Assessment on the Roles of Trees and Forests in Building Resilience against Droughts

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SAMOA

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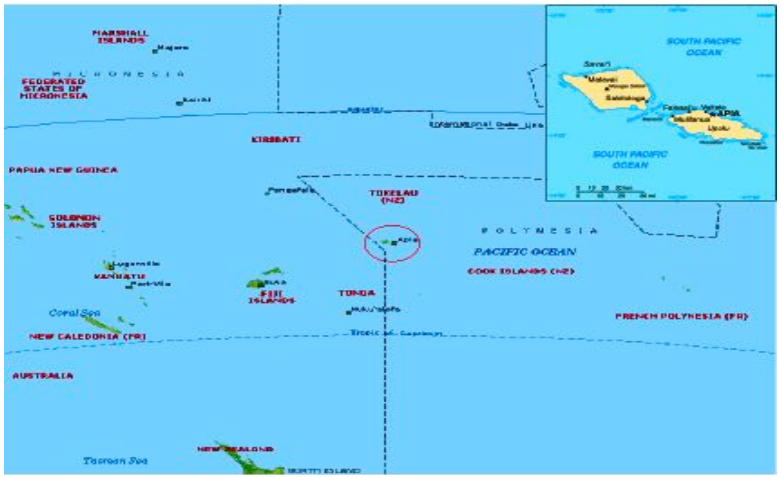
Country Profile

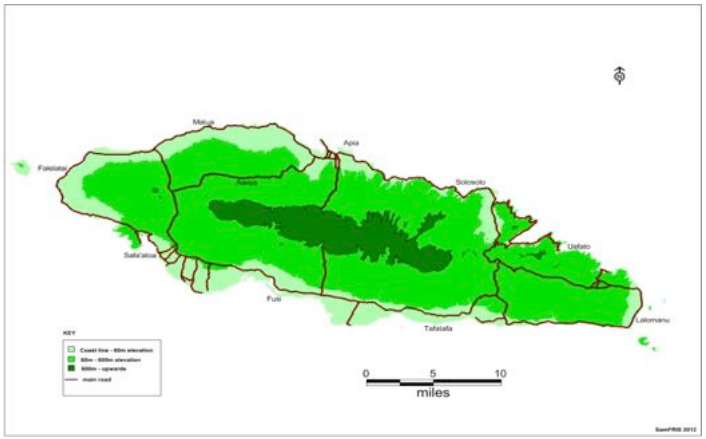
- **Population -** 180,140 thousand
- **Land area** - 2935 km2
- **Climate**
  - Nov-Apr (wet & warm)
  - May – Oct (dry & cool)
  - Temp (ranging from 24 – 32°C daily)



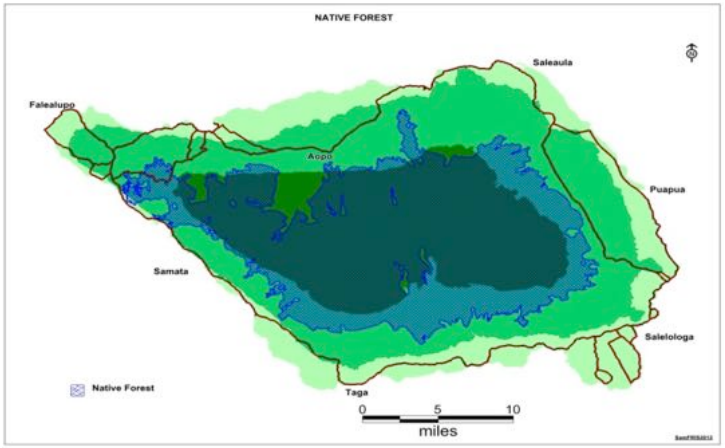
- **Sea Level Rise**
  - projections of 0.9 and 0.88m between the years 1990 and 2100 (IPCC 2001)
- **Tropical Cyclone** – increase in tropical depressions Dec - Feb
- **El Niño Trends**

Area of forest cover/ forest typology

- 80% of the land is customary owned, 15% is owned by government and the 5% is private and freehold land
- that 60% of the forest cover remaining for Samoa
  - Upolu



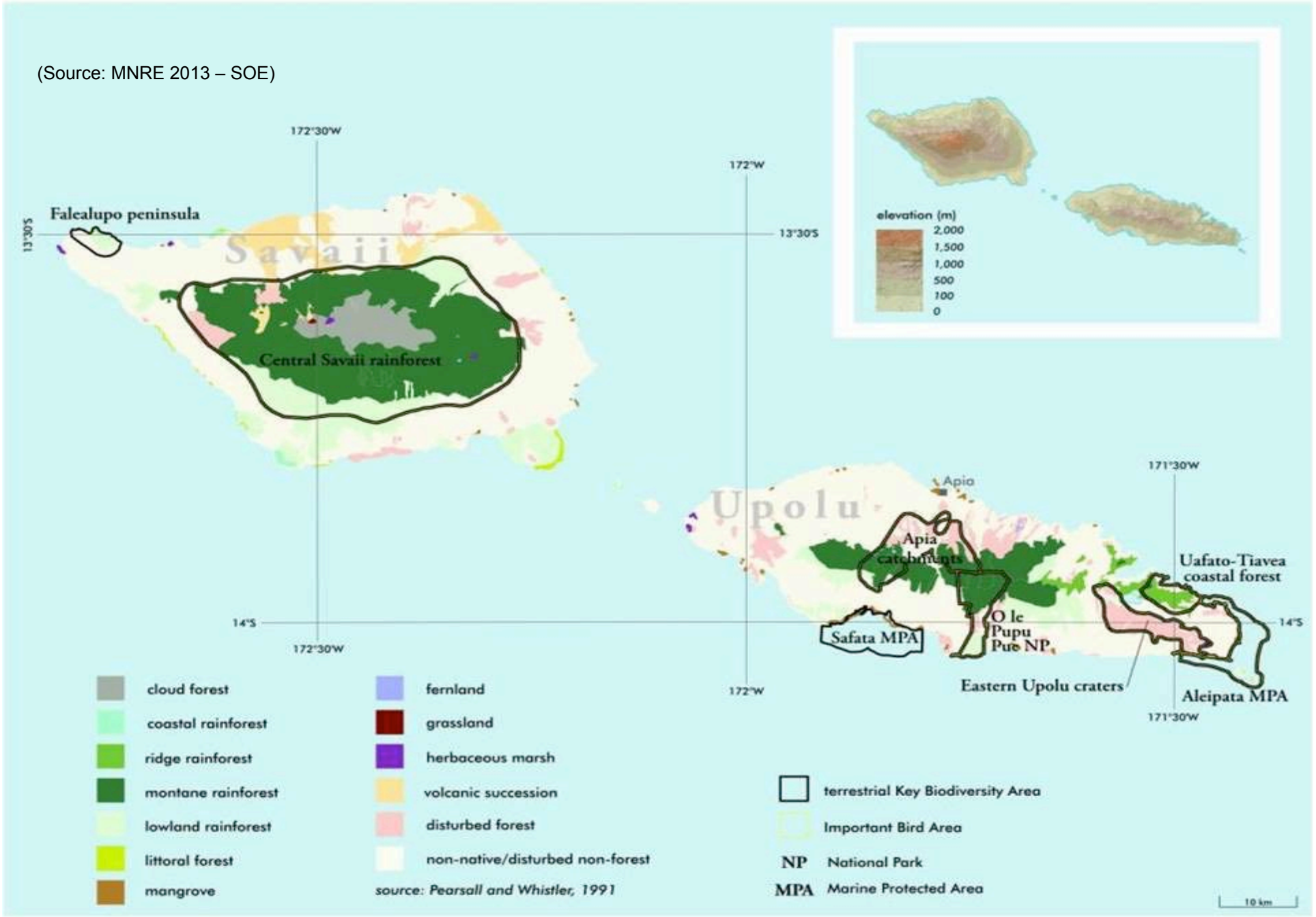
  Savaii



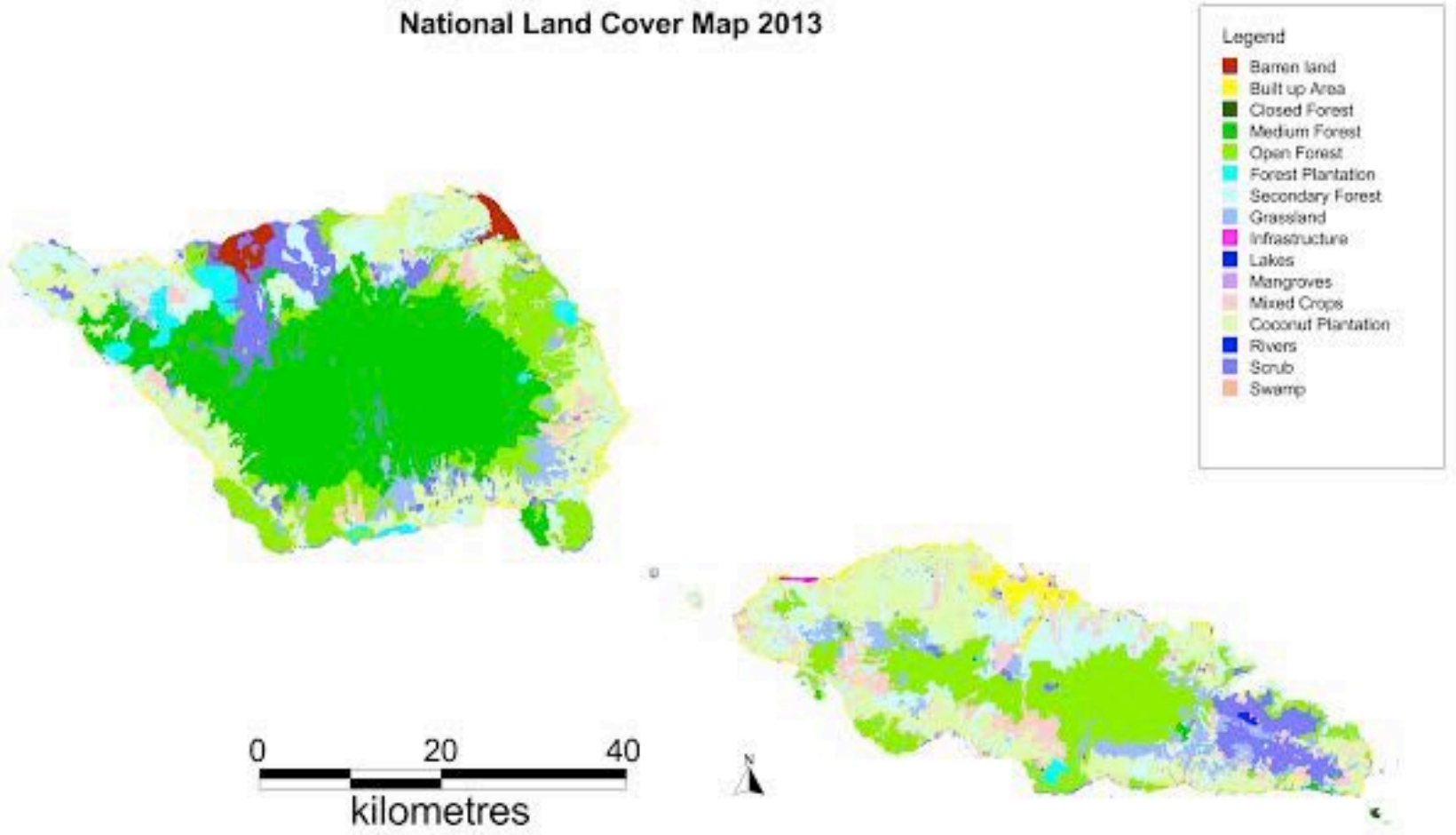
  - dominant forest categories describing the remaining forest of Samoa is “medium” and “open” forest which are defined as having > 65% and > 45% forest cover

