# APPENDIX A: ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AGSO | Australian Geological Survey Organisation |
| ANZLIC | Australia New Zealand Land Information Council |
| ASDI | Australian Spatial Data Infrastructure |
| BoM | (Australian) Bureau of Meteorology |
| CAD | computer aided drafting |
| CSIRO | (Australian) Commonwealth Scientific and Industrial Research Organisation |
| CVA | Community Vulnerability Analysis |
| DMU | (SOPAC) Disaster Management Unit |
| DXF | data exchange format |
| EMA | Emergency Management Australia |
| FGDC | (US) Federal Geographic Data Committee |
| FLIS | Fiji Land Information System |
| ftp | file transfer protocol |
| GIS | geographic information system |
| GPS | Global Positioning System |
| HAU | (SOPAC) Hazard Assessment Unit |
| IAVCEI | International Association of Volcanology and Chemistry of the Earth's Interior |
| IDNDR | International Decade for Natural Disaster Reduction |
| IEAust | Institution of Engineers, Australia |
| IGNS | (NZ) Institute for Geological and Nuclear Sciences |
| LAN | local area network |
| NDMO | National Disaster Management Officers |
| NGO | non-government organisation |
| NOAA | (US) National Oceanographic and Atmospheric Administration |
| NSDI | (US) National Spatial Data Infrastructure |
| PCGIAP | Permanent Committee on GIS Infrastructure for Asia & the Pacific |
| PEAC | Pacific ENSO Applications Centre |
| PIC | Pacific Island Country |
| PNG | Papua New Guinea |
| PNGRIS | PNG Resource Information System |
| PPRR | prevention, preparedness, response and recovery (the disaster management process) |
| PTWC | Pacific Tsunami Warning Centre |
| QDNR | Queensland Department of Natural Resources |
| RADIUS | Risk Assessment Tools for Diagnosis of Urban Areas Against Seismic Disaster |
| SDI | spatial data infrastructure |
| SERMP | Suva Earthquake Risk Management Scenario Pilot Project |
| SII | spatial information infrastructure |
| SOPAC | South Pacific Applied Geoscience Commission |
| SPDRP | South Pacific Disaster Reduction Program |
| TCWC | Tropical Cyclone Warning Centre |
| UNDHA | United Nations Department of Humanitarian Affairs |
| UNDRO | Office of the United Nations Disaster Relief Coordinator |
| Unitech | University of Technology (PNG) |
| UPNG | University of Papua New Guinea |
| USGS | United States Geological Survey |
| USP | University of the South Pacific |
| VANRIS | Vanuatu Resource Information System |
| VMIS | Volcanic-hazard Mapping and Information System |
| VSS | Volcanological Service Support |
| WAN | wide area network |
| WGS 84 | World Geodetic System 1984 |

## APPENDIX B: WORKSHOP PARTICIPANTS

| NAME | POSITION | COUNTRY | WORKSHOP |
|---|---|---|---|
| Pilimi 'Aho | Deputy NDMO | Tonga | 1 & 2 |
| Joe Barr | Consultant | Australia | 2 |
| Linda Berry | CDS Administrator | Australia | 2 |
| Randall Biliki | NDMO | Solomon Islands | 1 |
| Douglas Billy | SOPAC Counterpart | Solomon Islands | 1 |
| Litea Biukoto | SOPAC Project Assistant | SOPAC | 1 |
| Jone Bolaitamana | Principal Assistant Sec. | Fiji | 1 |
| James Britton | Lecturer USP | Fiji | 1 |
| Tony Brown | NDMO | Samoa | 1 |
| Clinton Chapman | | Niue | 1 |
| Joe Chung | Chief Technical Adviser | UNDHA | 1 |
| Job Essau | NDMO | Vanuatu | 1 & 2 |
| Wolf Forstreuter | Scientist | SOPAC | 1 |
| Williams Ganileo | | Vanuatu | 1 |
| Ken Granger | Facilitator AGSO | Australia | 1 & 2 |
| Judy Granger | Recorder | Australia | 1 & 2 |
| Christopher Ioan | Hydrogeologist | Vanuatu | 1 |
| Nilesh Kumar | Scientific Tech. Assistant | Fiji | 1 |
| Atu Kaloumaira | Technical Adviser | UNDHA | 1 |
| Ludwig Kembu | NDMO | PNG | 1 |
| Gabriel Kuna | Principal Hydrogeologist | PNG | 1 |
| Kelepi Mafi | Geologist | Tonga | 1 |
| Franck Martin | Scientist SOPAC | SOPAC | 1 |
| Vaipo Mataora | Survey Department | Cook Islands | 1 |
| Herman Patia | Volcanologist | PNG | 2 |
| Angelika Planitz | Consultant | UNDHA | 1 & 2 |
| Leo'o Polutea | Survey Department | Samoa | 1 |
| Gajendra Prasad | GIS Officer | Fiji | 1 |
| Telefoni Pulu | Engineering Officer | Tonga | 1 |
| Juno Laban | NGO Volunteer | Samoa | 2 |
| Rashmi Rita | GIS Officer | Fiji | 1 |
| Susanna Schmall | Consultant | SOPAC | 1 |
| Harald Schoelzel | Scientist | SOPAC | 1 |
| Graham Shorten | Scientist | SOPAC | 1 |
| Alf Simpson | Director | SOPAC | 1 |
| Arvin Singh | Scientific Officer | Fiji | 1 |
| 'Dingle' Smith | Consultant | Australia | 2 |
| Monika Swamy | Project Assistant | SOPAC | 1 |
| Abere Tababaki | GIS Officer | Solomon Islands | 1 |
| Sakaria Taituave | NDMO | Samoa | 1 & 2 |
| Lameko Talia | Senior Geologist | Samoa | 1 |
| Akapusi 'Tui' Tuifagalele | Disaster manager | Fiji | 1 |
| Lasarusa Vuetibau | Senior Technical Assistant | SOPAC | 1 |
| Andre Zerger | Student ANU | Australia | 2 |

# APPENDIX C: THE AUSTRALIAN SPATIAL DATA INFRASTRUCTURE

The concept of a national spatial data infrastructure (NSDI) is generally seen as being first articulated by US President Bill Clinton, in Executive Order 12906 on 11 April 1994. That Order defined the US NSDI concept as:

> *the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data*

and 'geospatial data' as:

> *information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies. Statistical data may be included in this definition at the discretion of the collecting agency.*
>
> (US, 1994)

A Federal Geographic Data Committee (FGDC) was established under the Executive Order and charged with coordinating the development of the NSDI through three major activities, namely:

- *Establishment of a National Geospatial Data Clearinghouse, which is a distributed electronic network of data producers and users connected through the Internet.*
- *Development of standards for data documentation, collection, and exchange so that data can be shared across State and local boundaries on many different hardware platforms and with many different software programs.*
- *Development of procedures and partnerships to create a national digital geospatial data framework that would include important basic categories of data significant to a broad variety of users.*

(FGDC, 1994)

This US lead has been taken up by many jurisdictions since 1994 including Australia. In Australia the lead has been given by the Australia New Zealand Land Information Council (ANZLIC) which has been actively promoting Australian Spatial Data Infrastructure (ASDI).

