Forest Fire Risk Mapping in Kyauktalone Area

Taunggyi Township

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13th November 2024

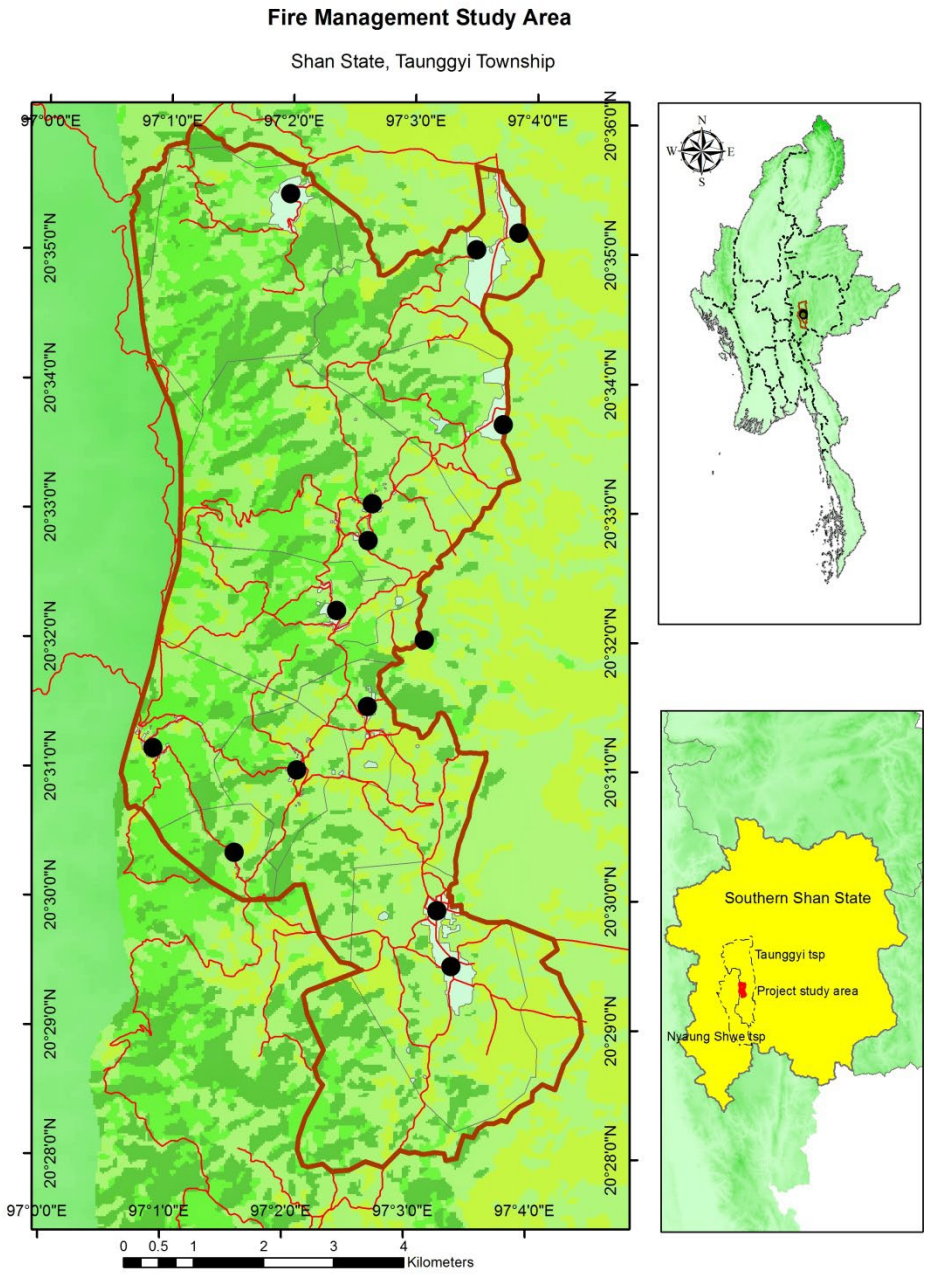
Review and Analysis of fire use and fire context to underpin Risk Reduction and Readiness for Fire Management

- Conduct analysis of existing traditional land management knowledge and practices related to fire management including a pilot at community/township level

- Conduct a township level pilot fire vulnerability assessment (including underlying causes of fire, land use patterns, and impacts of climate change)

- Submit a project completion report

MFA has rely to a combination of conventional field survey methodology and Geospatial Analysis techniques (also satellite data, GIS databases) in this study



Study area

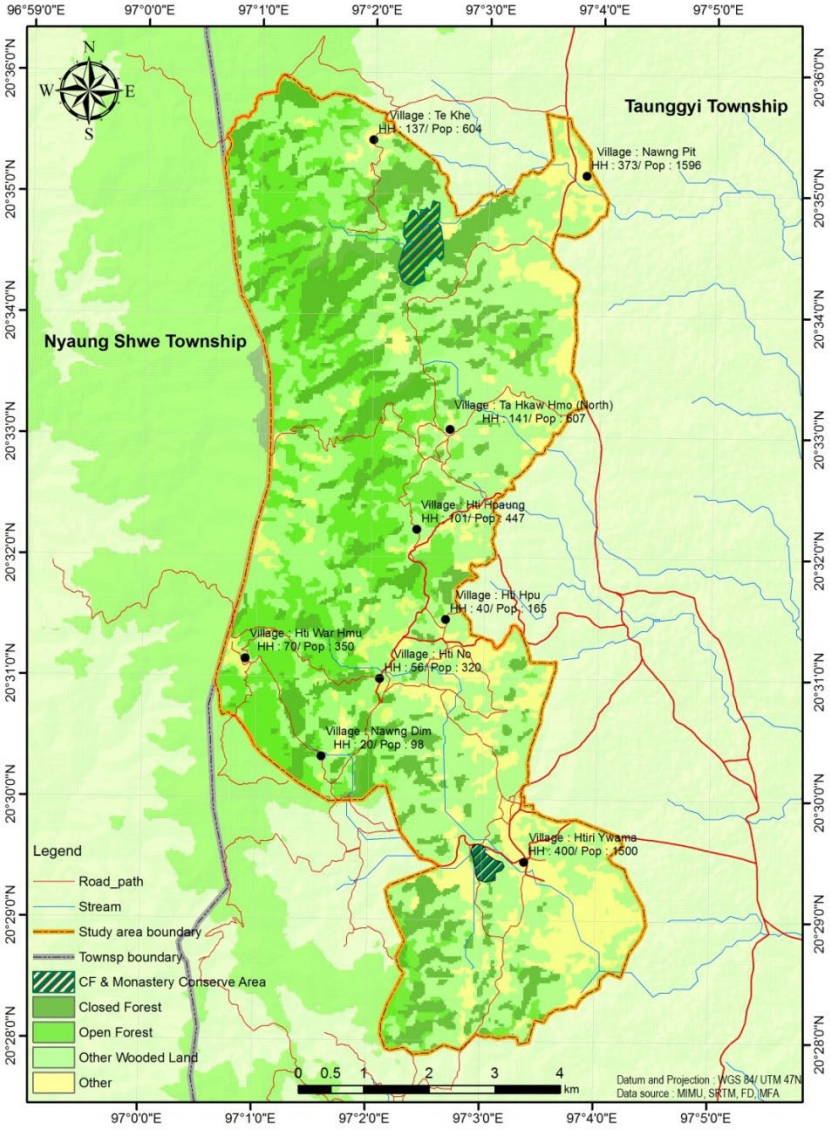
Southern Shan State
Taunggyi District
Kyauktalone Sub-Township