Forest Distribution

(Source: MNRE 2013 – SOE)

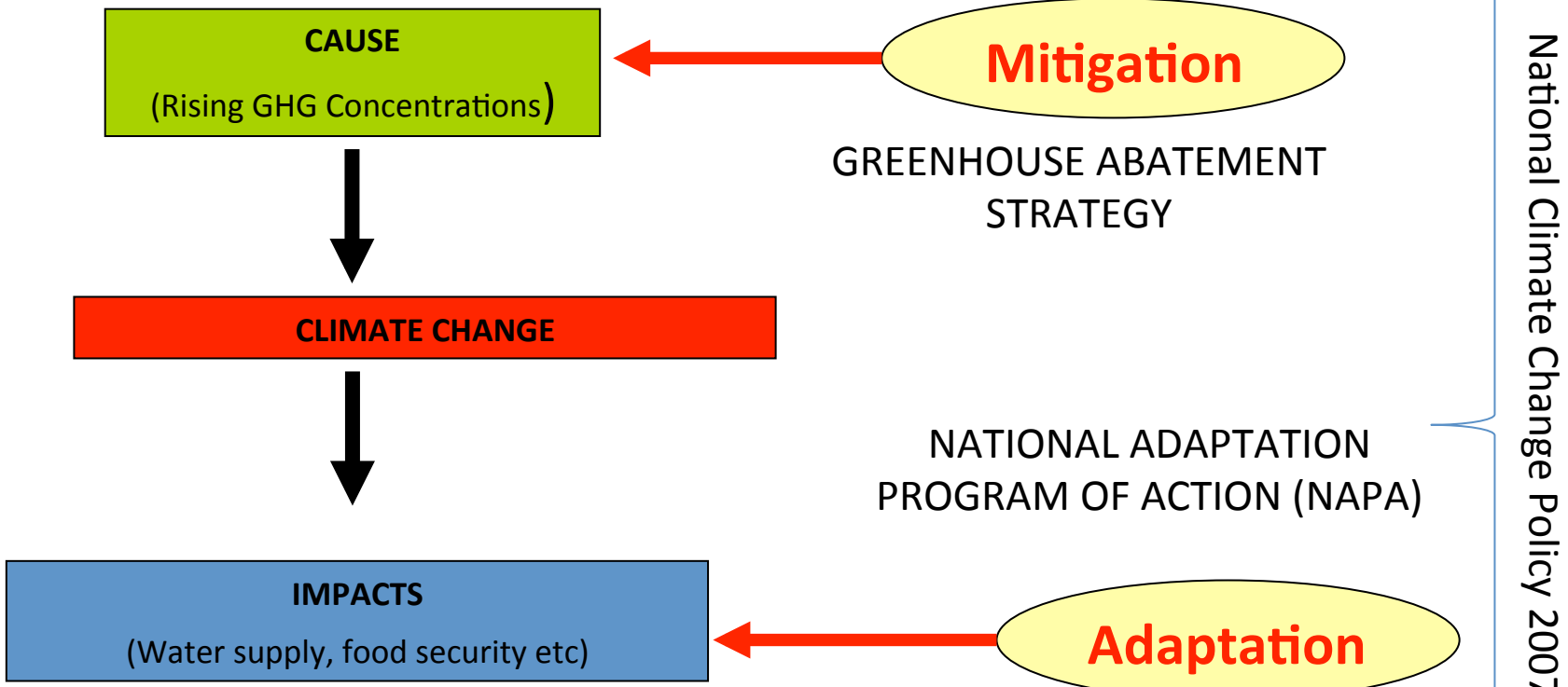


National Land Cover Map 2013



SamFRIS 2014

SAMOA'S POLICY RESPONSES



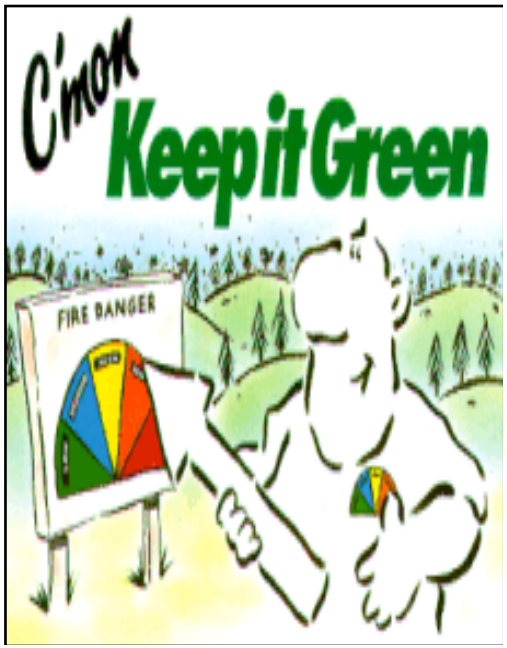
Definition of Adaptation:

In simple terms:

"Learning to live with the new climatic conditions

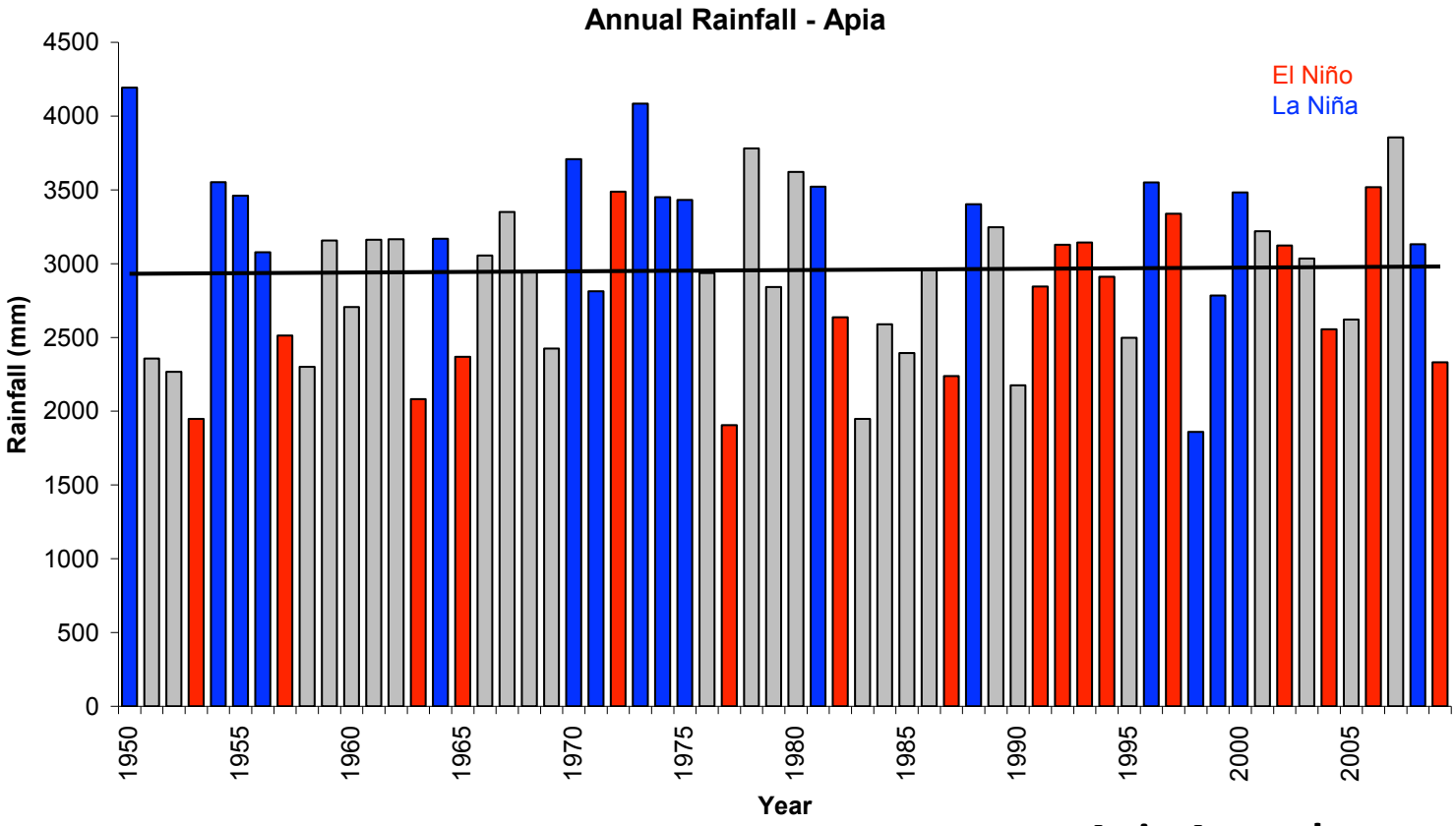
Droughts in the Country

- Metrological, Agricultural, Hydrological, Socio-economic
- Drought periods in 1983, 1997, 2011 and recorded the worse period in 2004
- Data of climate data from MET
- Pictures of dry areas



