

The El Niño event of 2015/16 in Sri Lanka - Predictions, Preparedness, Communication and Impacts

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Historical El Niño Impacts in Sri Lanka

El Niño has significant impacts on Sri Lanka's rainfall, temperature, wind and associated climatic features. There have been many studies over the last two decades to establish clear impacts on the climate by various authors (e.g Rasmusson & Carpenter (1983); Ropelewski & Halpert (1987); Fernando et al. (1995); Suppiah R. (1996); Sumathipala and Punyadeva (1998), Kane (1998); Punyawardena & Cherry (1999); Malmgren et al. (2003); Zubair et al. (2008), Adhikari et al., (2010); Yahiya et al., 2010, Punyawardena et al., 2010, Hapuarachchi & Jayawardena, Weerasinghe, K A & Jayawardena (2016), Jayakody (2016)). There are discernible and documented impacts on Sri Lanka's water resources, natural hazards, agriculture, health and coral reefs. Among them floods, droughts, landslides, cyclones, storm surges and coastal inundation are more common (Zubair, 2004a). Water borne diseases and those that are affected by water availability for transmission such as malaria and dengue are concerns.

Identifying El Niño influences within Sri Lanka is not straightforward as they vary, from event to event, by region, by decade, and season. In particular, the El Niño influences on rainfall changes by season with more rainfall in May, and October to December and less in June to August, and January to April (see figure 1). The temperature remains warmer during all seasons during an El Niño event (see graph figure 2). El Niño influences are considerably modulated by Madden Julian Oscillation, Indian Ocean Dipole and warming Indian Ocean conditions. There have been recent major droughts and floods which did not coincide with El Niño.

All of this makes the communication of El Niño information challenging. What is needed is a communication of nuance; informed and careful interpreters and continuous updates based on monitored conditions and updated predictions. In spite of these challenges, if one looks at past history, there is considerable information in an El Niño which should be communicated. For example: there is a higher chance of bad droughts and floods occurring due to El Niño depending on the rainfall in May. Rainfall in May is highly variable and this can ameliorate the dry conditions that have built up or to a 9-month dry spell until August. Land and sea temperatures can be predicted with high confidence during El Niño.

Indeed, during the 2015/2016 event the rainfall behaved very much as expected (figure 1) and the temperature was warmer as expected but much more than in the past (figure 2).

National Preparedness

Sri Lanka is emerging from three decades of conflicts. This affects the resources allocated to infrastructure and networks, community trust in government, and the regulation of private construction, all of which affects societal and environmental vulnerability. Population rise from 10 million (1960) to 20 million (2014) has also pushed more and more people into vulnerable locations which are prone to flood, landslide or coastal inundation.

National preparedness for El Niño is within the umbrella of the Ministries in charge of Disaster Management, Water Resources, Science and Technology and Agriculture. These Ministries do not coordinate action related to El Niño although the Departments under them may share the information. There are no dedicated funds for El Niño preparedness from national resources. The Disaster Management Agency, the Department of Agriculture and the Department of Meteorology have ongoing funding to deal with climate variability. There has not been a coordinated response to El Niño since the abortive attempt in 1997 led by the Ministry of Science and Technology. The recent event was no different.

The Department of Meteorology is in charge of climate predictions in Sri Lanka and communicating authoritative information, but progress has been slow in adopting prediction methods (Zubair, 2002, 2004b) until the recent decade. Motivated individuals in other Departments also pay attention to El Niño events and to climate variability in general. During the 2002 event communication about the El Niño and likely impacts were provided by the Department of Agriculture to their field officers.

El Niño Impact Predictions for Sri Lanka

The Department of Meteorology relies on Global Forecast Centers (WMO, ECMWF, IRI and others) for El Niño predictions; and its officers participate in the South Asia Climate Outlook Forum (SASCOF) which has been active recently. The SASCOF of April 2014 predicted a dry tendency for the Southwest (summer) monsoon over Sri Lanka. In April 2015, The SASCOF of 2015 predicted a drier tendency for most of Sri Lanka except in the Northern region, which had a near-normal tendency. The SASCOF held in October 2015 predicted wetter conditions for October and November, and normal conditions thereafter.

