

Air transport

There are two airports in Kraljevo Municipality namely military airport in Lađevci and sports/recreational airport in Kraljevo. Military airport "Morava" in Lađevci has a very strategic position due to the proximity of commercial centers and main roads (M5, M22 and M23). It was registered as a Military airport however as part of the conversion today is regarded as military/civilian airport.

According to the findings of Kraljevo Municipality Risk Assessment airport facilities are at no risk from flooding.

2.2.1 DISASTER EFFECTS - DAMAGES AND LOSSES

2.2.1.1 ROAD DAMAGES

March 2016 flooding have caused damages to a total of 320 km or road resulting with 510 million RSD damages in the area of Kraljevo Municipality.

Table 4: Road Damages in Kraljevo Municipality

Damage to Roads	Length	Estimation of Costs RSD (million)
Asphalt roads	240 km	480
Macadam roads	40 km	20
Dirt roads	40 km	10
Total	**320 km**	**510**

(source: PDNA table-top exercise)

Presented damages are considering all the reconstruction costs including damage to the asphalt and macadam layer, supporting walls, road embankments and water channels by the side of the road. However, it is interesting to note that, as mentioned earlier, that 2nd category roads and particularly municipal roads are at higher risk of flooding in comparison to 1st category roads.

Picture1: .Flooded 2nd category roads in Kraljevo Municipality
(source: www.kraljevo.biz)

It is clear that poor maintenance starting from building without project documentation onto insufficient bearing capacity of the base of the roads and inadequate system of surface water channeling is making 2nd category and municipal roads particularly vulnerable to floods.

Picture 2: Municipal macadam and dirt roads in Kraljevo Municipality damaged by landslides
(source: www.kraljevo.biz)

Besides that, excessive raining causing flash floods in connection with the above/mentioned problem of inadequately solid road base and lack of water channels are subsequently leading to landslides also causing damages to road transport.

Picture 3: 1st category road and bridge in Kraljevo Municipality
(source: www.kraljevo.biz)

On the other hand, 1st category roads, which are 100% covered by asphalt in Kraljevo Municipality, are clearly less vulnerable to floods when compared with two other types of roads which goes to show that investing in prevention and better building policies will subsequently result with less damages.

However, bridges still remain at high risk of flooding primarily due to the fact that rivers/streams are filled with branches and/or waste which is drastically reducing their water flow potential particularly in case of increased torrential waters. With the increase of torrential waters debris starts accumulating in river and stream beds predominantly keeping in range of bridges thus forming barriers. This provokes water to spill in upstream sections undermining the foundations of bridge piers which could lead to actual bridge demolition.

Table 5: Bridge damages in Kraljevo Municipality

Bridge damages	
Damages	Estimated Value RSD (million)
Destroyed	100
Damaged	5
Total	**105**

(source: PDNA table-top exercise)

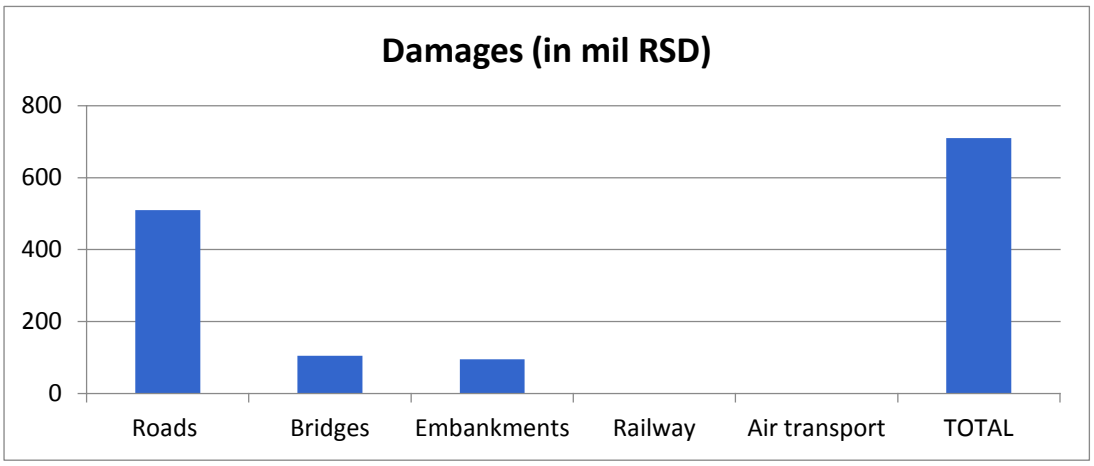
The above mentioned problem, exacerbated by the poor maintenance of river beds which includes overgrowing vegetation, has led to the fact that 2 bridges were destroyed and 8 partially damaged resulting in 105 million RSD damages. Damages were noted both in reinforced concrete and wooden bridges.

And finally, damages were noted in river embankments which were estimated at 95 million RSD.

2.2.1.2 RAILWAY AND AIR TRANSPORT DAMAGES

There were no damages reported in the railway and air transport system as already estimated per Kraljevo Municipality Risk Assessment.

Chart 4: Total Damages in Kraljevo



(source: PDNA table-top exercise)

In conclusion, out of a total of 710 million RSD damages some 71,83% are registered on roads. However, adding bridges to this financial amount, as they are also part of road infrastructure, this percentage raises to 86,61%. On the other hand there were no damages recorded in railway and air transport just leaving the problem of embankments as the underlying cause for potential damages in road transport.

2.2.1.3 LOSSES

March 2016 flooding have caused losses of a total 118, 72 million RSD in the area of Kraljevo Municipality. The ration between losses and damages in transport sector is therefore 1 to 6.

Kraljevo Municipality Department for Emergency Situations have been actively involved in response to flooding from March 2016. During the initial phase, emergency rehabilitation of the infrastructure facilities that are essential for the functioning of local communities (roads and embankments) has been conducted. This called for involvement of qualified experts from Waterworks Public Utility Company, Public Utility Company for Roads and Public Company Directorate for Planning and Construction. In that concern, the losses in public works, wages of workers, removing of debris following the effects of landslides and use of alternative routes were estimated at 118,72 million RSD.

Picture 4: Embankment damage/loss in Kraljevo Municipality
(source: www.kraljevo.biz)

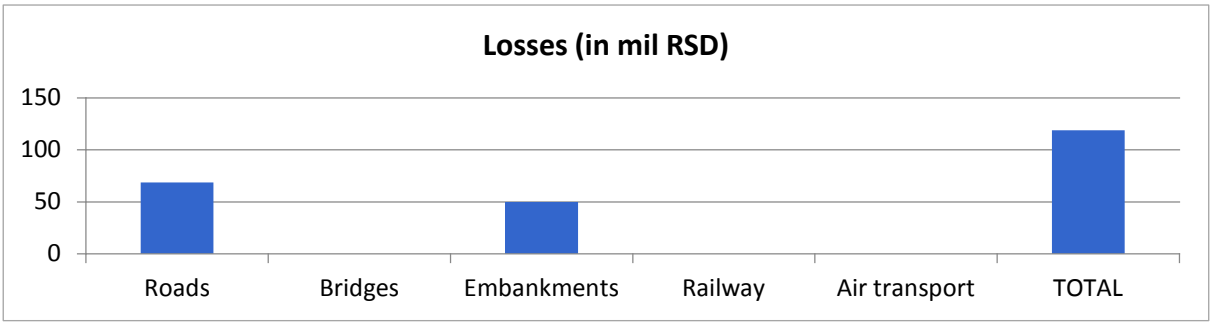
One of the particularly important issues that has called for immediate attention following the 2016 floods was the protection of river embankments. Special consideration was given to this aspect of emergency response as additional ruptures in the base of the embankments could have increased damages not only to transport but also to other sectors. Therefore, damages for embankments are estimated at 95 million RSD whilst losses were projected at 50 million RSD.

Table 6: Losses in Kraljevo Municipality

Loss in 6 months	Estimated Value RSD (million)
Public services	0,72
Wages of workers	7
Removing rubble	10
Embankment protection	50
Alternative routes	51
TOTAL	118,72

(source: PDNA table-top exercise)

Chart 5: Total Losses in Kraljevo Municipality



(source: PDNA table-top exercise)

In conclusion, out of a total of 118,72 million RSD losses some 57,88% are registered on roads whilst the remaining 42,12% is registered for the protection of embankments.

2.1 HOUSING

Approximately 65% of the entire stock in Serbia, and in Kraljevo in particular, was built during 1971-1980 being the most productive period[7]. Only 5-6% of the stock originates from before 1919. An additional share of about 10% was added to the current stock after 1990. Thus, the housing stock in the country is not very old.

Over 80% of the existing housing stock is built of solid materials, notably: bricks and reinforced concrete. The remaining 20% cannot be considered structurally sound. It is, however, evident that some of the old multi-unit buildings might need substantial investment to be brought up to standards.

[7] Taken from PDNA for Serbia after 2014 Floods.

