Spatio-temporal patterns of armed conflicts in Sri Lanka: 1989-2016

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Abstract

Geospatial analyses are vital in contemporary conflict studies as the incidence of armed conflicts frequently varies both in space and time. This article investigates the spatiotemporal patterns of armed conflicts in Sri Lanka from 1989 to 2016. The spatial locations of armed conflict incidents were identified using the Geo-referenced Event Dataset provided by the Uppsala Conflict Data Program. The distribution patterns of the armed conflicts and their spatial relationships were investigated using Moran I statistics. The standard deviational ellipses were generated to understand the directional distribution of the armed conflicts and power relationships between different actors. Spatiotemporal hot-spots were identified using the Getis-OrdGi* statistic and the Mann Kendall trend test analysis. The results reveal that 4576 armed conflicts took place at 630 locations in various parts of Sri Lanka during the period of study and these caused 65372 fatalities. Eleven dyads were also identified among which the government of Sri Lanka and Liberation Tigers of Tamil Eelam caused 87% of incidents and 92% fatalities. Jaffna city and suburb areas emerged as persistent hot-spots of armed conflicts during 1989 - 2009. Colombo, Mannar, Vavunia, Welioya, Batticaloa, and Kilinochchi emerged as sporadic hot-spots while Vellamullivaikkal locality appeared as a significant new hot-spot in 2009. The discussion explores the existent socioeconomic disparities in terms of demography, poverty, education within the armed conflict hot-spot areas.

Keywords: *Armed conflicts, Geospatial analysis, Spatio-temporal patterns, Geo-referenced Event Dataset*

Background

The overall trend of armed conflict in the world has generally declined since the end of the Cold War (Pettersson and Wallensteen 2015, 436). However, the spatiality of armed conflict depicts clearly visible regional variation overtime (Melander 2015). The Middle East, Africa and Asia account for most of the worsening trend in armed conflicts in the world today (Melander 2015; Sedda, Qi, and Tatem 2015). Within Asia,

Sri Lanka had experienced one of the most protracted armed conflicts in the region, commonly known as the Sri Lankan Civil War which caused enormous and irreparable damage to population, environment, and economy of the country (Bastian, Kottegoda, and Uyangoda 2010; Goodhand and Walton 2017, 130). After three-decades-long military offensive, in 2009, the government of Sri Lanka succeeded in controlling ongoing armed conflicts in the country.

However, there is a need to understand the underlying economic, social and political causes of the armed conflicts as well as their Spatio-temporal dynamics for establishing long-lasting peace.

From a broader perspective, competition for control over limited resources vital for life, such as land and water, plays a prominent role in triggering armed conflicts among the contesting parties around the world, while social, cultural and political rigidities keep on fuelling them further (Pre & Assessment 2015; Schleussner et al. 2016, 9218). The same is largely true in the context of Sri Lanka and appears as the root cause of the most obvious armed conflicts arising from the incompatible demands for 'homelands'(Korf 2005, 214). Simultaneously, a closely interlinked combination of ethnic, socioeconomic, ideological motivations and political instabilities forced the 'homelands' sentiments of various groups towards armed conflicts in the country (Abeyratne 2004, 1295-1314; Korf 2005, 215).

These kinds of competitions and ideological motivations vary from region to region as well as time to time (De Juan 2012). As a result, the occurrence, intensity, and causes of armed conflicts become an inherent spatiotemporal phenomenon. Due to this, sub-national level geospatial analyses of armed conflict have been continuously gaining importance (Raleigh et al. 2010, 651-660). Several studies have investigated the spatial patterns of armed conflicts (De Juan 2012) and have shown that armed conflicts tend to cluster spatially in certain areas (Buhaug and Gleditsch 2008, 215; De Juan 2012). Further, geographic clusters of conflicts provide strong clues about the specific characteristics prevailing in individual locations, underlying factors and potential areas of new conflict occurrences (Ward and Gleditsch 2002, 245). Generally, areas located in close proximity of conflict clusters are more prone to the propagation of new conflict events than the farther ones (Buhaug and Gleditsch 2008, 219). From this point of view, Spatio-temporal analyses of armed conflicts can be utilized to understand the diffusion patterns of resource competition, power relationship and overall nature of conflicts in a community.

On the other hand, Spatio-temporal analyses can be useful for understanding the socioeconomic consequences of armed conflicts in various parts of a country. Armed conflict often leads to forced migration, refugee problems, and the destruction of social, political, and economic infrastructure which ultimately causes regional disparities in development (Gates et al. 2012, 1713-1722). At the same time, regional disparities in development may predispose armed conflicts (Stewart 2002). Therefore, the interrelationship between armed conflicts and spatiotemporal disparities in development can be employed to explore armed conflict-induced socio-economic impacts and vice versa.

Though Sri Lanka has passed through a long period of armed conflicts, Spatio-temporal analyses of these events are relatively scarce within the field of conflict studies. Therefore, this study explores the spatio-temporal patterns of armed conflicts in Sri Lanka since 1989. Based on the results, armed conflict-induced socioeconomic disparities have also been highlighted in the discussion.
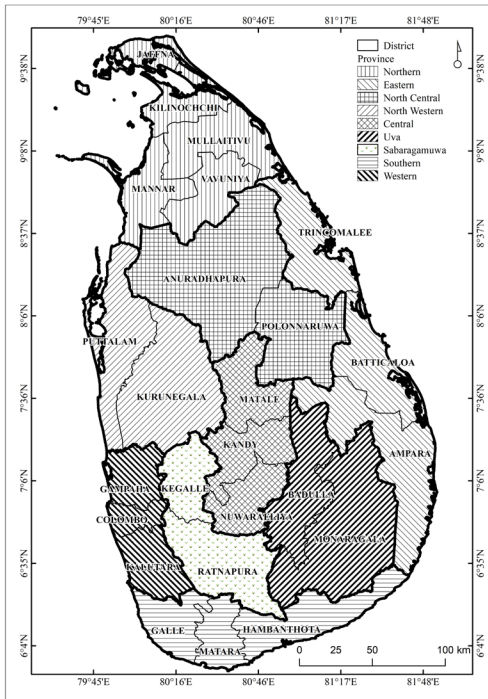
Fig. 1: Map of Sri Lanka and its Nine Provinces