The ANZLIC vision of the ASDI is one that 'comprises a distributed network of databases, linked by common policies, standards and protocols to ensure compatibility. In this model, each database would be managed by custodians with the expertise and incentive to maintain the database to the standards required by the community and committed to the principles of custodianship.' The core components of this model are linked as follows:

***INSTITUTIONAL FRAMEWORK***
*defines the policy and administrative arrangements for building, maintaining, accessing and applying the standards and datasets*

***TECHNICAL STANDARDS***
*define the technical characteristics of the fundamental datasets*

***FUNDAMENTAL DATASETS***
*are produced within the institutional framework and fully comply with the standards*

***CLEARING HOUSE NETWORK***
*is the means by which the fundamental datasets are made accessible to the community, in accordance with policy determined within the institutional framework, and to the technical standards agreed.*

(ANZLIC, 1997)

A more detailed description of these components of the ASDI concept can be found on the ANZLIC web site, whilst the Australian Government's position paper can be found on the Australia Survey and Land Information Group (AUSLIG) web site. ASDI has also been caste in the context of an even wider Oceania region infrastructure promoted by the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP). The Oceania GIS Infrastructure has the same structure as ASDI.

The ASDI concept achieved remarkably broad acceptance at the policy level throughout Australia in less than twelve months, due largely to the effective promotion given it by ANZLIC. The concept has quickly found its way into all Australian jurisdictions and its principles and terminology have already being taken up in entities such as the Queensland Spatial Information Infrastructure Strategy (QSIIS) – formerly known as the Queensland Land Information System (QLIS). In the wider information technology (IT) industry, ASDI has already been accepted as an integral part of the wider national information infrastructure.

Key Web sites worth looking at include:

| | |
|---|---|
| FGDC | http://fgdc.er.usgs.gov |
| ANZLIC | http://www.anzlic.org.au/anzdiscu.htm |
| AUSLIG | http://www auslig.gov.au/pipc/csdc/sdi4.htm |
| PCGIAP | http://www.permcom.apgis.gov.au |

# APPENDIX D: INFORMATION NEEDS

GROUP A: SURFACE OF THE EARTH

| TOPIC | THEME |
|---|---|
| GEOLOGY - rock type, strata, age, faults, seismic network, etc | Hazards, Setting |
| GEOTECHNICAL – engineering properties, etc | Hazards, Shelter |
| SOILS – type, properties, depth, etc | Hazards, Setting |
| DRAINAGE FEATURES – lakes, salt pans, rivers, feature names, etc | Hazards, Setting |
| HYDROLOGY – ground water, bores, water quality, river flows, etc | Hazards, Sustenance |
| TERRAIN – elevation, slope, aspect, feature names, etc | Hazards, Setting |
| COASTLINE – beaches, tidal flats, rocks, reefs, tides, feature names, etc | Hazards, Setting |
| OCEAN – depth, currents, sea state, etc | Hazards, Setting |
| HAZARD HISTORY – details of previous earthquake, landslide, flood, etc | Hazards |
| HAZARD POTENTIAL – earthquake, landslides, tsunami, flood, etc 'threat' | Hazards |

GROUP B: CLIMATE

| TOPIC | THEME |
|---|---|
| WINDS – direction, strength, gusts, etc | Hazards, Setting |
| TEMPERATURE – maximum, minimum, means, extremes | Hazards, Setting |
| RAINFALL – amount, seasonal variation, extreme amounts, intensities, etc | Hazards, Setting |
| OTHER ATMOSPHERIC CONDITIONS – sunshine, lightning, fog, etc | Hazards, Setting |
| WEATHER – current, forecast, satellite images, weather station sites, etc | Hazards, Setting |
| HAZARD HISTORY – previous cyclones, severe storms, drought, etc | Hazards |
| HAZARD POTENTIAL – cyclones, severe storms, drought, etc threats | Hazards |

GROUP C: PLANTS AND ANIMALS

| TOPIC | THEME |
|---|---|
| VEGETATION – type, structure, species, traditional foods, etc | Hazards, Setting |
| ANIMALS – mammals, birds, fish, reptiles, insects, traditional foods, etc | Hazards, Setting |
| HAZARD HISTORY – bushfire, snake bite, shark attack, etc history | Hazards |
| HAZARD POTENTIAL – bushfire, poisons, venoms, munchies, etc threat | Hazards |

GROUP D: POPULATION & SETTLEMENT

| TOPIC | THEME |
|---|---|
| POPULATION – census and estimates of numbers, age, sex, migration, etc | Setting, Security |
| SETTLEMENT TYPE – city, town, village, hamlet, etc names & locations | Setting |
| SETTLEMENT REGULATION – land use zoning, building codes, etc | Shelter |
| STRUCTURE TYPES – houses, shops, schools, resorts, etc | Shelter |
| BUILDING CONSTRUCTION & MATERIALS | Shelter |
| EMERGENCY SHELTER – shelters/safe havens, assembly points, etc | Shelter |
| HAZARD HISTORY – building fires, inundation or earthquake damage, etc | Hazards |
| HAZARD POTENTIAL – fire spread, rubble, etc | Hazards |

GROUP E: CULTURAL

| TOPIC | THEME |
|---|---|
| LANGUAGE – what languages are spoken, translators, etc | Society |
| RELIGION – types, adherence, churches, temples, etc | Society |
| CUSTOM – cults, taboos, sacred sites, etc | Society |
| CULTURE – theatres, libraries, museums, heritage sites, meeting houses, etc | Society |
| HAZARD HISTORY – civil conflicts, pay back, racism, land disputes, etc | Hazards |
| HAZARD POTENTIAL – civil conflict, pay back, land disputes, etc | Hazards |

GROUP F: POLITICS

| TOPIC | THEME |
|---|---|
| INTERNATIONAL LEVEL – borders, EEZ, embassies, consulates, etc | Setting |
| NATIONAL LEVEL – parliament, electorates, etc | Setting |
| LOWER LEVEL – councils, wards, electorates, etc | Setting |
| HAZARD HISTORY – war, diplomatic conflict, civil war, coups, etc | Hazards |
| HAZARD POTENTIAL – international conflict, civil war, political strife, etc | Hazards |

GROUP G: PUBLIC ADMINISTRATION

| TOPIC | THEME |
|---|---|
| INTERNATIONAL – Forum offices, UN offices, etc | Setting |
| NATIONAL – department offices, facilities, etc | Setting |
| LOCAL – council chambers, offices, depots, etc | Setting |
| TRADITIONAL – chiefs or other meeting places, etc | Setting, Society |
| JUSTICE – courts, prisons, etc | Setting |
| JURISDICTIONAL BOUNDARIES – regions, districts, suburbs, etc | Setting |
| LAND TENURE – cadastre, formal tenure, customary tenure, etc | Setting |
| UNIONS & ASSOCIATIONS – professional, trade, industry, etc | Setting |
| HAZARD HISTORY – land disputes, strikes, crime, etc | Hazards |
| HAZARD POTENTIAL – land disputes, strikes, crime, etc | Hazards |