9 Villages

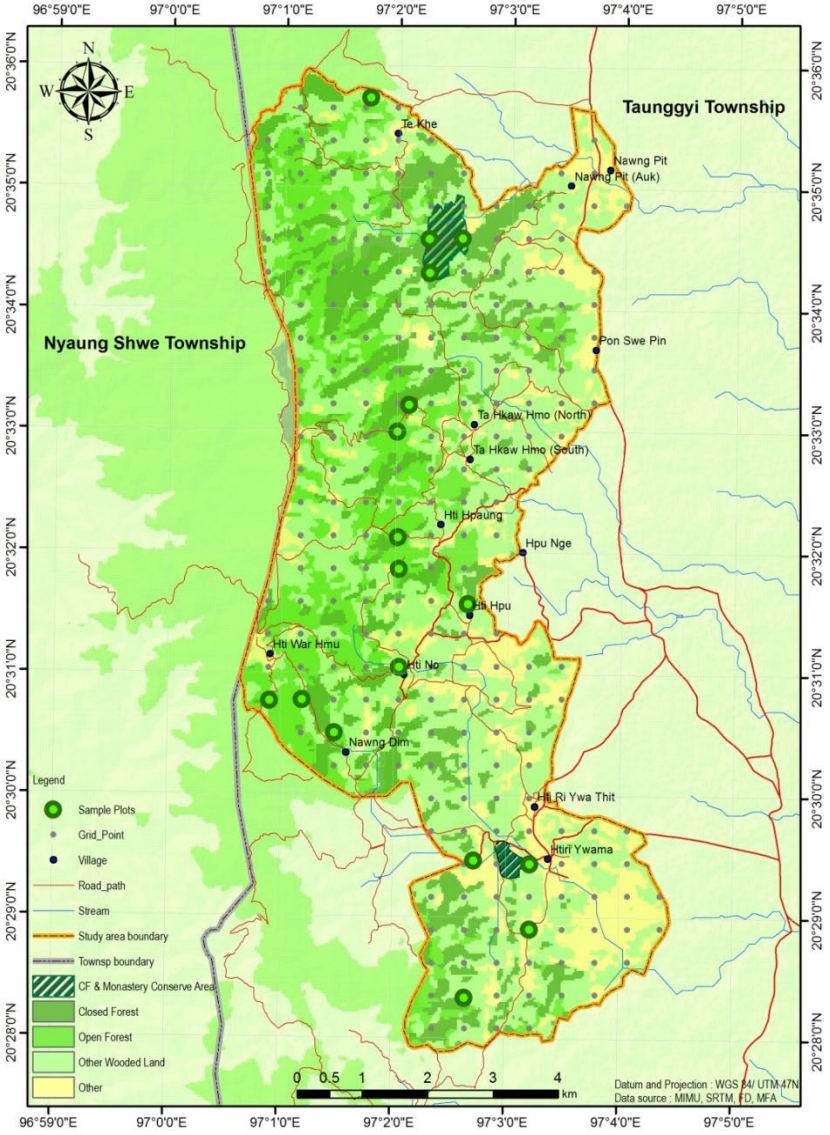
1. Nawng Pit
2. Htiri
3. Te Keh
4. Ta Kawt Moo
5. Hti Phaung
6. Hti Hpu
7. Hti Wah Moo
8. Hti Noh
9. Naung Din

Area cover 5057 hatres

Fire Management Study Area in Taunggyi township
Socio-Economic Survey Village



Biological Assessment in Fire Management Study Area



Remote Sensing and GIS techniques are used for based map preparations in resource assessment surveys

Field survey work initially planned for a conventional Fire Risk Management Planning Project based on non-spatial analysis;

- Forest resources (one shot inventory method)
- Biodiversity resources (SMART survey technology)
- NTFP resources (simultaneously within one shot inventory)
- Base line socio-economic surveys . (All baseline surveys have been accompanied and assisted by key informants in each field)
- Forest Fire Assessment survey (Framing Up Review and Analysis for Fire Management)

Localized Interviews

- Community groups (representatives of social groups and religious associations)
- Women's groups (women from the community focus group)
- Youth groups (village's youth group)
- key informants

Questionnaires have been focused on.

- Discuss fire management on different categories of community land.
- Explore changes in fire events over time and any fires that have damaged community assets.
- Explore knowledge of alternative land management practices and options for reducing the incidence of fire in the community.
- The team tried to meet as much as possible separately with groups of key informants to discuss fire related policies, laws and programs, the occurrence and causes of damaging fire events.
- Resilience information has been gathered from local interviews

- Discreet survey time has been used for transect field surveys through the pre-selected proposed Public Protected Forest, verifying the results of survey data

40 Tree Species recorded in study area

Sr	Myanmar	Scientific name	Sr	Myanmar	Scientific name
1	Bonmeza	Albizzia chinensis	21	Pyinma	Lagerstroemia speciosa
2	Thit-magyi	Albizzia odoratissima	22	Zaungbale	Legerstroemia villosa
3	Sit	Albizzia procera	23	Ondon	Litsaea glutinosa
4	Thitni	Amoora rohituka	24	Taw-thidin	Mallotus phillippenensis
5	Pan-ma	Anneslea fragrans	25	Thadi	Protium serrata
6	Ye-mein	Aporosa villosa	26	Cherry	Prunus cerasoides
7	Kyi	Barringtonia acutangula	27	Nyan	Quercus serrata
8	Swedaw	Bauhinia acuminata	28	Thit-cha	Quercus spp.
9	Thit-e	Castanopsis spp.	29	Letpan	Salmalia malabarica
10	Yindaik	Dalbergia cultrata	30	Laukya	Schima wallichii
11	Zinbyun	Dillenia pentagyna	31	Kadut	Shorea cinerea
12	Zibyu	Emblica officinalis	32	Kyetyo	Vitex pubescens
13	Thabye	Eugenia spp.	33	Mayarnin	Pittosporum nepaulensis
14	Nyaung	Ficus spp.	34	Pinsein	Docynia indica
15	Wetshaw	Firmiana colorata	35	Kalansan	All Other Species
16	Metlin	Garcinia paniculata	36	Khaung	All Other Species
17	Hmanni	Gardenia erythroclada	37	Lain	All Other Species
18	Chinyok	Garuga pinnata	38	Tharee	All Other Species
19	Tayaw	Grewia tiliaefolia	39	Thayoh	All Other Species
20	Petwun-gyi	Hibiscus macrophyllus	40	Thetkaing	All Other Species

Bam boo species	1yr old Culms	2yr old culms	3yr old Culms	Total Culms
Wa bo (Dendrocalamus brandisii)	144.18	179.75	123.58	447.51
Wa ya (Oxytenanthera nigrociliata)	16.85	22.47	18.72	58.04

10 NTFPs recorded in study area

No	Myanmar	Common
1	Bamboo shoot	Bamboo shoot
2	Gon-min	Amomum corynostachyum
3	Kadut	Ficus cunia (fig)
4	Mushroom	Mushroom
5	Myazar Root	Cynodon dectylon poaceae
6	Pin_sein (fruit)	Docynia indica/Eriolobus indica
7	Taw-pha-la	Cardamon
8	Thet-ke	Thatch grass
9	Thit-kya-poe	Cinnamon
10	Taw-gyin	Ginger

14 Herbal plants recorded in study area

Sr	Myanmar Name	Scientific name
1	Akyaw-paung-ta-htaung	
2	Kya-mok-seik	
3	Kya-shar	
4	Linzi-mushroom	
5	Mahar-Kar-Kyan-Sit	*Polygonum tomentosum Willd.*
6	Me-di-dok	
7	Panma (flower)	*Anneslea fragrans*
8	Say-gandamar	
9	Say-myin-khwa	*Asiatic pennywort (Hydrocotyle asiatica)*
10	Say-oh-bok	*Melastoma clarkenum*
11	Shint-matet	*Climbing asparagus*
12	Tabin-taing-mya-nan	*Vitis repens Wight & Arn.*
13	Than-gar-sin-gamon	
14	Yin-bya	*Dichora ferbrifuga*