The global prediction centers are not that skilled in predicting the climate in the Indian Ocean rim particularly in regions that have both wet and dry seasons. Thus the climate models from Global Forecast Centers do not represent the dynamics in the Indian Ocean too well. The Indian Ocean is particularly consequential for Sri Lanka.

The Department of Meteorology does provide month-ahead predictions which however are not disseminated widely. The Foundation for Environment, Climate and Technology (FECT) provides seasonal statements to water managers, and via social media (fectsl.blogspot.com, @fectlk, and [facebook.com/fectsl](https://www.facebook.com/fectsl)). Both of these are limited efforts.

In general, apart from newspaper reports, no preparatory actions have been reported since the communication failures for the 1997-98 El Niño. The reports in the Sinhala and Tamil media are even less than in the English media although it is through these languages that the majority communicate. The official communications and warnings from the Department of Meteorology remain in Sinhala and English with little in Tamil.

Climate during the El Niño event

Overall in Sri Lanka, the rainfall for 2015/2016 followed that of historical norms with increased rainfall in May, and October to December and decreased in other months, and increased temperature in all months. There was flooding in 2014. The rice cultivation was not affected in the 2015 *Yala* season (April to September) because of the high rainfall in May 2015. (Figure 1).

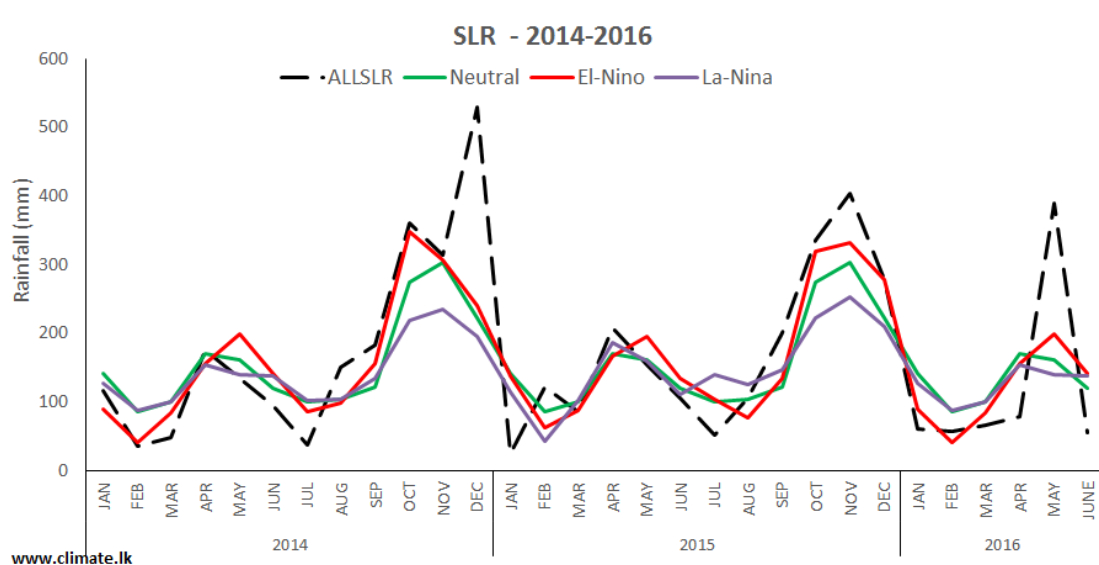


Figure 1: This analysis is based on results presented in Adhikari et al (2010) and Zubair et al., (2008). All Sri Lanka rainfall (SLR) has been constructed using the average from 15 well distributed rainfall stations. The average monthly rainfall climatology for Sri Lanka during El Niño (red line), Neutral (green) and La Niña (blue) is shown along with SLR (dashed black line) from Jan 2014 to June 2016 for comparison. The El Niño episode appeared briefly in mid-2014 and subsided later on. A fresh El Niño event started in May 2015. (Image source: FECT).

The strongest climate impact from El Niño in Sri Lanka was due to rising temperatures. Sri Lanka was much warmer during the 2015/16 El Niño than what is usually observed during an El Niño. (Figure 2). The rise in Indian Ocean sea temperatures was responsible.

