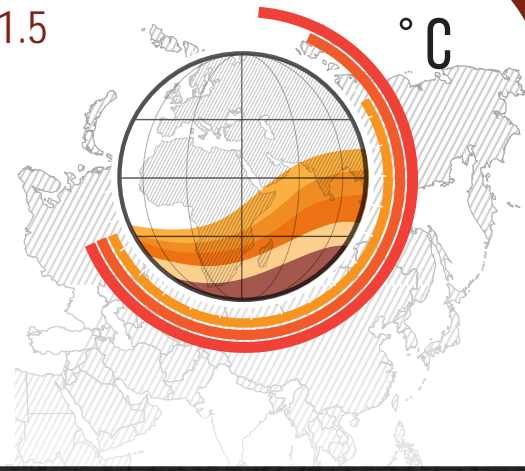


SHOKA ELUNDULUKO LYUUPYU WOMEWANGANDJO MUUYUNI LYOPASHIYELEKITHO SHOODIGILII SELSIUS 1.5 NOLI VULITHE PO LYA HALA OKUTYA MONAMIBIA



Etsokumweuvathano lyaParis oli na elalakano lyokungambeka elunduluko lyuupyu womewangandjo kofi yoshiyelekitho shoodigilii selsius 2, unene tuu pashiyelekitho shoodigilii selsius 1.5. Okuuva ko enwethomo pandondo yopashitopolwa yonkalo yuupyu muuyuni oya kitakana kokutseyitha ompumbwe noonkatu dhokwiigilila elunduluko lyonkalo yombepo. Sigo okonena eindilo lyokushonopeka okuza kiigwana olya hulile ondjlakati naashono sha pumbiwa, mono uyuni wa tegelelwa wu kale wa ndjenja noshiyelekitho shoodigilii selsius 3.2 konima yethelemumvo.

MuNamibia, uupyu wopashitopolwa nuukukutu otawu ka kala owundji wu vulithe oshiyelekitho muuyuni. Onkene eyopombanda lyoshiyelekitho shoodigilii selsius 1.5 muupyu wopauyuni otawu kala wu na enwethomo edhigu pashitopolwa, tali kwata ko nayi Eyandjaganeko lyomeya, Uunamapya nUuniimuna, Uundjolowe osho wo iikandjo yimwe mbyono hayi vulu okwiikwathela kuyo yene. Oshiyelekitho shoodigilii selsius 1.5 ohashi vulu okuteywa muufupi wuulethimbo lyomimvo omulongo dha landula ko, noshiyelekitho shoodigilii selsius 2 moomvula omulongo dha landula ko.

Shino osha hala kutya Namibia oku na ompumbwe yeendelelo okukaniitha omayakulo keigililo.