Peri-urban growth of Kraljevo is characterised by a great deal of Illegal construction, informal settlements and uncontrolled urban sprawl. A low quality of life in illegal settlements is evident due to a lack of services and insufficient social integration, but the most obvious indicator is the very poor condition of physical structures and infrastructures. One of the typical issues for Serbia, including Kraljevo, is a large number of illegal or unfinished houses. People live in unfinished houses, mostly built without permits, and with a severe lack of sewage. Often inhabitants of those houses make improvised sewage network towards a nearby stream posing risks of overspills into the streets during strong rains. Similarly, in case such illegal houses are affected by disasters, there are no legal ways to ensure compensations for people. Currently, the Government of Serbia put a lot of effort into legalising houses, wherever possible, which have been built without proper permits.

Picture 5: Floods affecting the housing sector in Kraljevo

Kraljevo has the highest concentration of IDPs, the share of IDPs and refugees (21,000 persons) forms 17 per cent of the total population [UNECE, 2003]. Often, they live in illegally constructed houses and shelters.

The vulnerable groups often need financial support for the management of existing housing, such as the maintenance, service costs and utility bills. Assistance for the large refurbishment of apartments and residential buildings is also needed. For the legalisation of illegal structures, exemptions from payment for construction permits or legalization fees are needed by the poorest and most vulnerable households.

2.1.1 DISASTER EFFECTS - DAMAGES AND LOSSES

2.1.1.1 ASSUMPTIONS AND ESTIMATES

There is no official classification of housing typology in Serbia. This is why, for the purposes of the current assessment the same typology as the one developed for 2014 PDNA was used in the housing sector [PDNA, 2014, page 52]:

Table 7: Typology of Houses Used in Assessment

Type	Description
H1	Individual, permanent, made of bricks and reinforced concrete (RC), > 150 m^2
H2	Individual, permanent, made of bricks and RC, 80 m^2 < house > 150 m^2

Type	Description
H3	Individual, permanent, made of bricks and RC, < 80 m^2
H4	Individual, improvised temporary houses[8]
H5	Apartment Block

In terms of damage classification, an official categorisation was used as outlined in Methodology 1987, namely:

Table 8: Classification of Damages for Houses

Category	Description
Category 1 (C1)	Minor damages to roof, smaller cracks in mortar, partially damaged glass windows and chimneys (24 hours under water when flooded)
Category 2 (C2)	Larger damages to roof, window glasses, wider areas of cracked and fallen mortar, knocked down chimneys, many cracks in sidewalls and smaller cracks in bearing walls
Category 3 (C3)	Severe damages to roof construction, smaller cracks in reinforced concrete pillars, knocked down sidewalls, severe damages to windows and doors (more than 24 hours under water when flooded)
Category 4 (C4)	Major damages in pillars (numerous cracks), roof construction (partially knocked down), sidewalls (major deformation and knocked down) and installations.
Category 5 (C5)	Damage and deformation to the construction elements including the damages noted in previous categories. These include diagonal cracks in bearing pillars and vertical communication (stairways and lifts)
Category 6 (C6)	Fully destroyed or to be demolished house

For the estimation of damages and losses, bills of quantities for typical houses and typical damages were used as estimated for PNDA 2014 [PDNA, 2014, page 56]. Values of the unit prices used of construction works were confirmed with representatives of the Serbian government and participants of the Workshop held in Arandjelovac, Serbia, on June 21-24, 2016.

[8] Also auxiliary houses were accounted for under this category.

Table 9: Value per m^2 for Various Types of Houses and Damage Categories, RSD[9]

Damage Categories / Types of houses	C1	C2	C3	C4	C5	C6
H1	12,600	18,900	25,200	31,500	37,800	50,400
H2	12,600	18,900	25,200	31,500	37,800	44,100
H3	12,600	18,900	18,900	25,200	37,800	44,100
H4	5,040	5,040	5,040	5,040	5,040	5,040
H5	31,500	32,760	34,650	36,540	37,800	N/A

2.1.1.1 ESTIMATION OF DAMAGES

During Mach 2016 floods, some of the flooded houses in Kraljevo suffered significant structural damages, however, in most of the others, walls and floors got saturated, electric installation of the flooded floors were reported to be permanently damaged, bathroom fixture got clogged with mud, wooden doors, windows, and floors were destroyed, furniture and home appliances were also damaged or destroyed. All these consequences were registered in Kraljevo by the commissions estimating damages from the floods. None of the housing unit was reported to have been fully destroyed by the floods.

Overall, over 1700 people from 276 households were affected by the floods. A detailed breakdown of these people for various local communities is presented in Annex 1. About 193 housing units and 141 auxiliary facilities attached to the houses were found to be damaged by the floods according to the assessment reports, however there was no description of the kind of auxiliary facilities damaged as well the structure and the type of houses that were damaged, therefore assumptions had to be made for the table top exercises.

An overall overview of the estimated damages in RSD to the houses is presented in the table below.

Table 10: Damage Estimation of Houses, RSD[10]

Types of houses	Damage Categories						Damage Total, Million RSD
	C1	C2	C3	C4	C5	Fully Destroyed	
H1	34,20	0,00	6,69	0,00	0,66	0,00	**41,55**
H2	122,18	6,24	17,52	0,00	1,17	0,00	**147,11**
H3	111,96	0,00	14,55	0,00	7,76	0,00	**134,28**
H4	452.14	0.00	0.78	0.00	3.07	0.00	**456,00**
H5	10.30	0.00	0.60	0.00	0.00	N/A	**10,89**
TOTAL	**730.79**	**6,24**	**40,14**	**0,00**	**12,66**	**0,00**	**789,83**

[9] The original estimates in PDNA 2014 were given in Euro. An official UN rate of 1 Euro = 126.01 RSD for March 2016 was used in the assessment.
[10] Source: PDNA Workshop (Arandjelovac, June 2016) group exercise.

In addition to the houses, damages to home appliances have also been estimated based on outcomes of the workshop in Arandjelovac (see Table 11 below).

Table 11: Damaged Home Appliances

Appliances	#	Total Value, Million RSD
Fridge	276	3,31
Stoves	276	3,04
TOTAL, #	**552**	**3,35**

2.1.1.2 ESTIMATION OF LOSSES

In the reports provided, there has been no distinction made for private and public assets.

The following losses were analysed:

- Cost of (some) relief and recovery measures taken
- Works, cleaning, and government support to the housing sector

All available manpower and machinery of the Public Utility Companies and the Communal Police Department were involved in the activities led by the Town Emergency Situation Staff.

The evacuation was organised protecting all values at the territories of the flood-affected local communities, in accordance with the evacuation plan. The evacuation was organized in line with the main evacuation elements, including: evacuation assembly point, main evacuation routes, securing public law and order, transportation, engagement of transport means and reception of the evacuated persons and animals.

In the course of the rescue activities, 15 person asked for assistance and accommodation in the reception centre. The total of 4 persons (3 men and 1 woman) were accommodated in the gerontological centre, and one woman in the General Hospital in Studenica.

As at March 15, 2016, Centre for Social Work distributed the financial assistance in the total amount of RSD 635,000.00, specifically: 31 increased financial assistances, each for the amount of RSD 10,000.00 (large families and persons who took the funds for their accommodation) and 66 financial assistances each for the amount of RSD 5,000.00 (persons who were accommodated with their relatives).

The available spatial capacities of the Agricultural high-school “Đorđe Radić” were used for reception of animals evacuated for the flood-affected areas.

In addition to the above, a number of cleaning works were carried out, which are presented below (a more detailed description of the effort is presented in the table in Annex 2)

Table 12: Estimation of Losses[11]

	Total Value, Million RSD	Loss in Personal Income, Million RSD
Relief and Early Recovery Measures		
Evacuation (15 to reception centre and 4 to gerontological centre)	0,57	
Measures by Centre for Social Work	0,6	
Manpower engaged in relief and rescue	0,6	
Sub-Total	**1,77**	
Losses		
Cleaning community and households (sludge, furniture, etc.)	2,8	
Lost working days of working part of population (65,1% for 5 days)		7,4
Internal roads, control and disinfection inside and outside the house	6,6	
Pumping out water from buildings	0,62	
Assistance provided by Centre of Social Work for temporary accommodation	0,635	
Sub-Total	**10.65**	**7,4**
TOTAL	**12.42**	**7,4**

2.2 ENVIRONMENT

Environment affects all sectors of economic and social activity. People's quality of life and well-being depends to a great extent on the state of the environment. Ecosystems provide a range of goods (such as food, water, medicines and energy) and services (such as the dilution and transformation of waste, the regulation of the water cycle, carbon sequestration, the maintenance of biodiversity and recreation) that sustain and satisfy human life.

Environmental capital or assets are made up of the ecosystems that provide society and economies with environmental goods and services. The environmental changes caused by a disaster can produce direct damage to natural assets such as forests, soil, biodiversity etc. or to environment infrastructure facilities such as pollution control equipment, water quality testing devices etc. Direct damage to the environment can be estimated as the value of the assets affected. They may also lead to indirect losses when the related environmental services are reduced, diminished in quality or made more expensive.

Over the years, damage and loss to the environment as a result of a natural hazard is often overlooked and underreported as part of the total damage assessment conducted by the Governments. Most of the times, the value of damage to the environment is considered as an intangible value and is difficult for officials to take an

[11] Source: PDNA Workshop (Arandjelovac, June 2016) group exercise.

account of the damage and losses to the environment. Environmental damage assessment takes into account several major constraints, such as the scarce time available for carrying out the assessment, the lack of information on affected ecosystems and the paucity of markets for most environmental services.

