



LIVE & LEARN
Environmental Education

Living with volcanoes

**A community's guide to preparedness and response,
before, during and after volcanic eruptions**





This guide was developed by Live & Learn Environmental Education for the World Health Organization (WHO) & the Applied Geoscience and Technology Division (SOPAC), Secretariat of the Pacific Community (SPC).



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Introduction

Live & Learn Environmental Education Hemi Wanem?

Live & Learn Environmental Education hemi wan non-gavman, non-profit okenaesasion we hemi wantem makem save blong ol man blong envaeronmen bae I stap kam antap. Live & Learn Environmental Education hemi bin stap festaem long 1992 mo hemi gat ofis I stap long, Vanuaut, Solomon Islands, Fiji, Papua New Guinea, Cambodia, Maldives, Vietnam mo Indonesia.

Wok blong Live & Learn hem luk how no yu save joinem ol tingting blong envaeronment mo calja mo development we is tap kam insaed long edukesen blong ol yut blong south Pacific. Hemi makem long use mol aksen-bes programs we hemi bildum up ol skils blong ol man blong ho no yu save makem stret ol problems blong laef olgeta blong fujia.

Buk ia Hemi Wanem?

Program long buk ia hemi bin kam festaem blong helpem ol man blong Vanuatu we oli gat sam aksen we oli makem blong traem daonem ol risk blong ol volkeno we I stap spoilem laef blong olgeta. Buk ia hemi gat wan plen blong joinem save mo aksen blong rabis saed blong ol volkeno taem I faerap mo olsem seifti blong wota tu.

Yu save makem wan plen blong redi taem volkeno I faerap sipos yu usem tingting we I stap finis longsaed ho nou yu save daonem ol risk blong narafala samting we I stap spoilem laef blong yumi.

Wan samting we hemi impoten bigwan, ol infomesen we I staop hemi mas gat gud save mo ol man oli mas save hem stret mo tu ol infomesen hemi mas makem sam aksen blong yumi bae I kam.

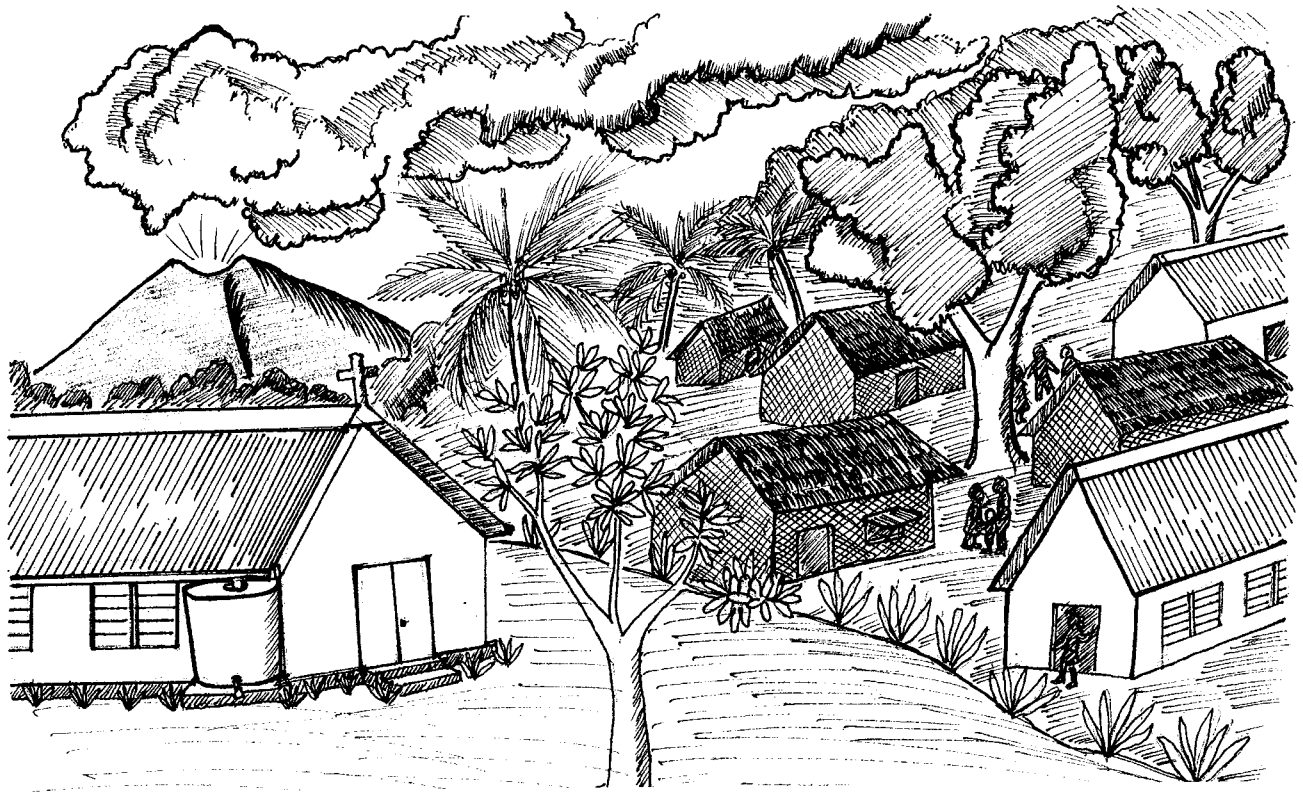
Ho Nao yu Save usem Buk ia?

Gaed ia hemi gat sam tingting ol komuniti oli save usem sipos oli slip klosap long volkeno taem oli makem wan plen blong redi blong disasta. Hemi stap helpem ol komuniti fasilitator mo gavman ofisa we oli wok wetem komuniti long saed daonem rabis saed bong laeftaem volkeno i faerup.