* Linzi-mushroom was grown in Hti_phu village wooden land

10 Orchids recorded in study area

Plot	Village	Myanmar Name	Scientific name	Remark
1	Naungpit	Ground Orchid		
		Stem Orchid		
5	Htiri	A-naw-ya-hta		
		Kein-na-yi		
		Kywet-myee		
		Moe-lon-hmine		
		Thon-yaung-che		
6	Htiri	A-naw-ya-hta		
		Ground Orchid		
8	Htiri	Ground Orchid		
9	Takhawmu	Ground Orchid		
		Stem Orchid		
10	Takhawmu	Ground Orchid		
11	Htiphaung	Ground Orchid		
		Kywet-myee		
		Pae-poe-tee		
		Stem Orchid		
		Thazin		
12	Htiphaung	Ground Orchid		
13	Htiphu	Ground Orchid		
14	Htiwamu	Ground Orchid		
15	Htiwamu	Ground Orchid		

5 mammal species recorded in study area

Plot	Village	Common	Scientific name	Remark
2	Naungpit	Squirrel	Pallass Squirrel	
3	Naungpit	Barking deer	Red Muntjac	Foot track
		Mole	Talpidae	Nest
11	Htiphaung	Jungle Cat	Jungle Cat	
12	Htiphaung	Squirrel	Pallass Squirrel	
13	Htiphu	Squirrel	Pallass Squirrel	
14	Htiwamu	Barking deer	Red Muntjac	
		Jungle Cat	Jungle Cat	
		Hog Badger	Hog Badger	
		Squirrel	Pallass Squirrel	
		Flying Squirrel	Red Giant Flying Squirrel	

18 Birds species recorded in study area

No.	Common	Scientific name
1	Black drongo	Dicrurus macrocercus
2	Black Naped Monarch	Hypothymis azurea
3	Blue Thorated Barbet	Megalaima asiatica
4	Chinese Francolin	Francolinus pintadeanus
5	Common Iora	Aegithina tiphia
6	Common myna	Acridotheres tristis
7	Golden fronted leafbird	Chloropsis aurifrons
8	Gray-Headed Parakeet	Psittacula finschii
9	Grey -headed canary flycatcher	Culicicapa helianthea
10	Grey-crowned warbler	Phylloscopus tephrocephalus
11	Hill Prinia	Prinia superciliaris
12	Lineated Barbet	Megalaima lineata
13	Red -Billed Blue Magpie	Urocissa erythroryncha
14	Red -Whiskered Bulbul	Pycnonotus jocosus
15	Scarlet backed flowerpecker	Dicaeum cruentatum
16	Scarlet minivet	Pericrocotus speciosus
17	Spotted Dove	Streptopelia chinensis
18	White -throated Kingfisher	Halcyon smyrnensis

The causes of forest fire in the study area were observed as:

- There is a trail in the forest which connects settlement villages in Nyaung Shwe with the Taunggyi municipality, a market place. People use the motorcycle to go to the Nawng Kar market. Carelessness of trekkers and smokers cause forest fire in the study area.
- Grazing is partly allowed in the forest land. Cattle grazers sometimes use fire inside the forest for smoking which spread as forest fire.
- The economy of the locality is based on subsistence farming and they have less capital and income opportunities. Poor socio-economic conditions of the people encourage them to set fire in the forest to get dry firewood for subsistence use and also for sell.
- NTFP collectors and medicinal plant hunters (from the outside of project area) are main sources of unacceptable fires.