GROUP H: PUBLIC SAFETY

| TOPIC | THEME |
|---|---|
| DEFENCE FORCES – HQ, barracks, facilities, resources, etc | Security |
| PROFESSIONAL SERVICES – fire station, police station, control centre, etc | Security |
| VOLUNTEER FORCES – bases, control centres, etc | Security |
| DISASTER PLANS – prevention, preparedness, response, recovery | Security |

GROUP I: SOCIAL

| TOPIC | THEME |
|---|---|
| HEALTH SERVICES – hospitals, doctors, clinics, dentists, ambulance, etc | Security |
| DISABILITIES – blind, deaf, handicapped, etc | Security |
| DEATH SERVICES - morgues, undertakers, cemeteries, crematoriums, etc | Security |
| EDUCATION - schools, colleges, universities, etc | Society |
| COMMUNITY SERVICES - shelters, refuges, social workers, etc | Society |
| WELFARE SERVICES - Red Cross, St Vincents, NGOs, etc | Society |
| HAZARD HISTORY - epidemics, plagues, etc | Hazards |
| HAZARD POTENTIAL - epidemics, plagues, prevention programs, etc | Hazards |

GROUP J: PRIMARY INDUSTRIES

| TOPIC | THEME |
|---|---|
| AGRICULTURE - subsistence & other crops, livestock, storage, etc | Sustenance, Security |
| FISHERY - aquaculture, shore facilities, traditional fish traps, etc | Sustenance, Security |
| FORESTRY - logging, plantations, nurseries, etc | Security |
| MINING - mines, basic processing, etc | Security |
| HAZARD HISTORY - pests and diseases, fire, accidents, etc | Hazards |
| HAZARD POTENTIAL - pests and diseases, fire, accidents, etc | Hazards |

GROUP K: SECONDARY INDUSTRIES

| TOPIC | THEME |
|---|---|
| BASIC PROCESSING - abattoirs, mills, sawmills, refineries, brick kilns, etc | Security |
| FABRICATION - ship building, concrete batching plants, chemicals, etc | Security |
| CONSTRUCTION INDUSTRIES - design, plant & equipment, workshops, etc | Shelter, Security |
| HAZARD HISTORY - fires, explosions, accidents, pollution, etc | Hazards |
| HAZARD POTENTIAL - waste disposal, accidents, etc | Hazards |

GROUP L: SERVICE INDUSTRIES

| TOPIC | THEME |
|---|---|
| RESEARCH & DEVELOPMENT - laboratories, test facilities, etc | Security |
| FINANCE INDUSTRIES - banks, insurance, etc | Security |
| MANUFACTURING - clothing, footwear, crafts, etc | Security |
| ACCOMMODATION - resorts, hotels, motels, hostels, etc | Shelter, Security |
| COMMERCE - markets, shops, stores, bakeries, cafes, etc | Security |
| HAZARD HISTORY - fires, accidents, etc | Hazards |
| HAZARD POTENTIAL - fires, accidents, etc | Hazards |

GROUP M: TRANSPORT & STORAGE

| TOPIC | THEME |
|---|---|
| ROADS & STREETS - surface, capacity, bridges, etc | Shelter |
| ROAD TRANSPORT - cars, buses, trucks, recovery vehicles, etc | Shelter |
| OFF-ROAD MOVEMENT - cross country mobility, etc | Shelter |
| RAIL & TRAMWAYS - permanent ways, bridges, etc | Security, Setting |
| RAILWAYS - rolling stock, engines, repair facilities,, etc | Security, Setting |
| PIPELINES - material carried, pumping stations, pipe material, age, etc | Sustenance, Setting |
| PORTS - wharves, cargo facilities, anchorages, etc | Security, Setting |
| SHIPPING SERVICES - ship types, services, repair facilities, etc | Security, Setting |
| AIRFIELDS - capacity, surface, facilities, etc | Security, Setting |
| AIR SERVICES - aircraft register, services, repair facilities, etc | Security, Setting |
| SPECIAL STORAGE - cold stores, ice plants, explosives, chemicals, etc | Sustenance, Security |
| HAZARD HISTORY - accidents, pollution, etc | Hazards |
| HAZARD POTENTIAL - accident black spots, warning signs, etc | Hazards |

GROUP N: COMMUNICATIONS

| TOPIC | THEME |
|---|---|
| TELECOMMUNICATIONS - phone, radio, TV, Internet, mobile phone, etc | Sustenance |
| OTHER FORMS - postal, print media, couriers, etc | Sustenance, Society |
| HAZARD POTENTIAL - communications disruption, etc | Hazards |

GROUP O: LIFELINE SERVICES

| TOPIC | THEME |
|---|---|
| FUEL SUPPLY - bulk fuel & gas storage, service stations, etc | Sustenance |
| POWER SUPPLY - generation, distribution, reticulation, etc | Sustenance |
| WATER SUPPLY - source, storage, treatment, reticulation, tanks, etc | Sustenance |
| WASTE TREATMENT - sewage, garbage, hazardous waste storage, etc | Sustenance |
| FOOD SERVICES - freezers, bulk stores, bakeries, supermarkets, cafes, etc | Sustenance |
| GENERAL SERVICES - clothing, hardware, repair services, etc | Sustenance, Security |
| HAZARD HISTORY - fire, explosion, pollution, contamination, etc | Hazards |
| HAZARD POTENTIAL - safety regulations and standards, fire, etc | Hazards |

GROUP P: SPACE

| TOPIC | THEME |
|---|---|
| ASTRONOMY - sun rise & sun set times, moon phases, etc | Setting |
| SATELLITES - type, access, footprint, etc | Sustenance, Setting |
| HAZARD POTENTIAL - space junk re-entry, solar flares, etc | Hazards |

GROUP Q: AUTHORITIES (sources of 'expert' advice)

| TOPIC | THEME |
|---|---|
| PROFESSIONAL - meteorologists, geologists, engineers, etc | Hazards, Security |
| TECHNICAL - GIS and computer staff, plant operators, builders, etc | Shelter, Security |
| EXTERNAL ASSISTANCE -aid agencies, etc | Security |
| EMERGENCY MANAGERS - key police, fire, rescue and military staff | Security |
| CIVIL - business, political, church and community leaders | Security, Society |
| TRADITIONAL - custom leaders, community elders, etc | Security, Society |

**Comments**

The thematic groupings used in this appendix was used to survey NDMOs and national GIS officers involved in the Suva workshop. The results of that survey are summarised in Appendix F.