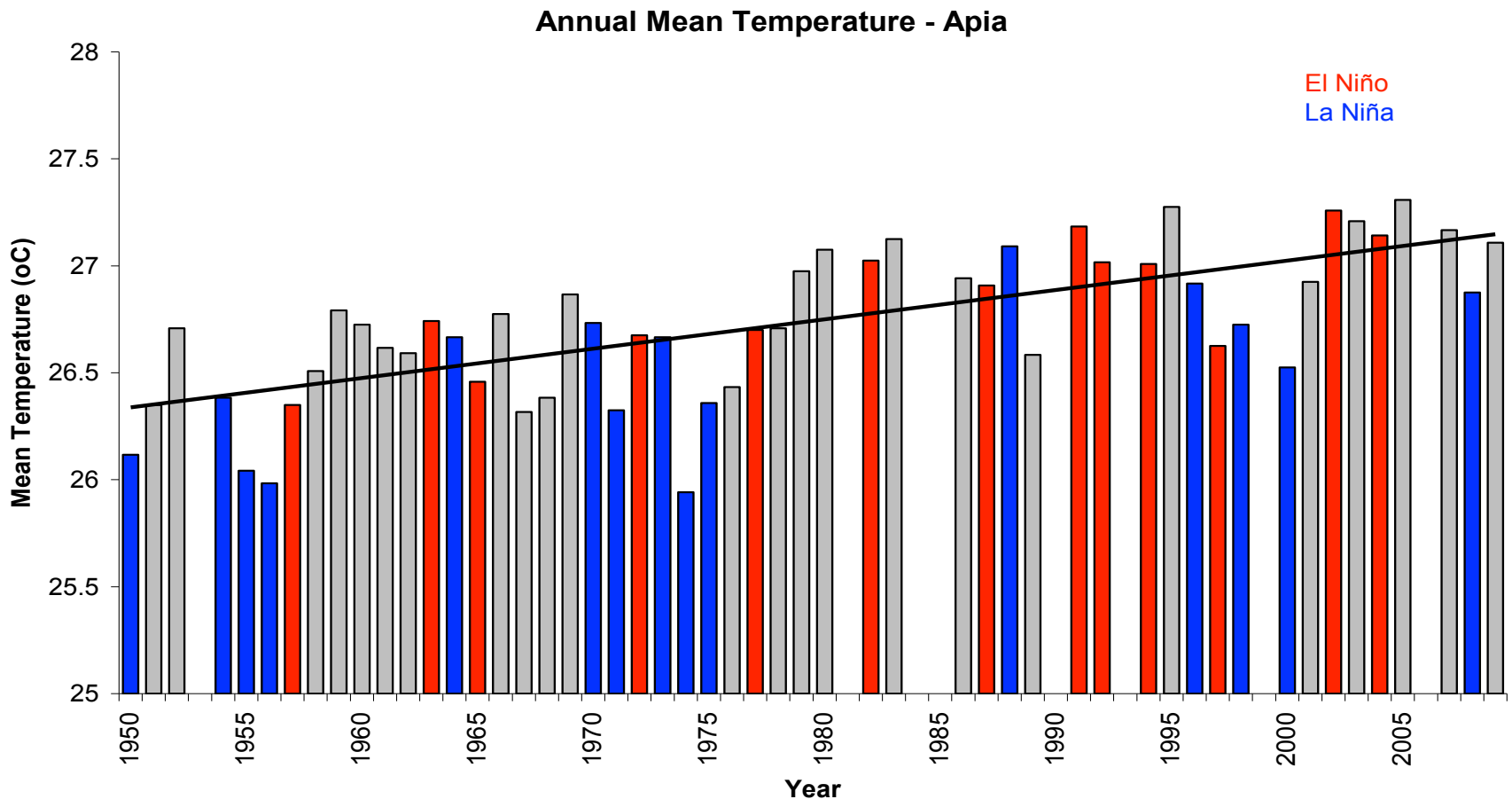

Mu aafia ai vaomatua,
1983,1997, 2004, 2011

Suiga faaletausaga o le timu 1950-2010, le iloga se suiga



Apia Annual Mean Rainfall unchanged From 1950 to 2010

Suiga ole Vevela i Samoa 1950-2010, 0.22 tikeri siitia ai



Apia Annual
Mean Temperature +0.22deg C
From 1950-2010

CLIMATE SUMMARY JULY 2015

(Based on the data collected at Apia Observatory Station, Mulinuu)

Rainfall

Total Rainfall
4.6 mm

Wettest Day
Fri 3rd (1.2mm)

Number of Rainy Days
5 days

July 2015 is the driest ever on record with July 1983 the second driest recorded 15.0 mm of total monthly rain. 2015 & 1983 are both El Nino years.

Temperature

Mean Temperature
23.5 degC

Hottest Day
Tues 21st (33.0degC)

Coldest Morning
Sun 19th (20.5degC)

Mean Temperature in July 2015 was 0.3degC cooler than temperature in July 2014.

Atmospheric Pressure

Mean Pressure
1012.7hPa

Highest Pressure
1015.8hPa (Sat 25th)

Lowest Pressure
1009.3hPa (Fri 3rd)

Mean Atmospheric Pressure in July 2015 was 1.7hPa lower than July 2014

Evaporation

Total Evaporation
116.9mm

Mean Evaporation
5.3mm

Mean Evaporation in July was 0.3mm higher compared to the previous month - June 2015

Wind

Windiest Day
Sun 5th (11.8m/s)

Mean Wind Speed
6.9m/s

Easterly winds dominated the wind records in July 2015

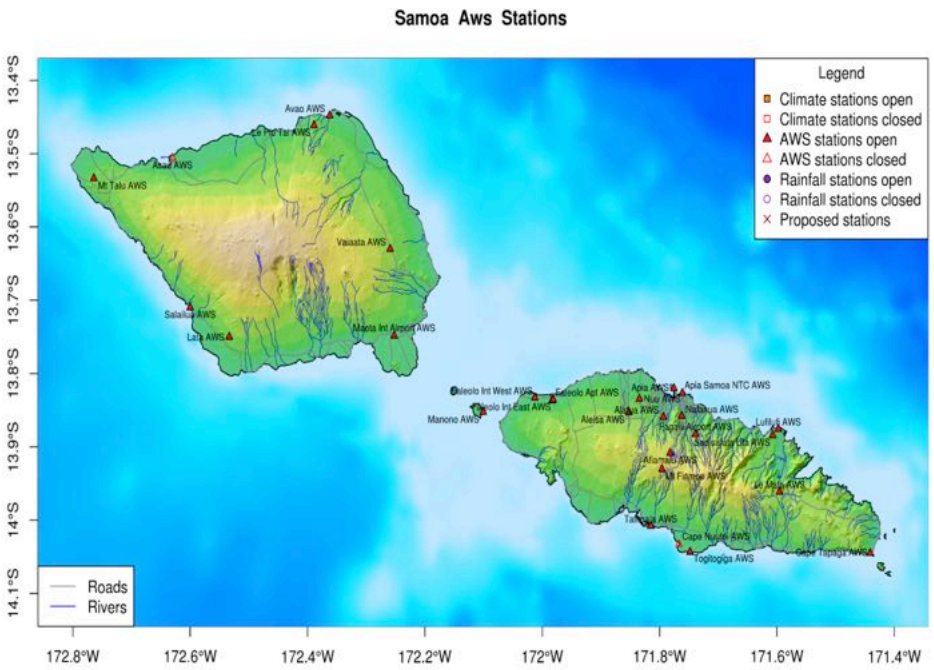
CONTACT US
Samoa Meteorology Division, MNRE
T(685) 20855 F: (685) 23176
W: www.samet.gov.ws
www.facebook.com/Samoa Meteorological Services

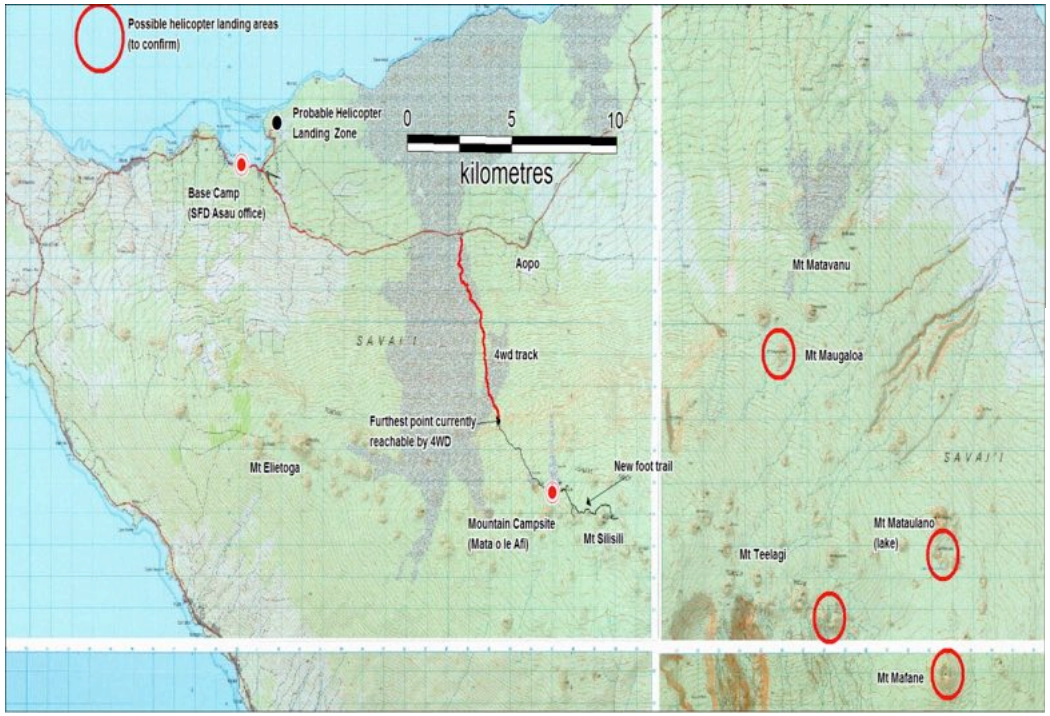
A product of Samoa's Early Warning System (CLEWS)