Following a disaster, line ministries tend to focus on damage to assets and the subsequent cost of damage is based on the replacement value; however, measuring damage to the environment and determining the replacement cost is difficult given the absence of proper baseline data. In addition, costing can be complicated by the fact that environmental hazards can be rehabilitated through natural processes. In some cases rehabilitation of the environment comes in the form of long-term mitigation projects such as the afforestation, watershed management projects, land use planning etc. These projects are implemented to mitigate against future impacts on specific disasters. Moreover, environmental economics as a sub-discipline within economics is still being refined, with much room for innovations and improvements in tools and methodologies for environmental valuation.

Important Environmental Factors for Municipality of Kraljevo

Kraljevo is drained by important river systems including the Ibrar and Morava. The municipality also has a protected natural park "Golija" which covers total area of 75,183.00 ha in the mountains and it hosts the Golija-Studenica biosphere reserve, the first UNESCO-MAB registered biosphere reserve in Serbia. With its unique land forms it serves as a major tourist attraction from nearby towns and other bordering countries. It is also emerging as an important European center of genetic diversity and has great importance for the conservation of bird diversity of Serbia.

Kraljevo boasts of unploughed upland on hillsides and river valleys are mostly featured by forest wealth and mountain stockbreeding. The forest resources make 46.8% of the total area, which is higher than the average for the Republic of Serbia. Almost 80% of the forests are deciduous by nature and rest evergreen. The ownership structure of forests in the territory of Kraljevo shows that 62% of forests are state-owned, while 38% are privately owned. The forests in Kraljevo are also popular as hunting reserves due to presence of animals such as roe deer, wild boars, rabbits, pheasant, partridge, fox, wolf, wild goose etc..

Intensive agricultural production leading to loss of vegetation cover, forest degradation and land use changes associated with urbanisation, including undercutting of slopes by road construction, account for environmental pressures in Kraljevo. An estimated 20-25 % of the land is considered to be vulnerable to landslides, and construction on vulnerable land is a problem.

Industrial activity, in the area has had detrimental environmental effects. Emissions of air pollutants in Kraljevo are due to the industrial installations, traffic and the heat supply system. The two major and potentially the biggest polluters "Wagon Factory" and "Magnohrom" in recent years had decline economically which resulted in decrease in production volume, significantly reducing emissions of pollutants. Taking into account the area occupied and the layout of these plants, they can be considered as sources of surface pollution in the area.

The soil pollution in Kraljevo has increased over time due to factors such as in correct selection of type and quantity of mineral fertilizers, use of pesticides, over use of organic fertilizers, municipal and industrial waste, lack of flood irrigation and water management facilities, soil erosion etc. Some parts of the agricultural land are plagued with heavy metal pollution. The degradation of land due to these factors as well as mining activities and unmanaged landfill activities in the area have been drivers of environmental risks.

The Ministry of Agriculture and Environmental Protection is responsible for overall environmental management in the country and looks after management of national parks, inspection surveillance, water quality protection, chemical and waste management and acting as focal point for various multi-lateral environmental agreements. The Serbian Environmental Protection Agency (SEPA) is an administrative authority under the Ministry of Agriculture and Environmental Protection that has legal obligations in the field

of environmental monitoring, data collection and management, and preparation of national reports on the state of the environment and its components. Other agencies and institutes that play an important environmental role include the Republic Hydrometeorological Institute, the Nature Protection Institute, Public Health Institutes and the Agency for Spatial Planning.

2.2.1 DISATER EFFECTS - DAMAGES AND LOSSES

There have been no particular assessments on the effect of March 2016 floods on environment of Municipality of Kraljevo. The main environmental problems perceived to be emanating post disasters, according to the assessment reports and discussions with concerned officials were (i) activation of landslides and soil erosion; (ii) degradation in water quality, contamination and increased turbidity of water in private wells in the rural area (iii) generation of debris and disaster waste and (iv) potential contamination of agricultural land.

Picture 5: March 2016 Floods in Kraljevo
(Source: www.b92.net)

The major environmental impact from this disaster was the triggering of landslides. Debris flows and other mass movements caused erosion and removal of productive soils, disturbed landscapes and polluted rivers with excess sediments. The disaster could have also affected the wildlife and caused fish kills in the rivers due to deposit of sediments but these have not been registered by the assessment reports.

There were no reports of any damage to forested area and the disaster effect was therefore insignificant. Erosion caused due to landslides can be accounted for direct damages, but this factor was taken into account by the local assessment reports, not there was any mention of the damage to the existing pollution control equipment and services.

Losses in general are not accounted by the assessment reports. Contamination of agricultural land by heavy metals and other pollutants was not assessed. The mud and debris generated by the floods is significant compared to normal daily and monthly generation levels, therefore the costs associated with removal of debris and cleaning of waterways, roads etc. would be accounted as loss.

The disaster also affected the governance as the PUCs had to employ additional employ machinery and manpower for removal of the mud and silt from waterways as well as removal of disaster debris. The PUCs had to work in extraneous circumstances to cope with task at hand but they showed a lot of resilience.

Picture 6: Landslides in Kraljevo

(source: www.kraljevo.biz)

The floods also increased the risks and vulnerabilities in Kraljevo. While toxic chemicals and hazardous waste releases were not recorded post floods, there should be monitoring of hot spots to chronic exposure in the medium to long-term, especially around the industrial areas. The unmanaged solid waste management facilities and disposal of disaster waste could also lead to contamination of land and surface water and cause pollution. Given their vulnerability to pollution, groundwater and surface

water as well as aquatic life and fish will also require regular monitoring. The floods disaster increased the risk of landslide activation, with potentially significant socio-economic consequences from damages to housing, roads and other infrastructure.

2.2.2 WATER SUPPLY AND SANITATION

For municipality of Kraljevo, it was important to control the drinking water quality for its residents and control the spread of pandemics; therefore it took several measures in that capacity. Water supply and sanitation is considered usually under the Infrastructure sector but due to paucity of data and environment being a cross cutting section with Water Supply and Sanitation, a brief section to detail out disaster effects has been included in the overall environment sector.

Municipality of Kraljevo gets its water from water flowing through the basins of the Morava, Georgia, Ibar and Ribnica. There is no monitoring of the surface water quality at the local level to give a detailed insight into the quality of water.

The quality of water from the springs originating from river Ibrar is monitored by the competent institutions of the city of Kraljevo. The only measure taken before this water is sent to the distribution network of the city is disinfection with chlorine. The moderate pollution of river Ibrar, the natural characteristics of the river Ibar springs and the self-cleaning potential of groundwater helps in obtaining high quality drinking water from this source. Only in some parts of River Ibrar water pollution is an issue.

The reliable supply of clean, safe piped-water and efficient sewerage services are crucial for inducing greater economic activity and commercial developments for both rural and urban areas in Kraljevo. The water supply system in Kraljevo consists of a system of drainage wells and the collection piping and two pumping stations to discharge water in the distribution network. Distribution network consists of about 580 km of the pipeline. This amount is not sufficient for now connected users, especially in summer. Part of suburbs and most of the villages (about 60,000 inhabitants) are not included in the organized water supply and the face shortage of hygienic drinking water. In rural areas of Kraljevo only 1,307 households avail water supply. It is estimated that about 50,000 others get water supply through wells, hand pumps and water pumps.

The quality of water from the water supply and individual wells is not monitored due to lack of system of control and management. The drinking water quality is at risk due to poor infrastructure. This is especially seen in rural water supply systems that system of monitoring the water quality control is lacking.

Length of urban wastewater collecting network 359 km. In rural areas, 15 sewage networks were built without appropriate filters without management facilities. In other rural areas wastewater is collected in individual septic tanks or flows uncontrolled into the travel channels and canals to drain into storm water or rivers.

2.2.2.1 DISASTER EFFECTS ON WATER AND SANITATION

Fortunately, during and after the March flood there were no failures in the system of water supply and sewage, and the services were not disrupted broadly in municipality of Kraljevo. Only in one of the villages, Sirca there was a physical break down of the water supply system during the floods and the problems are still ongoing.

In the rural areas, there was increased water turbidity in some private wells. These alternative systems of water supply are not under epidemiological and hygiene control, therefore the water quality is not maintained. The effect of the floods on solid waste management facilities have not been mentioned in the assessment reports. The existing solid waste management facilities in Kraljevo are not sufficient to meet the demands and it is presumed that the debris and disaster waste due to the floods would have increased the pressure on solid waste management facilities and their disposal.

In the city of Kraljevo, the emergency staff engaged all the competent authorities in mechanical removal of waste, pest control, disinfection and disinfestation. The competent authorities, PUCs, Institute for Public health in Kraljevo and competent inspection services were involved. All sanitation processes were undertaken as specified by under the Emergency Situation Activity Plan of the Institute for Public Health in Kraljevo and Veterinary Specialist Institute in Kraljevo. The PUC looking after waterways was engaged to provide drinking water to the citizens in coordination with the local community presidents.