This listing has evolved over the past decade as a result of my experience in undertaking or being involved in information user needs studies in the public safety sector including the Australian Defence Force and the police and emergency service agencies in Queensland.

# APPENDIX E: REPRESENTATIVE BUILDING INVENTORY FORMATS

## A. SOPAC Pacific Cities Project Building Data Attributes

### Main use

house
flats
shed
commercial
industry
public services
health services
public safety
church, temple etc.
education
accommodation
community facilities
depot/garage
communication
other

### Second important use

none
house
flats
shed
commercial
industry
public services
other

### Plan regularity, main structure

regular
irregular

### Wall material

concrete
timber
metal
fibre-cement sheets
brick
traditional material
other

### Windows or glass doors

normal <75% of wall
large >75 % of wall
open wall space
none

**Roof material**

metal
tiles
concrete
fibre-cement sheets
traditional material
wooden shakes
other

**Roof shape**

flat = gable
gable ended
hip ended

**Roof pitch**

flat
low (<1:4 slope)
high (> 1:4 slope)

**Number of storeys**

Numeric value, e.g. 0, 1, 20, of occupiable levels

**Base floor area per storey**

< 50 sqm
50 - 100 sqm
100 - 200 sqm
200 - 400 sqm
> 400 sqm

**Minimum floor height**

Numeric value in cm, e.g. 0, 30, 180

**Maximum floor height**

Numeric value in cm, e.g. 0, 30, 180

**UD material**

slab
wooden poles
concrete columns
steel columns
steel + concrete columns
load bearing walls
wooden poles + walls
concrete columns + walls
steel columns + walls

**UD structure**

slab
soft
stiffened

**Concrete cantilever**

Numeric length of cantilever in cm e.g., 0, 100, 800

**Burglar bars**

yes
no

For open space areas the following attributes are collected

**Open space**

vegetated
grassed
sealed
gravelled
equipment yard
storage yard
other

**Level**

flat
steep

Source: Dr Graham Shorten, SOPAC HAU

**B. Suggested *Building* Database Format & Coding for Duke of York Survey**

The objective of this trial was to locate and gather information on each community in the Duke of York group so that its level of risk from the impact of any major hazard, such as tsunami, volcanic ash fall, etc could be calculated.

PRIORITY 1: BUILDINGS. The following information on each building in each community should be recorded:

1. Building name (if it has one e.g. St Josephs Church)
2. Address*
3. Locality*
4. Building use or function*
5. Height of the floor above the ground*
6. Number of stories*
7. Material of the walls*
8. Material of the roof*
9. Pitch of the roof*
10. Location (GPS latitude and longitude)
11. Elevation (GPS elevation above height datum)
12. Comments (any additional information that may be relevant)

* see accompanying notes for suggested categories, coding and database structure.

PRIORITY 2: INFRASTRUCTURE. In addition to buildings, careful note should be made of supporting infrastructure, especially :

- water supply (wells, pumps, tanks, etc)
- power supply (generators, power lines, etc)
- fuel supply (bulk storage of drum stores for fuels and bottled gas)
- transport infrastructure (roads, wharves, airstrips, etc)
- communications facilities (radio transmitter/receiver towers or antenna, etc)

Careful note should be made of their GPS location and elevation and descriptions recorded and/or photos taken.

PRIORITY 3: GENERAL. General descriptions, photos and sketch maps of anything else that may be of interest such as gardens, dense stands of forest, coconut plantations, etc would be useful.

Suggested Format (MapInfo table)

| | | |
|---|---|---|
| UFI | Integer | |
| Feature | Character | 35 |
| Address | Character | 35 |
| Locality | Character | 25 |
| Type | Character | 1 |
| Fl_ht | Decimal | 3,1 |
| Gd_ht | Decimal | 4,1 |
| Sto | Decimal | 2,0 |
| Wa | Character | 1 |
| Ro | Character | 1 |

# APPENDIX D: INFORMATION NEEDS

GROUP A: SURFACE OF THE EARTH

| TOPIC | THEME |
|---|---|
| GEOLOGY - rock type, strata, age, faults, seismic network, etc | Hazards, Setting |
| GEOTECHNICAL - engineering properties, etc | Hazards, Shelter |
| SOILS – type, properties, depth, etc | Hazards, Setting |
| DRAINAGE FEATURES – lakes, salt pans, rivers, feature names, etc | Hazards, Setting |
| HYDROLOGY – ground water, bores, water quality, river flows, etc | Hazards, Sustenance |
| TERRAIN – elevation, slope, aspect, feature names, etc | Hazards, Setting |
| COASTLINE – beaches, tidal flats, rocks, reefs, tides, feature names, etc | Hazards, Setting |
| OCEAN – depth, currents, sea state, etc | Hazards, Setting |
| HAZARD HISTORY – details of previous earthquake, landslide, flood, etc | Hazards |
| HAZARD POTENTIAL – earthquake, landslides, tsunami, flood, etc 'threat' | Hazards |

GROUP B: CLIMATE

| TOPIC | THEME |
|---|---|
| WINDS – direction, strength, gusts, etc | Hazards, Setting |
| TEMPERATURE – maximum, minimum, means, extremes | Hazards, Setting |
| RAINFALL – amount, seasonal variation, extreme amounts, intensities, etc | Hazards, Setting |
| OTHER ATMOSPHERIC CONDITIONS – sunshine, lightning, fog, etc | Hazards, Setting |
| WEATHER current, forecast, satellite images, weather station sites, etc | Hazards, Setting |
| HAZARD HISTORY – previous cyclones, severe storms, drought, etc | Hazards |
| HAZARD POTENTIAL – cyclones, severe storms, drought, etc threats | Hazards |

GROUP C: PLANTS AND ANIMALS

| TOPIC | THEME |
|---|---|
| VEGETATION – type, structure, species, traditional foods, etc | Hazards, Setting |
| ANIMALS mammals, birds, fish, reptiles, insects, traditional foods, etc | Hazards, Setting |
| HAZARD HISTORY – bushfire, snake bite, shark attack, etc history | Hazards |
| HAZARD POTENTIAL – bushfire, poisons, venoms, munchies, etc threat | Hazards |

GROUP D: POPULATION & SETTLEMENT

| TOPIC | THEME |
|---|---|
| POPULATION – census and estimates of numbers, age, sex, migration, etc | Setting, Security |
| SETTLEMENT TYPE – city, town, village, hamlet, etc names & locations | Setting |
| SETTLEMENT REGULATION – land use zoning, building codes, etc | Shelter |
| STRUCTURE TYPES – houses, shops, schools, resorts, etc | Shelter |
| BUILDING CONSTRUCTION & MATERIALS | Shelter |
| EMERGENCY SHELTER – shelters/safe havens, assembly points, etc | Shelter |
| HAZARD HISTORY – building fires, inundation or earthquake damage, etc | Hazards |
| HAZARD POTENTIAL – fire spread, rubble, etc | Hazards |