UUPYU MUUYUNI WU VULITHE PASHIYELEKITHO SHOPANDJELE

ENWETHOMO PASHITOPOLWA MUNAMIBIA

1.5°C VS 2°C VS 2.5°C VS 3°C

ENWETHOMO PASHITOPOLWA MUNAMIBIA		1.5°C	VS	2°C	VS	2.5°C	VS	3°C
Ethaneko lyelunduluko lyonkalo yombepo ³ ONKALOYOMBEPO	Uupyu wopokati (°C)	▲ 2		▲ 2.7		▲ 3.3		▲ 4
	Omakuthikuthi guupyu (omasiku)	▲ 50		▲ 78		▲ 114		▲ 148
	Omuloka komvula	▼ 4%		▼ 7%		▼ 11%		▼ 14%
	Omvula ondhigu (omasiku)	▼ 1		▼ 1		▼ 2		▼ 2
	Omasiku ga kukuta	▲ 12		▲ 17		▲ 22		▲ 27
Iilanduli ya tengenekwa ⁴ OMEYA	Eyopombanda lyomuku ⁵	▲ 10%		▲ 14% ⁶		▲ 17% ⁶		▲ 20% ⁶
	Etondoko lyokombanda ⁷	▼ 19% ⁶		▼ 30% ⁶		▼ 40% ⁶		▼ 50% ⁶
	Ehito lyomeya kofi ye ⁸	▼ 33% ⁶		▼ 49% ⁶		▼ 66% ⁶		▼ 82% ⁶
UUNAMAPYA NUUNIIMUNA UUNIIMUNA	Iilya ⁵ (eteyo)	▼ 5% ⁶		▼ 10%		▼ 15% ⁶		▼ 20%
	Uuniimuna ⁵ (eteyo)	▼ 5%		▼ 20%		▼ 35%		▼ 50%
UUNDJOLWELE UUNDJOLWELE	Malaria ⁹ (oomwedhi dha nika oshiponga)	▼ 23% ⁶		▼ 34% ⁶		▼ 44%		▼ 56% ⁶
	Edhengo lyuupyu ⁹ (oonomola dhomasiku ga nika oshiponga)	▲ 21		▲ 41		▲ 41		▲ 188
UUNSHITWE UUNSHITWE	Embugaleko ⁵	▲ 11% ⁶		▲ 18% ⁶		▲ 18%		▲ 43%
	Eshonopalo/ehulopo lyomaludhi gontumba ¹¹ (iinamwenyo nomiti)	▲ 30% ⁶		▲ 40%		▲ 50%		▲ 60%

¹ Oshiyelekitho shoonkatu dhonkalo yombepo. <https://climateactiontracker.org/global/cat-therometer>

² Nkemelang, T. et al. 2018. Okunganeke kutya uupyu muuyuni pashiyelekitho shoodigilii selsius 1.5 nowu vulithe po olawu ti ngiini kiitopolwa ya kukuta yaBotswana, Namibia, Ghana, Mali, Kenya naEthiopia: Efatululo lyomilandu dho-ASSAR mokusongonona. <https://ly/2yHbWPF>

³ Shi ikwatelela keuliko lyonkalo yombepo ku T. Kemelang. University of Cape Town, South Africa.

⁴ Shi ikwatelela ketongokonono lyuuyelele ku R. Bouwer. University of Cape Town, South Africa.

⁵ Reid, H., Sahlen, L., Stage, J. and MacGregor, J. 2008. Enwethomo lyelunduluko lyonkalo yombepo koonzo dhuuntshitwe niyemo yaNamibia. Climate Policy. <https://doi.org/10.3763/cpol.2008.0521>.

⁶ Okuhunganeke egwedhelo lyiyemo yu ukilila pwaa na oshiyelekitho sha adhika.

⁷ Amell, N.W., Hudson, D.A. and Jones, R.G. 2003. Iiholelwa yelunduluko lyonkalo yombepo yopashitopolwa: Etengeneke melunduluko lyonkalo yombepo kiitopolwa yaSouthern Africa. Journal of Geographical Research: Atmospheres. <https://doi.org/10.1029/2002.JD002782>.

⁸ Doll, P. naFlorke, M. 2005. Oshiyelekitho muuyuni tashi hunganeke ehengumukilo lyokupwina po kwomeya gokohi ye. Frankfurt Hydrology Paper 03. Institute of Physical Geography, Frankfurt University.

⁹ Tanser, F.C., Sharp, B. and le Sueur, D., 2003. Enwethomo lya nika oshiponga lyelunduluko lyonkalo yombepo ke taandelo lyaMalaria muAfrica. The Lancet. [https://doi.org/10.1016/S0140-6736\(03\)14898-2](https://doi.org/10.1016/S0140-6736(03)14898-2).

¹⁰ Garland, R.M., Malocane, M., Engelbretch, F.A., Bopape, M.J.M., Landman, W.A., Naidoo, M., Merwe, J.V.D. and Wright, C.Y. 2015. Omayelekelo gopashitopolwa gomasiku guupyu wanakupwe muAfrica osho wo oshiponga kuundjolowe womuntu. International Journal of Environmental Research and Public Health. <https://dx.doi.org/10.3390%2Fijerph121012577>.