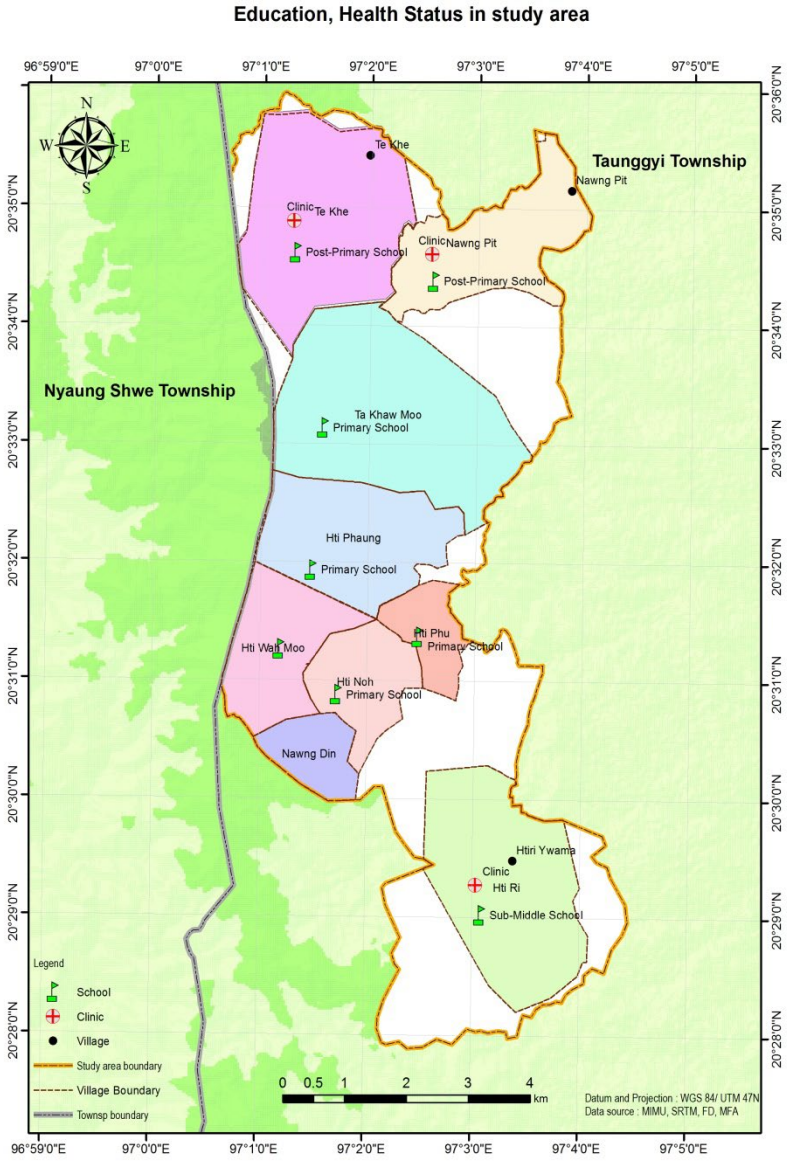
Forest fire occurrences in study area

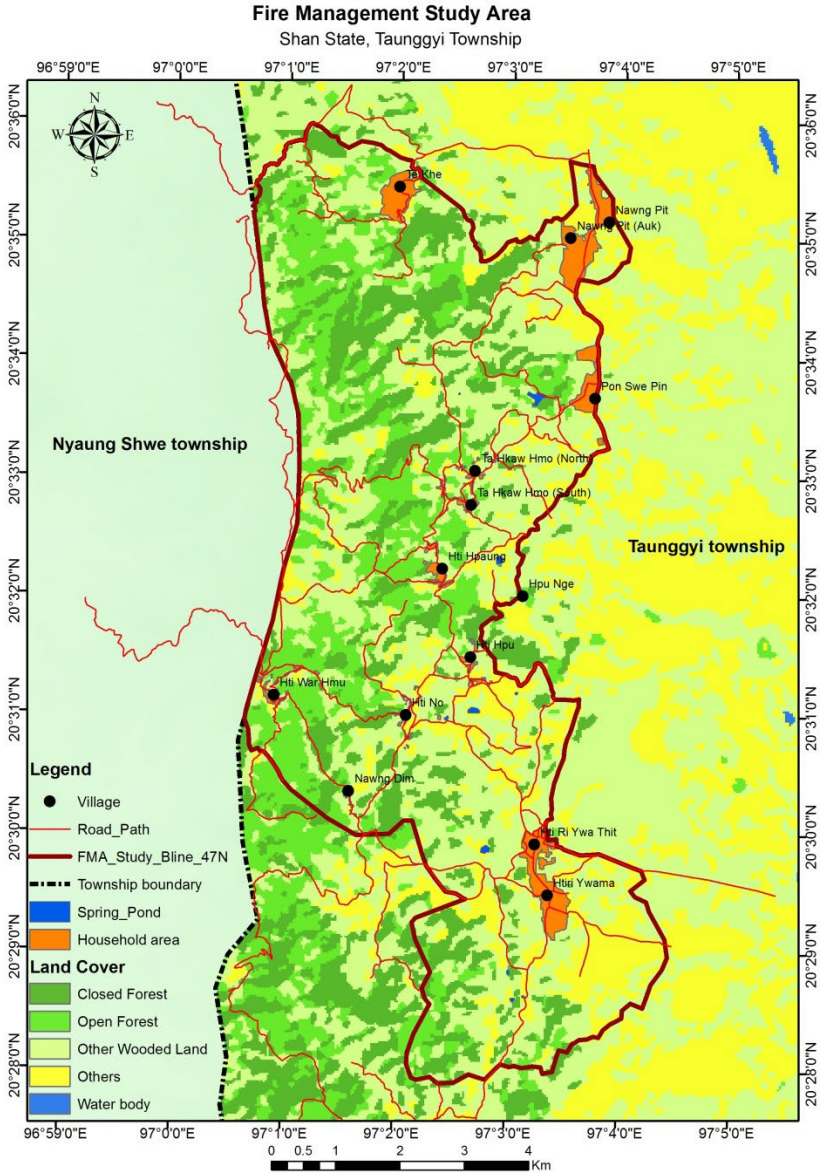
	Village	Occurences	Season (Rainy/Cold/Hot)	Fire type	Burning duration	Fuel Type
1	Nawng pit	Every year	Hot (Mar/Apr)	Surface	1 days - 1 night	Dry leaf/litter/weedy
2	Ta khe	Every year	Hot (Mar/Apr)	Surface	1 days/ max 2 days	Dry leaf/litter/weedy
3	Htiri	Every year	Hot (Mar/Apr)	Surface	1 Night	Dry leaf/litter/weedy
4	Ta hkaw moo	Every year	Hot (Mar/Apr)	Surface	1 days/ max 2 days	Dry leaf/litter/weedy
5	Hti paung	Every year	Hot (Mar/Apr)	Surface	1 to 2 days	Dry leaf/litter/weedy
6	Hti pu	Every year	Hot (Mar/Apr)	Surface	1 day	Dry leaf/litter/weedy
7	Hti no	Every year	Hot (Mar/Apr)	Surface	1 day	Dry leaf/litter/weedy
8	Hti wah mo	Every year	Hot (Mar/Apr)	Surface	1 day	Dry leaf/litter/weedy
9	Nawng din	Every year	Hot (Mar/Apr)	Surface	1 day	Dry leaf/litter/weedy

Disaster Care in study area

Sr.	Village	Wildfire		Settlements fire		Storm	Hazard Resistance Level	Socio-economic score
		Freq	Season	Freq	Year	freq/year		
1	Hti_Ri	Yearly	Mar-Apr				Fair	2
2	Nawng Pit	Yearly	Mar-Apr	1	1980	1/1999	Fair	2
3	Hti Pu	Yearly	Mar-Apr			1/2010	Poor	1
4	Hti Wah Moo	Yearly	Mar-Apr			1/2010	Poor	1
5	Ta Kawt Moo	Yearly	Mar-Apr	1	1989	1/1972	Fair	2
6	Hti Phaung	Yearly	Mar-Apr	1	1970	1/1998	Poor	1
7	Naung Din	Yearly	Mar-Apr				Poor	1
8	Te Ke	Yearly	Mar-Apr	1	1979	1/2000	Poor	1
9	Hti Noh	Yearly	Mar-Apr			1/2010	Poor	1

Education and Health Care in study area





Baseline Socio-Economic Data

		Socioeconomic score											Ranking Score Highest to Lowest	Vulnerability Rank
V_id	Village	Rd	Hs	Ec	Hc	Ag	Ws	Fs	Dc	Inc	Lo	Tot		
1	Ta Khaw Moo	1	2	1	1	3	2	1	2	1	3	17	2	Medium
2	Hti Noh	1	1	1	1	3	1	1	1	1	1	12	1	High
3	Hti Ri	2	3	3	3	2	3	1	2	1	2	22	3	Low
4	Ta Khe	2	2	2	3	1	3	1	1	1	3	19	2	Medium
5	Hti Pu	1	1	1	1	3	1	1	1	1	1	12	1	High
6	Nawng Pit	3	3	2	3	2	2	2	2	1	3	23	3	Low
7	Hti Paung	1	1	1	2	3	1	1	1	1	2	14	1	High
8	Hti Wah Mu	1	2	1	2	3	1	1	1	1	2	15	2	Medium
9	Nawng Din	1	1	1	1	3	1	1	1	1	1	12	1	High
10	Exclude	2	2	2	2	2	2	2	2	1	2	19	2	Medium