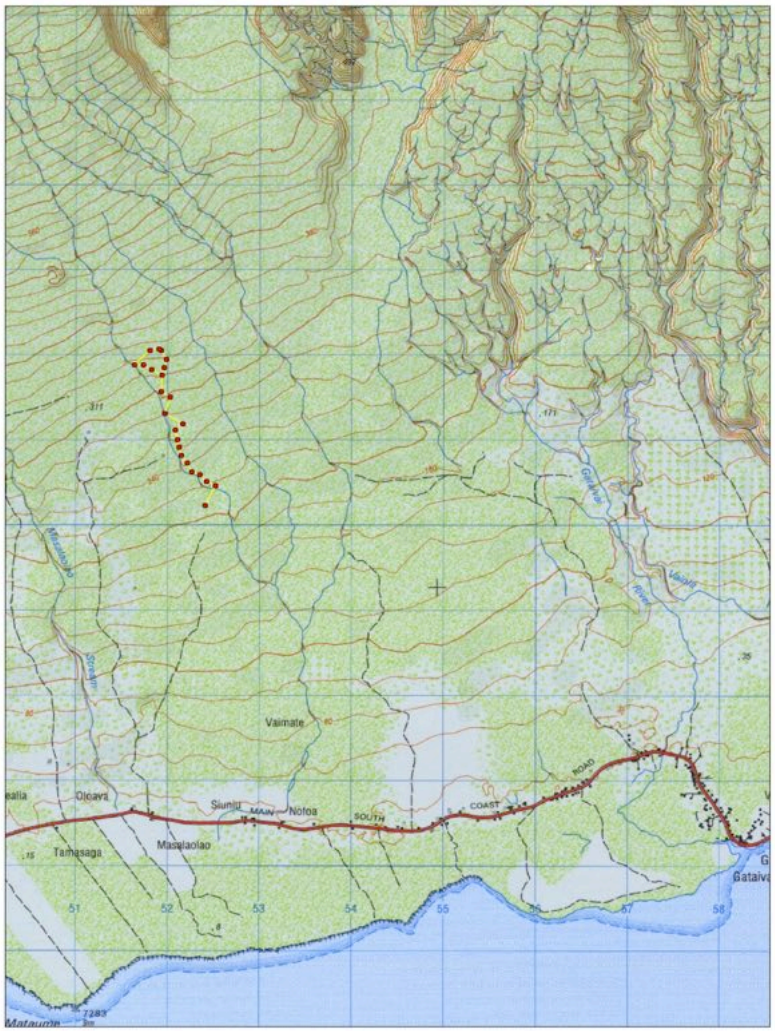
- Rainfall in June 2015 was generally 'average to below average'. Pg 1 & 2
- Generally 'average to below average rainfall received for the April to June 2015 period. Pg 3
- The hottest day temperature of 33.6degC was recorded at Apia on June 18th. The coldest night temperature of 14.4degC was registered at Afiamalu on June 5th. Pg 4
- The mean atmospheric pressure for Apia was above normal. Pg 4
- Easterly winds dominated across all stations in June. Pg 5 & 6
- Warmer than average sea surface temperature recorded across the equatorial region.
  Samoa waters recorded
  0.5 to 1.0degC. Pg 7
- **2015 EL NINO CONTINUES** and forecast to persist for the rest of 2015 and well into 2016. Pg 8
- 'Average to below average' rainfall is favored for the August to October 2015 period. Pg 8

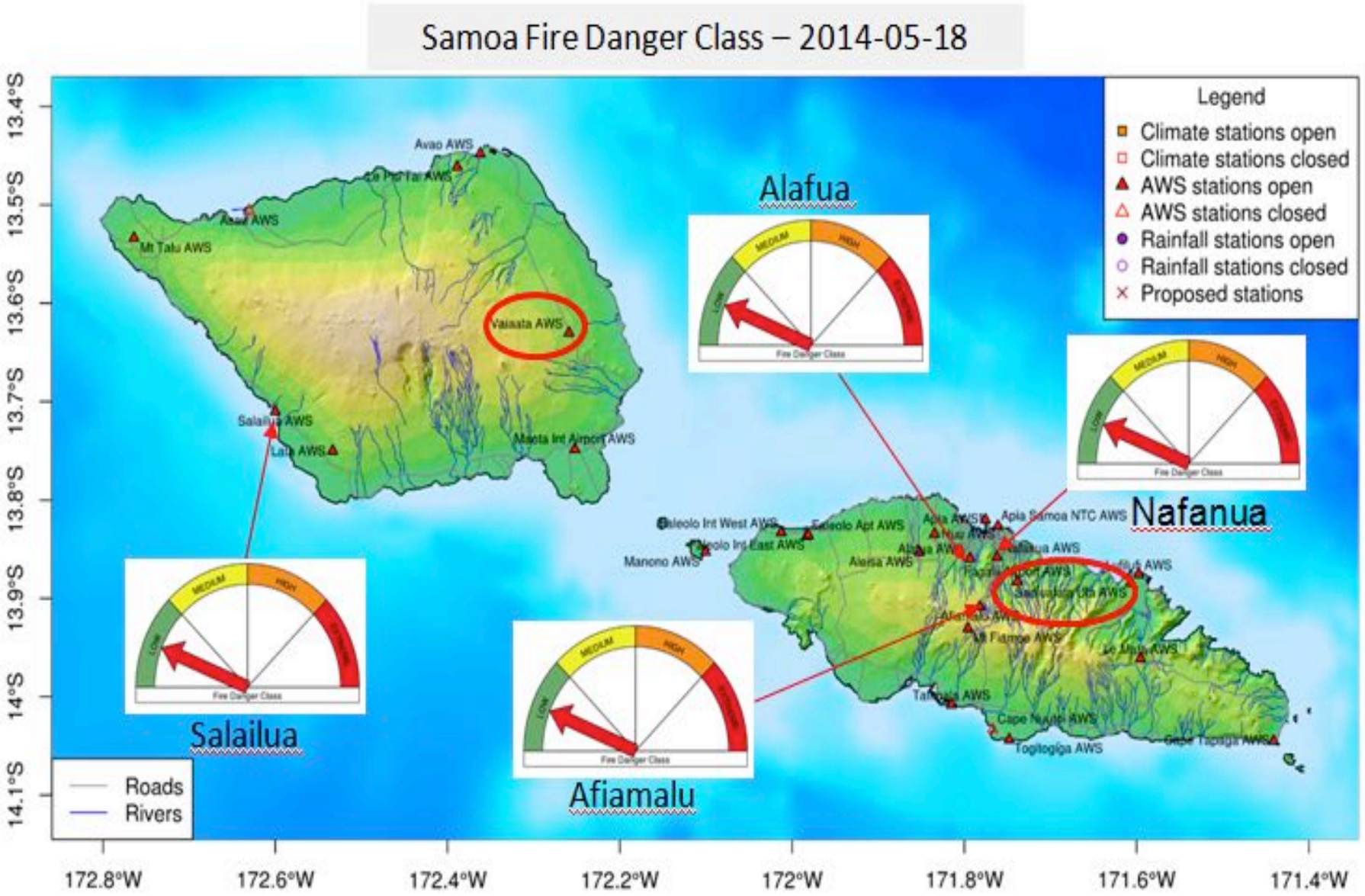
Case Study Area

- Aopo Forest Area & Gataivai Forest Area
  - The Aopo area recently experienced a forest fire in October 2003 and Gataivai in 2011, with an estimated area of damage exceeding 100km2
  - Fire Danger Warning Signboard

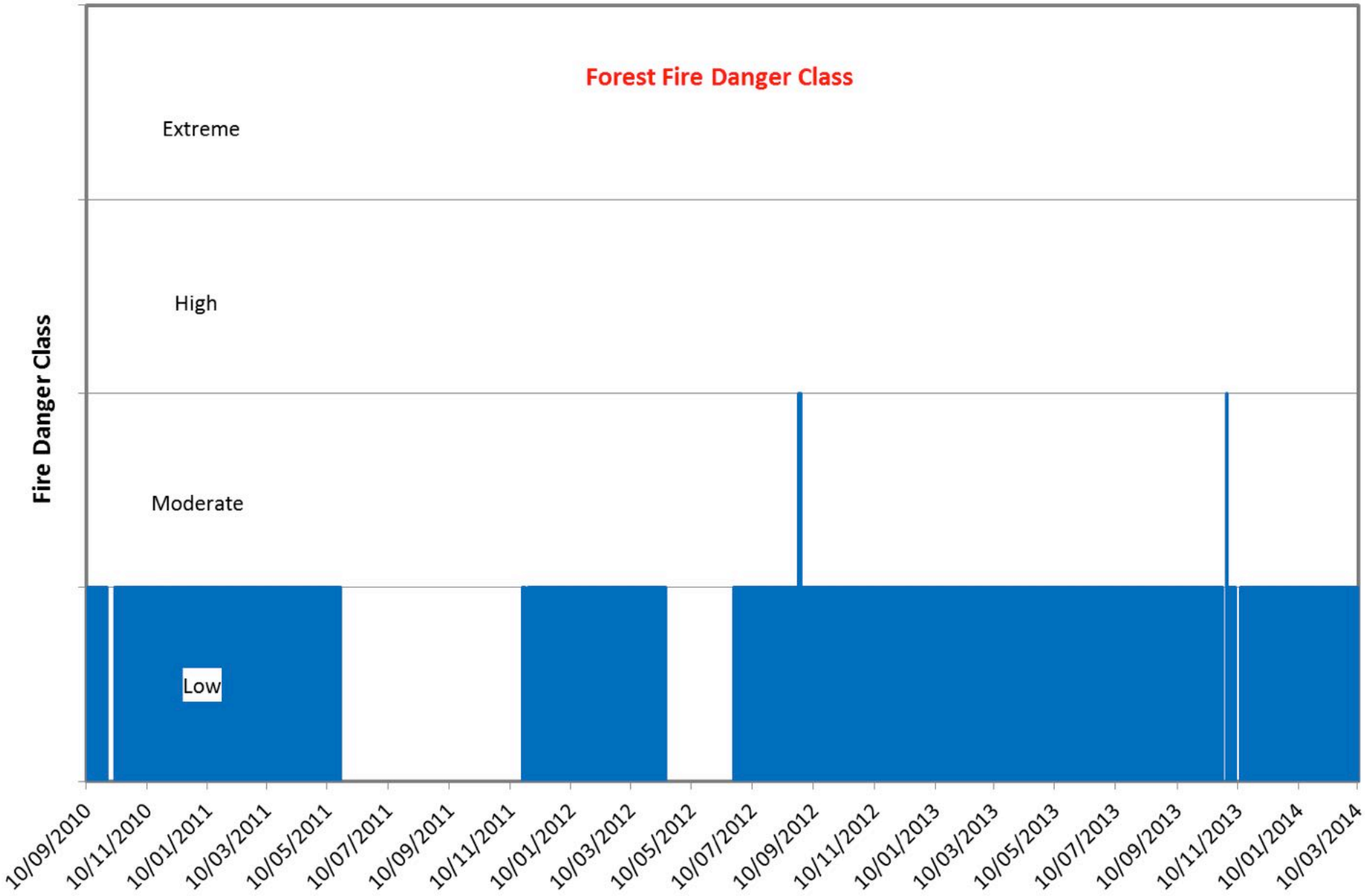



Possible helicopter landing areas
(to confirm)
Probable Helicopter
Landing Zone
0
5
10
kilometres
Base Camp
(SFD Asau office)
Aopo
Mt Matavanu
SAVAI'I
4wd track
Mt Maugaloa
Furthest point currently
reachable by 4WD
Mt Elletoga
New foot trail
SAVAI'I
Mountain Campsite
(Mata o le Afi)
Mt Silisili
Mt Mataulano
(lake)
Mt Teelagi
Mt Mafane