Material and methods

Introduction to Study Area

Sri Lanka is an island country situated in the south-western part of the Bay of Bengal in the Indian Ocean. It extends from 5°55′to 9°51′ northern latitudes and from 79°41′ to 81°53′eastern longitudes (Fig.1). The total geographical area of the country is about 65525 km^2 and administratively, the country is organised under nine provinces which further consists of 25 districts. Sri Lanka is populated by a multi-ethnic and multi-religious society. Its total population was counted as 20,359,439 in 2012 (Department-of-Census-and-Statistics 2012) and the estimated mid-year population of 2018 was approximately 21,670,000 (DCS-SL, 2018). The Sinhalese makeup 74.9% of the total population and are largely concentrated in the south-west and central parts of the country. The Sri Lankan Tamils comprise 11.15% of the population predominantly living in the northern and eastern provinces. Other prominent ethnicities are Sri Lankan Moors (9.3%), Indian Tamils (4.12%), Sri Lankan Malays (0.22%) and Burghers (0.19%). The people of the country follow four religious beliefs i.e. Buddhism, Hinduism, Christianity, and Islam. According to the 2012 Census, Buddhists comprise 70.1% of the population, Hindus 12.6%, Muslims 9.7% and Christians 7.6% (Department-of-Census-and-Statistics 2012). This ethno-religious diversity of Sri Lanka has been admired on one side but it has caused devastating armed conflicts throughout history on the other side.

Data used

The Uppsala Conflict Data Program (UCDP) is the major data provider about organised violence around the world and its archives provide geo-referenced data of such events for about the last 40 years. Also, the definition of armed conflict provided by the UCDP as well as how conflicts are systematically defined and studied has been used as the global standard. Geo-referenced Event Dataset (GED) of UCDP about armed conflict in Sri Lanka from 1989 to 2016 has been used in this study. This high-quality dataset includes individual observations (incidents) of organized armed clashes between two or more parties causing at least one fatality at a given date and location (Sundberg and Melander 2013, 524). Plenty of information is provided about

each incident such as the type of conflict, actors and dyad[1], geographic location (place names, geographic coordinates), number of fatalities, date and time of the event, and source of information, etc. Basically, the dataset segregates all conflicts into three categories, namely TYPE 1 - state-based, TYPE 2 - non-state based and TYPE 3 - one-sided (Croicu and Ralph 2017). TYPE1 is armed conflict typically occurring between the government of the state and another government (inter-state) or between organized opposition groups within a state (intra-state). Armed conflicts between two organized opposition groups falling under TYPE 2 are non-state based conflicts. The third category contains the conflicts carried out by organized groups, either governments or opposition, targeting civilians in the state. The locational precision of the incidents has been classified into seven categories. The exact gratical location of an incident is the best spatial resolution of the dataset whereas the coarsest spatial resolution is marked as a country's centroid. The best temporal resolution is the exact date of the event. The incidents reported with the coarsest spatial resolution (centroid of the country) have been excluded from the analysis of this study.

Methods applied in the study

The methodology of this study largely relies on descriptive and simple spatial statistical analysis techniques. First of all, the number of armed conflicts recorded annually from 1989 to 2016 was presented in summary tables and a graph for obtaining an overall picture as well as for identifying the 'peak-and-valley' trends in the armed conflicts

The locations of the conflict during each 'peak-and-valley' period were depicted on maps for visualising their Spatio-temporal patterns. A centrographic analysis method; standard deviational ellipse, was drawn to analyse the pattern of armed conflict incidents as well as the dyads over space. The standard ellipses summarize the spatial characteristics of the incidents in terms of central tendency, dispersion, and directional trends (Scott and Janikas 2010, 27-41).

The significance of location in terms of conflict-related fatalities was assessed using the local Moran I statistic (Anselin 1995, 93-115). The local Moran I statistic computes the mean and variance of the attributes in a given set of events as well as deviation values of the neighbouring events are multiplied together to create a cross-product. A positive Moran's I index indicates the clustering of similar attributes (High-High or Low-Low) while a negative Moran's I index value indicates the outliers of dissimilar attributes (Low-High).

To assess the spatiotemporal pattern of armed conflict, the Emerging Hot-Spot Analysis (EHSA) tool of ArcGIS Desktop 10.3.1 was used. The EHSA evaluates the spatiotemporal patterns of a set event using a combination of two spatial statistics; Getis-OrdGi* statistic (Ord and Getis 1995, 93-115) to identify the degree of spatial clustering and the Mann-Kendall trend test (Mann 1945, 245-259; Kendall & Kendall & Gibbons 1990) to evaluate the temporal

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1. A dyad is the pair of two actors engaged in violence (in the case of one-sided violence, the perpetrator of violence and civilians)

trends. For this purpose, the incident data were first converted into net CDF (Network Common Data Form) by aggregating them into space-time bins with a spatial resolution of five kilometres and a temporal resolution of one year. The EHSA tool provides maximum of 17 distinct categories of hot- and cold-spots and classifies each space-time bin into one of these categories.