Rd – Road access

Hs – House structure

Ec – Education Care

Hc – Health Care

Ag – Age Group

Ws – Water source and sufficient

Fs – Food security

Dc – Disaster Care

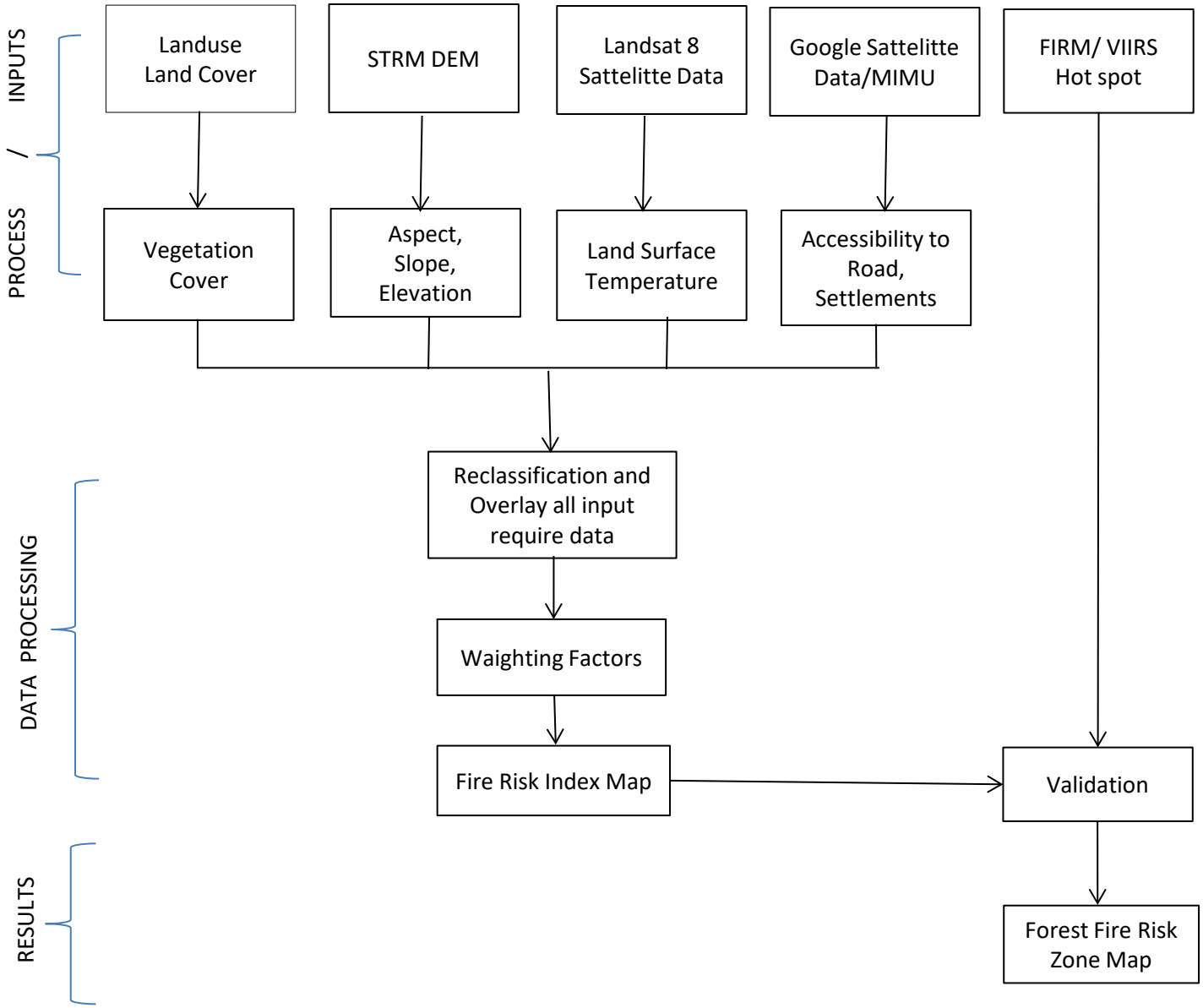
Inc – Income Security

Lo – Land ownership

Data sets used in Forest Fire Risk Mapping

Data Set	Data type	Details	Spatial Resolusion	Source
Fire Hotspots	Point	Longitude, Lattitude, Burnt date, time	375m	FIRMS/VIIRS-SNPP
SRTM DEM	Raster	Elevation, Slope, Aspect	30 m	(CGIAR-CSI) website
Land Cover 2015	Raster	Landuse Land Cover data	30 m	Landsat Image, FD
Land Surface Temperature (degrees Celsius)	Raster	Thermal Band 10, 11	100 m	Landsat 8
Boundaries	Polygon	Township, Villige tract		MIMU
Village	Point	Village coordinate		MIMU
Road Network	Line	Major Roads		MIMU
Paths, Trials	Line	Digitized from Google image		Google Earth Image
Water body	Polygon	Stream, Pond, Spring		Google Earth Image, MIMU
Village Boundaries	Polygon	Villagers Participatory Mapping		MFA/ Villagers

Data Processing diagram



Variables	Weight (%)	Class	Value Assign	Level
LULC	20	Water Settlement Agriculture Scrub and Grass Forest	 1 2 3 4 5	 Very Low Low Medium High Very High
Aspect (Direction)	15	E NE,SE N, NW S W, SW	1 2 3 4 5	Very Low Low Medium High Very High
Slope (Degree)	15	0-15 15-20 20-25 25-30 > 30	1 2 3 4 5	Very Low Low Medium High Very High
Elevation (meter)	15	1200-1400 1400-1600 1600-1800 1800-2000 2000 above	1 2 3 4 5	Very Low Low Medium High Very High
LST (°C)	15	14.98 -18.47 18.47-20.04 20.04-21.73 21.73-24.4 24.4-29.81	1 2 3 4 5	Very Low Low Medium High Very High
Distance to Road (meter)	20	< 100m 100m -200m 200m -300m 300m -400m > 400 m	1 2 3 4 5	Very High High Medium Low Very Low

FRI = 20%LULC + 15%A + 15%S + 15%E + 15%LST + 20%DR

Where: **FRI** is the fire risk index,

LULC is the landuse land cover,

A is Aspect,

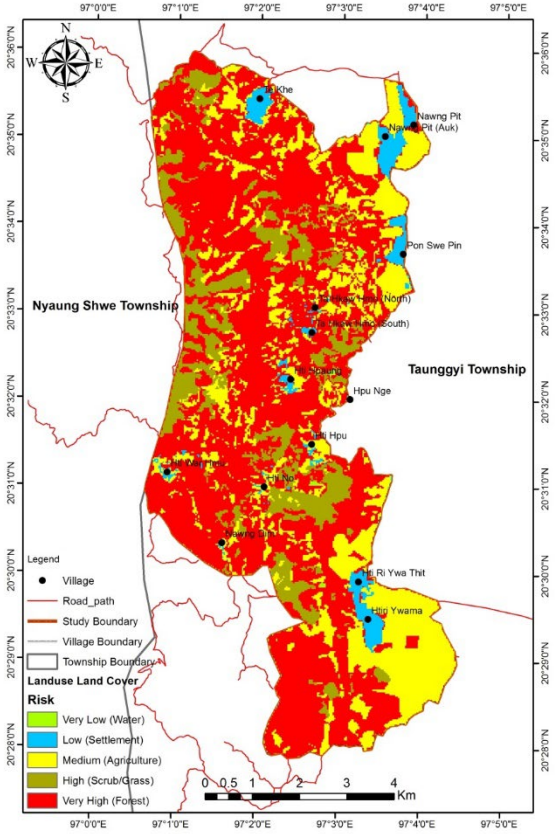
S is Slope,

E is Elevation,

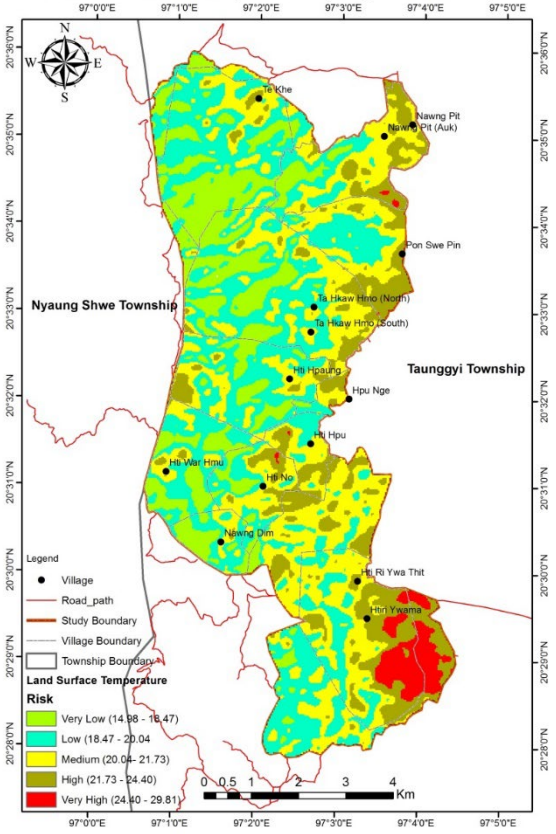
LST is Land Surface Temperature and

DR means the distance from the road.