GROUP E: CULTURAL

| TOPIC | THEME |
|---|---|
| LANGUAGE – what languages are spoken, translators, etc | Society |
| RELIGION – types, adherence, churches, temples, etc | Society |
| CUSTOM – cults, taboos, sacred sites, etc | Society |
| CULTURE – theatres, libraries, museums, heritage sites, meeting houses, etc | Society |
| HAZARD HISTORY – civil conflicts, pay back, racism, land disputes, etc | Hazards |
| HAZARD POTENTIAL – civil conflict, pay back, land disputes, etc | Hazards |

GROUP F: POLITICS

| TOPIC | THEME |
|---|---|
| INTERNATIONAL LEVEL – borders, EEZ, embassies, consulates, etc | Setting |
| NATIONAL LEVEL – parliament, electorates, etc | Setting |
| LOWER LEVEL – councils, wards, electorates, etc | Setting |
| HAZARD HISTORY – war, diplomatic conflict, civil war, coups, etc | Hazards |
| HAZARD POTENTIAL – international conflict, civil war, political strife, etc | Hazards |

GROUP G: PUBLIC ADMINISTRATION

| TOPIC | THEME |
|---|---|
| INTERNATIONAL – Forum offices, UN offices, etc | Setting |
| NATIONAL – department offices, facilities, etc | Setting |
| LOCAL – council chambers, offices, depots, etc | Setting |
| TRADITIONAL – chiefs or other meeting places, etc | Setting, Society |
| JUSTICE – courts, prisons, etc | Setting |
| JURISDICTIONAL BOUNDARIES – regions, districts, suburbs, etc | Setting |
| LAND TENURE – cadastre, formal tenure, customary tenure, etc | Setting |
| UNIONS & ASSOCIATIONS – professional, trade, industry, etc | Setting |
| HAZARD HISTORY – land disputes, strikes, crime, etc | Hazards |
| HAZARD POTENTIAL – land disputes, strikes, crime, etc | Hazards |

GROUP H: PUBLIC SAFETY

| TOPIC | THEME |
|---|---|
| DEFENCE FORCES – HQ, barracks, facilities, resources, etc | Security |
| PROFESSIONAL SERVICES – fire station, police station, control centre, etc | Security |
| VOLUNTEER FORCES – bases, control centres, etc | Security |
| DISASTER PLANS – prevention, preparedness, response, recovery | Security |

GROUP I: SOCIAL

| TOPIC | THEME |
|---|---|
| HEALTH SERVICES – hospitals, doctors, clinics, dentists, ambulance, etc | Security |
| DISABILITIES – blind, deaf, handicapped, etc | Security |
| DEATH SERVICES - morgues, undertakers, cemeteries, crematoriums, etc | Security |
| EDUCATION - schools, colleges, universities, etc | Society |
| COMMUNITY SERVICES - shelters, refuges, social workers, etc | Society |
| WELFARE SERVICES - Red Cross, St Vincents, NGOs, etc | Society |
| HAZARD HISTORY - epidemics, plagues, etc | Hazards |
| HAZARD POTENTIAL - epidemics, plagues, prevention programs, etc | Hazards |

GROUP J: PRIMARY INDUSTRIES

| TOPIC | THEME |
|---|---|
| AGRICULTURE - subsistence & other crops, livestock, storage, etc | Sustenance, Security |
| FISHERY - aquaculture, shore facilities, traditional fish traps, etc | Sustenance, Security |
| FORESTRY - logging, plantations, nurseries, etc | Security |
| MINING - mines, basic processing, etc | Security |
| HAZARD HISTORY - pests and diseases, fire, accidents, etc | Hazards |
| HAZARD POTENTIAL - pests and diseases, fire, accidents, etc | Hazards |

GROUP K: SECONDARY INDUSTRIES

| TOPIC | THEME |
|---|---|
| BASIC PROCESSING - abattoirs, mills, sawmills, refineries, brick kilns, etc | Security |
| FABRICATION - ship building, concrete batching plants, chemicals, etc | Security |
| CONSTRUCTION INDUSTRIES - design, plant & equipment, workshops, etc | Shelter, Security |
| HAZARD HISTORY - fires, explosions, accidents, pollution, etc | Hazards |
| HAZARD POTENTIAL - waste disposal, accidents, etc | Hazards |

GROUP L: SERVICE INDUSTRIES

| TOPIC | THEME |
|---|---|
| RESEARCH & DEVELOPMENT - laboratories, test facilities, etc | Security |
| FINANCE INDUSTRIES - banks, insurance, etc | Security |
| MANUFACTURING - clothing, footwear, crafts, etc | Security |
| ACCOMMODATION - resorts, hotels, motels, hostels, etc | Shelter, Security |
| COMMERCE - markets, shops, stores, bakeries, cafes, etc | Security |
| HAZARD HISTORY - fires, accidents, etc | Hazards |
| HAZARD POTENTIAL - fires, accidents, etc | Hazards |

GROUP M: TRANSPORT & STORAGE

| TOPIC | THEME |
|---|---|
| ROADS & STREETS - surface, capacity, bridges, etc | Shelter |
| ROAD TRANSPORT - cars, buses, trucks, recovery vehicles, etc | Shelter |
| OFF-ROAD MOVEMENT - cross country mobility, etc | Shelter |
| RAIL & TRAMWAYS - permanent ways, bridges, etc | Security, Setting |
| RAILWAYS - rolling stock, engines, repair facilities,, etc | Security, Setting |
| PIPELINES - material carried, pumping stations, pipe material, age, etc | Sustenance, Setting |
| PORTS - wharves, cargo facilities, anchorages, etc | Security, Setting |
| SHIPPING SERVICES - ship types, services, repair facilities, etc | Security, Setting |
| AIRFIELDS - capacity, surface, facilities, etc | Security, Setting |
| AIR SERVICES - aircraft register, services, repair facilities, etc | Security, Setting |
| SPECIAL STORAGE - cold stores, ice plants, explosives, chemicals, etc | Sustenance, Security |
| HAZARD HISTORY - accidents, pollution, etc | Hazards |
| HAZARD POTENTIAL - accident black spots, warning signs, etc | Hazards |

GROUP N: COMMUNICATIONS

| TOPIC | THEME |
|---|---|
| TELECOMMUNICATIONS - phone, radio, TV, Internet, mobile phone, etc | Sustenance |
| OTHER FORMS - postal, print media, couriers, etc | Sustenance, Society |
| HAZARD POTENTIAL - communications disruption, etc | Hazards |

GROUP O: LIFELINE SERVICES

| TOPIC | THEME |
|---|---|
| FUEL SUPPLY - bulk fuel & gas storage, service stations, etc | Sustenance |
| POWER SUPPLY - generation, distribution, reticulation, etc | Sustenance |
| WATER SUPPLY - source, storage, treatment, reticulation, tanks, etc | Sustenance |
| WASTE TREATMENT - sewage, garbage, hazardous waste storage, etc | Sustenance |
| FOOD SERVICES - freezers, bulk stores, bakeries, supermarkets, cafes, etc | Sustenance |
| GENERAL SERVICES - clothing, hardware, repair services, etc | Sustenance, Security |
| HAZARD HISTORY - fire, explosion, pollution, contamination, etc | Hazards |
| HAZARD POTENTIAL - safety regulations and standards, fire, etc | Hazards |

