



Hon. Dr Mahendra Reddy

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(Ministerial Statement: Flooding, Catchment Management and Global Commitment)

Honourable Speaker

Honourable Prime Minister

Honourable Leader of Opposition

Honourable Members of Parliament

Madam Speaker, Flooding, or waterlogging of low lying areas and overflowing of rivers and creeks is generally associated with excessive rainfall induced runoff which are beyond conveyance capacity of our rivers and drains. In Fiji, as indicated in my last Ministerial statement the high intensity rainfall coupled with catchment activities and physical characteristics of our catchments (slopes) contribute to the damaging floods.

Madam Speaker, please allow me to elaborate on the causes of flooding in Fiji.

Flooding in Fiji is intrinsically related to our catchments and how we manage our catchments. **Madam Speaker**, the longitudinal profile of most our catchments indicate upper catchment slopes that are very steep in nature, followed by a rapid transition to the mature channel and flood plain slopes to the ocean. Moreover these catchments are broadly characterized by:

- High flow variability due to rainfall patterns,
- Topography and short, relatively steep catchments.
- Relatively rapid base-flow recession and low minimum flows due to catchment topography and geology.
- High extreme flows occurring relatively frequently followed by high intensity rainfall, although for limited duration.

With steep slopes in our catchment, the potential for runoff after rainfall is greatly increased. Runoff refers to the rate and quantity of water that runs off the land into the channel network. Runoff in our catchment is a function of local catchment slope, lithology, land cover and land tenure/cultivation practices. **Madam Speaker**, while we do not have control over the slope and lithology of our catchments, we certainly have control over the land cover and cultivation practices and that is where we can start.

Furthermore, **Madam Speaker**, most of our catchments are dominated by steep, mountainous topography with deeply incised streams. Approximately, 40 - 50 % of the major catchment in Fiji have steep land with slopes greater than 18° while much of the remaining catchment area is rolling and hilly land with slopes ranging from 3- 18°. Thus following major rainfall much of water flows into flood plains as the surface runoff. **Madam Speaker**, the flowing water has high velocity and often carries debris which causes much damage. The steep slope also presents the problem of high erosivity of the soil, hence there is high nutrient load and siltation in our rivers.

Madam Speaker, rivers play an important role in human history. The economy of a nation depends on its rivers and great rivers like Nile, Euphrates, Rhine, Danube and Ganges are great examples how rivers sustain life and national economies. Moreover, rivers play an active part in regulating surface water flow and drainage channels. **Madam Speaker**, most of our rivers often flows peacefully, but during wet season it turns into a raging torrent that spares no one, it confronts the politicians, water experts and local residents often with major social and economic challenges.

Madam Speaker, I'd like to quote a few lines by Goethe, (1749 – 1832) the German Scientist and Novelist, I quote "*The water is a friendly element for those who know it and know how to handle it*" unquote. Goethe wrote these words two centuries ago, it is valid today and represents an eternal truth. I would like to reiterate this to my able colleague **Hon. Prem Singh**, who at my last Ministerial statement on surface water assessment thought otherwise. This therefore demonstrates that if we are to mitigate any water related disaster it becomes essential that we develop knowledge understand the basics of hydrology and water management.

As such **Madam Speaker**, we are working closely with the Ministry of Education, Heritage and Arts to develop curriculum that encompasses the holistic watershed education to be taught in year 10 -12 from next year. **Madam Speaker**, flood is one of the water related disaster that affects us more often here in Fiji. The frequency of these flood events seem to have increased in last decade. To mitigate the impacts of flood we have to understand the flood process and floodplain dynamics.

Madam Speaker, the flooding system includes;

1. the physical process of flooding,
2. the inhabitants of floodplains, their infrastructures and ecosystems, and
3. the people and organizations in the public and private sector that influence or are subject to flooding and its impacts.

Flooding systems are continuously changing because of natural and socioeconomic processes, as well as activities that are intended to reduce flood risk. **Madam Speaker**, we have records of floods from 1840¹, till the most recent Easter weekend floods, yet we do not have flood risk management policy. It time now we think critically about it and the Ministry of Waterways has identified actions to undertake such activities to reduce our risks to floods. I guess most of us would be wondering why do we need Flood risk management policy or flood management policy, let me elaborate.

Madam Speaker, Flood risk management is the process of;

1. data and information gathering,
2. risk assessment,
3. appraisal of options, and making, implementing, and
4. Reviewing decisions to reduce, control, accept, or redistribute risks of flooding.