Table 1: Types of Armed Conflicts and Fatalities in Sri Lanka: 1989–2016

Type of violence	No. of incidents	%	No. of Fatalities	%
State - based conflict	4128	90	61265	93.71
Non - state conflict	92	2	613	0.95
One - sided violence	356	8	3494	5.34
Total	4576	100	65372	100

Analyses and Results

The overall scenario of armed conflicts in Sri Lanka: 1989-2016

According to the UCDP-GED, a total number of 4576 armed conflict incidents leading to 65372 conflict-related fatalities were recorded in Sri Lanka from 1989 to 2016 (Table 1). Geographically, these conflict incidents occurred at 630 locations throughout the country. An overwhelming proportion (90%) of the incidents is state-based conflicts and only 10% of incidents are non-state conflicts and one-sided violence.

In terms of the parties involved in these armed conflicts, a total of ten different actors were identified i.e. 1) Civilians of Sri Lanka, 2) Eelam People's Revolutionary Liberation Front (EPRLF), 3) Government of Sri Lanka, 4) Liberation Tigers of Tamil Eelam (LTTE), 5) Liberation Tigers of Tamil Eelam Karuna's Party (LTTE - K), 6) Muslim community of Sri Lanka, 7) People's Liberation Army (JVP), 8) People's Liberation Organisation of Tamil Eelam (PLOTE), 9) Peoples Alliance Party (PA) and 10) United National Party (UNP).

These ten actors formed eleven dyads of the conflict incidents during the period of study. Among eleven different conflict dyads, the most recurrent involved government of Sri Lanka and LTTE. These two parties were involved in 87.57% of incidents which caused 92.85% conflict-related fatalities (Table 2).

Year-wise number of armed conflict and related fatalities from 1989 to 2016 show increase and decrease several times (Fig. 2). The number of fatalities to follows a similar trend throughout the period. Substantial escalations in these two factors were observed in 1991, 1995 and 2008 while significant declines were recorded in the years 1994, 2002 and 2010. Accordingly, 4 distinct 6 to 8-year phases of armed conflicts are detectable over the whole period. The first phase was from 1989 to 1994 while the second, third and fourth are from 1995 to 2002, 2003 to 2010 and 2011 to 2016 respectively. Compared to the first two phases, an unprecedented rise in the number of conflicts and fatalities are visible in the third phase whereas the fourth phase indicates a no-conflict situation.

Table 2: Number of incidents and fatalities by dyad

| Conflict dyad creating the event	incidents	%	No. of fatalities					
			Side A	Side B	Civilians	unknown	All	%
Government of Sri Lanka - LTTE	4007	87.57	14462	37568	7480	1187	60697	92.8
LTTE - Civilians	244	5.33	0	0	2400	82	2482	3.8
Government of Sri Lanka - JVP	118	2.58	208	205	33	3	449	0.7
LTTE – LTTE- K	64	1.40	120	68	8	13	209	0.3
JVP - Civilians	57	1.25	0	0	257	0	257	0.4
Government of Sri Lanka - Civilians	55	1.20	0	0	752	3	755	1.1
Supporters of PA - UNP	13	0.28	2	1	2	28	33	0.1
EPRLF - LTTE	8	0.17	65	19	3	144	231	0.3
Muslims (Sri Lanka) - Tamil	5	0.11	10	0	0	29	39	0.1
Government of Sri Lanka - EPRLF	3	0.07	61	58	0	0	119	0.2
LTTE - PLOTE	2	0.04	13	88	0	0	101	0.2
Total	4576	100	14941	38007	10935	1489	65372	100
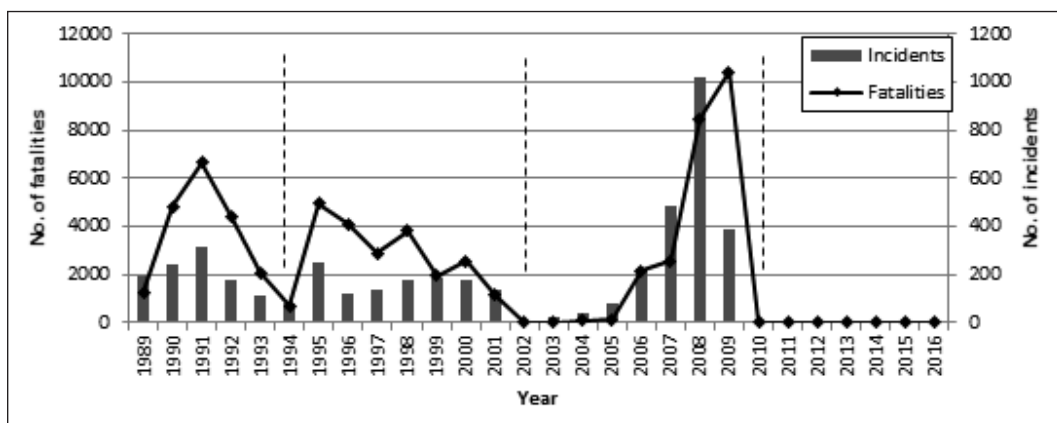
Fig. 2: Year-wise Number of Conflict Incidents and fatalities

Spatio-temporal patterns

For analysing the spatial patterns of armed conflict, the GED dataset was divided into four distinct phases of time; 1989 - 1994, 1995 - 2002, 2003 – 2010, and 2011 - 2016 as described in the previous section (Fig.2). A total of 59 incidents (42, 8, 9 from first, second and third phases respectively), having a low spatial resolution (country centroid) were excluded from the spatial analyses. Detailed statistics of each phase are given in Table 3.