2.2.3 DAMAGES AND LOSSES IN ENVIRONMENT AND WATER AND SANITATION

As mentioned under the effects of disaster, the damages in Environment and water and sanitation sector were mainly concerned with breakdown of water supply system at village Sirca and the hill side erosions due to landslides. As the data is not available from the assessment reports the economic value could not be estimated at this point. Most of the losses stem from the disposal of disaster waste and the removal of debris, mud, silt etc. from the water ways. Disinfection of waterways and wells also accounted for losses. Other losses stem from loss of revenue due to breakdown in the water supply system in village Sirca which is still in discontinuation and people are estimated to get water from alternative sources. Provision of drinking water supply to the affected population also accounted for loss to the PUC. There were also costs incurred to the manpower employed by the PUC to cope with the tasks at hand. Losses from increased pollution loads would also have likely been experienced but these were not possible to measure due to lack of data.

Table13: Damages and Losses in Environment and Water and Sanitation

Damages and Losses	Estimated Value RSD (million)	
	Damages	Losses
DAMAGES		
Breakdown of Water supply system at Sirca	x	
Hillside erosion due to Landslides	50	
LOSSES		
Disinfection of water supply[12]		10
Collection and disposal of disaster waste[13]		0,55
Waste disposal[14]		0,5
Provision of drinking water to the affected population[15]		9,37
Disinfection of roads and pavements, bearing walls and green areas		4,63
Loss of revenue due to breakdown in water supply in Sirca		X
Manpower engaged by PUC Water works and Public health		0,6
Manpower engaged by PUC for cleaning		0,36

[12] 110 RSD/m^3
[13] Costs estimated at 442.4 RSD/m3 and 10 vehicles carrying 60 tonnes each for 5 days
[14] Costs estimated at 165.9 RSD/tonne for disposal
[15] 15 litres/person for 9 days at 40RSD/litre (including labour costs)

TOTAL[16]	50	**26.01**

3 SOCIO-ECONOMIC IMPACT OF THE MARCH 2016 FLOODS

The macroeconomic impact of this disaster event will not be apparent in the in the GDP of the Municipality.

Among the productive sectors assessed, **for agriculture**- the national average of 23%, comparing the land owned by the flood affected farmer, to the area flooded per farmer, indicates the extent to which the land used by the average farmer got flooded (FAO, 2016). In Kraljevo that number amounts to 60% (comparing 2.5 ha average household arable land to 1.5 ha average size of affected land per household). It is anticipated that most of the vegetable production can be replanted with some extension in the production deadlines (FAO, 2016). Table 3 shows the correlation between affected agricultural land and the farming population.

Table 14: Areas and Population Affected

Areas and shares of land affected		Population and shares affected	
Arable land in municipality (ha)	38,377	Total households (HHs)	42,028
Average HH arable land	2.5	Agri HHs	8,218 (regular) 5,450 (irregular)
Average size of affected land/HH (ha)	1.5	Total Agri HHs	13,668
Share of land affected/HH	60%	Share of Agri HHs	33%
Total land affected (ha)	2,250.00	Share of registered HHs	60%
Share of arable land affected	5.86%	Flood affected HHs	700 (regular) 800 (irregular)
		Share of agri HHs	11%

On average, only 6% of the affected farming households in Kraljevo rely solely on agricultural activities for their incomes and livelihoods while the remaining are farmers who consume for their own agriculture or livestock production. RNA also found that of 6% of the affected farmers within the municipality, the cash crops affected their main source of income (FAO, 2016).

The RNA report stresses that the poorest farmers engaged in high value crops will be the most affected by the disaster as they will experience reduced incomes and will face increased recovery costs. Subsistence farmers will experience some increase in costs and spending in order to meet their consumption needs. The development of all affected farmers will decline and stagnate for 1-3 years, as they aim to recover and re-establish their production. The likelihood of food insecurity is very low, as very few farmers rely solely on their production to meet their consumption needs (FAO, 2016).

Another point the report highlights is that the levels of rural poverty – and in particular debts – are likely to increase in the affected areas. Some of the affected farmers use commercial credits, and they will find it

[16] Based on the data available and discussed during table top exercises. Gaps in the assessment are due to lack of data.

harder to pay back their creditors and will have to restructure their loans. With reduced yields and less financial stability, many farmers will face challenges to further invest in future seasons. Small-scale and subsistence farmers will more be more likely to fall into poverty, as they will have few assets to sell and they are often not credit viable. (FAO, 2016).

Most of the insurance companies in principle do not insure against floods, significantly reducing the farmers' choices. A very small number of companies provide insurance packages for floods, on the condition that (FAO, 2016):

1) A basic agricultural insurance package is purchased against: fire, lightning and hail, subsequently, with insurance against floods as an additional option,
2) Crops are in a location with flood defences (embankments). These have to be checked by the insurance expert.

This means that most of the flood affected farmers Kraljevo would be rejected by all insurance companies in the country (FAO, 2016).

Access to employment is a key factor when considering vulnerability of the affected population. Employment serves as an important source of income and savings to face emergency situations. Bearing in mind that agriculture does not account for overall employment in Kraljevo, it is likely that the impact of the floods will be not be felt much in the context of employment and income levels .

Minor impact on employment and livelihood was on account of damage to infrastructure facilities, particularly the roads and bridges. This affected the livelihood of people at least for 5 days in the municipality.

Damages to housing also made an impact on the livelihoods, incomes as well as quality of human life. According to the assessment reports, the citizens suffered about 7,4 million RSD in income losses due to floods. Disasters have the potential to have serious impact, especially for the vulnerable groups mostly living in informal settlements that lack construction permit and property registration, but these issues were not addressed in the assessment reports.

The loss of employment and the lack of temporary job opportunities can marginalize vulnerable groups further into poverty, post disasters. Gender was not taken into account by the assessment reports to estimate the impact of the floods; however, households with women in charge generally have more difficulties, especially due to lower income wages and loss of that income severely affects their livelihoods. There has been rise in unemployment in Kraljevo, social issues due to IDPs and other vulnerable groups such as the elderly and the disabled. The impact of the floods on these groups was not taken into account by the assessment teams.

There were worries that social disturbances caused post floods would increase dissatisfaction and apprehensions that the crime rates would increase in the area as a result.

People are connected to each other within particular social groups such as family, friends and colleagues and generally, access to social networks reinforces people's resilience in the disaster affected situations. When the affected have an access to such network, it can influence social resilience and reduce the individual vulnerabilities. Many of the vulnerable groups lack a strong social network which could buffer the effects of disaster. These vulnerable groups should be taken into consideration and the impact of disasters on increasing their social and economic vulnerabilities should be considered while undertaking post disaster assessments in future.

4 POST DISASTER RECOVERY AND RECONSTRUCTION

Post-disaster needs refer to the financial requirements to ensure recovery of social conditions and economic development to at least the same levels that prevailed prior to the occurrence of the disaster, as well as the

requirements to reconstruct all destroyed assets under disaster-resilient standards within a building-back-better strategy.

The aim of recovery activities is to restore the path to achieve sustainable socio-economic development, while that of reconstruction activities is to reduce disaster risk to more manageable levels, with full participation of public and private sector stakeholders under the general guidance and leadership of the Government. Under recovery are included many actions designed to restore the levels of production, personal wellbeing and environmental conditions that prevailed before the disaster occurred. Recovery activities essentially aim to provide the necessary financial support to re-start production and restore social conditions.

Due to time constraints a detailed review of Recovery and reconstruction needs for the sectors under consideration could not be carried out during the workshop at Arandjelovac. Therefore, a more qualitative and descriptive analysis of the short, mid and long term strategic measures have been included. The recovery and reconstruction needs estimates have been calculated, wherever possible, depending on data on damage and loss assessments. Some measures have been indicated but cost estimates could not be indicated due to paucity of data and time during the workshop.

4.1 AGRICULTURE SECTOR

4.1.1 RECOVERY NEEDS

In the agriculture sector the recovery needs include provision of agricultural inputs (seeds, seedlings, fertilizers, fuel, fodder, plant protection material, tools etc.) to re-start agricultural production. There was a limited impact on the livestock and the animals had to be shifted to temporary shelters. There is a need to rehabilitate them and provide animal feed. However, the number of animals affected was not provided by the assessment reports. The reconstruction activities require repair and restoration of the infrastructure required for agriculture. There is a need to restore the agricultural land and clean it of all the sediments and debris caused due to floods. Along with restoration of agricultural land it is important to include soil improvement measures. Emergency loans to support local agricultural enterprises will be helpful to tide over in case of future losses that have not been accounted for. An overview of the recovery and reconstructions needs is given in Table 16, with cost estimates wherever possible. The details of short term, mid-term and long term strategic needs for recovery for agriculture sector are given below.