Yu save usem gaed ia, taem yu tokotok wetem komuniti long volkeno, mo tu yu save usem taem yu makem toktok mo woksop blong plenem disasta risk redaksen.

Gaed hemi gat 5 seksen i stap insaed:

1. Laef blo yumi we I stap silip klosap long ol volkeno
2. Rabis saed taem long volkeno i faerup
3. Redi blong taem we volkeno I faerap
4. Protectem renwota sos blong yu
5. Kirap wetem Komuniti action



1 Laef blo yumi we I stap silip klosap long ol volkeno

Perpos blong buk ia

Taem noia, olaktiviti blo volkeno long ol aelan long Ambrym, Gaua, Ambae mo Tanna hemi makem yumi fraet long helt blong yumi taem oli faerup. Yumi bin luk finis long Ambrym mo Gaua ol komuniti i gat nid bigwan longsaed komuniti save mo plen blo aksen blong protektum sefti blo wota blo dring. Depatmen blo Helt mo Departmen blo Jeoloji, Maens mo Wota Resos i wantem makem wan samting we yumi stapem ol rabis saed blong volkeno long wota blo dring blo yumi.

Laef klosap long ol volkeno

I kat fulap jalens blong olketa komunitis we oli stap kolosap lo wan volkeno I mas rere from. Taem we volkeno hemi faerap, bae i kat fulap issues we ol komunitis oli save fesem. samtaem bae ino kat enaf kakae mo wora, bae oli save muvum ol manples iko lo wan niufala eria, mo tu bae plante oli save trabol lo saed blong helt mo ekonomi. Emia sam lo ol issue we I save tekem ples lo kominiti lo wan taem or afta we volkeno hemi faerap. Be sapos yumi gat wan gudfala plan from ol samting olsem, bae ol komunitis oli save rere gud blong respon mo recava hariap.

Wanem ia Volkeno?

Volkeno hemi wan hol antap lo kraon we olketa hot ston mo ash mo ol kas we oli stap insaed lo kraon, oli stap kamaot lo hem.

Taem we wan volkeno i faerap, hemi save sakem hot lava, ol ash mo ol ston insaed lo graon iko antap. Ol ashflow mo lava insaed lo wan volkeno I save kapsite mo ron daon lo any saed blo volkeno ia. Mo tu ashfall ia I save spoilem nogud olketa komuniti we oli stap silip samples downwin long volkeno ia.

Ol sopmat mo flood oli save ron bigwan stat antap long volkeno mo iko daon long olketa valley. Sopmat ia I kat fulap hot ston insaed lo hem mo speed blong sopmat ia hemi quick tumas, hemi save kilim any samting we I blokem rod blong hem.

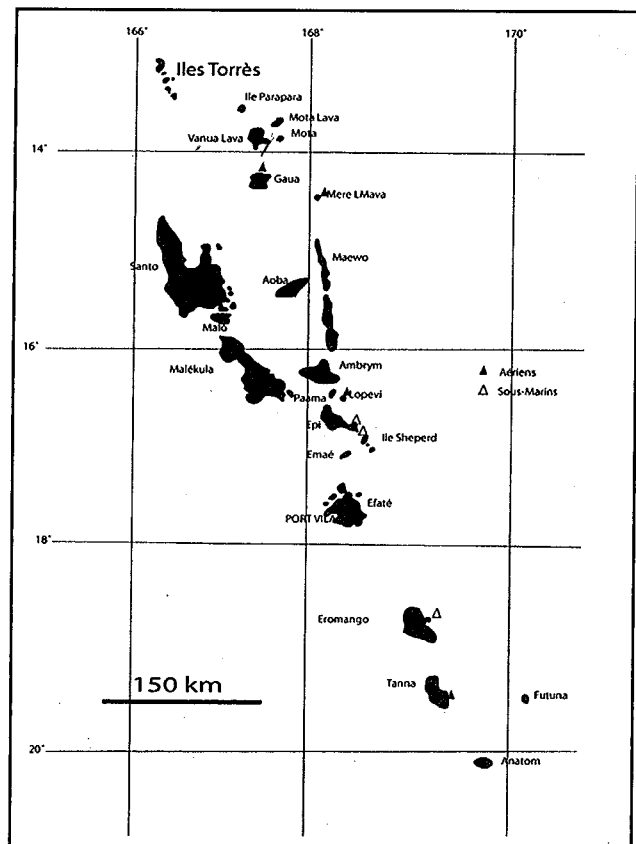
From wanem nao ol komuniti we oli satp silip klosap long ol volkeno I mas redi?

Ol komuniti we oli redi gud blong respon taem we volkeno I faerap, oli kat gudfala save lo how blong lukaotem gud olketa taem we volkeno I faerap finis. Mo tu, olketa oli redi blong lukaotem gud narafala komuniti we oli stap lo semak trabol.

Ol stamba blong tok save mo respon hemi ol komuniti. Ol komuniti we oli stap silip klosap lo wan volkeno oli mas mekem wan action plan blong olketa. Hemia blo oli save wanem nao bae oli mas mekem *befo, long taem ia mo afta* we wan volkeno I faerap.

Ol volkeno lo Vanuatu

Fulap man mo woman lo Vanuatu oli stap silip kolosap long ol eria we I kat ol volkeno. I kat ol volkeno we oli active o laef yet long ol aelan blong Ambae, Ambrym, Lopevi, Gaua mo Tanna. Yasur volkeno lo Tanna hemi wan aktiv volkeno bigwan. Hemi save faerap fulap taem long wan dei mo hemi stap faerap 200 yias I pas finis (Gavman blong Vanuatu). Volkeno ia ikat wan cone mo wan bigfala eria blong ash. Treid winds oli sakem fulap long ol ash blong Yasur raonem aelan blong Tanna.