Table 3: Number of incidents and fatalities by phase

Phase	No. of Locations	No. of Incidents	No. of Fatalities
1989 - 1994	251	1081	18106
1995 - 2002	269	1180	21360
2003 - 2010	358	2253	23770
2011 - 2016	3	3	7
Excluded	1	59	2129
Total	882	4576	65372

During the first phase of 6 years from 1989 to 1994, 1081 armed conflicts occurred at 251 locations in various parts of Sri Lanka (Fig. 3a). At least one incident was reported from each of the 25 districts during this phase. The highest number of incidents were reported from Batticaloa (108) followed by Trincomalee (75), Mannar (50), Jaffna (49) and Ampara (46). Also, some districts in the Northern Province of like Jaffna, Killinochchi, and Mullaitivu witnessed a large number of incidents but the number of fatalities in these incidents was not as high as in other districts. The total number of incidents slightly increased

during the second phase of 8 years from 1995 to 2002 and 1180 incidents of armed conflicts and 21360 fatalities were recorded at 269 locations (Table 3). The distribution pattern of the incidents shifted more towards the Northern and Eastern provinces of the country (Figure 3b). The Southern, Western and Central provinces remained considerably free from the armed conflicts during this period as no incident was observed in seven districts namely Kurunegala, NuwaraEliya, Ratnapura, Kalutara, Galle, Matara, and Hambanthota. During the third phase of 8 years from 2003 to 2010, there was a significant rise in the number of incidents (2253) and 23770 fatalities were reported from 358 locations (Table 3). They are
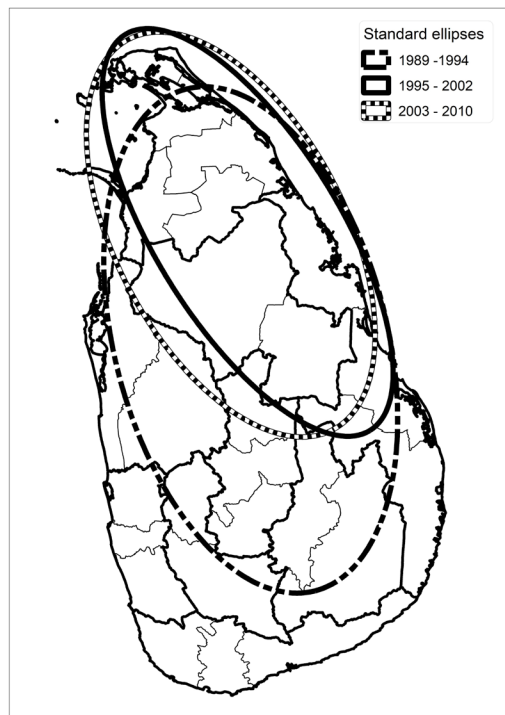

Fig. 4: Directional distribution of armed conflicts: 1989-2010

largely clustered in the Northern Province as shown in Figure 3c. Only three incidents in three different locations were recorded in the fourth phase of 6 years from 2011 to 2016 and this indicates the cessation of the active armed conflicts in the country. Therefore, the fourth phase was excluded from further analysis.

The standard deviational ellipses of the armed conflicts during the above discussed three phases illustrate the distribution patterns of the armed conflict over space (Fig.4). A widespread geographical dispersion of the incidents is clearly visible during the first phase (1989-1994). In contrast to this, the eclipses show a concentration and shift of the incidents towards the northern and eastern parts of the country.

There are significant spatial and temporal variations in the Conflict-related fatalities in Sri Lanka (Fig.5). In general, the locations suffering from a higher number of fatalities are clustered in the Northern Province. During the first phase, the Elephant pass of the Jaffna peninsula was marked as the location with the highest number of the fatalities (2625) followed by Batticaloa (1108), Jaffna (1073) and Mullaitivu towns (987). The highest number of fatalities was recorded in Kilinochchi, Jaffna and Alampil towns during the second phase while some locations in Mullaitivu district recorded the highest number of fatalities during the third phase.

Spatial autocorrelation analysis was used to identify the clusters of most lethal incidents (Fig.6). The high-high spots indicate the locations where higher conflict-related fatalities surrounded primarily by high fatality incidents within one-kilometre radius. In contrast, the high-low spots represent spatial outliers where high fatalities surrounded primarily by low fatality incidents. Elephant pass denotes the clustering of high-high incidents during the first phase (Fig.6a) while high-low incidents cluster around Jaffna, Pooneryn town, Trincomalee, and Batticoa. During the second phase, their locations; Jaffna, Killinochchi and Mankulam towns are evidence for high-high incidents (Fig. 6b). During the third phase, the high-high clusters spread around Vellamullivaikkal locality, Puthukkudiyiripu town, Pnnikkankulam, and Killinochchi town while Jaffna, Muhumalai, Kilali, and Mannar town remain as spatial outliers (Fig.6c).