Vaimate
Olcava
Siumu
Nofoa
Masalaolao
Tamasaga
ROAD
COAST
SOUTH
MAIN


Samoa Fire Danger Class – 2014-05-18
Legend
Climate stations open
Climate stations closed
AWS stations open
AWS stations closed
Rainfall stations open
Rainfall stations closed
Proposed stations
Roads
Rivers
Alafua
Nafanua
Salailua
Afiamalu
Avao AWS
Mt Talu AWS
Vaisala AWS
Salailua AWS
Maota Int Airport AWS
Apia Samoa NTC AWS
Manono AWS
Alaisa AWS
Togitogiga AWS
13.4°S
13.5°S
13.6°S
13.7°S
13.8°S
13.9°S
14°S
14.1°S
172.8°W
172.6°W
172.4°W
172.2°W
172°W
171.8°W
171.6°W
171.4°W

Forest Fire Danger Class

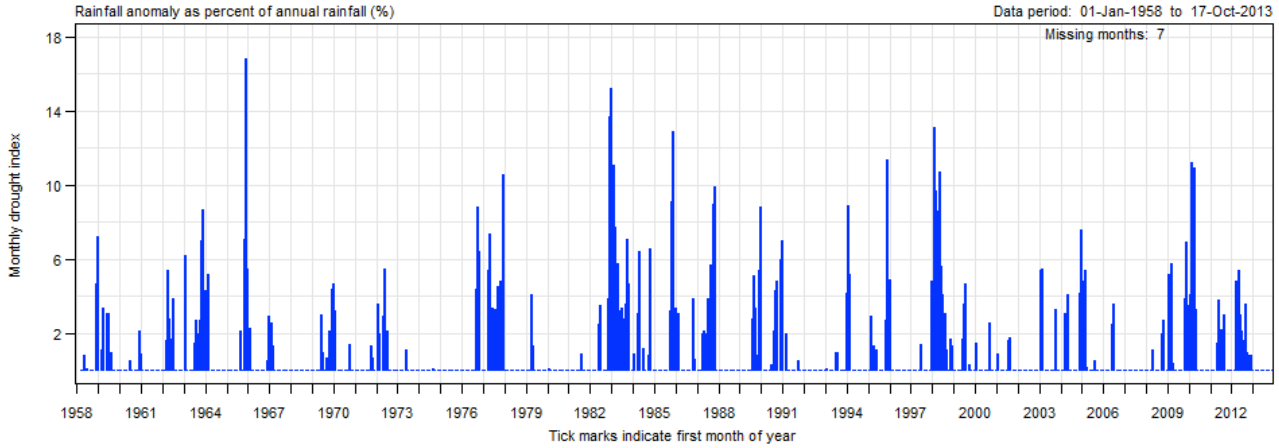


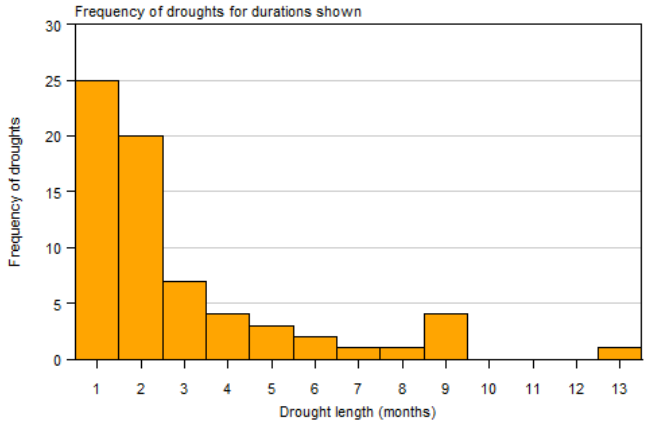
Drought Warning in Samoa

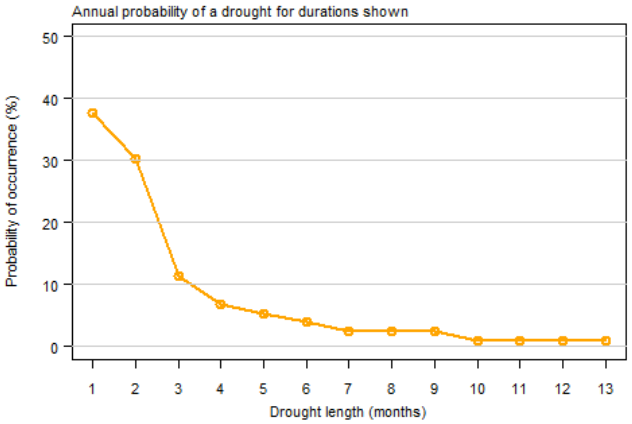
- There is no drought warning for Asau and Gataivai. However a drought watch is issued for the Asau to Aopo region