¹ Flooding in the Fiji Islands between 1840 and 2009 – Risk Frontiers

Integrated flood risk management explicitly recognizes the interrelationships between all risk management measures, and their analysis, costs, and effectiveness, within changing social, economic, and environmental contexts. It can be helped by improving access to data and models, sharing and communicating risk analyses, involving a wider range of stakeholders, and coordinating risk management actions.

Madam Speaker, studies² of past floods in Fiji has indicates that the causes of flooding are wide and varied. This includes human induced changes in the catchment that increases rainfall-runoff as well as climate change and climate variability. Some of the recommendations from such studies are;

- i. Investing in improving the health of natural ecosystem for flood mitigation through integrated river catchment management, including sustainable management of upstream forestry, good farm husbandry, and management remnant natural freshwater wetlands.
- ii. Increase investment in the maintenance of physical infrastructures including drainage canals, drains and infield farm drains to reduce probability of flooding.

² Economic Costs of the 2009 Floods in the Fiji Sugar Belt and Policy Implications

- iii. Integrate disaster risk reduction considerations in all development initiatives, including:
 - a. Integrate disaster risk in national development planning processes at national, provincial, district, and village/settlement levels
 - b. hazard and risk assessments: Revise development approval processes and guidelines to require hazard and risk assessments of development initiatives, particularly in hazard-prone areas
 - c. Develop and enforce proper land-use planning and development of a flood mitigation strategy

Madam Speaker, these are the regulatory instruments in our scope and with which we can reduce the impacts of these floods. As indicated earlier, **Madam Speaker**, water management cannot be done in isolation therefore the Ministry of Waterways will work with other relevant agencies to achieve its mandate and increasing the adaptive capacity of our nations to floods.

Madam Speaker, the Ministry of Waterways has mapped out a plan to address this through an integrated approach. This includes;

- i. Assessing and delineating our catchments. We at this stage do not have comprehensive maps of our catchments, and hence we do not know the physical characteristics of our catchments. **Madam Speaker**, it is very important we delineate our catchments and sub-catchments and carry out water balance in the catchments. In doing so, we will understand how water behaves in our catchments and further our understanding of sub-catchments that provide greatest flow in river system post rainfall events.
- ii. Assessing and establishing rainfall trends in our catchments. **Madam Speaker**, this will allow us to further understand the rainfall in catchments and delineate trends in rainfall, and ascertain whether increasing or decreasing trend is. For any trends identified we need to compute the change point at relevant statistical significance level and identify drivers for such change point. While some study has been carried on this, there is a need to carry out such analysis for most of rainfall stations.
- iii. Using water governance paradigm and formulating appropriate policies and frameworks in place that provide the enabling environment to implement catchment management and flood mitigation initiatives.
- iv. Technical assessment and hydrodynamic modelling of our waterways. **Madam speaker**, often such expertise are not available locally and can be procured as form of consultancy and/or technical assistance from other nations who have technical capacity to carry out such assessment. An

example for such is the JICA funded, **Project for the Planning of the Nadi River Flood Control and Structures.**

- v. Building of retention dams in the upper parts of the catchment to allow for the control flow of water downstream following the rainfall. **Madam Speaker**, the site investigation has completed, key sites identified and scope of work has already been developed and we are now looking into engaging contractors for construction for such dams.

Furthermore, **Madam Speaker**, the Ministry taking a pro-active approach rather than being reactive to this events. These divided into three stages;

- i. anticipation of the next possible flooding event,
- ii. the actuality of the event, and
- iii. The aftermath.

Madam Speaker, these are as follows;

- i. **Planning.** Before an event threatens, the Ministry ensures that conveyance systems are ready to convey water. This includes maintenance of existing drains and drainage infrastructure, identify areas for new drains and dredging and other activities.

- ii. **Detection.** An ongoing flood information-gathering system is required, to provide warning of when and where an event will take place and also to monitor prevention and mitigation systems. This calls for early warning system and while the early warning systems has been in place for some of our rivers (atleast 3), we need to extend this to other river systems.
- iii. **Post flood assessment.** After the event has passed, it is important to assess the magnitude of the flood event in terms of establishing the flood heights, establish maximum discharge in the rivers and preparing flood inundation maps.

Madam Speaker, From 1970 to 2000, 40 tropical cyclones passed through Fiji waters³. Individual cyclones deliver varying precipitation patterns according to the strength and longevity of the storms, the proximity of their tracks to land and the organization of the cloud bands. However, high magnitude rainfalls normally produce big flows in Fiji's rivers and large overbank floods are a frequent problem because the upper sections of river basins have rugged volcanic topography promoting a high degree of hydrological short-circuiting.