The EHSA examined 60270 space-time bins (2870*21) and returned five spatiotemporal hot-spot categories as defined in Table 4. Out of 2870 space bins, 89 are sporadic, 64 are consecutive, 36 are new, 7 are persistent and 3 are intensifying hot-spots. There is no spatiotemporal cold-spot identified and the rest of the space bins (2671) remain as neither statistically significant hot-spot nor cold-spot. During the period of 1989 and 2010, 36 locations around Vellamullivaikkal locality of Mullaitivu district were identified as significant new hot-spots as shown in Figure 7. Jaffna town emerged as a persistent hot-spot where surrounding areas mark with intensifying and consecutive hot-spots. Sporadic hot-spots appear in Colombo, Batticoloa, Kilinochchi, Vavuniya, and Welioya town indicating the occurrence of armed conflicts in irregular time intervals. The consecutive hot-spots are also widespread that indicates succeeding occurrences of armed conflicts in certain areas in the Northern Province.
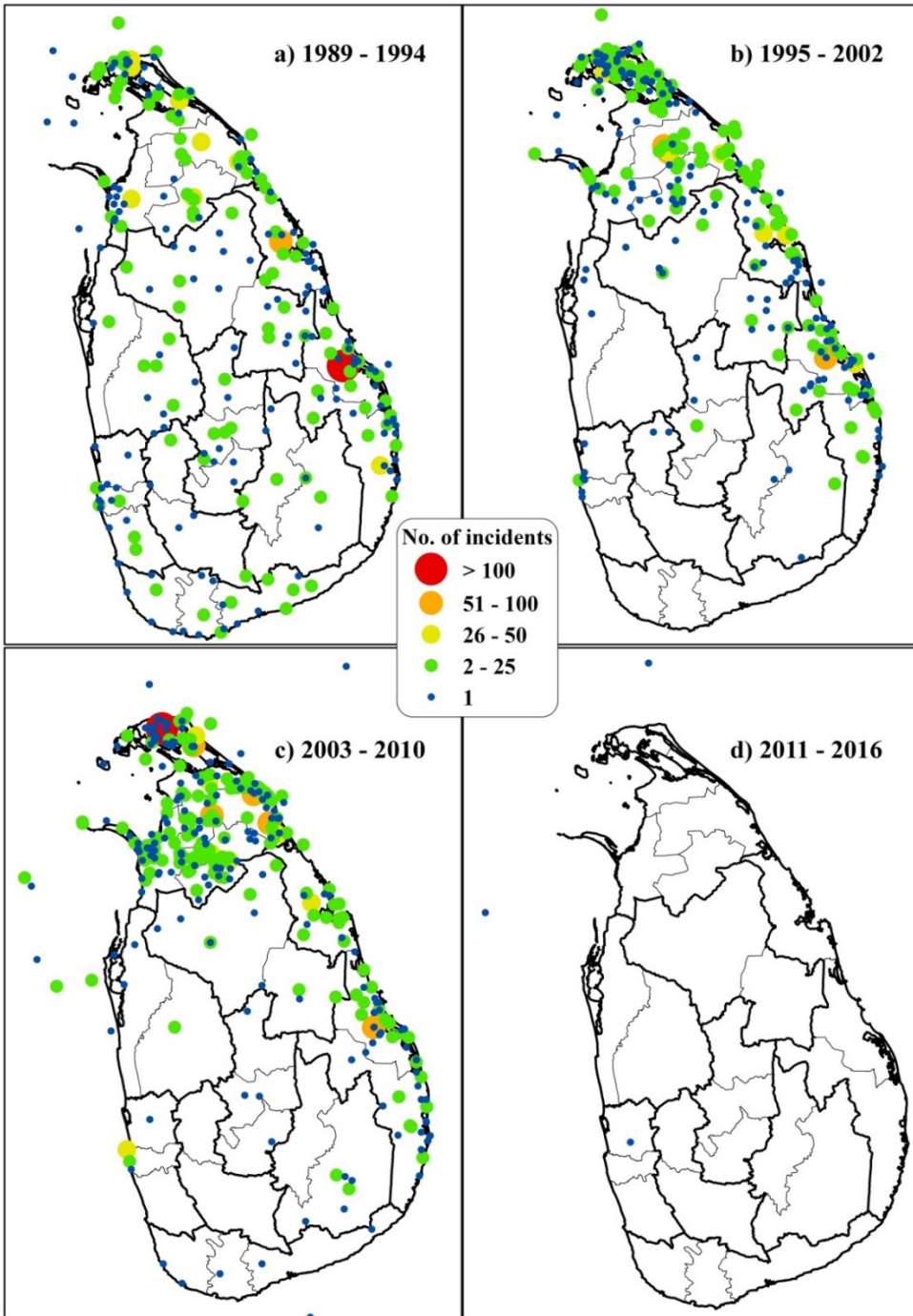
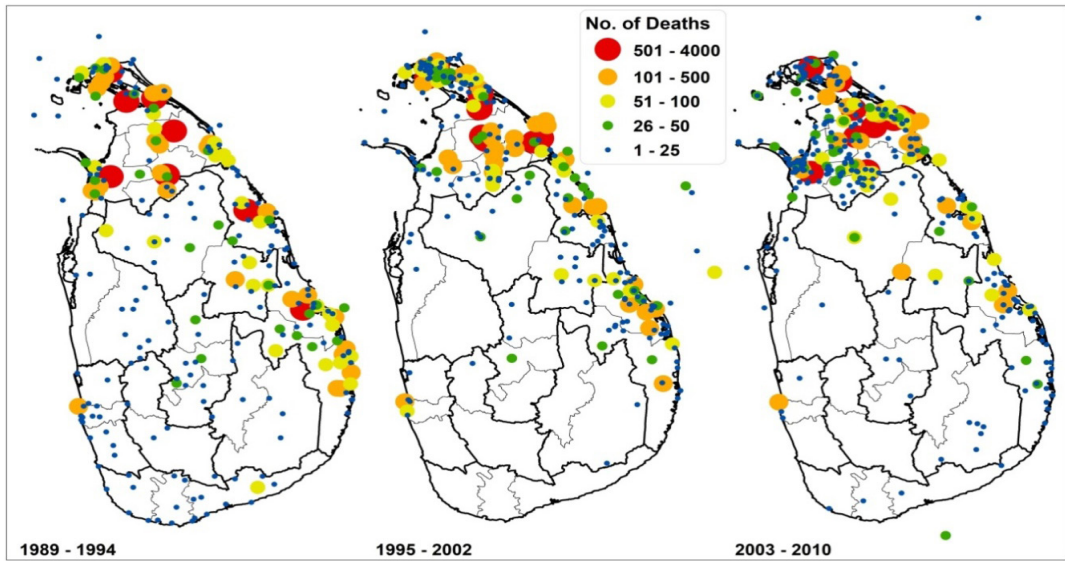Fig. 3: Number of armed conflict incidents by location: 1989-2016