Table 16: Recovery and Reconstruction Needs in Agriculture Sector

RECOVERY and RECONSTRUCTION NEEDS	Estimated Value in RSD (million)
RECOVERY	
Provision of seeds and other inputs for planting the next crops	28.82
Assistance to farmers in case of further losses	27
RECONSTRUCTION +BBB	
Repair and rehabilitation of agriculture land	4.6
Soil improvement/rehabilitation of lands that received sediments (BBB)	X
Repair and restoration of infrastructure needed for agriculture	0.14
Tehnical support in reconstruction and recovery (advisory)	X
Develop a municipal level plan on expansion and upgrading of agricultural infrastructure	X
Development of early warning system tailored for farmers	X

Training and capacity building activities	X

Short term strategic measures (6 months)

- Provision of inputs (seeds, fertilizers, disinfectants, etc.) to farmers whose crops were lost due to the disaster, to ensure next year´s harvest. These would be the priority support measures to the farmers.
- Removal of debris and other harmful materials from flooded arable lands. The disposal of debris needs to be done with ample considerations for environmental impacts.
- Restoration of agricultural infrastructure with emphases on immediate repair and rehabilitation of high priority irrigation schemes, watercourses, storage tanks and wells, is the need of the hour in Kraljevo.
- Technical support for reconstruction and recovery activities in agriculture and build back better practices need to be integrated into all the procedures right from the inception of recovery and reconstruction processes.
- Analyse the existing agricultural system and legislative framework in Kraljevo municipality and strengthen the capacity of the staffs of municipal Agricultural Department/ Division and relevant agencies, to deliver national and local legislation, policies and strategies on disaster risk reduction, through technical advice, human resources and expertise, training, practical tools and services.

Mid-term strategic measures (6-18 months)

- Seek experts' opinions (agriculture and environmental experts) on how best to optimize the use of the farm-lands (multiple crops, etc.).
- Replacement of lost and damaged equipment and domestic animals.
- Develop a municipal level plan on expansion and upgrading of agricultural infrastructure (irrigation, flood protection, storage facilities, access to market the products) in accordance with the BBB concepts: i.e. incorporation of DRR and climate change aspects (usage of materials, location, etc).
- Conduct a market research to enhance the promotion of local products
- Develop Agricultural Sector-specific municipal level strategy on disaster risk reduction addressing concerns across such areas as agriculture, forestry and natural resource management (sustainable agriculture – hazard resistance crops, sustainable water management and utilization, environmental protection and climate change adaptation practices, etc.).
- Development of early warning system tailored for farmers.
- Conduct trainings of trainers for selected local authorities in Kraljevo on PDNA.

Long term strategic measures (18+months)

- Capacity building of the communities on sustainable agricultural practices.
- Compensation of the value of the destroyed farmland.
- Mobilization of resources and implementation of the risk reduction strategy for agriculture.
- Preparation of a plan , based on the findings of the market research, for expansion of the market for local products and implement the plan
- Reformation of insurance policy and development of policies, laws and management systems that improve the resilience of the Agricultural Sector in the future.

4.2 INFRASTRUCTURE - TRANSPORT

4.2.1 BUILD BACK BETTER

Reconstruction of Kraljevo transport sector including roads, bridges and embankments should be conducted with the implementation of disaster-resilient features. Such measures would encompass comprehensive inter-sectoral involvement of various experts the likes of engineers, geologists, economists and hydro engineers. Introduction of disaster risk reduction measures in road works are estimated at a total of 140 million RSD (90 million RSD for DRR measures and additional 50 million RSD for costs of construction and material). "Build Back Better" costs concerning bridges are estimated at 28 million RSD (13 million RSD for hydrology assessment, 5 million RSD for project documentation and 10 million RSD for construction material). Finally, flood protection works concerning embankments are estimated at 20 million RSD in cost of construction and material.

Table 17: Build Back Better needs in Kraljevo Municipality

Item	BBB (in mil RSD)
Road	140
Bridge	28
Embankments	20
Railways	0
Air transport	0
TOTAL	188

(source: PDNA table-top exercise)

4.2.2 RECOVERY NEEDS

The resilience of transport sector in Kraljevo is in fact represented through its capability to resume operations at a level similar to that before the flooding occurred. In that concern recovery has to encompass all the steps necessary to recover the transport capacity that was lost during the March 2016 flooding. Therefore, total recovery needs have to involve costs of damages, costs of losses incurred during response phase and costs of services discontinued during flooding, as well as more "flood resilient" BBB measures introduced in new and improved infrastructure. Therefore, the overall recovery costs following March 2016 floods in Kraljevo including damages, losses and build back better reconstruction add up to a total 1,016 billion RSD.

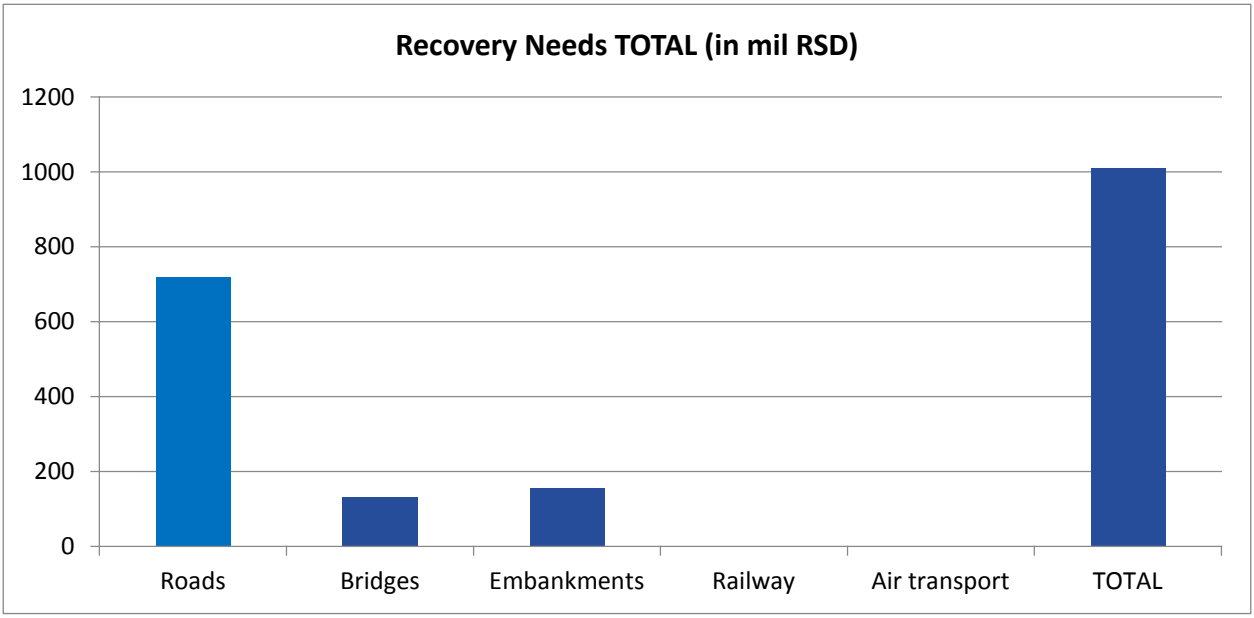
Table 18: Overall Recovery Costs in Kraljevo Municipality

Item	Damage (in mil RSD)	Loss (in mil RSD)	BBB (in mil RSD)	Recovery needs TOTAL
Road	510	68,72	140	718,72
Bridge	105	0	28	133
Embankments	95	50	20	165
Railways	0	0	0	0
Air transport	0	0	0	0
TOTAL	710	118,72	188	1016,72

(source: PDNA workshop table-top exercise)

More than two/thirds of total recovery costs (718,72 mil RSD) are considered to be costs concerning roads whilst costs of bridges and embankments are represented with 10-15 % in overall recovery costs respectively (133 mil RSD in bridges and 165 mil RSD in embankments). This is pointing to the fact that it is indeed road infrastructure the most vulnerable item within transport sector. However, without tending to bridges and embankments as underlying causes for road damages overall future recovery costs could not be properly addressed which is subsequently calling for comprehensive programmatic approach.

Chart 6: Total Recovery Needs in Kraljevo Municipality



(source: PDNA workshop table-top exercise)

4.2.2.1 RECOVERY PLANNING

It is without a doubt that damages to the roads and bridges, damages to embankment and flood protections costs, landslides and mudslides that have furthermore threatened infrastructure including all the other costs associated with traffic communication disruption have affected immediate costs. This has all produced short term impact on economic and social life in Kraljevo for at least 5 days, and in some local communities even longer than that. Most commonly recognized problems were difficulties in accessing hospitals, markets, work and school so the use of alternative routes where possible was introduced as a short-term solution. Besides that, due to traffic disruption even the local and city administration including emergency services faced problems in lacking access to their respective facilities. And finally, during this first response phase other issues were raised as well the likes of the question of jurisdiction in terms of regional and local roads, damaged bridges on watercourses of second category etc.

It is for this reason that the Kraljevo City Authorities have emergently adopted the Conclusion which launched the initiative to organize a joint meeting of representatives of all local governments in the basin of the West Morava, representatives of the Government of the Republic of Serbia and the Serbian Public Utility Waterworks company. On April 07 in Kraljevo this joint meeting took place (participated also by PIMO and UNDP) with the objective to adopt appropriate decisions aimed at joint defense against floods, both at local government and national level. Meeting recommendations went into the direction of solving the long-term issues in terms of introduction/strengthening of early warning systems (monitoring, informing), protection and response capacities, investment and urban planning. Conclusively, it was proposed to develop studies to improve the protection against flooding in the basin of the West Morava and the establishment of a regional center water flooding center in this part of Serbia.