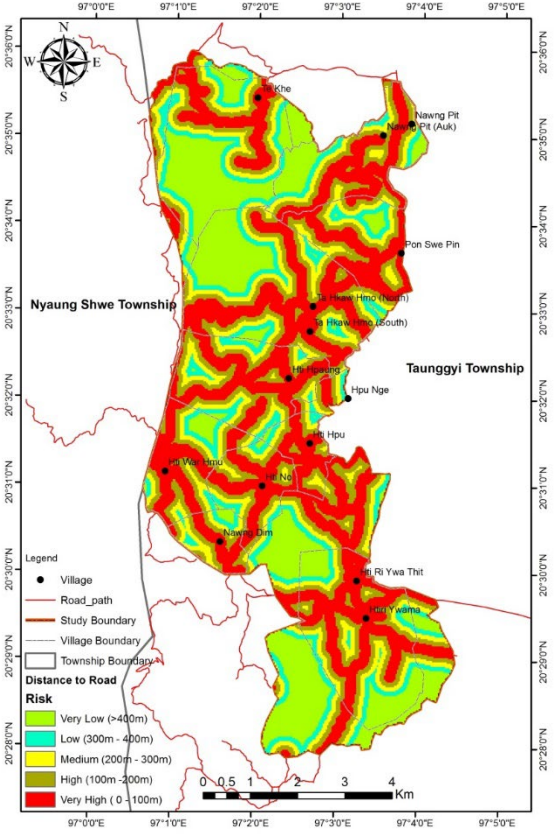
Landuse Land Cover



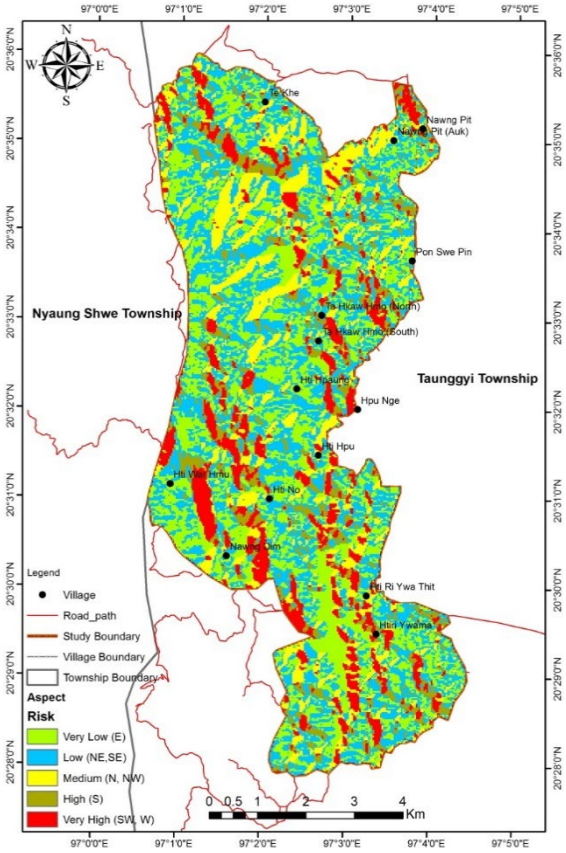
Land Surface Temperature (Degree Celsius)



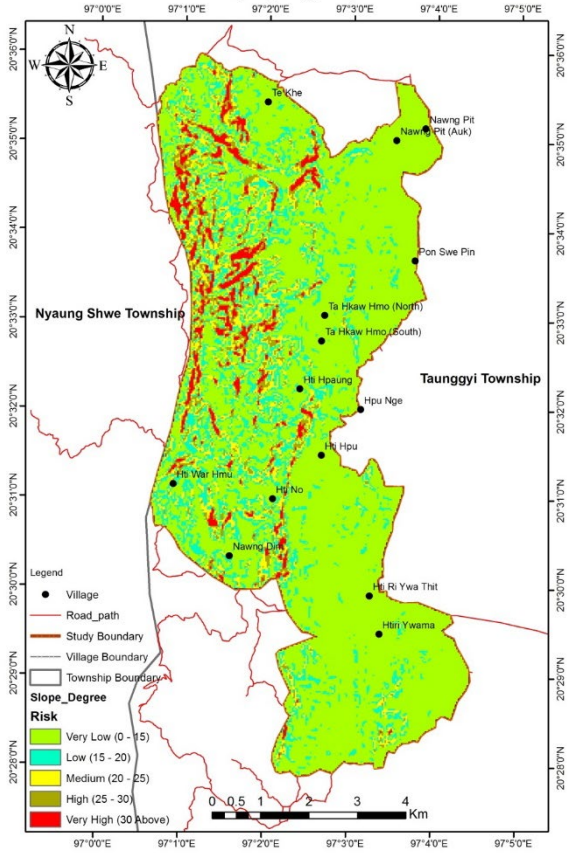
Distance to Road



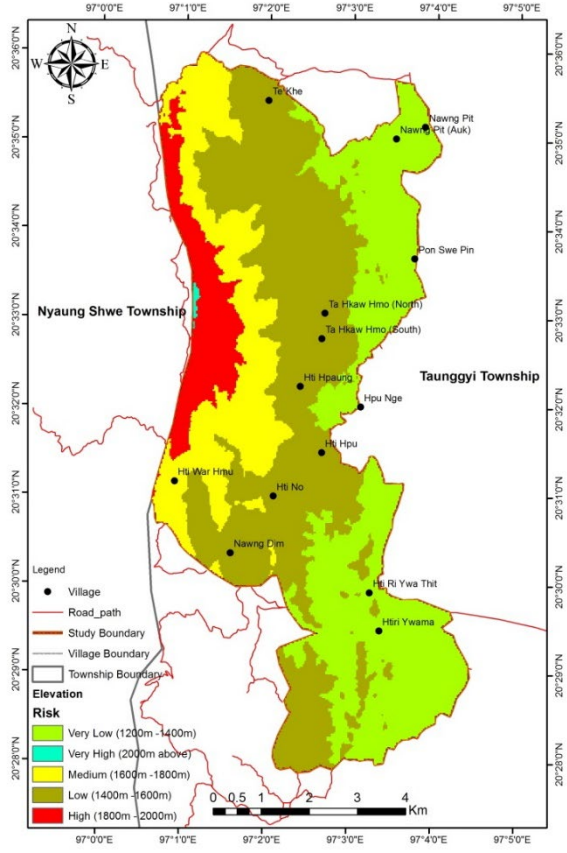
Aspect



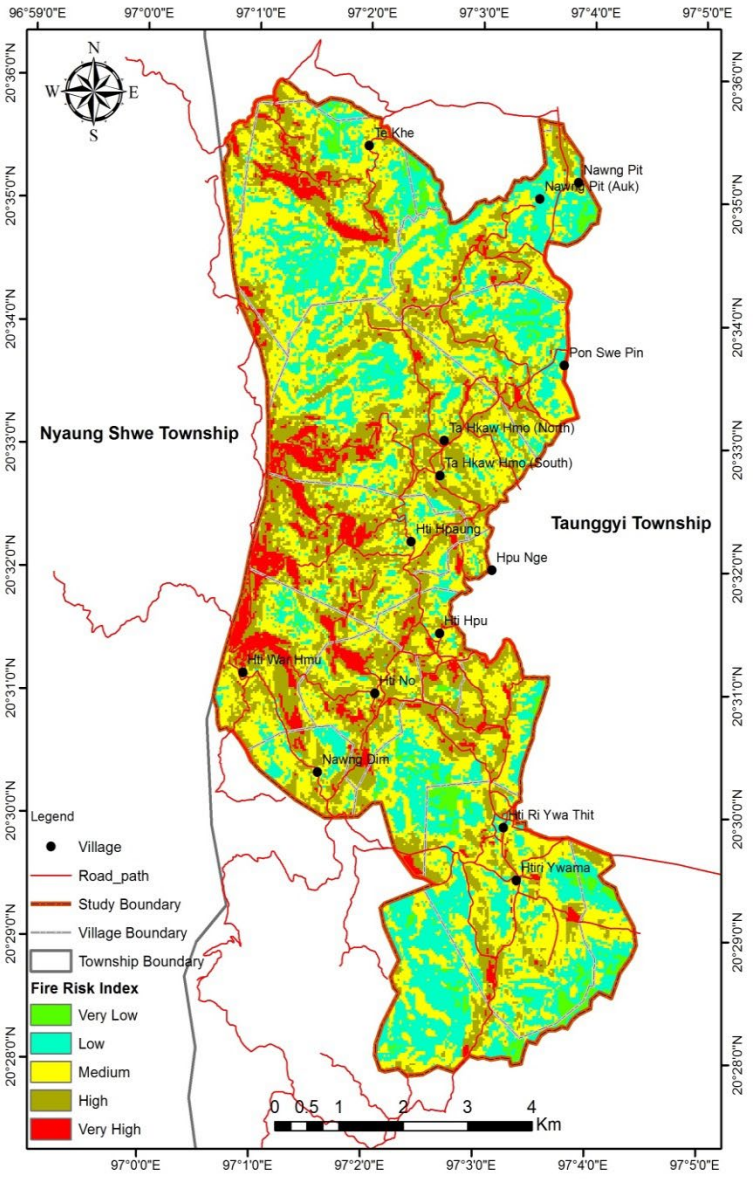
Slope (Degree)