Fig. 5: Magnitude of the conflict-related fatalities by location: 1989-2010
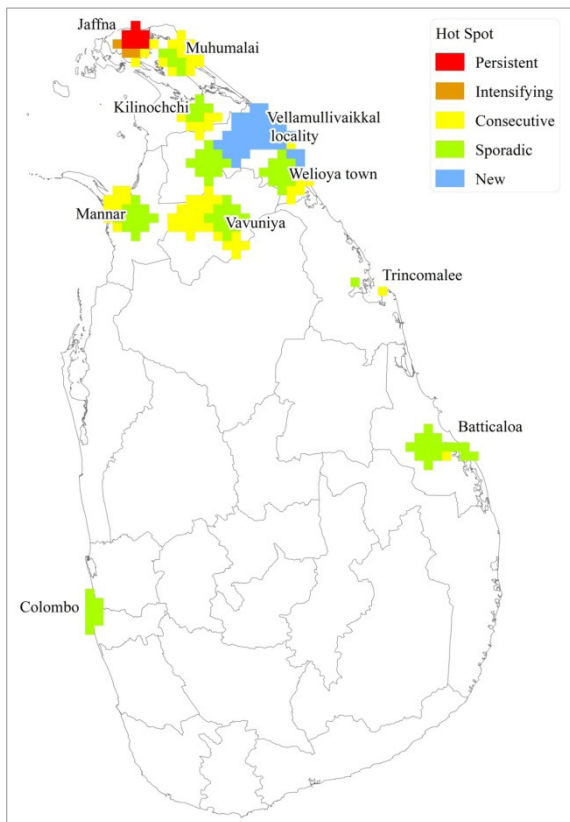

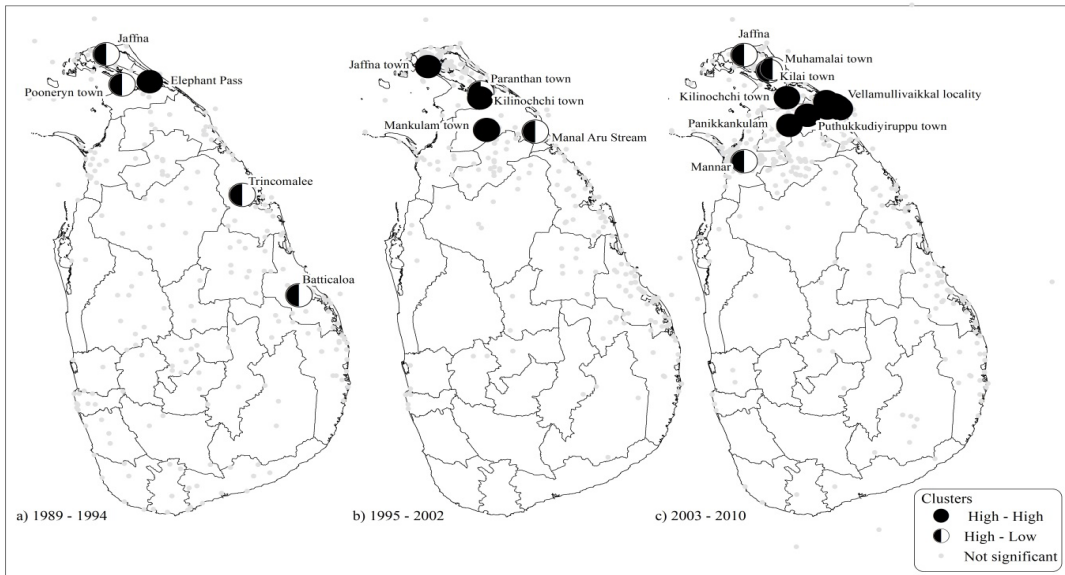Fig. 7: Spatiotemporal hot-spot of armed conflicts: 1989-2010

Fig. 6: Spatial autocorrelation of conflict incidents: 1989-2010

Table 4: Classification scheme for statistically significant hot-spots

Pattern Type	Description
Persistent	A location that has been a statistically significant hot-spot for 90% of the time-step intervals (19 years) with no discernible trend indicating an increase or decrease in the intensity of clustering over time.
Intensifying	A location that has been a statistically significant hot-spot for 90% of the time-step intervals. In addition, the intensity of the clustering of high counts in each time step is increasing overall.
Consecutive	A location with a single uninterrupted run of statistically significant hot-spot bins in the final time-step (2009) intervals. The location has never been a statistically significant hot-spot prior to the final hot-spot run and less than 90% of all bins are statistically significant hot-spots
Sporadic	A location that is an on-again than off-again hot spot. Less than 19 of the 21 years have been statistically significant hot-spots.
New	The most recent time step interval (2008/2009) is a statistically significant hot-spot for the first time.