Other long-term impacts in terms of transport were also discussed as it is inevitable that the March flooding will potential produce negative economic impact on transit transport since the floods have affected the international road transport too. Besides that, potential transport disruptions could have negative impact on tourism due to transport problems and the vicinity of National park Kopaonik and Golija, Spas (Mataruska, Vrnjačka) and medieval monasteries Studenica and Zica. Furthermore, transport problems could adversely impact provision of health services as the Medical Center in Kraljevo is in fact a regional center and therefore affects neighboring local communities i.e. all municipalities gravitating to Kraljevo Medical Center. All of this is particularly exacerbated in terms of vulnerable groups namely persons with special needs, disabled, elderly, women, children and especially a large number of displaced persons (more than 22000 in the area of Kraljevo). With that concern, prioritization of strategic infrastructural measures is as follows:

Short term strategic measures (6 months)

- Reconstruction of the most critical transport routes (following the prioritization assessment)
- Provisional strengthening of embankments (in cooperation with Waterworks Public Utility Company)
- The construction of alternative routes – adaptation
- Enhanced cooperation with the housing sector (troubleshooting citizens´ problems regarding transportation and meeting their basic needs, health care, water supply etc.)
- Strengthened communication with: local level authorities, public utility companies , schools and health institutions, private entrepreneurs (private sector) and public sector
- Development of needs assessment and action plan (deadlines, responsible persons, financing, etc.)
- Implementation of construction works
- Organization of public forums (awareness raising).

Mid-term strategic measures (6-18 months)

- Rehabilitation and reconstruction of embankments (BBB)
- Implementation of construction works (BBB)
- Expropriation of land
- Preparation of project documentation
- Recovery od landslides
- Implementation of risk assessment
- Cooperation with the national level authorities
- Control of the process and progress of reconstruction
- Enhanced monitoring and maintenance of infrastructure facilities.

Long term strategic measures (18+ months)

- Strengthening public sector
- Construction of new roads (infrastructure development strengthens the region's economic development however in line with environmental aspects)
- Construction of new flood protection facilities (cooperation with water management structures regarding development of new policies and strategies for flood protection and mitigation)
- Multi-sectoral cooperation with respective ministries in terms of education and awareness raising
- Relocation of the road (pending finding of risk assessment)
- Modernization of traffic monitoring (video recording/surveilling critical traffic infrastructure, introduction of GIS system with landslides) and appropriate capacity building.

4.3 HOUSING

4.3.1 RECOVERY NEEDS

Housing rehabilitation/reconstruction is recognised as one of the key steps in closing gaps between emergency relief and sustainable recovery. It is also one of the first steps to reactivate the productive economy. Building the capacity of national and local authorities to promote, supervise and guide planning and construction processes is essential for a successful and sustainable reconstruction process. In Kraljevo, the central government and local municipalities have to be enabled to set up legislative and regulatory frameworks to promote local initiatives and local involvement in planning and construction issues.

The following key aspects should be taken into account:

- policy and regulatory framework and institutional capacity building;
- land and property;
- financing;
- labour and implementation;
- technology and construction practices (including Build Back Better);
- architectural design;
- construction materials;
- building codes and compliance mechanisms and quality assurance;
- risk reduction measures related to settlement or construction;
- others (e.g. gender, vulnerable groups, etc.).

However, due to limited resources (both human and financial) allocated for this exercise, only key issues from the above list will be addressed in this report. An overview of the recovery and reconstructions needs is given in Table 19, with cost estimates wherever possible. The details of short term, mid-term and long term strategic needs for recovery for housing are given below:

Short-term strategic measures (6 months)

- A more detailed investigation and analysis of consequences of the March 2016 floods
- Debris management (completed)
- Interim Shelters (completed)
- Repair of damaged houses (BBB)

Mid-term strategic measures (6-18 months)

- Inventory of illegal houses and support to the legalisation process (underway)
- A detailed flood risk assessment for the housing sector
- Development of a recovery plan with structural improvements in housing sector (BBB)
- Retrofitting of houses (BBB)
- Facilitation support to house owners and users of state property
- Capacity building measures including training of skilled workers, making building documentation available, etc.

Long-term strategic measures (18+ months)

- Implementation of flood/landslide risk mitigation plan for Kraljevo, including DRR measures (e.g. early warning)
- Development of detailed plan for revision of the existing methodologies of assessment of damages and losses, closing the existing gaps between the existing Methodology (1987) and PDNA
- Strengthening of local governments in pre- and post-disaster activities
- Revision of building codes whenever required (BBB)

- Introduction of new or improvement of current quality assurance, technical standards used, and building codes whenever required
- Incorporation of concrete requirements for the housing sector into the planning procedures and plans at both national and municipal levels (Rural and urban landuse plans)

More details and cost estimations are included in the table below.

Table 19: Recovery and reconstruction Cost in Housing Sector in Kraljevo Municipality[17]

RECOVERY and RECONSTRUCTION NEEDS	Estimated Costs RSD (million)
RECOVERY	
Disinfection and pest control of the houses, walls and in area around the houses	6,62
Pumping of water	0,62
Cleaning community and households (sludge, furniture, etc.)	2,8
Assistance Provided by Centre of Social Work to assist in temporary accommodation	0.635
Governance: Training of staff and committees to assess the damage, the revision of rules on the construction, updating methodology	0,50
RECONSTRUCTION	
Repair costs for the damaged houses + auxiliary facilities+ BBB costs (10% of the amount)	786.72
Reconstruction needs for houses with significant damages + use of more resilient and better materials (BBB)	12,64
Risk reduction through the development of low cost early warning systems and alarms	0,3
Purchase of furniture	4,31
Procurement of household appliances	3,95
TOTAL	819,09

[17] Source: PDNA Workshop (Arandjelovac, June 2016) group exercise.

4.4.1 RECOVERY NEEDS

The main activities envisaged for the recovery of the environment and water and sanitation are so that the conditions are restored to pre-disaster conditions and enable the people to return to normalcy. The recovery measures most helpful to affected communities are those that allow victims to return to work, restart production flows, improve access to services, restore governance and reduce risks and vulnerabilities. An overview of the recovery and reconstructions needs is given in Table 20, with cost estimates wherever possible. The details of short term, mid-term and long term strategic needs for recovery are given below:

Table 20: Recovery and Reconstruction Needs for Environment and Water and Sanitation

RECOVERY	Estimated Value (RSD)
Decontamination of water for pollutants	X
Disinfection of water supply	10
Collection and disposal of disaster waste	1.05
Provision of water supply to the affected population	9,37
Disinfection of roads and pavements, bearing walls and green areas	4,63
RECONSTRUCTION	
Stabilization of slopes	55
Repair and Water supply system at Village Sirca + BBB	X
Redrafting of land use plans	0.3
2 additional dumper trucks for solid waste collection	13.5
Investments in improving the waste water management	X
Training, capacity building and community awareness programmes	X
Upgrade of landfill sites using appropriate technologies	X

Source: PDNA workshop table top exercises

Short Term strategic measures (0-6 months)

- Disinfection of roads and pavements, green areas etc. is an urgent requirement after floods to ward off any dangers of epidemics. These will include the collection, transport and environmentally safe disposal of debris and mud generated by the floods and landslides.
- Removal of collected water from the streets is an urgent requirement to restore commuting and people's ease of life.
- Cleaning and disinfection of wells (rural and urban) and unblocking sewers as well as of the water supply network is necessary.
- Provision of drinking water using cisterns/water tanks/tankers trucks and the costs of any other additional water quality analyses are also immediate recovery needs.
- Although, solid waste management facilities were not assessed post floods it is presumed that the collection activities would have been suspended and they need to be restored too for maintaining the hygiene of the area.
- The repair of water supply system at Sirca would be one of the main reconstruction needs.

Mid Term strategic measures (6-18 months)

- Care should be taken to observe any contamination of ground water as well as other sources of water, as an after effect of the floods, so that measures are taken to decontaminate and restore the systems as soon as possible.
- Although there were no reports on forests being destroyed or any impact to the biodiversity and the wildlife in the area, it would still be wise to take additional steps for protection of the biodiversity in the area.
- Reconstruction needs should look to 'Build Back Better' or rather for environment 'Build Back Greener'. Reconstruction needs for environment would involve mainly the stabilization and remediation activities in landslide-affected areas. It would effective to look into the forested areas to see if any reforestation is required.
- The drinking water quality is at risk due to poor infrastructure, therefore more investments are needed to introduce improved standards of design for the water supply systems and monitoring the water quality
- Wastewater facilities at the Municipality need to be upgraded along with better provision of solid waste management practices.