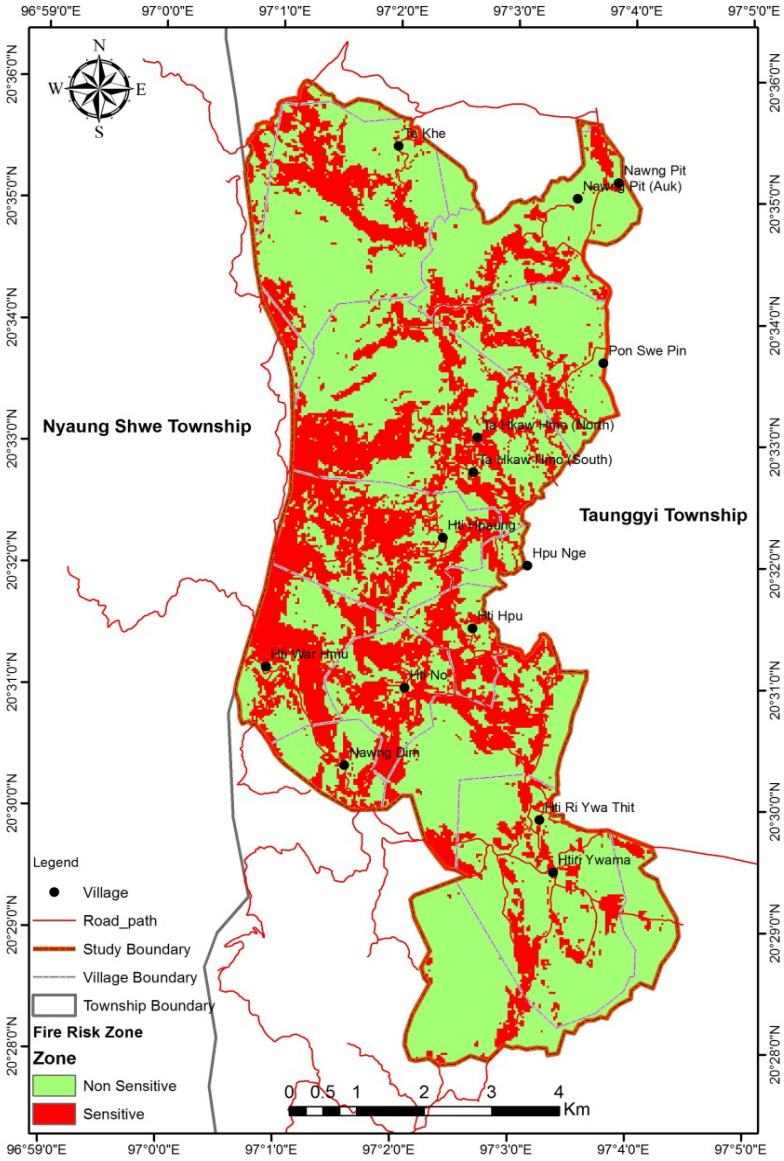
Elevation



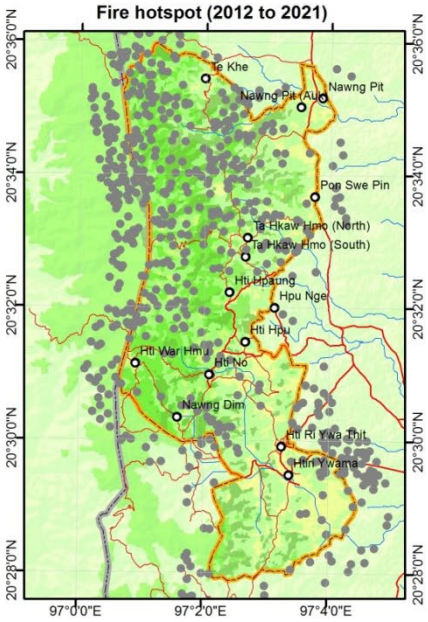
Fire Risk Index Map

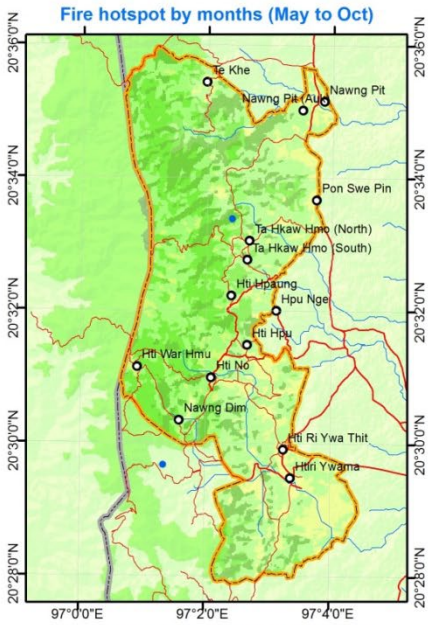


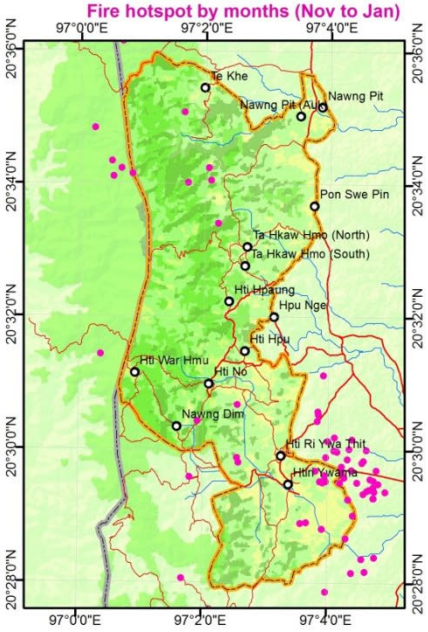
Fire Risk Zone

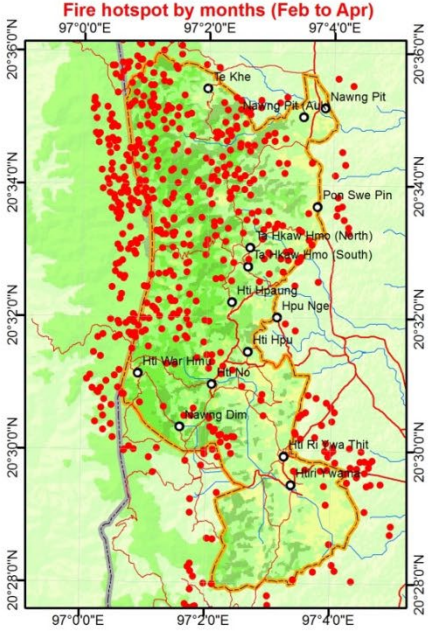


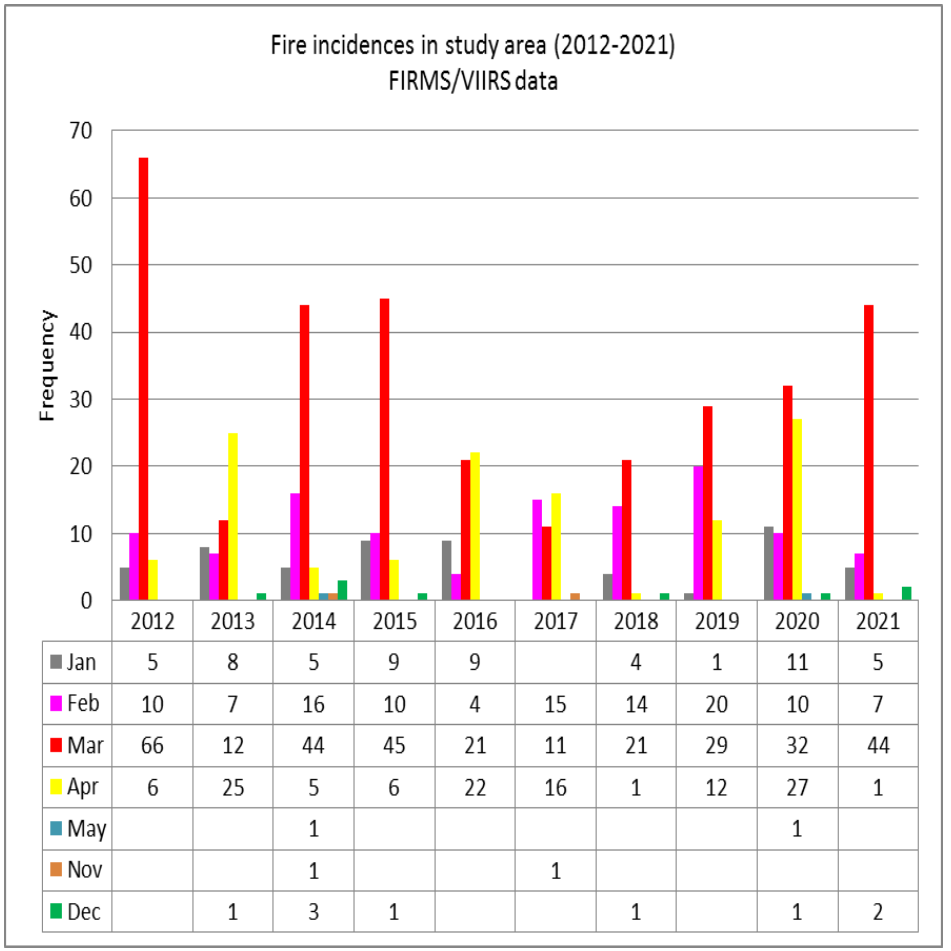
Validation using Fire Hotspot Data (FIRMS/VIIRS)











	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Jan	5	8	5	9	9		4	1	11	5
Feb	10	7	16	10	4	15	14	20	10	7
Mar	66	12	44	45	21	11	21	29	32	44
Apr	6	25	5	6	22	16	1	12	27	1
May			1						1	
Nov			1			1				
Dec		1	3	1			1		1	2

Existing Fire Management Practices

Village	Wildfire, Season, Occurrences, Period	Settle-ment Fire	Early protection	Wildfire protection Practices	Wildfire Suppression Practices	Awareness and Penalty
Hti Ri	Surface fires, Summer (February, March, April), Yearly, 1 to 2 days		Collaborate clear rubbish around village,	Villagers burning bushes and litters along road	Villagers collaborate suppression by using green leaves	Awareness before hot season, Fine (penalty) system whose caused fire
Nawng Pit	-ditto-	1/1980	Burning corn and garlic residuals at autumn season	Awareness, Watchers, Patrolling within CF Break line in CF	-ditto-	-ditto-
Hti Phu	-ditto-		Early burning around Niger Farms,		-ditto-	-ditto-
Hti Wah Mu	-ditto-		-ditto-		-ditto-	-ditto-
Ta khawt Mo	-ditto-	1/1989	-ditto-		-ditto-	-ditto-
Hti Phaung	-ditto-	1/1970	-ditto-		-ditto-	-ditto-
Nawng Din	-ditto-		-ditto-		-ditto-	-ditto-
Te Keh	-ditto-	1/1979	-ditto-		-ditto-	-ditto-
Hti Noh	-ditto-		-ditto-		-ditto-	-ditto-

Forest fire prevention and control plan and Recommendations

a. Objective of forest fire prevention
b. Preventive measures (Pre-attacking plans)
c. Procedures to be followed during forest fire incidents;
d. Measures to extinguish forest fires.
e. List of Responsible Officials
f. Assigned responsibilities
g. Activities
h. Level of Readiness
i. Actions to be taken after extinguishing the fire (Mopping up and Rehabilitation)
j. Consequences and pre-attacking situations

Biological Survey Forms Trees and Bamboo

District : Taunggyi		Township : Taunggyi			Plot no				