As shown in Table 5, the involvement and power distribution of the conflict dyads is also changed remarkably over space and time. All the dyads except LTTE and LTTE-K appeared only during the first phase, however, the number of dyads decreased with the second, third and fourth phases. The manifestation of some actors is limit to one-time phase; for example, JVP, EPRLF, and PLOTE only appear in the first phase while LTTE-K appears only in the third phase. Moreover, the conflict between the government of Sri Lanka and JVP, JVP and civilians, supporters of PA and supporters of UNP restrict to the districts of south, western and central parts of the country. Conflicts between the government of Sri Lanka and LTTE, LTTE, and civilians appear in all three phases expect fourth and their dispersion prominently in the North and East districts of the country. In contrast, a lessening power disputation is visible between the government of Sri Lanka and civilians. And it has shifted to the north-eastern part of the country during the third phase. A very few conflict incidents have occurred between Muslims (Sri Lanka) and Tamils, yet it is visible only in the first three periods.

Discussion

Sri Lanka faced different kinds of internal armed conflicts within its territory over the past 30 years. This study as well as many others (Ganegodage and Rambaldi 2014, 42-53; De Mel 2007) has revealed that the government of Sri Lanka and the LTTE have been the major actors in these conflicts. The active intervention of state government in such conflicts around the world is inevitable but the grounds for the origin of other actors, processes of their growth and reasons behind their disappearance should be studied in detail with respect to time and space. This study clearly revealed the Spatio-temporal patterns of power rivalry among different actors involved in the armed conflicts in Sri Lanka from 1989 to 2016. However, their origin and gradual growth are not visible during this period because these are rooted deep in the history of various communities in the country. According to available literature, the oldest conflict actor is the JVP, which was founded in 1965 as a political movement in southern Sri Lanka (Gunaratna 1990). The LTTE was founded in 1976 with its base in Jaffna district of the Northern Province and a faction of it known as LTTE-K was formed in the Eastern province in 2007. The EPRLF and the PLOTE are two former militant groups formed in 1980. Except for the JVP, all other actors are confined to the north-eastern part of the country. The uprising of these conflict actors reflects ethnic struggle against the persistent power imbalance and in the northern and eastern parts of the country. On the other hand, the insurrection of the JVP indicates the fidgety of the people in the southern part of the country especially during 1989-1994.

Table 5: Involvement of the conflict dyads by time phase and district

The dyad creating conflict event	No. of incidents			
	1989-1994	1995-2002	2003-2010	2011-2016
Government of Sri Lanka-LTTE	**Total** 826	**Total** 1120	**Total** 2061	**Total** 0
	Districts Batticaloa (159), Jaffna (122), Mullaitivu (108), Trincomalee (102), Mannar (62), Vavuniya (61), Ampara (60), Kilinochchi (50), Polonnaruwa (18), Anuradhapura (17), Badulla (10), Colombo (6), Kurunegala (3), Puttalum (3), Kandy (2), Sea (43)	Districts Jaffna (251), Mullaitivu (249), Batticaloa (148), Kilinochchi (100), Trincomalee (95), Vavuniya (82), Ampara (44), Mannar (25), Polonnaruwa (20), Colombo (17), Anuradhapura (13), Badulla (7), Puttalum (2), Gampaha (1), Matale (1), Monaragala (1), Sea (64)		
LTTE - Civilians	**Total** 76	**Total** 53	**Total** 115	**Total** 0
	Districts Ampara (25), Batticaloa (14), Trincomalee (9), Mullaitivu (5), Polonnaruwa (5), Anuradhapura (4), Vavuniya (3), Colombo (2), Jaffna (2), Kilinochchi (1), Mannar (1), Monaragala (1), Puttalum (1), Sea (3)	Districts Batticaloa (7), Colombo (6), Jaffna (6), Polonnaruwa (5), Trincomalee (5), Ampara (4), Anuradhapura (4), Mullaitivu (4), Moneragala (3), Vavuniya (3), Kandy (2), Badulla (1), Gampaha (1), Puttalum (1), Sea (1)	Districts Mullaitivu (21), Jaffna (15), Trincomalee (15), Batticaloa (12), Colombo (11), Vavuniya (10), Monaragala (9), Ampara (6), Anuradhapura (4), Polonnaruwa (3), Badulla (1), Galle (1), Kandya (1), Kilinochchi (1), Matale (1), Sea (4)	

Government of Sri Lanka- JVP	Total	118	0	0	0
	Districts	Badulla (20), Kandy (14), Colombo (14), Hambanthota (12), Kurunegala (9), Matara (8), Anuradhapura (6), NuwaraEliya (6), Galle (4), Kalutara (4), Polonnaruwa (4), Trincomalee (4), Matale (3), Ratnapura (3), Monaragala (2), Gampaha (1), Vavuniya (1), Mullaitivu (1), Sea (2)			
LTTE – LTTE-K	Total	0	0	64	0
	Districts			Batticaloa (42), Trincomalee (7), Ampara (5), Polonnaruwa(5), Colombo (3), Mannar (1), Sea (1)	
JVP - Civilians	Total	57	0	0	0
	Districts	Colombo (11), Badulla (9), Kandy (7), Hambanthota (6), NuwaraEliya (6), Kurunegala (3), Matara (3), Galle (2), Gampaha (2), Kalutara (2), Matale (2), Monaragala (2), Anuradhapura (1), Polonnaruwa (1)			