Map ia hemi talem ol ples volkeno i stap long Vanuatu



2 Rabis saed taem long volkeno i faerap

Asfal

Asfal hemi ol smolsmol das blong ston blong volkeno we I stap kamoat insaed long volkeno taem we volkeno hemi faerap. Volkeno I stap sakem ol ash ia olsem smok blong faea, mo wind I save karem olketa ash ia olbaot. Ash ia hemi stap foldaon long graon olsem ashfall. Weaples we ashfall hemi kasem, hemi save kavaremap gud ol haos, ol kakae long karen mo tu hemi save spoilem ol man mo ol animal. Ash ia hemi mekem ol rabis smok we hemi save blokem laet blong sun. Toti blong ashfall hemi save mekem toti long ol wota supply mo spoilem ol wood mo kakae blong man. Taem we ashfall I foldaon bigwan tumas long wan ples, hemi save

karem out ol lif blong olketa tri mo tu hemi save spoilem nogud ol haos blong ol man. Mo tu ash i foldaon tumas haus i foldaon mo branj blong tri i brok brok mo berem karen

Kakae bae ino enaf

Taem we volkeno hemi faerap, hemi save damejem plante haos, mo ol karen mo ol ples blong kasem wota. Hemia bae hemi wan bigfala problem lo ol aelen we volkeno i stap long hem from se fulap famili long ol vilej oli stap kasem kakae blong olketa lo karen. Asfal mo concon ren hemi spoilem ol lif mo stampa blong kumula, taro, banana mo manioc mo aelen kabej tu bae oli stap kam had blong groem.

Sipos we volkeno I spoilem ol kakae lo karen, bae ol man oli mas lukaotem narafala ples blong kasem kakae. Kavman I save kivim sam sapot long olketa komuniti long trabol taem olsem. Be hemia tu I save createm ol narafala problem long ol difren level. Taem olsem, ol komuniti I mas sitaon gud blong storian mo mekem I stret.

Wota bae ino enaf

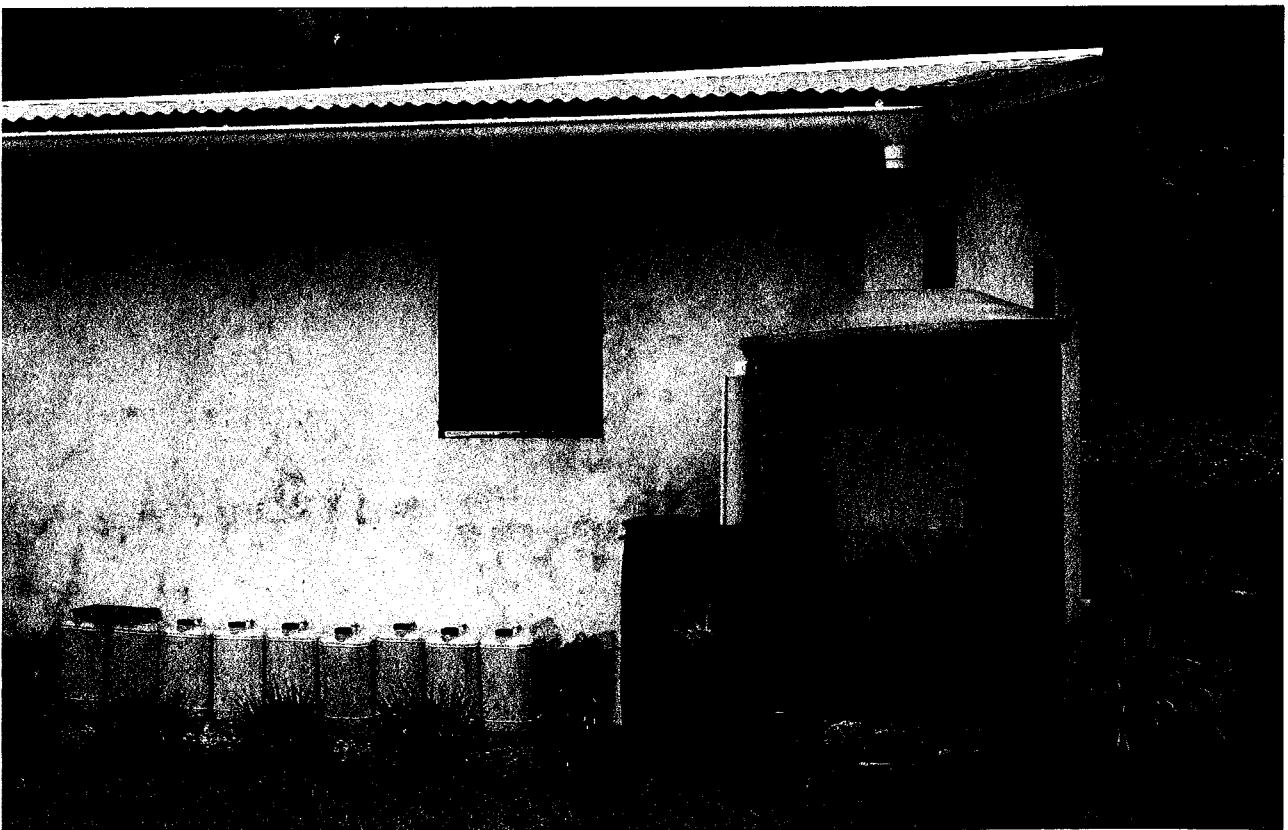
Ol man oli mas gat klein wota blong dring mo kuk olsem wasem hen blong yumi.