Forest Fire Class Index

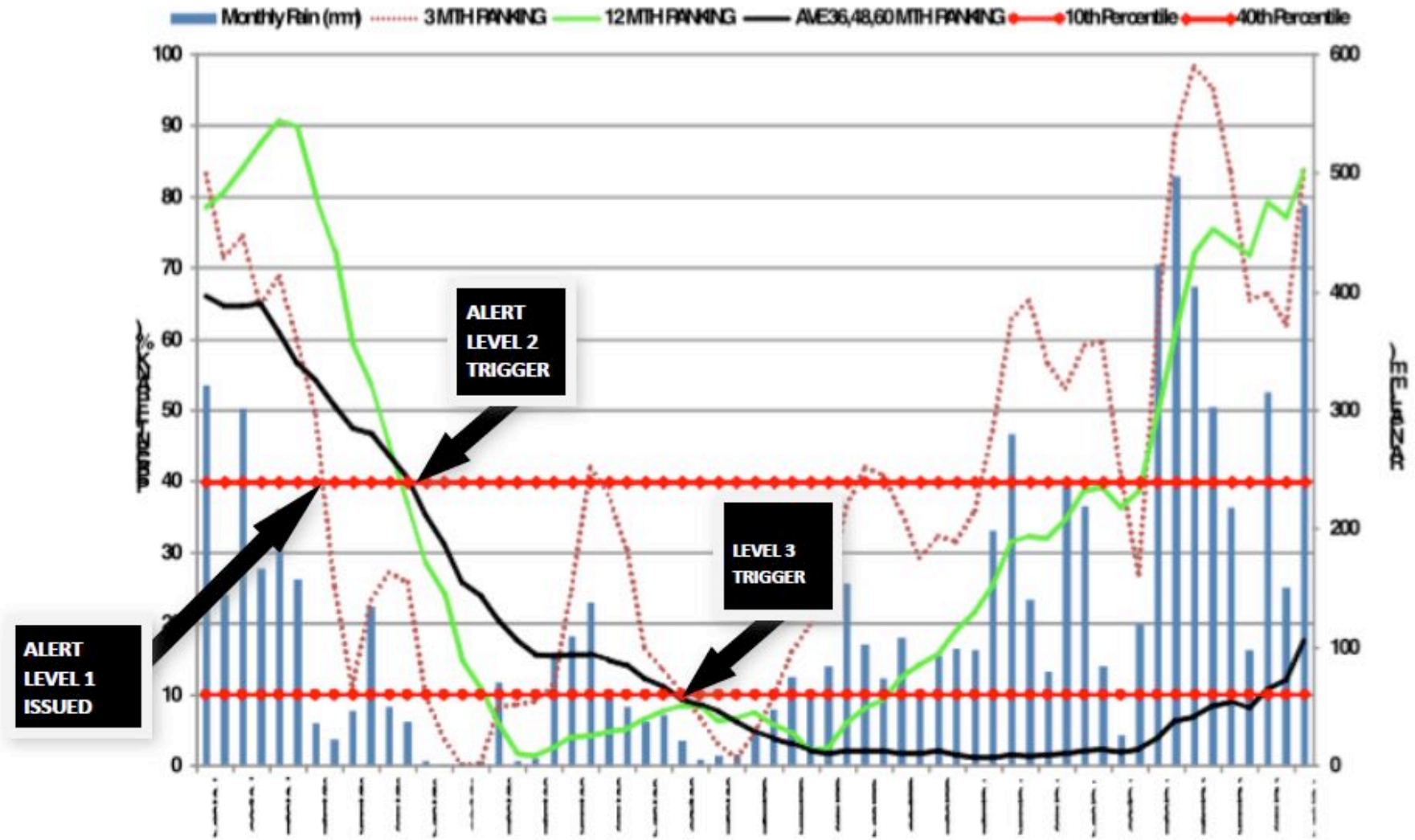
Drought risk







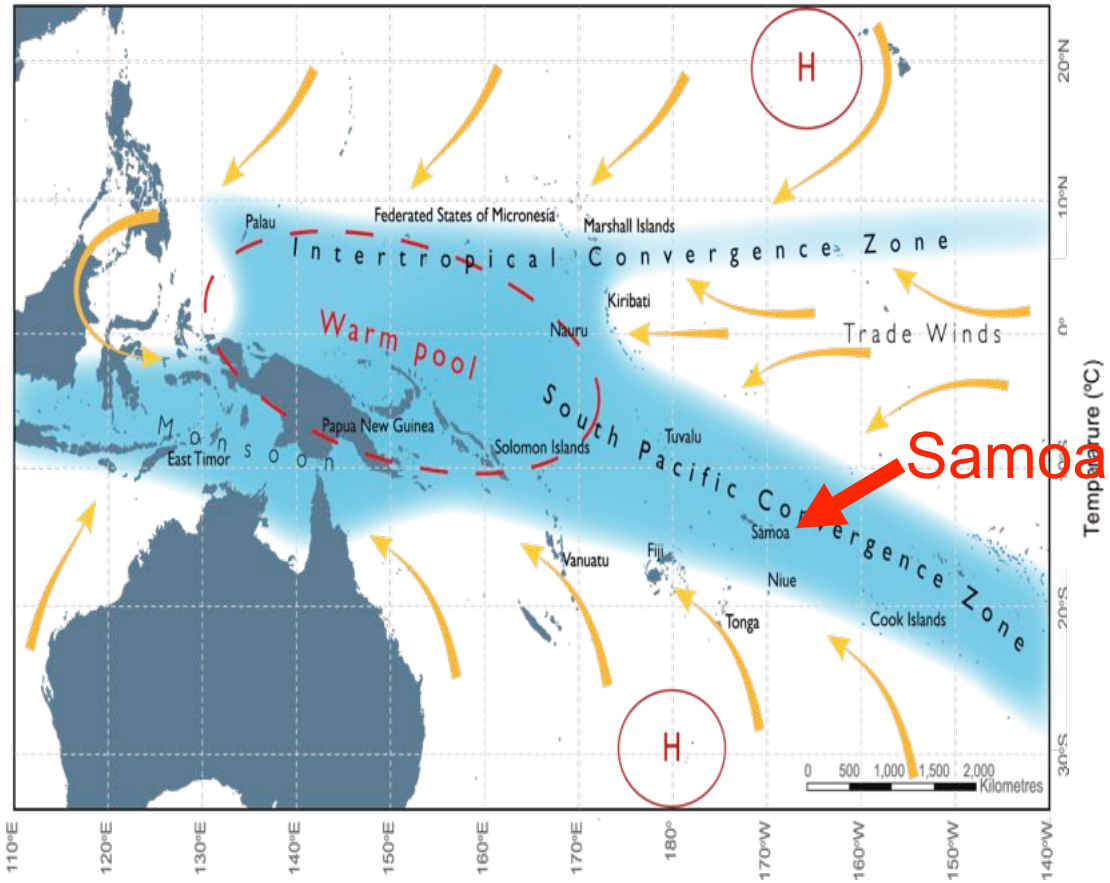
Drought warning



Fire Weather Moisture Codes

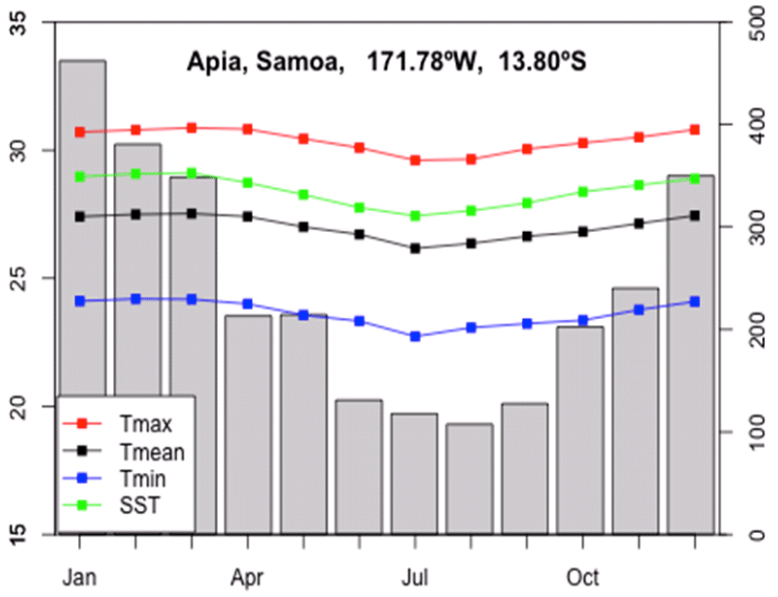
- **Fine Fuel Moisture Code (FFMC)**
  - The FFMC is an indicator of the relevant ease of ignition and flammability of fine fuels.
  - FFMC Ignition Potential -> Difficult: 0.74; Moderately easy: 75-84; Easy: 85-88; Very easy: 89-91; Extremely easy: 92 +
- **Duff Moisture Code (DMC)**
  - The DMC is a rating of the average moisture content of loosely compacted organic layers of moderate depth.
  - DMC Mop-up-needs -> Little: 0-10; Moderate: 11-20; Difficult: 21-30; Difficult and extended: 31-40; Difficult and extensive: 41 +
- **Drought Code (DC)**
  - The DC is rating of the average moisture content of deep, compact, organic layers. This code is a useful indicator of seasonal drought effects on forest fuels and amount of smouldering in deep duff layers and large logs.
  - DC Mop-up-needs -> Low: 0-100; Moderate: 101-175; Difficult: 176-250; Difficult and extended: 251-300; Difficult and extensive: 300 +

Vaega tetele e mafua ai le suiga ole tau



Samoa

Vaega o Ao ma Timuga (SPCZ)
Vevela o le Sami
Savili / Tuaoloa

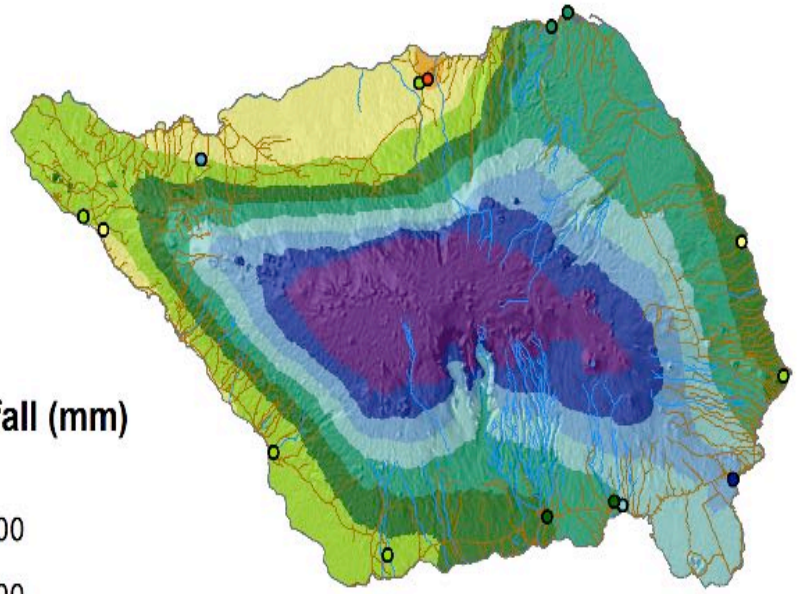


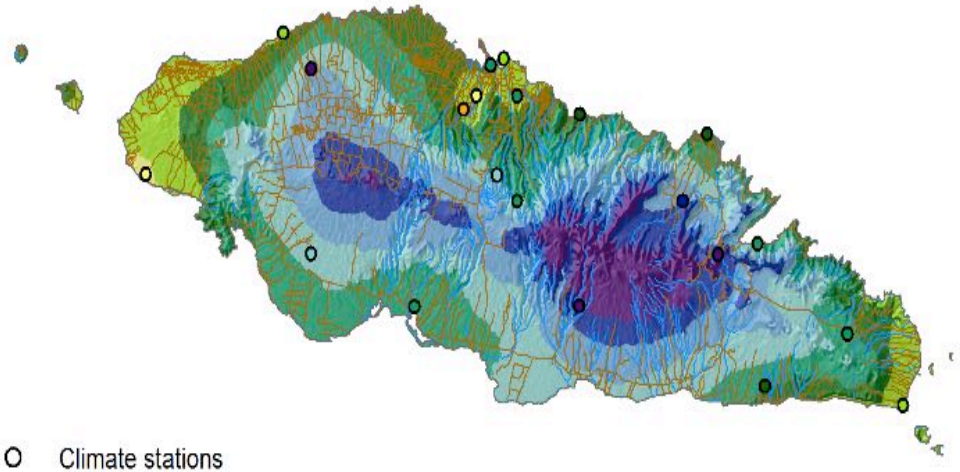
Vaitau o Samoa
(vevela, timu)

How are droughts currently impacting on trees, forests and forest dependent people?

- According to the best available current information, the Samoan climate in 2090 (Samoa Meteorological Division and Australian Bureau of Meteorology 2011) is expected to be:
- • 2 ◦C warmer (medium projection) with an increase in the number of days of extreme heat
- • >5% wetter (with most rainfall increases expected in the wet season and with little change in dry season rainfall) and with increases in the number of days of extreme rainfall
- • Little change in drought (at once to twice every 20 years for moderate to severe drought)
- • Probable decline in the number of tropical cyclones, but a possible increase in their intensity.

Samoa
Mean Annual
Total Rainfall





Rainfall (mm)

- 5,500
- 5,000
- 4,500
- 4,000
- 3,500
- 3,000
- 2,500
- 2,000
- 1,500
- 1,000

Disclaimer:
This map is based on all currently available rainfall stations with a minimum of 2 years of data.

Based on the period 1980 - 1999

Map prepared May 2014

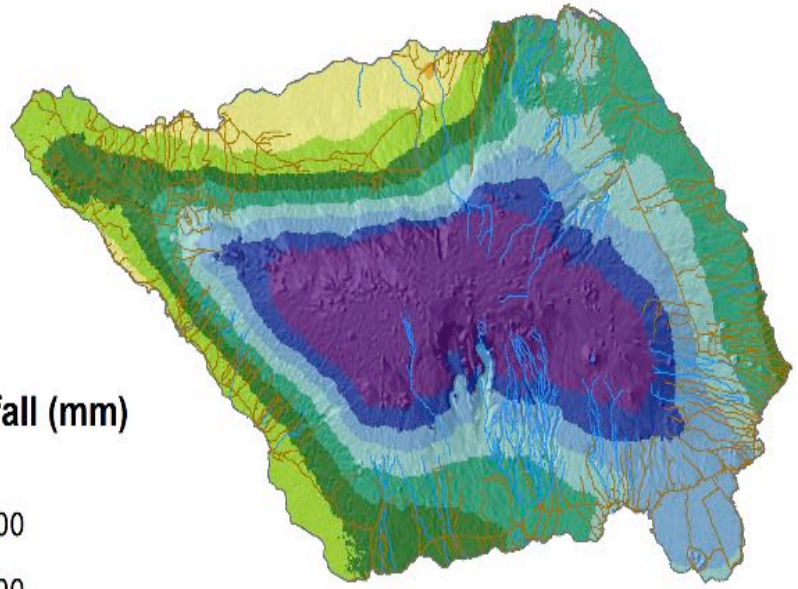
Projection: Western Samoa Grid WGIS

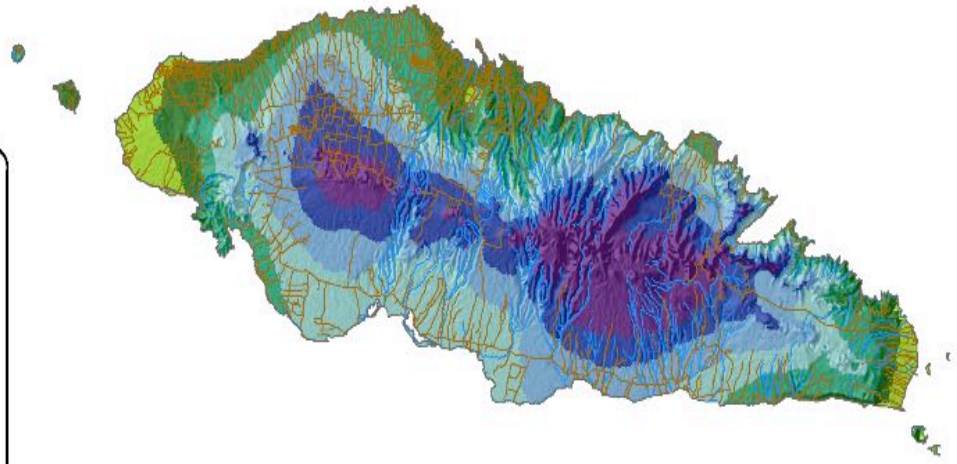
Note that the climate station markers are coloured using the same classification and colour scheme as the under lying climate grid.