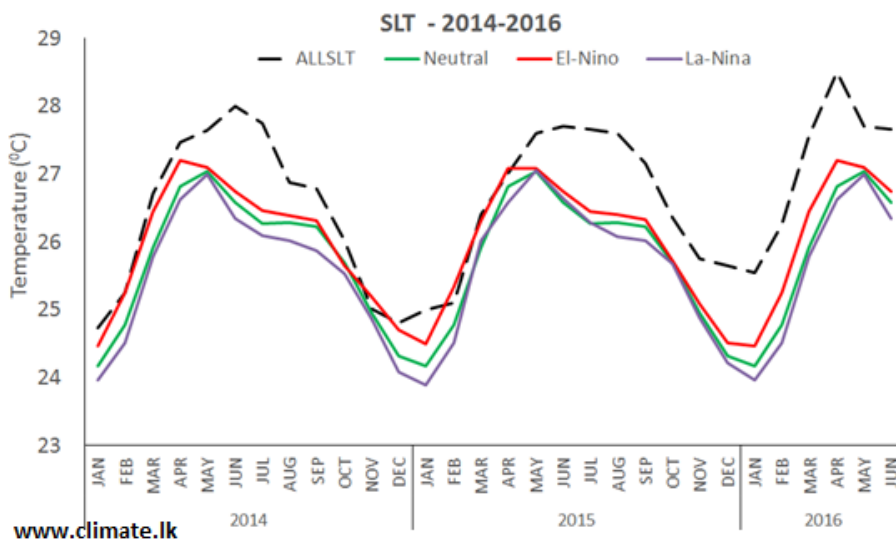


Figure 2: This analysis is based on results presented in Zubair et al. (2016, in draft). All Sri Lanka temperature (SLT) has been constructed using the average from 15 well distributed temperature stations. The average monthly temperature climatology for Sri Lanka during El Niño (red line), Neutral (green) and La Niña (blue) is shown along with SLT (dashed black line) from Jan 2014 to June 2016 for comparison. (Image source: FECT).