Taem we volkeno I faerap, ashfall we hemi foldaon I save putum poison long ol wota supply mo I save spoilem ol narafala tool blong pamem wota. Bae quality blong wota ia we oli stap dring I save kam nogud mo bae oli no save dring wota bakegen olsem befo. Hemia I wan bigfala wari blong ol komuniti from ol man oli no save laef longtaem spos oli nokat wota blong dring.

Plante komuniti long Vanuatu oli stap kasem wota blong dring long ol ples olsem spring wota mo ol reva. Sam oli kat ol wells, ol wota tank mo ol narafala container blong fulumap wota. Nomata wanem oli stap usum blong holem wota blong dring, hemi gud blong oli stap kavaremap gud wota ia. Sapos no, taem we volkeno hemi faerap, ol toti I save foldaon insaed long wota ia mo mekem I nogud blong dring.

Plante taem, ol man we oli stap sick from we oli dring wota we ashfall I spoilem, oli ino luksave se wota ia we oli stap dring hemi nogud.

Kontek WHO mo SOPAC-SPC taem yu wantem karem wan buk long "Keeping Your Drinking Water Safety Community Toolkit". Hemi gat gud infomesen blong ol komuniti fasilitator mo helt ofisa I stap insaed lon ho nou yu save plen long makem wota blong yu hemi stap sef.



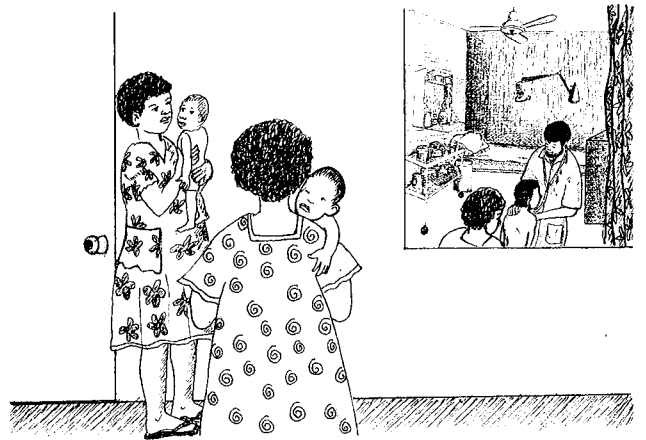
Yu gat plenti jois blong storem wota blong hous. Yu save usem kontena mo tank any kaen saes.

Helt Blo Yu

During mo afta taem blong asfal, plante man oli save kasem ol differen sick olsem sotwin, mo sikras long eye mo skin. Hemia wan bigwan long ol ples we ol man oli no stap lukaotem gud olgeta lo taem we volkeno I faerap.

Moni Blo Yumi

Long Vanuatu, fulap man oli kat kakae from we oli planem ol crops long karen. Mo tu oli stap salem ol crops ia blong winim vatu blong family blong olgeta. Ashfall mo ol narafala impact taem we volkeno hemi faerap I save spoilem ol karen mo ol crops blong olketa. Long ol taem olsem ia, ol family I save lusum vatu blong olketa we oli stap winim long karen, mo hemia tu I mean se komuniti bae hemi lusum bigfala vatu.



Yu mas groem stret kaikai blong sol blong volkeno sipos yu wantem makem karen blong bae stap kam antap bakagen afta asfal hemi spoilem karen blong yu.





Yu gat sam taem we volkeno hemi faerap bigwan olsem ol man oli mas muv bae oli go long wan narafala ples we hemi sef blong olgeta.

Laef Blo Yumi

Hemi wan had samting blong movum wan komuniti iko long wan niufala ples sapos we volkeno I bin spoilem nogud ol haos, mo karen mo wota supply mo ol narafala samting blong olketa. Plante long ol families bae oli lusum ol normal way of laef blong olketa mo oli mas jenisim sam fasin blong olketa blong oli save statem wan niu laef long wan niu ples.

Bae oli lusum ples mo nem blong olketa from se oli lusum stret graon blong olketa. Plante komunitis bae oli mas stat bekegen blong leftemap nem blong komuniti mo wanwan laef blong olketa. Hemia I save affectem tingting blong ol man mo tu I save

jenisem ol fasin blong ol man long komuniti bae I kam nogud.

Taem mol man olgeta wan komuniti oli mas makem laef blong olgeta I stat bakagen laef blong olgeta bae hemi had olsem. Yu mas makem karen bakagen mo tu yum as makem haus bakegen mo ol pikini blon yu oli mas go long wan niu skul blong olgeta.



Taem ol man blong wan komuniti olgeta oli mas muv long wan narafala ples yu gat wan narafala komuniti we oli mas helpem olgeta, bae oli mas redi olsem.



Wan komuniti Disasta Manejmen Komiti hemi mas makem wan Disasta Manejmen Plan we hemi telam ol aksens we ol komuniti oli mas gat taem volkeno I faeraup.