¹¹ Midgley, G., Hughens, G., Thullier, W., Drew, G. & Fden, W. 2005. Ekonakono lyenwethomo lyonkalo yombepo meyoooloko lyiikwanyala moNamibia, omutungilo guuntshitwe niilonga yalyo. Ongundu yomapekapeko gelunduluko lyonkalo yombepo: South African National Biodiversity Institution. Cape



Iilonga mbino oya li ya kwatelwa komeho kEndiki lyelongelokumwe lyeigililo lyomapekapeko muAfrica naAsia (CARIAA), nekwatho lyoshimaliwa okuza kepangelo lya- UK, mukupendula po iigwana (Dfid) no (IDRC), Canada. Omayele ga gandjwa miilonga muno ogaamba ye eta po osheetlwa po shino noina ga kalela po o-Dfid no-IDEC nenge Ewiliko lyOogavena.



<http://www.assar.uct.ac.za/>



IILANDULI YEPUNYALO PAWUYUNI KONKALO YOMBEPO YA NAMIBIA

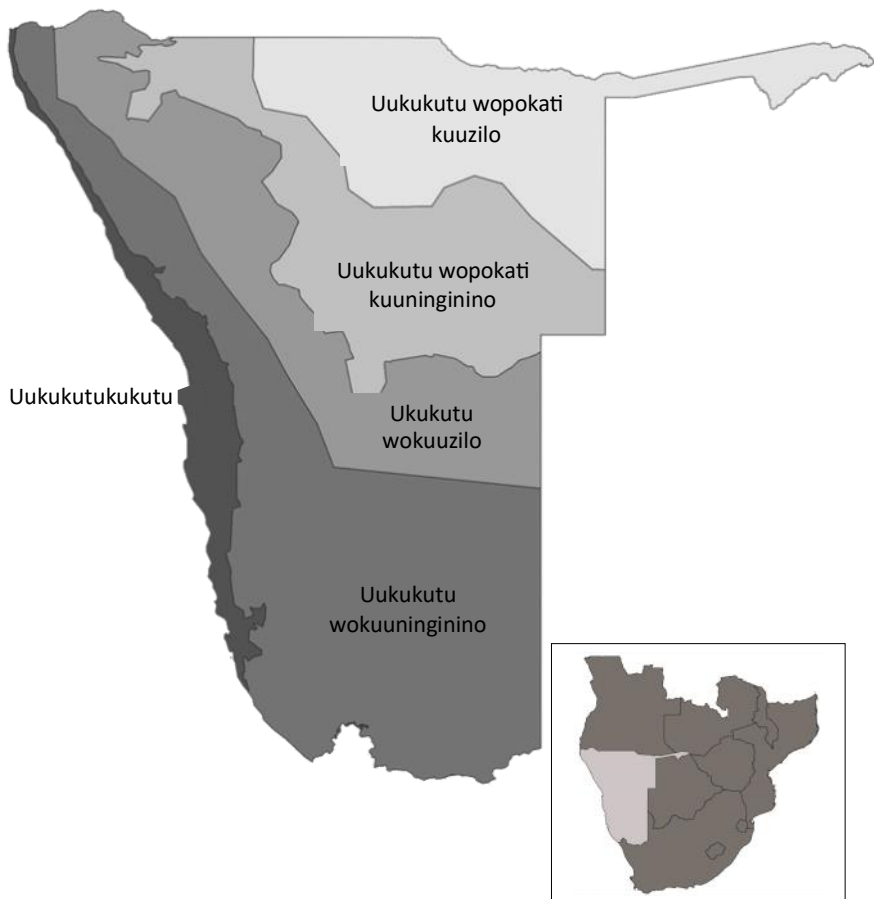
	UUKUKUTUKUKUTU				UUKUKUTU WOKUUNINGININO				UUKUKUTU WOKUUZILO				UUKUKUTU WOPOKATI KUUNINGININO				UUKUKUTU WOPOKATI KUZILO				NAMIBIA AYIHE			
	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C
Omuloaka komvula (%)	-6	-9	-12	-16	-7	-9	-16	-18	-4	-6	-9	-13	-3	-8	-8	-12	-4	-6	-9	-12	-4	-7	-11	-14
Oshikakothimbo shuukukutu (omasiku)	+10	+17	+18	+25	+12	+18	+22	+28	+13	+17	+21	+28	+12	+17	+22	+30	+13	+17	+21	+28	+12	+17	+22	+27
Oshikakothimbo shuututo (omasiku)	0	0	-1	-1	0	-1	-1	-1	0	-1	-1	-1	-1	-1	-2	-1	-1	-1	-2	-2	-1	-1	-1	-1
Omasiku gomuloaka ogundji (oomilimeta <10/esiku)	0	0	0	0	0	-1	-1	-1	0	-1	-1	-2	-1	-2	-2	-2	-1	-2	-3	-4	-1	-1	-2	-2