- Climate stations
- Roads
- Rivers

0 5 10 20 Kilometres

Samoa
Projected Mean Annual Total Rainfall for 2080-2099





Rainfall (mm)

- 5,500
- 5,000
- 4,500
- 4,000
- 3,500
- 3,000
- 2,500
- 2,000
- 1,500
- 1,000

Disclaimer:
This map is based on projections listed in Table 12.3, Chapter 12, Samoa, in Climate Change in the Pacific: Scientific Assessment and New Research, Vol 2, country reports.

Emissions scenario: High (A2)

Model projections: Multi-model mean

Map prepared May 2014

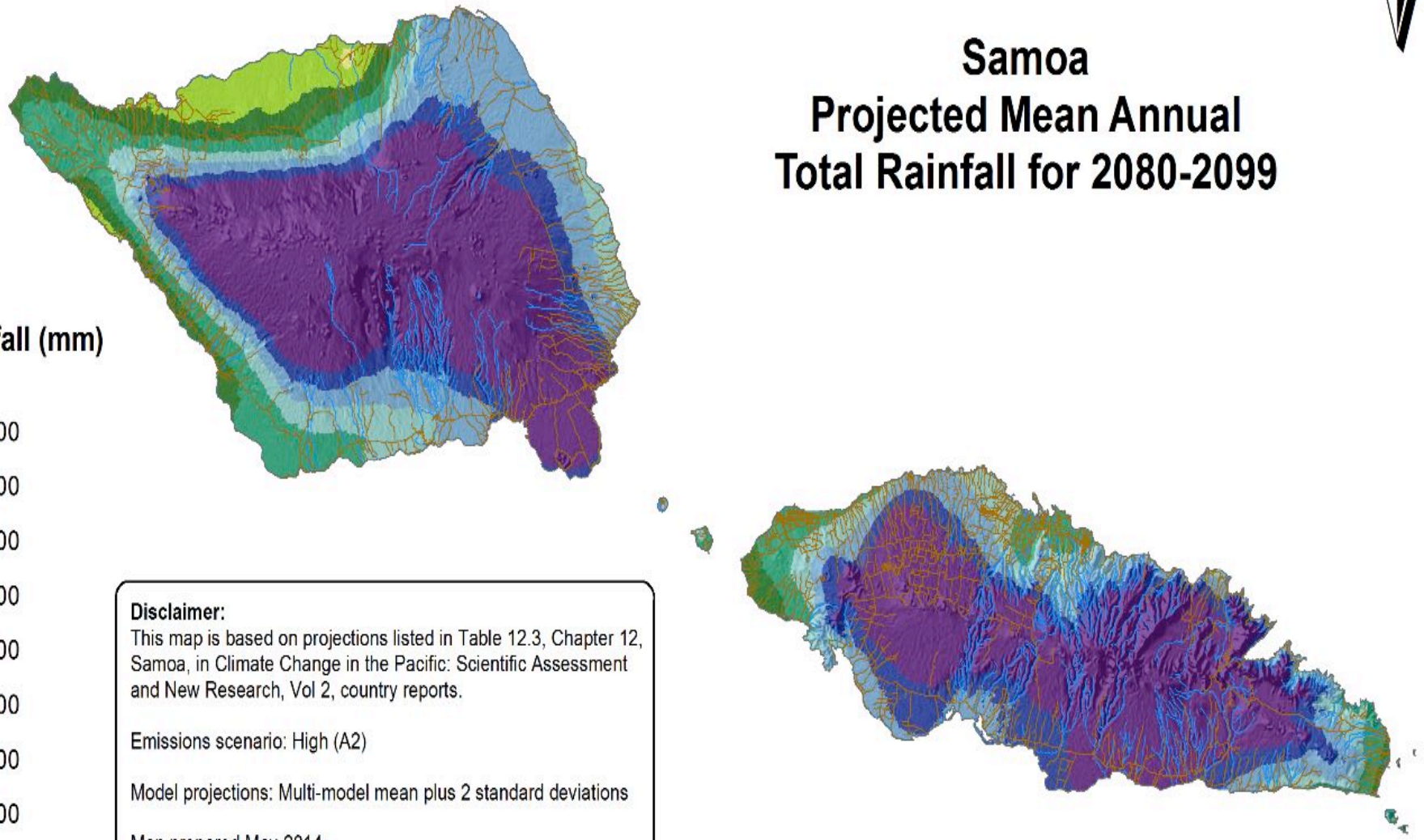
Projection: Western Samoa Grid WGIS

Roads

Rivers

0 5 10 20 Kilometres

Samoa
Projected Mean Annual Total Rainfall for 2080-2099



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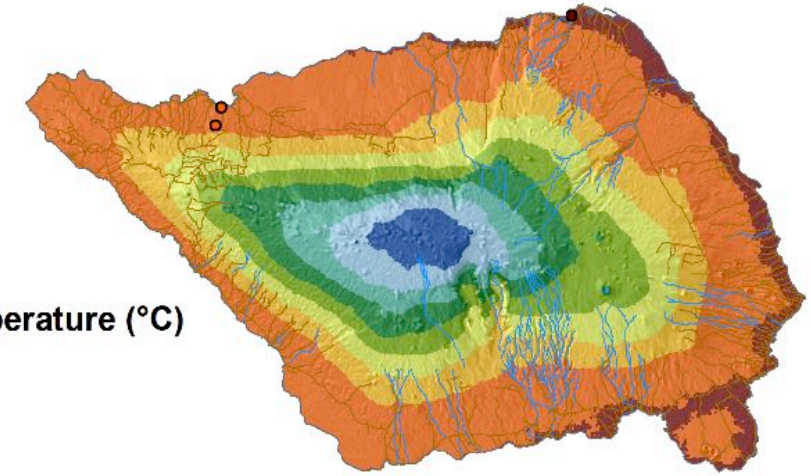
Emissions scenario: High (A2)

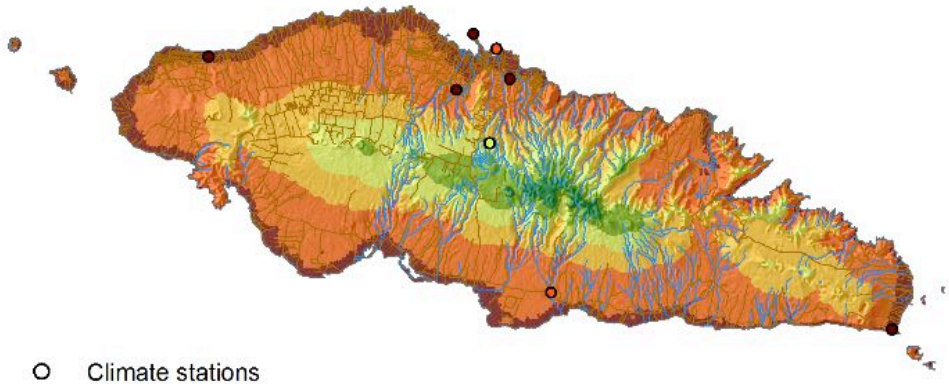
Model projections: Multi-model mean plus 2 standard deviations

Map prepared May 2014

Projection: Western Samoa Grid WGIS

Samoa
Mean Annual
Average Daily
Maximum Temperature





Temperature (°C)

30
28
26
24
22
20
18
16
14

Disclaimer:
This map is are based on all currently available temperature station data.

Based on the period 1980 - 1999

Map prepared May 2014

Projection: Western Samoa Grid WGIS

Note that the climate station markers are coloured using the same classification and colour scheme as the under lying climate grid.