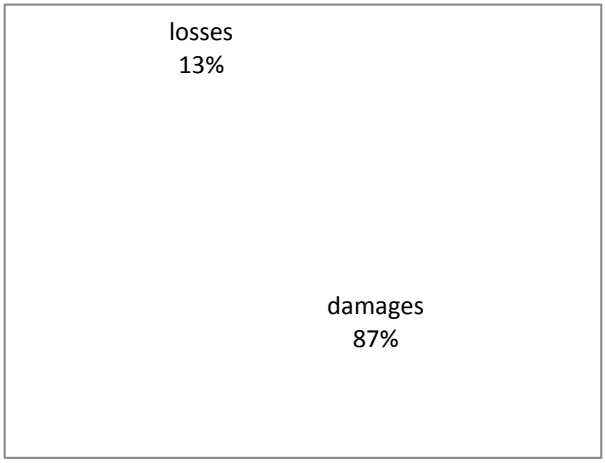
Long term strategic measures (18+ months)

- In the long term, the role of natural flood management and green infrastructure needs to be further strengthened in the area. Nature and resources based management helps for ex. In improving the soil's water storage capacity and conserving water in natural systems, which in turn helps in preventing floods and soil erosion. This ecosystem-based DRR approach is a more efficient and cost effective way of flood management rather than simply focusing on physical infrastructure for combating the effect of floods.
- Looking at the area impacted by floods, it is also important that risk hazard maps are drawn out and land use planning is undertaken. Along with ecosystem based DRR, these measures will improve the environmental conditions in Kraljevo which would enhance the physical and mental well-being of its citizens.
- The Ministry of Environment and Agriculture ministry should encourage and stress the need for integrated pre-development planning as it will reduce risks of damages to the environment by natural disasters.
- Mainstreaming DRR into the Water and Sanitation sector involves the reconstruction and retrofitting of facilities so that they are hazard-resilient. The location, design and construction of these facilities must take all types of hazard risks into account.
- Adopting clear policies on the development of Water and Sanitation facilities, and supported by the training of staff on incorporating DRR into the construction / development of these facilities and coordination at all levels.
- The disposal sites for the debris are often the same as the uncontrolled solid waste management disposal sites. The disposal sites are generally non-engineered (without liners and appropriate cover) which can lead to the uncontrolled disposal and spread of municipal solid waste, including electronic wastes. The reconstruction activities also need to look into building better landfill sites using appropriate technology.
- There should be community awareness building programmes to understand the direct and indirect effects and costs of Water and Sanitation facilities due to disaster. Comprehensive and regular capacity building process of the community and other stakeholders is needed to increase and maintain their ability to face any future disaster.
- All Water and Sanitation services should be gender sensitive and must take into account the needs of both male and female population. Particular focus should also be on the vulnerable population which includes the elderly, children, disabled and the marginalized communities.

5 CONCLUSIONS AND RECOMMENDATIONS

The flood event March 2016 caused damages and losses to many municipalities in Serbia including municipality of Kraljevo. Based on table top assessments of the impact made during the workshop at Arandjelovac, the flood event resulted in total damage and loss of about 1684,34 million RSD, out of which 87 percent represented the destruction of physical assets in the affected areas, and 13 percent represented losses in production and economic flows. Due to strenuous efforts by the national government and the Local municipalities, the impact of the disaster was minimized to a certain extent. There were no casualties reported and timely evacuation of people was carried out according to the emergency plans. The other inferences drawn were:

Chart 7: Damage and Losses in Kraljevo



- Due to limitation of data from the assessment reports, the full picture for damages and losses for the March 2016 floods could not be detailed in this report. Due to lack of data many assumptions needed to be made for estimations of damages and losses. Therefore, this report can be considered only as a template for PDNA report and the data should not be used for any kind of references.

- For a much more extensive PDNA report, there needs to be a comprehensive collection of all the data sets to cover all the gaps and lacunae present in the present available assessment reports, which will require a much more extensive time period.

- The socio-economic impacts of March 2016 disaster are still not very apparent according to the discussions. However, the flood had impact on the livelihoods and social well-being of the people for a short period of time. Another point the report highlights is that the levels of rural poverty are likely to increase in the affected areas, especially for those household involved in agriculture.

- It is clear from the assessment reports that the capacity of the Local Governments to timely conduct Damage and Loss Assessments is limited, both in terms of knowledge (technical and legal), as well as in terms of manpower and funds. As thoroughly discussed at the workshop in Arandjelovac, the entire work of the commissions has to be modernized, both in terms of practices and tools used. For instance, utilization of the modern IT technologies could be a good asset in registering damages occurred and processing/presentation of result of commissions' work. Staff of the commissions are to be trained on regular basis and kept accessible not only within municipalities but also for support to other municipalities

- Coordination and collaboration between the central government and the local municipalities for capacity building of the personnel involved in post disaster assessments is essential for adoption of methodologies in line with PDNA

5.1 RECOMMENDATIONS FOR RECOVERY PLANNING

The Recovery Needs for Municipality of Kraljevo were assessed by the groups on agriculture, Infrastructure, Housing and Environment to come up with short, medium and long term strategic measures required for recovery from the effects of the floods. The municipal as well as the central government will need additional assistance from various international organizations and funding agencies in order to effectively address the

interventions necessary for recovery from the effects of the floods. For Municipality of Kraljevo and Serbia should consider the floods as an opportunity to build back better and address the deficiencies in the system. They should view the recovery and reconstruction program as an integral part of socio-economic development plans and risk assessment should be made an integral part of the development agenda. Socially vulnerable groups should be focussed especially in the development of risk profile.

Municipality of Kraljevo needs to ensure that recovery strategies clearly establish roles and responsibilities for all actors, including mechanisms to hold all stakeholders accountable. It should also use the recovery planning process to align all actors behind its risk reduction agenda. Strengthening the coordination of recovery actors to avoid gaps and increase focus on resilient recovery interventions should be paramount.

The following are the recommendations for the sectors that were undertaken for the table top exercises during the workshop:

Transport sector

Development of City of Kraljevo transport sector should be aligned with the strategic document "City of Kraljevo Development Strategy 2015-2020".[18] In that concern all the transport issues should be reflected in specific goal 2.2. "Traffic infrastructure in the City area enabling good quality connection and high level of safety". That being said, a total of 33 respective projects are proposed for implementation dealing with development of project documentation and reconstruction and/or building of traffic infrastructure. Even though traffic infrastructure is in the very essence of each development strategy and therefore connected to all specific goals, for the purpose of this paper its connection to the specific goal 3.3. "Improving and introducing responsible policies in the area of safety and protection of city and citizens" is reflected in following conclusions/recommendations:

- Development of tailor-made Needs Assessment and action plan dealing with transport sector in the city of Kraljevo. This Needs Assessment/Action Plan should include timelines, responsible persons, financing, etc. and it should also prioritize future project investments and planning.
- As an urgent measure (short-term action) most critical traffic routes should be reconstructed, damaged embankments provisionally strengthened, alternative roads adapted and reconstructed, debris around the bridges cleaned, landslides temporarily secured.
- All the undertaken initiatives should include all the relevant stakeholders i.e. local level authorities, public utility companies, schools and health institutions, non-governmental organizations, private entrepreneurs (private sector), public sector and housing sector (troubleshooting citizens´ problems regarding transportation and meeting their basic needs, health care, water supply etc.)
- Awareness raising actions should be organized tackling the problem of ecological awareness which is the underlying risk leading to flooding (public forums and open discussion concerning the problem of citizens throwing litter in the rivers).
- As a mid-term measure project documentation is to be prepared so that the implementation of construction works could begin. These works should follow the Build Back Better principle in overall rehabilitation, recovery and reconstruction projects namely with embankments, roads and landslides.

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http://www.kraljevo.org/cms/mestoZaUploadFajlove/21012015%20STRATEGIJA%20RAZVOJA%20GRADA%20KRALJEVA.pdf

- The overall reconstruction process is to be closely monitored and traffic infrastructure facilities maintained so that future risks are mitigated (e.g. riverbeds and embankments are to be cleaned from grass, bushes and debris).
- As a precondition for successful implementation of long-term goal cooperation with regional bodies/institutions as well as cooperation with national level authorities is to be enhanced and formalized. This will lead to the strengthening of the public sector and better understanding of disaster risks (e.g. with the better positioning of Civil Protection authorities) and overall multi-sectoral cooperation with respective ministries not only in terms of reconstruction but also in terms of education and awareness raising leading to general capacity building.
- Emphasizing the importance of disaster risk reduction should lead to adequate implementation of risk assessment findings with relocation of the roads, expropriation of land, construction of new traffic infrastructure thus making it less vulnerable to the effects of disasters.
- That being said, new roads and new flood protection facilities are to be constructed (still in line with environmental aspects and flood protection/mitigation strategies) and modern technological solutions introduced (traffic monitoring i.e. video recording/surveillance critical traffic infrastructure, introduction of GIS system with landslides).

Housing Sector

- During recovery and reconstruction, it is recommended to maximize the use of alternative energy sources, more resilient and better materials ("green" materials)
- Drastically increase energy efficiency in the housing sector
- An action plan needs to be put together and implemented on how the current housing conditions could be improved in Kraljevo
- Reduce vulnerability of various social groups with particular focus on the poorest layers of the society, middle-income and young families, expand construction of social housing
- Development and implementation of the City Housing Strategy
- Improve investment climate for funding of required maintenance of housing multi-family houses

Agriculture sector

- Strengthen the capacity of the Ministry of Agriculture and relevant agencies in Kraljevo, to deliver national legislation, policies and strategies on disaster risk reduction, through technical advice, human resources and expertise, training, practical tools and services

- Development of Agricultural support services for agricultural rehabilitation, such as extension services, farming schools, technical expertise, capacity building training, etc.).

- Development of Agricultural Sector-specific national strategies on disaster risk reduction across agriculture, forestry and natural resource management.