GROUP P: SPACE

| TOPIC | THEME |
|---|---|
| ASTRONOMY - sun rise & sun set times, moon phases, etc | Setting |
| SATELLITES - type, access, footprint, etc | Sustenance, Setting |
| HAZARD POTENTIAL - space junk re-entry, solar flares, etc | Hazards |

GROUP Q: AUTHORITIES (sources of 'expert' advice)

| TOPIC | THEME |
|---|---|
| PROFESSIONAL - meteorologists, geologists, engineers, etc | Hazards, Security |
| TECHNICAL - GIS and computer staff, plant operators, builders, etc | Shelter, Security |
| EXTERNAL ASSISTANCE -aid agencies, etc | Security |
| EMERGENCY MANAGERS - key police, fire, rescue and military staff | Security |
| CIVIL - business, political, church and community leaders | Security, Society |
| TRADITIONAL - custom leaders, community elders, etc | Security, Society |

**Comments**

The thematic groupings used in this appendix was used to survey NDMOs and national GIS officers involved in the Suva workshop. The results of that survey are summarised in Appendix F.

This listing has evolved over the past decade as a result of my experience in undertaking or being involved in information user needs studies in the public safety sector including the Australian Defence Force and the police and emergency service agencies in Queensland.

# APPENDIX E: REPRESENTATIVE BUILDING INVENTORY FORMATS

## A. SOPAC Pacific Cities Project Building Data Attributes

**Main use**

house
flats
shed
commercial
industry
public services
health services
public safety
church, temple etc.
education
accommodation
community facilities
depot/garage
communication
other

**Second important use**

none
house
flats
shed
commercial
industry
public services
other

**Plan regularity, main structure**

regular
irregular

**Wall material**

concrete
timber
metal
fibre-cement sheets
brick
traditional material
other

**Windows or glass doors**

normal <75% of wall
large >75 % of wall
open wall space
none

**Roof material**

metal
tiles
concrete
fibre-cement sheets
traditional material
wooden shakes
other

**Roof shape**

flat = gable
gable ended
hip ended

**Roof pitch**

flat
low (<1:4 slope)
high (> 1:4 slope)

**Number of storeys**

Numeric value, e.g. 0, 1, 20, of occupiable levels

**Base floor area per storey**

< 50 sqm
50 - 100 sqm
100 - 200 sqm
200 - 400 sqm
> 400 sqm

**Minimum floor height**

Numeric value in cm, e.g. 0, 30, 180

**Maximum floor height**

Numeric value in cm, e.g. 0, 30, 180

**UD material**

slab
wooden poles
concrete columns
steel columns
steel + concrete columns
load bearing walls
wooden poles + walls
concrete columns + walls
steel columns + walls

**UD structure**

slab
soft
stiffened

**Concrete cantilever**

Numeric length of cantilever in cm e.g., 0, 100, 800

**Burglar bars**

yes
no

For open space areas the following attributes are collected

**Open space**

vegetated
grassed
sealed
gravelled
equipment yard
storage yard
other

**Level**

flat
steep

Source: Dr Graham Shorten, SOPAC HAU

**B. Suggested *Building* Database Format & Coding for Duke of York Survey**

The objective of this trial was to locate and gather information on each community in the Duke of York group so that its level of risk from the impact of any major hazard, such as tsunami, volcanic ash fall, etc could be calculated.

PRIORITY 1: BUILDINGS. The following information on each building in each community should be recorded:

1. Building name (if it has one e.g. St Josephs Church)
2. Address*
3. Locality*
4. Building use or function*
5. Height of the floor above the ground*
6. Number of stories*
7. Material of the walls*
8. Material of the roof*
9. Pitch of the roof*
10. Location (GPS latitude and longitude)
11. Elevation (GPS elevation above height datum)
12. Comments (any additional information that may be relevant)

* see accompanying notes for suggested categories, coding and database structure.

PRIORITY 2: INFRASTRUCTURE. In addition to buildings, careful note should be made of supporting infrastructure, especially :

- water supply (wells, pumps, tanks, etc)
- power supply (generators, power lines, etc)
- fuel supply (bulk storage of drum stores for fuels and bottled gas)
- transport infrastructure (roads, wharves, airstrips, etc)
- communications facilities (radio transmitter/receiver towers or antenna, etc)

Careful note should be made of their GPS location and elevation and descriptions recorded and/or photos taken.

PRIORITY 3: GENERAL. General descriptions, photos and sketch maps of anything else that may be of interest such as gardens, dense stands of forest, coconut plantations, etc would be useful.

Suggested Format (MapInfo table)

| | | |
|---|---|---|
| UFI | Integer | |
| Feature | Character | 35 |
| Address | Character | 35 |
| Locality | Character | 25 |
| Type | Character | 1 |
| Fl_ht | Decimal | 3,1 |
| Gd_ht | Decimal | 4,1 |
| Sto | Decimal | 2,0 |
| Wa | Character | 1 |
| Ro | Character | 1 |

| | | |
|---|---|---|
| Ro_pi | Character | 1 |
| Comments | Character | 35 |
| Longitude | Decimal | 9,4 |
| Latitude | Decimal | 9,4 |

*UFI* Unique Feature Identifier - unique number for each record. Computer generated.

*Feature* Name of the feature as indicated by signs on or at the feature or local knowledge.

*Address* If street names are used in the community include number and street name.

*Locality* Village or settlement name.

*Type* Major activity conducted at feature as identified from field. The following broad activity groups have been used and features are displayed with the MapInfo symbols indicated in the following table:

| CODE | CLASSIFICATION | SYMBOL | COMMENTS |
|---|---|---|---|
| P | **P**ublic safety - police, fire, ambulance, SES, defence, etc | 12pt solid cross, black | *Sensitive facilities* related to the provision of emergency response |
| L | **L**ogistics - bulk supplies of fuel, gas & food; bulk storage and transport services | 12pt solid dot, yellow | *Sensitive facilities* that contribute significantly to community sustainability |
| D | **D**octors and other health services - hospitals, nursing homes, clinics, dentists, etc | 12pt solid cross, green | *Sensitive facilities* that provide all forms of health service |
| U | power **U**tilities - generation, distribution and service facilities | 12pt solid star, black | *Sensitive facilities* that provide power supplies |
| W | **W**ater supply and sewerage utilities - above ground storage, treatment, pumping, etc | 12pt solid dot, light blue | *Sensitive facilities* that store, treat or reticulate water and sewerage services |
| T | **T**elecommunications - radio, telephone, TV, etc | 12pt asterisk, black | *Sensitive facility* providing communications services |
| A | **A**ccommodation - commercial (non private) accommodation such as hotels, motels & resorts | 10pt solid square, red | *Special risks* associated with commercial accommodation where concentrations of people are found - typically short term accommodation |
| B | **B**usiness - commercial and professional facilities such as shops, offices, etc | 10pt solid square, yellow | *Special risks* associated with shopping centres and other places of business |
| E | **E**ducation - schools, TAFE, convents, child care centres, etc | 12pt 'flagged building', red | *Special risks* associated with concentrations of children |

| TOPIC | NEED |
|---|---|
| INTERNATIONAL LEVEL - borders, EEZ, embassies, consulates, etc | 2 |
| NATIONAL LEVEL - parliament, electorates, etc | 3 |
| LOWER LEVEL - councils, wards, electorates, etc | 3 |
| HAZARD HISTORY - war, diplomatic conflict, civil war, coups, etc | 2 |
| HAZARD POTENTIAL - international conflict, civil war, political strife, etc | 2 |