Omasiku omvula ya loka unene (oomilimeta <20/esiku)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Omwaalu gwomvula moompito ya loka unene (%)	0	-2	-5	-7	+1	+2	-4	-7	+5	+5	+5	+1	+2	+3	+1	0	+5	+1	+3	+8	+6	+5	+1	+1
Omwaalu gwomvula moompito ya loka sha pitilila (%)	+15	+12	+8	+3	+11	+11	+3	-4	+19	+21	+22	+12	+13	+19	+17	+12	+14	+14	+25	+26	+15	+13	+18	+21
Omwaalu gwomvula momasiku ya loka shi li pombanda (%)	0	-2	-3	-2	0	0	-2	-4	+2	+4	+3	+4	+4	+4	+5	+4	+5	+5	+5	+6	+3	+3	+3	+2
Omwaalu gwomvula ya loka omasiku gatano ga landulathana shi li pombanda (%)	0	-5	-5	-4	+1	-2	-3	-5	+2	+2	+4	+3	+2	+1	+2	+2	+2	+2	+2	+4	+3	+1	+2	+1
Elunduluko lyonkalo yombepo (°C)	+1.6	+2.2	+2.7	+3.2	+1.9	+2.6	+3.2	+3.8	+2.0	+2.7	+3.4	+4.0	+2.1	+2.9	+3.5	+4.2	+2.1	+2.8	+3.5	+4.1	+2.0	+2.7	+3.3	+4.0
Omwaalu gwomitenya dha pupyala (oopelesenda >90)	+73	+105	+139	+171	+73	+103	+134	+159	+85	+124	+157	+189	+86	+125	+164	+201	+89	+128	+168	+205	+81	+118	+153	+184
Omwaalu gomasiku ga pupyala (oopelesenda >90)	+77	+111	+147	+183	+63	+91	+124	+150	+78	+111	+150	+183	+86	+125	+165	+198	+95	+136	+179	+216	+75	+111	+150	+183
Omwaalu gomitenya dha talala (oopelesenda <10)	-40	-45	-49	-51	-31	-37	-40	-43	-30	-36	-39	-42	-30	-35	-39	-41	-30	-35	-39	-41	-33	-37	-41	-43
Omwaalu gomasiku gatalala (oopelesenda <10)	-49	-54	-57	-59	-40	-45	-49	-52	-41	-45	-48	-50	-42	-46	-49	-50	-42	-46	-49	-51	-41	-46	-49	-51
Oshikako shomakuthikuthi guupyu (omasiku)	+38	+65	+95	+126	+34	+61	+89	+117	+53	+84	+123	+160	+59	+92	+134	+174	+59	+96	+146	+180	+50	+78	+114	+148