3 Redi blong taem we volkeno I faerap

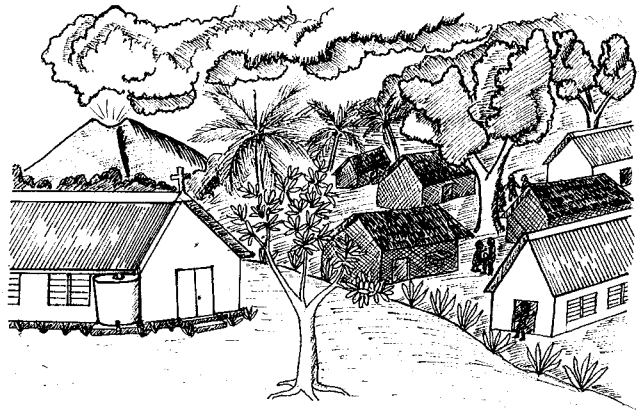
Oleketa komuniti we oli stap silip kolosap long wan volkeno bae oli mas tekem responsibili. Bae yum as rere blong ol impact we bae tekem ples taem we volkeno hemi faerap, mo yu mas rere blong tekem action befo, long taem ia, mo afta we volkeno hemi faerap.

Wanem blong mekem befo volkeno hemi faerap

- Setemap wan disasta komiti
- Kreatem wan disasta manejmen plan
- Lanem olketa komuniti woning system
- Fulumap enaf kakae mo putum I stap redi long wan ples
- Fulumap enaf wota blong dring mo putum I stap rere long wan ples (15-20L long wan wan man)
- Holem ol disasta supply wetem yu (olsen bokis blong fes aid, ol meresin, radio wetem batri, sam klos mo wan kalico blo kavarem gud fes blong yu from das blong volkeno)
- Kavaremap gud ol wota tank mo ol narafala containa blong wota
- Blokem gud ol paep iko lo ol wota tank, mekem se das blong volkeno ino save ko insaed mo spolem wota insaed long tank.

Wanem blong mekem long taem we volkeno hemi faerap

- Lisen gud long redio from olketa disasta infomesen
- Folem ol evacuasen oda we ol bigman oli stap kivim out
- Folem gud disasta plan blong yu
- Tok save wetem ol narafala memba blong komuniti
- Yu no mas ron iko long eni low lying eria, o eni reva o eni valley
- Lukaotem gud neiba blong yu we hemi nidim help (olsem ol olfala, small pikinini, sikman mo olketa disable)
- Sarem ol wota supply system
- Sarem every window mo do
- Kavaramap gud olketa masin mo ol wota pam we oli stap outside



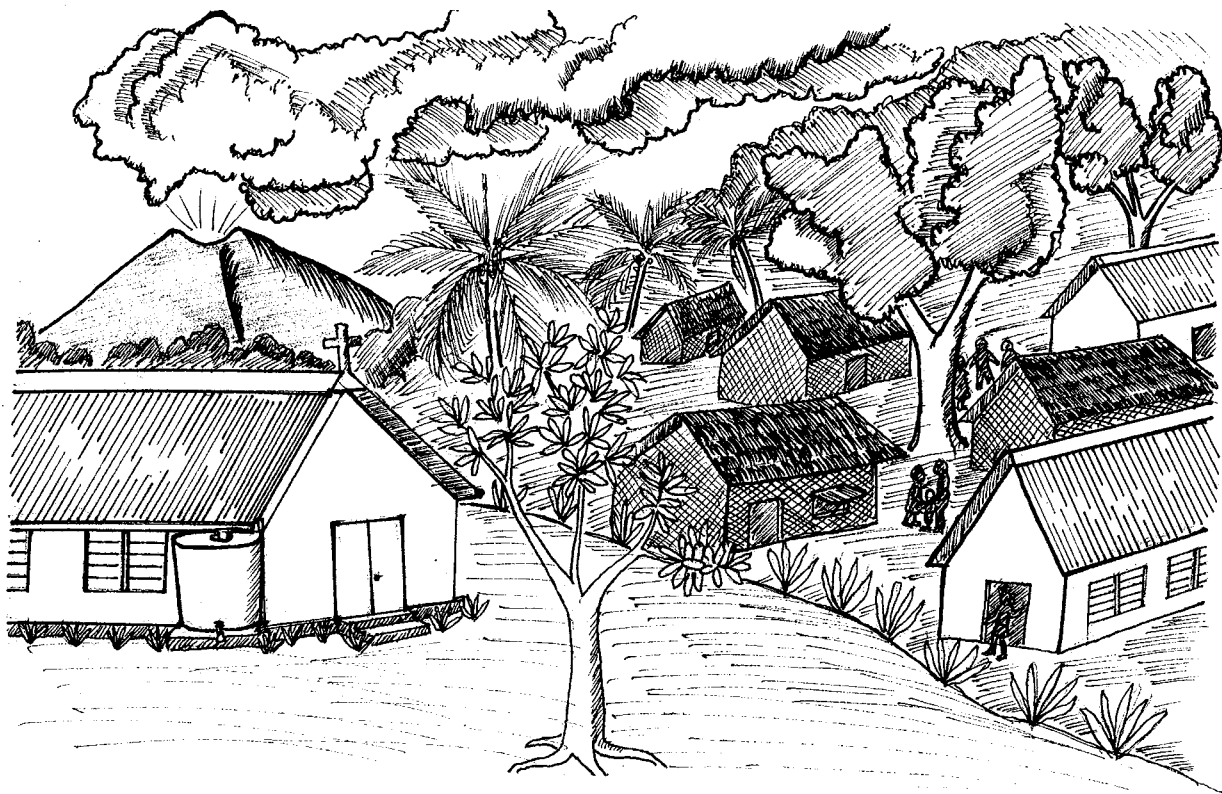
Wanem blong mekem afta we wan volkeno hemi faerap

- Protektem yu wan long ol ash fall mo das blong volkeno
- Wearem ol longfala klot mo hat we i kavremap bodi blong
- Sarem evri windo mo do
- Klearem ol ash mo das we oli stap long roof blong haos blong yu
- Klinim gud ol wota tank, ol narafala tool mo ol wota supply system
- Testem wota supply system blong yu
 - Wota saplae sisem
 - Wota blong tank
 - Wota blong riva, spring mo well
- Usum klin wota nomo blo ding mo kuk



Plante infomesen I stap long wan buk
"Keeping Your Drinking Water Safe
Toolkit".