GROUP G: PUBLIC ADMINISTRATION

| TOPIC | NEED |
|---|---|
| INTERNATIONAL - Forum offices, UN offices, etc | 2 |
| NATIONAL - department offices, facilities, etc | 3 |
| LOCAL - council chambers, offices, depots, etc | 6 |
| TRADITIONAL - chiefs or other meeting places, etc | 3 |
| JUSTICE - courts, prisons, etc | 1 |
| JURISDICTIONAL BOUNDARIES - regions, districts, postcodes, suburbs, etc | 5 |
| LAND TENURE - cadastre, formal tenure, customary tenure, etc | 2 |
| UNIONS & ASSOCIATIONS - professional, trade, industry, etc | 0 |
| HAZARD HISTORY - land disputes, strikes, crime, etc | 2 |
| HAZARD POTENTIAL - land disputes, strikes, crime, etc | 2 |

GROUP H: PUBLIC SAFETY

| TOPIC | NEED |
|---|---|
| DEFENCE FORCES - HQ, barracks, facilities, resources, etc | 3 |
| PROFESSIONAL SERVICES - fire station, police station, control centre, etc | 4 |
| VOLUNTEER FORCES - bases, control centres, etc | 3 |
| DISASTER PLANS - prevention, preparedness, response, recovery | 5 |

GROUP I: SOCIAL

| TOPIC | NEED |
|---|---|
| **HEALTH SERVICES - hospitals, doctors, clinics, dentists, ambulance, etc** | **9** |
| DEATH SERVICES - morgues, undertakers, cemeteries, crematoriums, etc | 0 |
| EDUCATION - schools, colleges, universities, etc | 7 |
| COMMUNITY SERVICES - shelters, refuges, social workers, etc | 4 |
| **WELFARE SERVICES - Red Cross, St Vincents, NGOs, etc** | **8** |
| HAZARD HISTORY - epidemics, plagues, etc | 3 |
| HAZARD POTENTIAL - epidemics, plagues, prevention programs, etc | 3 |

GROUP J: PRIMARY INDUSTRIES

| TOPIC | NEED |
|---|---|
| **AGRICULTURE - subsistence & other crops, livestock, storage, etc** | **9** |
| FISHERY - aquaculture, shore facilities, traditional fish traps, etc | 6 |
| FORESTRY - logging, plantations, nurseries, etc | 2 |
| MINING - mines, basic processing, etc | 2 |
| HAZARD HISTORY - pests and diseases, fire, accidents, etc | 2 |
| HAZARD POTENTIAL - pests and diseases, fire, accidents, etc | 2 |

| | | | |
|---|---|---|---|
| R | **R**ecreation facility - sporting clubs, grandstands, etc | 10pt solid square, green | *Special risks* associated with periodic concentrations of people |
| I | **I**ndustry - manufacturing and processing industries such as sawmills, sugar mills, cement plants, ship building, etc | 12pt solid triangle, yellow | *Special risks* associated with either processes and materials used and/or concentrations of people |
| H | **H**ouses - private, detached houses only | 9pt solid diamond, black | Detached houses only |
| F | **F**lats - includes all multi-occupant private dwellings including units, town houses and apartments | 9pt diamond, red | All forms of private accommodation other than detached houses - includes self contained holiday units or apartments typically used for longer stays than motels, resorts, etc |
| C | **C**ommunity facilities - churches, halls, public toilets, libraries, scout huts, monuments, etc | 12pt solid dot, purple | Mainly non-government facilities providing direct service to the community |
| G | **G**overnment facilities - offices, depots, etc of all levels of government | 12pt solid dot, dark blue | Facilities from which government services are provided or administered |
| S | **S**heds - informal buildings used mainly for storage | 9pt open diamond, black | |

*Fl_ht* Height of the floor above ground level. Estimated to the nearest 10cm from field observation. A value of 0.3 indicates a slab-on-ground construction.

*Gd_ht* GPS height of the ground at the lowest corner of the building (ie where the floor is highest above the ground.

*Sto* The number of stories.

*Wa* Material from which the features walls are constructed with the following codes:

| | |
|---|---|
| B | brick, masonry or stone |
| C | concrete block |
| P | precast concrete slab |
| R | reinforced concrete |
| T | timber |
| F | fibro |
| M | metal |
| N | 'native' (bush) material |

*Ro* Material from which the roof is constructed with the following codes:

| | |
|---|---|
| T | tiles |
| F | fibro |
| M | metal |
| C | concrete |
| N | thatch |

*Ro_pi* Roof pitch with the following codes:

| | |
|---|---|
| H | high (>1:4 slope) |
| L | low (< 1:4 slope) |
| F | Flat |

*Comments* Note field for added information on the feature derived from field notes.

*Longitude* Decimal GPS longitude.

*Latitude* Decimal GPS latitude.

## APPENDIX F: SUMMARY OF NDMO INFORMATION NEEDS SURVEY

GROUP A: SURFACE OF THE EARTH

| TOPIC | NEED |
|---|---|
| GEOLOGY - rock type, strata, age, faults, seismic network, etc | 1 |
| SOILS - type, properties, depth, etc | 2 |
| DRAINAGE FEATURES - lakes, salt pans, rivers, feature names, etc | 3 |
| HYDROLOGY - ground water, bores, water quality, river flows, etc | 6 |
| TERRAIN - elevation, slope, aspect, feature names, etc | 3 |
| COASTLINE - beaches, tidal flats, rocks, reefs, tides, feature names, etc | 4 |
| OCEAN - depth, currents, sea state, etc | 0 |
| **HAZARD HISTORY - details of previous earthquake, landslide, flood, etc** | **8** |
| HAZARD POTENTIAL - earthquake, landslides, tsunami, flood, etc 'threat' | 5 |