Eilongekidhilo lyuuyuni woshiyelekitho shoodigilii selsius 1.5 +

Etsokumweuvathano lyaParis oli na elalakano lyokungambeka elunduluko lyuuyenye womewangandjo koho yoshiyelekitho shoodigilii selsius 2 (unene tuu pashiyelekitho shoodigilii selsius 1.5) kombanda yoondondo dhomangeshefelo. Monena omauvanekelo gokushonopeka ga gandjwa kiigwana oga hulile ondjilakati kwaashono sha pumbiwa okwaadha elalakano ndika. Onkene, eyeleko lyuupyu womuuyuni otali vulu okupitilila oshintsa shuupyu woshiyelekitho shoodigilii 1.5 petameko lyomimvo omulongo dha landula ko nopashiyelekitho shoodigilii selsius 2 muulethimbo womimvo omulongo oonkwawo (Nkemeleng et. al. 2018). Uuyuni owu li oshiyelekitho shuupyu noodigilii selsius 3.2 mo-2100 (Oshiyelekitho shoonkatu dhonkalo yombepo).lilongo mbyono ihayi vulu okwiikwathela yo yene ngaashi Namibia, etale ko lyeyo pombanda lyuupyu muuyuni otali vulu okweetitha onkalo yombepo pashitopolwa, ndjono tayi vulu okukwatathana nokwiindjipaleka omaunkundi ngono ge li po nale. ligwana oyindji moNamibia oyi na oompito oonshona dhokwiigilila enwethomo lyomalunduluko ngono ga thanekelwa pashiyelekitho

shoodigilii selsius 1.5 nopombanda, omaigililo ngono ga kwatelwa komeho kepangelo ohaga taalele ashike oompumbwe dhomarendulopo gosheendelela. Onkene opu na ompumbwe yeendelelo yaNamibia a konge omaigililo ga kola nomayamukulo taga endebele shi na sha neyopombanda lyuupyu noshiyelekitho shoodigilii selsius 1.5 nowu vulithe po (Spear et al., 2018).

Omolwuuyebele mbuno uushono, Namibia okwa pumbwa okwiilongekidhila omalunduluko geendelelo gonkalo yombepo pashitopolwa. Opo ku igililwe oshiyelekitho shoodigilii selsius 1.5 dhomuuyuni, Namibia okwa pumbwa okweendelelitha etulomiilonga lyomilandu dhopashigwana dhelunduluko lyonkalo yombepo nondunge yetulo miilonga. Ngele iilongitho mbino oyi li pehala, ontseyo yiponga moshikako shopopepi yuupyu woshiyelekitho shoodigilii selsius 1.5 nenge wu vulithe po, Namibia ota ka kala e li pondondo yi li hwepo kokuyamukula komanwethomo ge na sha noshiyelekitho shoodigilii selsius 1.5 nenge wu vulithe po.



Namibia

Namibia oshilongo sha kukuta noonkondo. Oonkalo dhombepo yasho odha yooloka okuza kuukukutu wopokati kuumbangalantu, kuuzilo, nokuukukutukukutu kuuninginino nuumbugantu. Momatongonono getu otwa koneke enwethomo lya pitilila miyelekitho ya yooloka yuupyu womuuyuni miitopolwa itano: Uukukutukukutu, ukukutu wokuuninginino, ukukutu wokuuzilo, ukukutu wopokati kuuninginino nuukukutu wopokati kuuzilo.

Omolwuukukutu nuupyu wonkalo yombepo, Namibia ita vulu okwiikwathela komayooloko gonkalo yombepo, nopwaa na eigililo, elunduluko lyonkalo yombepo otali yitha pombanda uunkundi mbuka. Uuna ondjele yuupyu muuyuni yoshiyelekitho shoodigilii selsius 1.5 nenge yi vulithe po tayi uka komeho, omathanekouluko gonkalo yombepo ndjono Namibia ta ka taalela oga indjipala nonkalo yombepo ondhigu.