RF/PPF : Htitan proposed PPF		Sub-Tsp : Kyauktalon			Date :				
GPS Position		Forest Type							
Easting		Density							
Northing		Terrain							
Elevation		Soil Texture							
Land Category		Slop %			Under brush				
Tno	Code	Tree Species	DBH	Tree Height	Crown length	Stem Class	Infestation	Tree Class	Cut Stump	Remark
			(mm)	(m)	(m)					
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

District : Taunggyi		Township : Taunggyi			Plot number				
RF/PPF : Htitan proposed PPF		Sub-Tsp : Kyauktalon			Date				
GPS Position		Forest Type							
Easting		Density							
Northing		Terrain							
Elevation		Soil Texture							
Land Category		Slope %			Under brush				
Bno	Code	Bamboo Species	Clump number	Culms	1yr old	2 yr old	3 yr old	Cut stumps	Remarks
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Trees Regeneration and Non-Timber Forest Products Survey Form

District : Taunggyi		Township : Taunggyi		Plot no			
RF/PPF : Htitan proposed PPF		Sub-Tsp : Kyauktalon		Date :			
GPS Position		Forest Type					
Easting		Density					
Northing		Terrain					
Elevation		Soil Texture					
Land Category		Slope %		Under brush			

		Seedling	Sapling	Young	
Rno	Tree Species	Ht < 60cm	Ht (60 - 299 cm)	Ht 3m +	Remarks
				DB upto 4.99cm	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Township: Taunggyi		Site : Htitan area		Date :			
no	NTFPs variety	Locale			Situation		Usage	Remarks
		East	North	Elev	ext	Ind		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Wildlife Survey Form

Obs no		GPS position	East	North	Elev	Date					
						Time					
Observation Species			Live	Sign/Evidence							Remark
			number	Track	Scratch	Dung	Rub	Wallow	Sound	Nest	Carcass	
Forest Type			Density			Terrain					
Land Category			Soil Texture			Underbrush					
Obs no		GPS position	East	North	Elev	Date					
						Time					

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1. Township level pilot fire vulnerability assessment

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   Ashok Parajuli, Ambika Prasad Gautam, Sundar Prasad Sharma, Krishna Bahadur Bhujel, Gagan Sharma, Purna Bahadur Thapa, Bhuwan Singh Bist & Shrijana Poudel

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