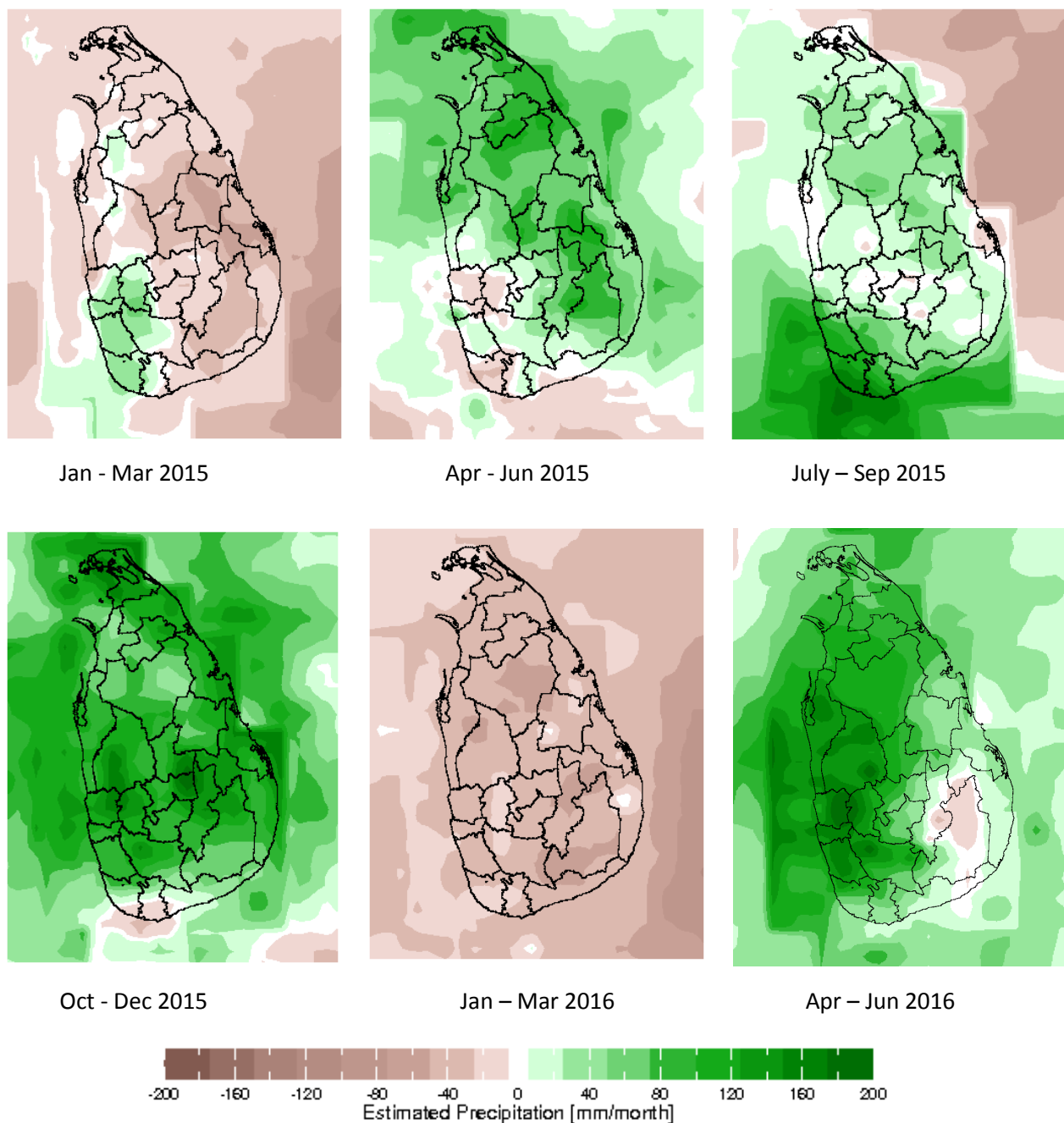


Figure 3: Quarterly seasonal precipitation anomalies for Sri Lanka for 2015 to Mid-2016. Top Row - Rainfall departures from historical averages (anomalies) for January-March (late Maha), April-June (early Yala), July-September (late Yala) for 2015. Bottom Row - October-December 2015 (early Maha), and January-March (late Maha), April-June (early Yala) for 2016. The historical average rainfall was calculated for January 2001-2016. (Image source: FECT).

There is much regional and seasonal variation in El Niño influences as seen in the above maps. Some of these conditions are as expected (from the historical averages) and could have been anticipated – but not all. There are events such as the cyclonic events of May 2016 that overwhelm the modest departures expected due to El Niño alone.

Communication via the Mass-Media

As Sri Lanka has been buffeted by a major drought in 2013/2014 and there was quite a keen sense of awareness regards climate anomalies during the 2015/2016 El Niño; thus there was great interest in the media. This led to a hunger for climate related articles from news outlets as much as the El Niño event.

Due to past failures in predicting impacts and in communicating them in Sri Lanka effectively, concerns over levels of uncertainty holds back robust communication and action based on El Niño predictions. For example, during the 1997-98 El Niño, drought was predicted and communicated in Sri Lanka without any nuance about seasons. This resulted in the wrong mitigation steps such as growing chilies and not harvesting tea - in the ensuing wetter than normal conditions in October to December 1997, there were massive losses in agriculture due to poor communication.

There were occasional reports on the El Niño for Sri Lanka in the media starting in 2014 which reported incidentally on the statements of the officials from the Department of Meteorology during their media briefings but not substantive communication of El Niño impacts for Sri Lanka.

Given the reticence amongst scientists to communicate the complex nature of El Niño evolution and its impacts, others have filled in the space. There were articles about the El Niño in the middle of 2014 in the national newspapers warning of an El Niño and drought impacts (Pathfinder Foundation, 2014). This warning turned out to be a false alarm as the El Niño condition turned neutral in September 2014 - even as the El Niño event died out, the warning was not updated. This sort of one-off warning by non-scientists through the media brought back the specter of mal-communication of El Niño as in 1997.

Subsequent news coverage did not report on the understanding of El Niño impacts on climate, and on socio-economic activities but simply warned of dire outcomes. Overall, if the media coverage is taken as a whole, the average person would have obtained confusing information which would not have helped with preparedness or mitigation actions.

Impacts of the 2015/2016 El Niño

During the El Niño event, the incidence of dengue rose in mid-2016 after dropping substantially in 2015, tea production dropped, there were floods in May 2016, rice production increased for the *Yala* of 2015, hydropower production was consistently higher than usual, there was coral bleaching particularly in the South-West. There are signatures of El Niño in these impacts and future analysis should carefully tease out the precise impacts so as to be better understand it so as to be better prepared in the future.

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