- Assessment of the possibilities for improvement of the Agricultural insurance system, enabling coverage of farmers in higher risk areas and development of state support mechanisms which enable improved agricultural insurance coverage

- Development of a state subsidy system which compensates farmers for limited activities in disaster prone areas

Environment and Water supply and Sanitation

- Water supply system in Kraljevo needs upgradation and investments to improve standards of design for the water supply systems and to check and improve the water quality

- Mainstreaming DRR into the Water and Sanitation sector is needed and will involve the reconstruction and retrofitting of facilities so that they are hazard-resilient.
- The water supply network needs to be extended to rural areas in Kraljevo and regularised so that people are not dependent on alternative sources of water supply
- There should be community awareness building programmes to understand the direct and indirect effects and costs of Water and Sanitation facilities due to disaster. Comprehensive and regular capacity building process of the community and other stakeholders is needed to increase and maintain their ability to face any future disaster.
- The role of natural flood management and green infrastructure needs to be further strengthened in the area for a cost effective solution to flood management. Ecosystem based DRR, reforestation, biodiversity protection etc. would help in harnessing nature's capacity to absorb or control disaster impacts in urban and rural areas.
- In the long run, the role of the Ministry of Environment and Agriculture along with Municipality of Kraljevo needs to be more proactive and encourage and stress the need for integrated pre-development planning as well as land use planning as it will reduce risks of damages to the environment by natural disasters. The hazard and risk assessments of Kraljevo should integrate mitigation strategies and embed the concept of building back greener.
- In order to improve future post-disaster assessments, it is recommended that a mechanism is put in place to monitor environmental degradation. This will help to create a baseline which will inform any environmental impact assessments undertaken. In turn this will enable the value of damage and loss to the environment to be taken into consideration and consolidated with sectoral damages and loss assessments undertaken by local municipal authorities and the national government in future.

Most importantly, Municipality of Kraljevo with support from the National Government, needs to build its resilience, upgrade its DRM agenda to not only focus on traditional risk mitigation through structural engineering measures, such as floods protection systems but also take into account, non-structural measures such as risk-informed spatial planning, enhanced weather forecasting and early warning, ecosystem based DRR and disaster risk financing and insurance solutions. Risk mitigation measures, and DRR as a whole, need to be further mainstreamed into the ordinary life of people and governance systems.

Disaster risk financing is another strategy that will help the Government, businesses, and people access financial protection and risk transfer solutions, such as insurance. Also helpful would be establishing national disaster funds to ensure fast disbursement and execution of financial resources to the municipalities, in the aftermath of a disaster. These financial resources will also help in conducting efficient and transparent post-disaster damages assessments.

After an extensive review, the present 1987 Post Disaster Assessment Methodology was found to be very comprehensive but it needs to be updated in accordance to the present times, incorporating the use of available modern technologies, in line with the PDNA methodology. Therefore, Municipality of Kraljevo would benefit from adopting Post Disaster Damages and Needs Assessments (PDNAs) and Recovery Frameworks (RFs) to guide the recovery process. The Serbian Government is already taking steps towards integrating the PDNA methodology in line with the provisions of the draft National Action Plan to implement the National Disaster Management Programme, Component Six (6.1.1.). The adoption and integration the PDNA methodology into national and local governance systems will further enable the national and local self-governments to develop and implement recovery plans more comprehensively in the future.

ANNEXES

ANNEX 1. THE NUMBER OF HOUSEHOLDS AND PERSONS AFFECTED BY FLOODS IN LOCAL COMMUNITIES

Local community	No. of households	No. of affected population
Šumarice	5	20
Sirča	15	100
Oplanići	3	20
Ribnica	1	100
Adrani	15	100
Mrsać	3	20
Žiča	2	20
Zelengora	20	50
Grdica	150	1000
Miločaj	3	30
Vitanovac	2	50
Progorelica	5	15
Obrva	10	100
Konarevo	40	100
Babsko Polje	2	10
Total	**276**	**1735**

ANNEX 2. ORGANISATIONS INVOLVED IN RELIEF AND RESCUE

#	NAME OF ENTITIES WITHIN THE PROTECTION AND RESCUE SYSTEM	Engagement of entities within the protection and rescue system in the period from March 7, 2016, till March 15, 2016		
		Manpower engaged	Machinery engaged	Resources engaged
1	Centre for Social Work of Kraljevo	6		2 official vehicles
2	Red Cross of Kraljevo	32		2 vehicles and 2 terrain vehicles
3	Health Centre of Kraljevo	4		1 sanitary vehicle with all equipment
4	PUC "Čistoća" Kraljevo	21	Combined machine excavator and loader, tip truck, two tanks, tractor with trailer, mini-combined machine	
5	PUC "Putevi" Kraljevo	24	FAP 1921 KV019XO, FAP 1921 KB0011IC, FAP 1921 KV031FD, FAP 1921 KV043MČ, FAP 1921 KB010SW, FAP 1414 KV028FV, FAP 3035 KV056OY, FAP 3035 KV056OY KV054IJ, Dredge CAT 315D, Dredge BGH 610, Backhoe loader 4 SH, skip SO 1059, Loader L800, ULT 160 C,	94.50 m3 of sand, 3m od pipes F400mm, 7m3 of ravel R10
6	PUC "Vodovod" Kraljevo	50	Tunk TAM 190 KV-021-ŽE, truck TAM 80 KV- 002- ŽĐ, Truck TAM 80 KV-029-FJ, Truck TAM 80KV- 043-LE tipper with trailer, JCB 80.20. (on trailer), Zastava 101 KV-024-CZ, Jyro 55 KV-024-CŽ , Zastava 101 pick-up KV-039-UE	
7	Emergency Management Sector – Department for emergency situations in Kraljevo	45	11 vehicles	3 pumps and 6 boats
8	Department for Defence and Emergency Situation and Engineering and Geological Affairs, the Administration of the Town of Kraljevo	5		1 official vehicle
9	Communal Police Division of the Town Administration of Kraljevo	23		2 official vehicles
10	Police Administration of the Town of Kraljevo	20		10 official vehicles
11	Veterinary Specialist Institute in Kraljevo	2		1 motor vehicles
12	Institute for Public Health in Kraljevo	20		4 vehicles, equipment for drinking water testing

#	NAME OF ENTITIES WITHIN THE PROTECTION AND RESCUE SYSTEM	Engagement of entities within the protection and rescue system in the period from March 7, 2016, till March 15, 2016		
		Manpower engaged	Machinery engaged	Resources engaged
13	Army of the Republic of Serbia	50		
14	Gendarmerie Division in Kraljevo	150		

ANNEX 3. IMPACT OF FLOODS

Cause	Damage	Affected economic and social life	Halt duration – time interval
Flood	LC Grdnica – residential and business facility, local infrastructure	Affected business activities of companies and population	5 days
Flood	LC Adrani – residential and business facility, local infrastructure	Affected business activities of companies and population	5 days
Flood	LC Sirča – residential, economic and business facilities and local infrastructure	Affected business activities of a large number of companies and population	5 days
Flood	LC Oplanići – residential facilitates (1 residential facility was flooded) and local infrastructure	Affected work and life of the local population	5 days
Flood	LC Šumaruce – residential facilitates and agriculture	Affected work and life of the local population	5 days
Flood	LC Ratina – agricultural areas and economic facilitates	Affected work and life of the local population	5 days
Flood	LC Vrba – agricultural areas	Affected work and life of the local population	5 days
Flood	LC Čujkovac – agricultural areas	Affected work and life of the local population	5 days
Flood	LC Stubal – agricultural areas	Affected work and life of the local population	5 days
Flood	LC Babsko Polje – agricultural areas and economic facilitites	Affected work and life of the local population	5 days
Flood	LC Mrsać – agricultural areas	Discontinuance in agricultural activities	5 days
Flood	LC Miločaj – agricultural areas and economic facilitates	Discontinuance in agricultural activities	5 days
Flood - erosion	Bridge over the Musina River	No companies, affected life of the population	1 day
Flood - erosion	Bridge over the Druska River– Drlupa – Milakovac	No companies, affected life of the population	Still in discontinuation (in accordance with the Decision of the Traffic Inspection)
Landslide	Road to Poumir (Cerje)	No companies, affected life of the population	Still in discontinuation
Landslide	Road in Bogutovac (old road towards Kršin)	No companies, affected life of the population	Still in discontinuation

Cause	Damage	Affected economic and social life	Halt duration – time interval
Flood	Road Grdica - Oplanić	No companies, affected life of the population	5 days
Flood	Water-management system in Sirča	No companies, affected life of the population	Still in discontinuation
Flood	Embankment on the Gruža River are damaged	Agricultural areas	Still at risk
Landslide	LC Milakovac - Family residential facility of Milica Pavlović	Residential facility	Still at risk
Landslide	LC Bare- Residential facilitates of Predrag Bojanić and Radoljub Bojanić	Residential facilitates	Still at risk
Landslide	LC Bare - Residential facility of Dejan nadrić	Residential facility	Still at risk
Landslide	Road Bare-Plana	No companies, affected life of the population	2 days
Landslide	LC Roćevići – facilities of the household of Lazar Đurašević	Affected agricultural activities	High level of risks
Landslide	LC Centar – residential facilitates of Avdi Beriša and Zvonko Sinidoli	Residential facilitates	High level of risks
Landslide	LC Centar – residential facility of Beriša Skender	Residential facilitates	High level of risks