4 Protectem renwota sos blong yu

Fesflas Devaes

Taem we hemi stap rain long wan taem o we afta volkeno I faerap, toti blong ashfall hemi save spoilem ren wota insaed long olketa tank. Hemi gud blong yu kat wan fesflas devaes, from se afta we volkeno I faerap, fes ren we I kam I save wasem ol toti ashfall lo ruf blong haos iko insaed long wota tank mo spoilem wota blong dring blong yu.

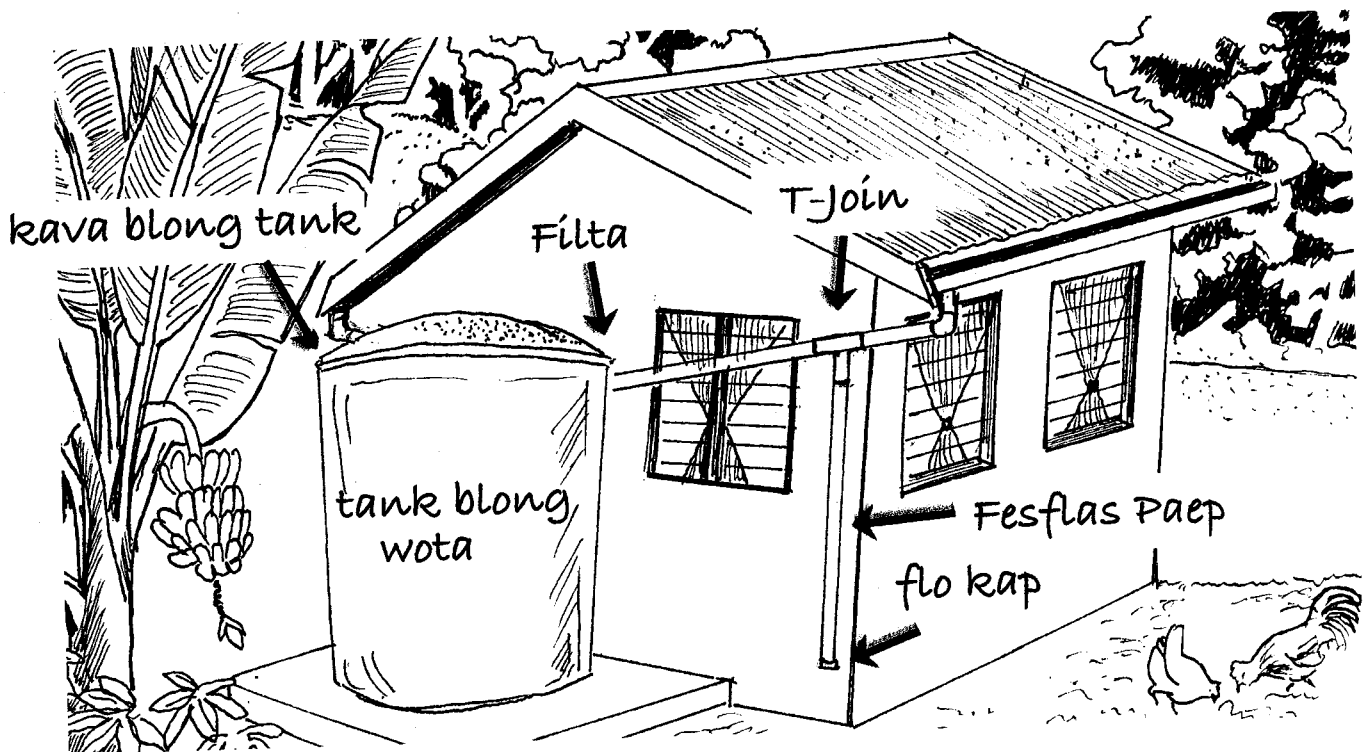
Mekem sua se yu gat wan lid blong wota tank blong yu o yu mas kavaramap gud. Mo tu, yu mas kavarampa pipe we hemi stap pulum wota ikam insaed long tank ia wetem

wan kalico. Hemia bae olsem wan filta blong bloke mol toti wota we I stap ron insaed long pipe iko long wota tank.

Yu save mekem wan fes-flas device blong yu wetem wan "T-join" valve. Hemia I save join wetem main wota paep bifo hemi ko insaed long tank. Taem fesflas hemi stap fulap blong wota festaem finis, wota bae stap ko long wota tank bakagen. Yu mas gat wan smolsmol hol I stap long flo-kap from hemi pulem ol wota long fesflas paep. Afta taem ren I finis yu save openem flo-kap mo ol wota we stap insaed bae hemi kam outsaed long paep noia.

Tri samting yu mas save:

1. Taem volkeno i faerup yu mas kaveremap tank blo wota
2. Afta ashfall hemi finis mo ren i stap kam, wota bae i flo long ruf we i go insaed long fesflas devaes. Taem fesflas hemi ful, wota bae i go insaed long tank.
3. Afta ren i finis, yu mas emptiaut fesflas devaes



Yu save kasem save blong honoia yu save makem wan fesflas devaes long Rural Wota Saplai Unit blong Depatmen blong Geologi, Maens mo Wota Risos



5 Kirap wetem Komuniti action

Vanuatu volkeno alet level

Ofis blong Geohazards Observatory hemi luk save ol aktiviti blong volkeno blong Vanuatu. Hemi makem jujmen blong denja blong volkeno mo talem ol man wanin level blong hem.