³ (Kostaschuk et al.,2001),

Madam Speaker, analysis of historical rainfall records at two Fijian meteorological stations with long term high quality records, Nadi Airport and Laucala Bay (Suva), demonstrates decadal variability and substantial interannual rainfall variability related to the El Nino Southern Oscillation (ENSO) phases.

Madam Speaker, A brief examination of the rainfall record Easter floods reveals that the total rainfall from 28th March to 1st April at Nadi Airport, Lautoka, and Penang Mill were 298, 313 and 315 mm, with highest 1 hour rainfall of 81 mm recorded at Lautoka at 7 am on 1st of April, the day of the flood. **Madam Speaker**, these are enormous 24 hr and 5-day rainfall. These rainfalls bear great resemblance to January 2009 and the March 2012 events and as such had similar devastating floods. In each of the flood identified above, the areas involved were subjected to record rainfall over short period of time that overwhelmed the conveyance systems that had been designed to cope with these events.

Madam Speaker, as such we now have to re-look at our drainage design. It is evident that our drainage designs are not able to cope up with these amounts of rainfall, moreover the tidal effects also exacerbates the ability of drains to discharge water. The Ministry will pursue this and identify drainage designs that are able to discharge these water efficiently during extreme events. Moreover, **Madam Speaker**, these events highlight the high chances of extreme flooding

when high intensity rainfall events coincide with saturated ground conditions, especially in short, steep river catchments. As such to mitigate these high runoff from the sub-catchments, the Ministry has started constructing retarding basins that would allow for control discharge of water during high intensity rainfall events. Some of these measures have been highlighted as priority projects under the JICA master plan.

Madam Speaker, based on post flood observations and anecdotal evidence of the Easter floods in Ba Catchment, it seems that the rainfall over 31st March and 1st April was very heavy and very intense (especially 1st April). Intense rainfall resulted in a rapid “flash” event with high discharges experienced, especially in the upper reaches of the Ba Catchment. Moreover, post flood assessment further indicates that the strength of the flow and the rate at which the water rose was greater than either 2009 or 2012 events in the upper parts of the catchments⁴. However, flood heights assessed in the lower parts of the catchments indicate flood heights lower than 2009 or 2012 events.

Madam Speaker, the most plausible explanation for such observation is catchment characteristics, its modification and impacts on propagating runoff

⁴ SPC Post Flood Assessment Prelim Findings.

during such events. As indicated earlier, runoff at very basic is a function of rainfall, catchment surface, catchment slope and infiltration capacity and if we are able to influence either of these we can mitigate runoff from our catchments.

Madam Speaker, although river water makes up only about 0.2 percent of all the fresh water on Earth, it plays a very important role. River health is impacted by human activity, land use in the catchment and direct management in the channel. A healthy river is essential to the economic, social, cultural and environmental wellbeing of all Fijians.

Madam Speaker, while there is a need to modify our catchments and waterways to support essential agricultural, economic and social activity, it is also imperative to balance these needs with maintaining a healthy environment. As such it requires a sustained combination of technology, legal and institutional frameworks, and, where feasible, market-based approaches and capacity building to address this.

Madam Speaker, in addition to capacity building, the challenge is not only to develop new approaches, but also to facilitate the practical, timely and cost-effective implementation of existing international and other agreements, policies and targets, which can provide a basis for cooperation to seek funding

opportunities to further our work to better manage our water resources. **Madam Speaker**, this therefore indicates we need to update our legislations and introduce policies that provide institutional support for such activities.

Madam Speaker, we need to invent a healthy catchments program to help improve Fijian river health. Furthermore, we need to assess the main source of sediment entering waterways (identify the hotspots) and mitigating erosion via usage of soft and hard measures. Including community led afforestation programs. Planting native trees and use of vertiver systems can help stabilize riparian zones, lead to a reduction in the amount of sediment entering our rivers. Moreover, **Madam Speaker**, to improve the health of local creeks and our rivers, we need to invest significant time and resources into the sustainable catchment management programs to help build resilient waterways, ensuring they can withstand extreme weather events.

Madam Speaker, apart from flooding some other issues that we currently face due to our ignorance of catchment is deteriorating water quality. Changes in water quality are primarily the result of human activities on land that generate water pollutants, or that alter water availability. Increasing evidence suggest that global climate change can change precipitation patterns, affect human activities on land and the associated water run-off can cause or contribute to degraded water quality.

Madam Speaker, often the highest water quality is typically found upstream and in the open oceans, while the most degraded is found downstream and in estuarine and coastal areas. Human health is the most important issue related to water quality and pollutants of primary concern include microbial contaminants and excessive nutrient loads.