Government of Sri Lanka-Civilians	Total	**21**	**11**	**20**	**3**
	Districts	Ampara (7), Batticaloa (3), Jaffna (3), Colombo (2), Hambanthota (1), Kandy (1), Monaragala (1), Polonnaruwa (1), Ratnapura (1), Trincomalee (1)	Trincomalee (4), Jaffna (2), Mullaitivu (2), Kandy (1), Kegalle (1), Vavuniya (1),	Jaffna (4), Batticaloa (3), Mannar (3), Trincomalee (3), Vavuniya (3), Badulla (2), Kilinochchi (1), NuwaraEliya (1)	Colombo (1), Sea (2)
Supporters of PA -UNP	Total	**10**	**3**	**0**	**0**
	Districts	Badulla (6), Kegalle (2), Kurunegala (1), Puttalum (1)	Badulla (1), Kegalle (1), Matale (1)		
EPRLF - LTTE	Total	**8**	**0**	**0**	**0**
	Districts	Ampara (2), Batticaloa (1), Jaffna (1), Mullaitivu (1), Polonnaruwa (1), Trincomalee (1), Vavuniya (1)			
Muslims (Sri Lanka) - Tamil	Total	**2**	**1**	**2**	**0**
	Districts	Ampara (1), Trincomalee (1)	Batticaloa (1)	Trincomalee (2)	
Government of Sri Lanka-EPRLF	Total	**3**	**0**	**0**	**0**
	Districts	Ampara (1), Vavuniya (1), Sea (1)			
LTTE - PLOTE	Total	**2**	**0**	**0**	**0**
	Districts	Vavuniya (1), Mannar (1)			
Total		**1123**	**1188**	**2262**	**3**

The fluctuation in the pattern of conflict incidents to some extent reflects contemporary geopolitical strategies of the state government, its failures, and its consequences. The first phase 1989-1994, represents the immediate follow-up period of the occurrence of armed conflicts between the government of Sri Lanka and the LTTE. The signing of the Indo-Lanka Accord in 1987 by the governments of Sri Lanka and India (Hancock, 1999) led to the uprising of the JVP during 1987-1989. The cancellation of the Accord and the ceasefire agreement again caused an eruption of armed conflicts in the northern parts of the country. In 1994 and 2002, there were two distinct ceasefire agreements between the government of Sri Lanka and the LTTE which brought a remarkable decline in the conflicts during these two years. However, incidence of conflicts escalated in 1995 and 2003 indicating a breakdown of the ceasefire agreements.

The hot-spot analysis of armed conflict from EHAA suggests that a vast area of the Northern Province, as well as some areas in Batticaloa district, Colombo city and a few areas of Trincomalee, have remained as the conflict hot-spots in Sri Lanka during the past three decades. It is not easy to ascertain if ethnic diversity and socioeconomic disparities are the root causes behind the conflicts in these hot spots areas due to the non-availability of the required data. However, armed conflict-induced spatial disparities in socio-economic development are quite obvious in the post-conflict phase in these hot-spot areas.

Apart from causing a large number of fatalities and disabilities, the armed conflicts have hampered the process of socio-economic development in the country, especially in the conflict hot-spot areas. One of the widely observed effects of this process is the massive displacement of the population from these areas. During the three decades of conflicts, approximately 800,000 people have been displaced mainly from the Northern and Eastern provinces of the country (Siriwardhana and Wickramage 2014). Because of this massive internal and international migration during this period, Sri Lanka became one of the highest refugees producing country in the world (Arunatilake, Jayasuriya, and Kelegama 2001). Ultimately, conflict-related fatalities, displacement, and migration made a clearly visible population decline in the Northern Province, especially in the Jaffna district. According to the census figures, the average annual population growth rate of Jaffna district has declined from 1.6% to -2.0% during the period 1981-2001. Until 1981, there was gradual population growth in Jaffna district as it increased from 635,117 persons in 1971 to 738,788 persons in 1981. However, in 2001 and 2012 it has declined to 490,663 and 583,071 persons respectively whereas Mannar and Mullaitivu districts have shown a considerable decrease during the same period. Killinochchi and Vavunia districts have shown a slight increase in 2001. However, these changes have occurred due to the internal migration process.

In addition to the above, the armed conflicts have created significant regional disparities as regards levels of poverty. The Household Income and Expenditure Surveys of Sri Lanka state that the people in the Northern Province are gripped by poverty (DCS-LK, 2016). In 2012 and 2016, the highest poverty headcount index

is reported in Mullaitivu and Killinochchi district respectively (Table 6).

Table 6: Poverty Head Count Index 2012 and 2016

District	2012 (%)	2016 (%)
Amapara	5.4	2.6
Batticaloa	19.4	11.3
Jaffana	8.3	7.7
Killinochchi	12.7	18.2
Mannar	20.1	1.0
Mullaitivu	28.8	12.7
Trincomalee	9.0	10.0
Vavunia	3.4	2.0
National Average (Sri Lanka)	6.7	4.1

Source: Department of Census and Statistics, Sri Lanka

On top of all, the armed conflicts have disrupted the education of the children in the Northern and Eastern Provinces. A recently published research highlights that post-conflict areas have devastating long-term influences on public health (Higashida, Soosai, and Robert 2017, 94). The study clearly indicates that armed conflicts have destroyed not only the peace, safety and socio-economic situation in certain parts of Sri Lanka but also damaged the public health and education structures which will take years to restore and bring the affected society on the path of development again.

Conclusion

This study made an attempt to explore the Spatio-temporal patterns of armed conflicts in Sri Lanka from 1989 to 2016 and their major effects on society. The findings revealed several Spatio-temporal hotspots of armed conflicts with a concentration and persistence in the northern parts of the country. These spatial and temporal patterns reflect the certain associations with the competition for power among various actors involved in the conflicts as well as old and new socio-political processes unfolding in the country. Further discussions highlighted the adverse effects of the armed conflict on the society and economy. It presented a huge number of fatalities these have caused, massive ousting of people these have forced, widespread destruction of health and education infrastructures these have created, huge socioeconomic disparities these have induced and, finally, irreparable damage to the development process of otherwise underdeveloped society these have triggered.

The above discussion signifies the need and importance of understanding spatial and temporal patterns of armed conflicts and indicates that it helps in monitoring and controlling the conflict situation as well as devising appropriate policies for the affected areas.

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