Vanuatu Volkeno Alert Level (VVAL) hemi talem ol man wanem level blong denja ol volkeno hemi stap makem blong yumi.

Olketa komunitis we oli stap silip kolsap long ol volkeno oli mas save gud ol difidren Vanuatu volkeno alet level. Mo tu, oli mas save wanem kaen aksen oli mas mekem taem we oli level ia oli jenis.



Nasnal Disasta Manejmen Ofis (NDMO) hemi responsibul blong telam ol komuniti we volkeno bae hemi gat aktiviti we I stap spoilem laef blong olgeta.

Vanuatu Volkeno Alert Level (Vanuatu Geohazards Observatory)

	Level	Aktiviti blong volkeno hemi bigwan oltaem (Yasur, Lopevi, Ambrym)	Lo level aktiviti ol volkeno i silip (Ambae, Gaua, Vanua Lava)
GRIN	0	Nomol o ol-level aktiviti	Nomol, i stap kwaet
	1	Aktiviti blong volkeno i kam antap smolmol, tingbaot danja klosap lon maot blong volkeno	Ol saen se volkeno i stap kirap
YELO	2	Moderate eruptions. Danger close to the volcano vent & within parts of the Volcanic Hazards Map	Continuation of awakening. Minor eruptions and danger near crater
ORANIS	3	Volkeno i stap faerup be ino bigwan tumas be i gat denja finis klosap long volkeno insaed long red eria	Konfemesen se volkeno i faerap smolmol mo danja klosap long maot blong volkeno
RED	4	Volkeno i faerup bigwan tumas mo denja i bigwan lon ol aelen mo nara aelen we hemi stap klosap	Volkeno i faerup bigwan tumas mo danja i bigwan lon ol aelen mo nara aelen we hemi stap klosap

(source: Vanuatu Geohazards Observatory, Vanuatu Volcanic Alert Level, 2009, available on 19 August 2011, at www.geohazards.gov.au)

Planem ol Komuniti sefti

Hemi wan bigfala denja taem we wan volkeno I faerap, mo spos ol komuniti oli no stap rere blong respon, bae olketa I save trabol bigwan. Olketa komuniti we oli stap silip klosap long wan volkeno oli mas developem wan action plan blong rere mo respon taem we volkeno I faerap.

Disasta Menejmen Komiti

Ol memba blong disasta komiti ia I mas kat ol difren lidas blong komuniti, olsem ol man, woman mo ol yangfala.

Spos we komuniti ia I stap insaed long red eria blong wan volkeno, disasta komiti I mas mit oltaem blong luksave ol jenis we I stap tekem ples long volkeno ia mo lukluk bakegen long action plan blong olketa.

Hemia blong mekem sua se, spos situation wetem volkeno hemi jenis, Komuniti tu hemi rere finis blong respon wetem action plan blong olketa.

Komunikesen i mas klia gud wetem infomesen blong ol Volcano Alert Level mo wanem kaen action ol komuniti I nid blong mekem long taem olsem.

Disasta Manejmen Plan

Wan disasta manajment plen hemi mas talemout wanem samting ol man i mas makem taem volkeno i faerup.

Plenti komuniti i makem disasta manajmen plen finis. Sipos yu no gat, I kat wan fom long nekis pej we yu save usum blong mekem wan volkeno response plan.

Volkeno Redi Disasta Manejment Plan

Nem blong memba blong disasta manejmen komiti

Nem blong komuniti :

Deit Blong Plan: ____ / ____ / ____

	Wanem aksen yumi mas makem?	Hu noa mas makem?	Wanem samting yumi nid blong makem aksen?
Bifo Volkeno i Faerap	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____
Taem Volkeno i Faerap	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____
Afta Volkeno i Faerap	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____	1. _____ 2. _____ 3. _____ 4. _____ 5. _____

Glossary

Ash fall: volcanic ash that falls from the air after an eruption.

Ash flows: a pyroclastic flow consisting predominantly of ash-sized (less than 4 millimeters in diameter) particles. Also called a glowing avalanche if it is of very high temperature. (*Foxworthy and Hill, 1982*)

Ash plain: a large area of ground that has been covered by heavy ash fall deposited after volcanic eruptions.

Cone: the area around the vent or opening of a volcano that is formed by either the explosion or collapse at a volcanic vent.

Gases: a range of gases including steam, carbon dioxide sulphur dioxide and hydrogen chloride that are that are released from a volcano vent during an eruption

Lava: the term used for magma (molten rock) once it has erupted onto the Earth's surface.

Magma: molten rock that is beneath the surface of the earth.

Molten rock: rock that has been heated to a point where it has become a liquid

Mudflows: the flowing mixture of water and debris (intermediate between a volcanic avalanche and a water flood) that forms on the slopes of a volcano. Sometimes called a debris flow or lahar, a term from Indonesia where volcanic mudflows are a major hazard. (*Teacher's Packet*)

Plumes: clouds formed by a mixture of volcanic gas and ash that is emitted by an eruption.

Steam: water that has been heated to a point where it changes from a liquid to a gas and is released into the air

Volcano: a vent (opening) in the surface of the Earth through which magma erupts; it is also the landform that is constructed by the erupted material. (*Teacher's Packet*)

Volcanic ash: fragments less than 2 millimeters (about 1/8 inch) in diameter of lava or rock blasted into the air by volcanic explosions. (*Teacher's Packet*)

Buk ia hemi bin luk ol Risos

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TingTing Blong Yufala

Yu save helpem mifala blong makem bukia bae hemi gud. Yu save telem mifala tingting blong yu longsaed ol kwesen I stap long pepa ia

Yu save makem wan kopi blong pej ia o yu save wraetem kwesen mo ansa blong hem long wan nara pepa mo sendem long Live & Learn Environmental Education.