Climate stations

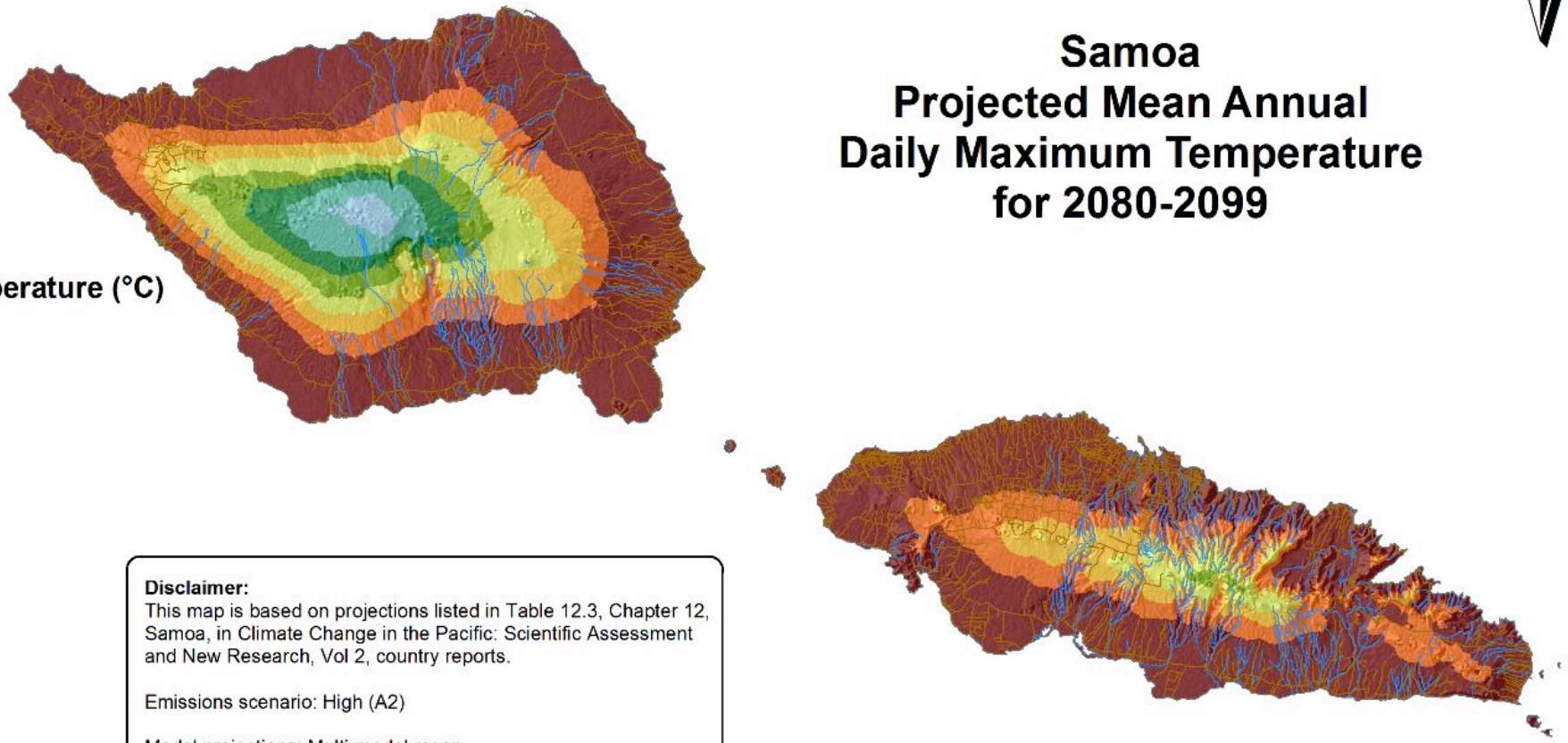
Roads

Rivers

0 5 10 20 Kilometres

Ministry of Natural Resources and Environment
Matagaluega o Punaoa Faanatura ma le Siosiomaga

Samoa
Projected Mean Annual Daily Maximum Temperature for 2080-2099



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Emissions scenario: High (A2)

Model projections: Multi-model mean

Map prepared May 2014

Projection: Western Samoa Grid WGIS

Ministry of Natural Resources and Environment
Matagaluega o Punaoa Faanatura ma le Siosiomaga

Likely implications of Climate Change on droughts and forests in the future

- The Current
- Seasonal temperature differences in Samoa are very small.
- • The wet season extends from November to April. Rainfall is greatly influenced by the position and strength of the South Pacific Convergence Zone, which lies between Samoa and Fiji during the wet season.
- • There is significant year-to-year variability in rainfall, which is strongly influenced by the El Nino-Southern Oscillation. The impact of the El Nino-Southern Oscillation is more significant in the wet season.
- • Positive trends are evident in both annual and seasonal mean air temperatures at Apia for the period 1950–2009.
- • Annual and seasonal rainfall trends for Apia for the period 1950–2009 are not statistically significant.
- • On average Apia experiences 10 tropical cyclones per decade, usually between November and
- • Droughts and flooding associated with the El Nino-Southern Oscillation have impacted the social and economic livelihoods of the Samoan people on many occasions in the past.
- • The sea-level rise near Samoa measured by satellite altimeters since 1993 is about 4 mm per year April. The high variability in tropical cyclone numbers makes it difficult to identify any long-term

- The Future
- Surface air temperature and sea-surface temperature are projected to continue to increase (*very high* confidence).
- • Wet season and annual mean rainfall is projected to increase (*moderate* confidence).
- • Little change is projected in dry season rainfall (*low* confidence).
- • The intensity and frequency of days of extreme heat are projected to increase (*very high* confidence).
- • The intensity and frequency of days of extreme rainfall are projected to increase (*high* confidence).
- • Little change is projected in the incidence of drought (*low* confidence).
- • Tropical cyclone numbers are projected to decline in the south-east Pacific Ocean basin (0–40ºS, 170ºE–130ºW) (*moderate* confidence).
- • Ocean acidification is projected to continue (*very high* confidence).
- • Mean sea-level rise is projected to continue (*very high* confidence).

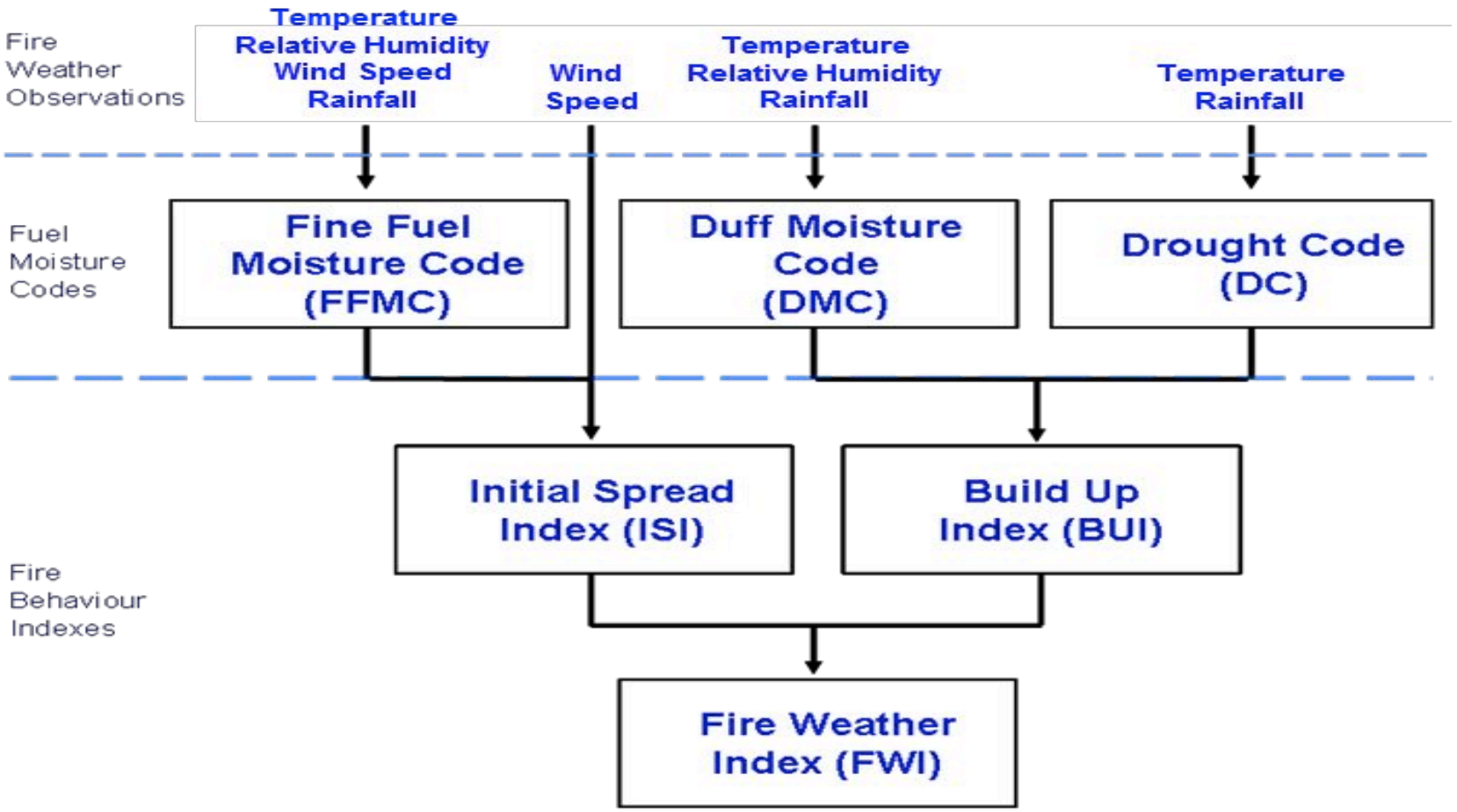
Fire Weather Danger Indices

- **Forest Fire Danger Class (FDC)**
  - The Forest FDC is a general indication of the ease of suppression (or the difficulty of control) of fire burning in standard fuel types i.e. forest.

- **Forest Rate of Spread (ROS)**
  - The Forest ROS is the forward progress per unit time of the head fire generally measured as m/hr.

- **Forest Head Fire Intensity (HFI)**
  - The head of a forest fire is defined as the portion of a fire edge showing the greatest rate of spread and fire intensity (i.e. generally to downwind or upslope)

Fire Weather Index (FWI) System



Lessons learnt

- Restoration/replanting program should focus on the native tree species that are dominant in the vegetation community naturally found in that area and that have important ecological values- such as are food trees for birds and bats or have cultural values- such as are useful for medicine or other cultural purposes.
- When selecting tree species to plant, the species most likely to persist in future climate should be selected. Given that we do not currently know which species are most likely to persist, it is recommended that native species should be selected that are appropriate to the relevant vegetation community.
- Risks from projected climate change can be reduced by planting mixtures of two or preferably three adaptable, compatible species together in catchment conservation areas .
- It is not recommended that any introduced species be planted in restoration projects (although some introduced species might be appropriate for some lowland agro-forestry projects), and certainly no invasive species should be planted.
- Considering that coastal, montane and cloud forests are likely to be disproportionately impacted by climate change in future, special effort should be made to increase the resilience of these forest communities by conducting restoration and forest conservation activities in these communities.

What can and should be done to promote a better future

- Introduction and management of agriculture crop varieties that withstand dry areas and new breed varieties can grow better in the areas where people live;
- Encourage the people to grow, drought resilience species of forest trees and varieties of food crops;
- Programmes need to raise awareness so that we understand the importance of building resilience against droughts;
- Local communities must be involved in the management of these programmes and implementing activities;
- Promotes tourism and by providing income generating activities, such as carving from forest trees and ecotourism activities in the forest, it should be encouraged in the communities to understand sustainable management of the ecosystems services;
- Scientific information and understanding on the impacts and effects of droughts on forest and trees should be addressed;

- Climate early warning information signs and brochures and posters should be distributed to the communities for constant reminder of the severity of drought periods;
- Frequency in drought due to climate change will leave Samoa with diesel as the only option, but then operation cost will be high and it will affect usage rate;
- Develop a policy and legislation for the management of drought in Samoa;
- Develop the Climate Early Warning System (CLEWs) to provide science tailored information to mainstream in to forest areas management;
- Conduct more science-based studies to provide results for proving the serious impacts of climate change on drought and forest areas.

Thank you.