Madam Speaker, the algal bloom at the Vaturu dam last year is just an example of this. The inconvenience caused to general public and cost associated with water carting, repairs of the filters at treatment Nagado treatment and increasing cost of treating water far outweigh the financial cost of managing the catchments. **Madam Speaker**, for those using water from river or boreholes for potable purposes the risks are higher now than ever before. The most ubiquitous freshwater quality problem is high concentrations of nutrients (mainly phosphorus and nitrogen) resulting in eutrophication, and significantly affecting human water use. Increasing phosphorus and nitrogen loads to surface- and groundwater come from agricultural run-off, and domestic sewage and are often detrimental to health.

Therefore to entice our communities to take care of the catchment we need incentives, and one such incentive is watershed markets. **Madam Speaker**, Watershed markets are a mechanism, typically involving payments for ecosystem services, such as water quality. This mechanism can take the form of upstream conservation and restoration actions. This means providing incentives to upstream resource owners to implement conservation practices, re-vegetate land and protect critical source areas, all of which reduce the downstream sediment loads. While this is new to Fiji, this could be explored further.

Any intervention to further catchment management should align with IWRM pillars: the enabling environment, institutional roles and management instruments. **Madam Speaker**, in 2002, the Johannesburg Plan of Implementation (adopted at the World Summit on Sustainable Development) recommended that all countries “*develop integrated water resource management and water efficiency plans by 2005.*” This was to include identifying actions needed to reform policies, legislation and financing networks, institutional roles and functions, and enhancing relevant management instruments to address water resource issues. While Fiji developed this policy, it is still draft and requires more work and this where we need to direct our policy efforts.

Moreover **Madam Speaker**, establishment of routine data collections for waterways and catchment management (hydrology and flood inundation data) by fully integrating monitoring and evaluation undertakings is essential for the Ministry to help mitigate future water related disaster. As such **Madam Speaker**, a dedicated assessment team would be established at the Ministry in future.

Madam Speaker, the changes we are aiming for will not happen overnight...this is a long term journey to manage our catchments and waterways.

How our activities tie / links to Global Goals

Madam Speaker, in 2015 and 2016, the world agreed on a complex set of global goals in the Paris Climate Agreement (2015), the Sustainable Development Goals (2015), the Sendai Framework for Disaster Risk Reduction(2015) and the New Urban Agenda (2016). **Madam Speaker**, Water is linked to these global commitments in many ways. In the Paris Climate Agreement 2015, major climate adaptation challenges include water security issues with respect to increases in water scarcity, drought and flood risk.

Madam Speaker, with its link to human health and well-being, clean water and sanitation, food production, sustainable cities and communities, and the quality of ecosystems, water is directly and indirectly also linked to many of the Sustainable

Development Goals (SDGs). Furthermore, improving the protection against water-related disasters is also covered under the Sendai Framework for Disaster Risk Reduction. The New Urban Agenda specifically concerns the sustainable development of cities and encompasses the water-related goals that are also part of the SDGs and the Sendai Framework. **Madam Speaker**, as such I stand before my fellow colleagues and urge them help us spread the gospel of water for our sustainable future and help Fiji achieve its global commitments.

Conclusion

Madam Speaker, the rainfall severity and variability has increased considerably in last two decades, and as such the volume of water in the rivers and creeks were beyond their discharge capacity. **Madam Speaker**, the nature and duration of flooding of the low lying areas in the lower parts of the catchments is a product of the changes in the regulatory services provided by the landscape due to increased agricultural developments, particularly on the steep lands and mangrove reclaimed lowlands. **Madam Speaker**, the severity of these floods could have been avoided had we collectively taken care of our catchments and practiced sustainable tillage and sustainable land use activities.

Madam Speaker, projections of future climate change in the Pacific also mean that surface and groundwater supplies could be affected by variations in rainfall, higher surface temperatures (leading to an increase in evapotranspiration) and sea level rise⁵. At the same time, there are competing activities in watersheds. Water is needed for a wide range of sectors: urban and rural water supplies, commercial forestry, industry, tourism developments and subsistence agriculture. All these activities combine to present many problems to good water governance at different scales.

Madam Speaker, I have indicated earlier that the water management in Fiji is fragmented and we are trying to consolidated water management activities. Therefore I would request all stakeholders to work together to further our will to manage our water resources. It is the time to consolidate our efforts, expertise and funds to promote water management activities. **Madam Speaker**, I therefore request all to assist us spread the importance of respecting and taking care of our catchments, as the citizens of this country it is our civic responsibility to take care of our catchments and associated hydrological conveyance systems and I urge all to do so.

⁵ Bettencourt et al. 2002

Madam Speaker, Thank you for giving me the opportunity to speak.

Vinaka Vakalevu, Thank you and Dhanyavaad.