Nem blong Yu: _____

Yu Slip we: _____

Okenaesen Blong yu o Komuniti Blong Yu: _____

Kontak Blong Yu : _____

1. Yu save telem hou no mo from wanem yu bin yusem buk ia. (e.g. yu wan NGO woka, gavman ofisa o helt woka?)

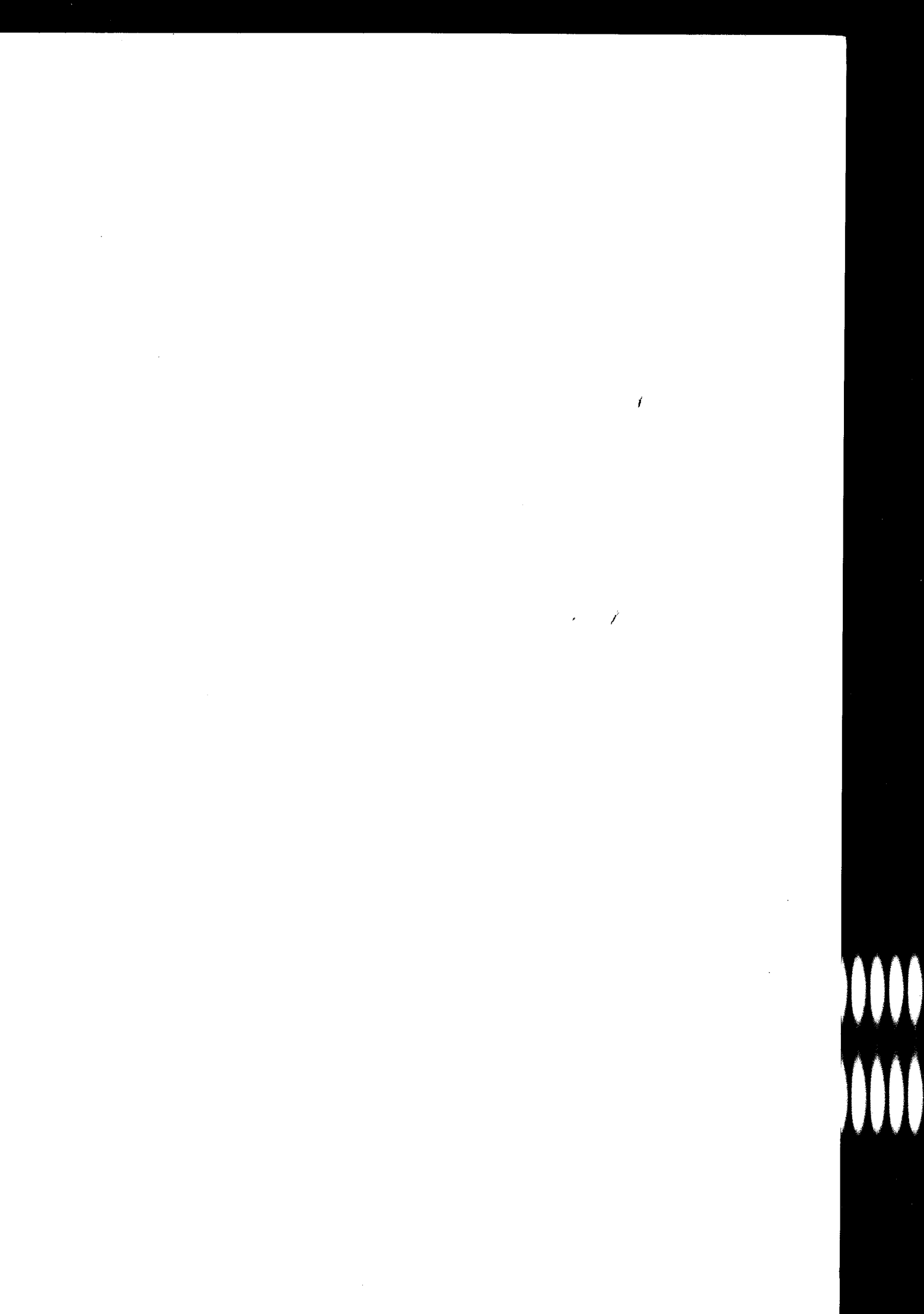
2. Buk ia hemi esi blong save or no gat? (sipos no gat yu save telam from wanem?)

3. Bukia hemi kavremap ol tingting or not gat? Wanem samting we I no gat be I mas gat?

4. Hou no bukia bae hemi kam antap blong hem?

5. Plis telam ani narafala tingting blong yu motu ani sajesen blong yu olsem

Tankyu Tumas!



Vanuatu Volcanic Alert Levels

(Vanuatu Geohazards Observatory)

COLOUR	LEVEL	FREQUENTLY ACTIVE VOLCANO (YASUR, LOPEVI, AMBRYM)	DORMANT VOLCANO (AMBAE, GAUA, VANUA LAVA)
	1	Increased activity. Danger near crater only	Signs of awakening
YELLOW	2	Moderate eruptions. Danger close to the volcano vent and within parts of the Volcanic Hazards Map	Confirmation of awakening. Minor eruptions and danger near crater
ORANGE	3	Large eruptions. Danger in specific areas within parts of Volcanic Hazards Map Red and Yellow Zones.	Notable to large eruptions. Danger in areas near crater and along main stream valleys
RED	4	Very large eruption, Island-wide danger	Very large eruption. Island-wide danger and potential impacts on neighbouring islands