GROUP B: CLIMATE

| TOPIC | NEED |
|---|---|
| WINDS - direction, strength, gusts, etc | 3 |
| TEMPERATURE - maximum, minimum, means, extremes | 3 |
| RAINFALL - amount, seasonal variation, extreme amounts, intensities, etc | 5 |
| OTHER ATMOSPHERIC CONDITIONS - sunshine, lightning, fog, etc | 1 |
| WEATHER - current, forecast, satellite images, weather station sites, etc | 2 |
| **HAZARD HISTORY - previous cyclones, severe storms, drought, etc** | **9** |
| HAZARD POTENTIAL - cyclones, severe storms, drought, etc threats | 5 |

GROUP C: PLANTS AND ANIMALS

| TOPIC | NEED |
|---|---|
| VEGETATION - type, structure, species, traditional foods, etc | 2 |
| ANIMALS - mammals, birds, fish, reptiles, insects, traditional foods, etc | 1 |
| HAZARD HISTORY - bushfire, snake bite, shark attack, etc history | 2 |
| HAZARD POTENTIAL - bushfire, poisons, venoms, munchies, etc threat | 1 |

GROUP D: POPULATION & SETTLEMENT

| TOPIC | NEED |
|---|---|
| **POPULATION - census and estimates of numbers, age, sex, etc** | **9** |
| **SETTLEMENT TYPE - city, town, village hamlet, etc names & locations** | **9** |
| **SETTLEMENT STRUCTURES - houses, shops, schools, resorts, etc** | **8** |
| SETTLEMENT REGULATION - land use zoning, building codes, etc | 4 |
| EMERGENCY SHELTER - shelters/safe havens, assembly points, etc | 4 |
| HAZARD HISTORY - building fires, inundation or earthquake damage, etc | 4 |
| HAZARD POTENTIAL - fire spread, rubble, etc | 4 |

GROUP E: CULTURAL

| TOPIC | NEED |
|---|---|
| LANGUAGE - what languages are spoken, translators, etc | 3 |
| RELIGION - types, adherence, churches, temples, etc | 6 |
| CUSTOM - cults, taboos, sacred sites, etc | 5 |
| CULTURE - theatres, libraries, museums, heritage sites, meeting houses, etc | 1 |
| HAZARD HISTORY - civil conflicts, pay back, racism, land disputes, etc | 2 |
| HAZARD POTENTIAL - civil conflict, pay back, land disputes, etc | 2 |

GROUP F: POLITICS

GROUP K: SECONDARY INDUSTRIES

| TOPIC | NEED |
|---|---|
| BASIC PROCESSING - abattoirs, mills, sawmills, refineries, brick kilns, etc | 1 |
| FABRICATION - ship building, concrete batching plants, chemicals, etc | 1 |
| CONSTRUCTION INDUSTRIES - design, plant & equipment, workshops, etc | 3 |
| HAZARD HISTORY - fires, explosions, accidents, pollution, etc | 2 |
| HAZARD POTENTIAL - waste disposal, accidents, etc | 3 |

GROUP L: SERVICE INDUSTRIES

| TOPIC | NEED |
|---|---|
| RESEARCH & DEVELOPMENT - laboratories, test facilities, etc | 1 |
| FINANCE INDUSTRIES - banks, insurance, etc | 3 |
| MANUFACTURING - clothing, footwear, crafts, etc | 1 |
| ACCOMMODATION - resorts, hotels, motels, hostels, etc | 4 |
| COMMERCE - markets, shops, stores, bakeries, cafes, etc | 3 |
| HAZARD HISTORY - fires, accidents, etc | 2 |
| HAZARD POTENTIAL - fires, accidents, etc | 2 |

GROUP M: TRANSPORT & STORAGE

| TOPIC | NEED |
|---|---|
| **ROADS & STREETS - surface, capacity, bridges, etc** | **8** |
| ROAD TRANSPORT - cars, buses, trucks, recovery vehicles, etc | 7 |
| OFF-ROAD MOVEMENT - cross country mobility, etc | 2 |
| RAIL & TRAMWAYS - permanent ways, bridges, etc | 1 |
| RAILWAYS - rolling stock, engines, repair facilities,, etc | 1 |
| PIPELINES - material carried, pumping stations, pipe material, age, etc | 1 |
| PORTS - wharves, cargo facilities, anchorages, etc | 4 |
| SHIPPING SERVICES - ship types, services, repair facilities, etc | 7 |
| AIRFIELDS - capacity, surface, facilities, etc | 4 |
| AIR SERVICES - aircraft register, services, repair facilities, etc | 3 |
| SPECIAL STORAGE - cold stores, ice plants, explosives, chemicals, etc | 1 |
| HAZARD HISTORY - accidents, pollution, etc | 2 |
| HAZARD POTENTIAL - accident black spots, warning signs, etc | 1 |

GROUP N: COMMUNICATIONS

| TOPIC | NEED |
|---|---|
| **TELECOMMUNICATIONS - phone, radio, TV, Web, mobile phone, etc** | **9** |
| OTHER FORMS - postal, print media, couriers, etc | 3 |
| HAZARD POTENTIAL - communications disruption, etc | 4 |

GROUP O: LIFELINE SERVICES

| TOPIC | NEED |
|---|---|
| FUEL SUPPLY - bulk fuel & gas storage, service stations, etc | 3 |
| POWER SUPPLY - generation, distribution, reticulation, etc | 7 |
| **WATER SUPPLY - source, storage, treatment, reticulation, tanks, etc** | **8** |
| WASTE TREATMENT - sewage, garbage, hazardous waste storage, etc | 3 |
| FOOD SERVICES - freezers, bulk stores, bakeries, supermarkets, cafes, etc | 1 |
| GENERAL SERVICES - clothing, hardware, repair services, etc | 2 |
| HAZARD HISTORY - fire, explosion, pollution, contamination, etc | 2 |
| HAZARD POTENTIAL - safety regulations and standards, fire, etc | 4 |

GROUP P: SPACE

| TOPIC | NEED |
|---|---|
| ASTRONOMY - sun rise & sun set times, moon phases, etc | 0 |
| SATELLITES - type, access, footprint, etc | 0 |
| HAZARD POTENTIAL - space junk re-entry, solar flares, etc | 0 |

GROUP Q: AUTHORITIES (sources of 'expert' advice)

| TOPIC | NEED |
|---|---|
| PROFESSIONAL - meteorologists, geologists, engineers, etc | 5 |
| **TECHNICAL - GIS and computer staff, plant operators, builders, etc** | **8** |
| EXTERNAL ASSISTANCE -aid agencies, etc | 4 |
| EMERGENCY MANAGERS - key police, fire rescue and military staff | 4 |
| CIVIL - business, political, church and community leaders | 4 |
| TRADITIONAL - custom leaders, community elders, etc | 4 |

Notes:

1. The totals include the responses by NDMOs who completed the survey and the inclusion of these topics in the damage assessment and drought assessment report proforma in use in PIC and explicitly identified in the Community Vulnerability Analysis methodology.
2. The maximum score possible is 10. Those with scores of 8 and above are highlighted in bold.