Etegameno melunduluko lyonkalo yombepo yaNamibia nedhigupalelo lyayo

Ondjele yuupyu tayu londo

Ondjele yuupyu moNamibia oya tegelelwa yi ye pombanda meendelelo shi vulithe ondjelekati muuyuni. Kegwedhelo kehe lyoshiyelekitho shodigilii selsius 0.5 mondjele yuupyu muuyuni, ondjele yuupyu yopokati moNamibia otayi yi pombanda noshiyelekitho shodigilii selsius 0.5-1. Oshiyelekitho shuupyu muuyuni shodigilii selsius 1.5, onga oshiholelwa, ondjele yuupyu oya tegelelwa yi ye pombanda moshilongo ashihe pokati koshiyelekitho shoodigilii selsius 1.6-2.1 (Okatabele 2). Iitopolwa mbi ya kukuta yokuuninginino oya tegelelwa yi kale yi na ondjele yuupyu yi li pombanda unene omanga iitopolwa mbi ya kukuta unene kwa tegelelwa yi na egwedhelo li li pevi.

Sho ngaa ondjele yuupyu muuyuni nopashitopolwa tayi yi pombanda, edhigupalo lyondjele yuupyu nalyo otali lunduluka. Omitenya nomausiku ga pupyala nago otaga ningi ogendji, omanga ondjele ya talala tayi shuna pevi noonkondo momitenya nomausiku ga talala. Omakuthikuthi ga ndjenja otaga ka holoka ogendji go otaga kala po ethimbo. Pashiyelekitho shoodigilii selsius 1.5, ethimbo lyomakuthikuthi guupyu otali ka ya pombanda lwopomasiku 59, mpono tawu kala wa londa noonkondo miitopolwa mbyono ya kukuta. Omakuthikuthi guupyu oga tegelekwa ga kale ga londa moshikako shethimbo lyomasiku 96 sigo 180 lwopondjele yuupyu wopashiyelekitho shoodigilii selsius 2 noshiyelekitho shoodigilii selsius 3. Elondo enene otali ka holoka miitopolwa yokuuzilo mbyono ya kukuta. Elondo lyondjele yuupyu otali londeke edhengo lyuupyu miitopolwa yaNamibia mbyono iinkundi, notayi londeke edhengo lyoshikukuta moshilongo.



Birgit Ottermann

Okatabele 2: Elunduluko pashitopolwa lyondjele yuupyu moNamibia, omakuthikuthi

	Local temperature increases	Duration of heat waves	Local rainfall decreases
1.5°C	+ 1.6-2.1°C	+ 34-59 days	- 3-7%
2°C	+ 2.2-2.9°C	+ 61-96 days	- 6-9%
2.5°C	+ 2.7-3.5°C	+ 89-146 days	- 9-16%
3°C	+ 3.2-4.2°C	+ 117-180 days	- 12-18%

Eshuno pevi lyomvula yokomumvo

Elondo lyondondo yuupyu wopauyuni, omwaalu gwomvula yokomumvo ogwa thanekwa gu kale gwa shuna pevi moshilongo ashihe (Okatabele 2). Omwaalu gweyopevi omunene gwoomvula ogwa tegeleliwa miitopolwa yokuuninginino mbyono ya kukuta unene, mbyono tayi kagwa pevi noopelesenda 6 osho wo oopelesenda 7 puupyu wopashiyelekitho shoodigilii selsius 1.5. Omanga pashiyelekitho shoodigilii selsius 3, iitopolwa mbino otayi ka mona eshunomonima lyoopelesenda 16 noopelesenda 18. Enwethomo lyomvula ya shuna pevi otali eta etamununo li li pombanda miitopolwa ya kukuta yokuuninginino, ekanitho lyevi ewanawa lyuunamapya nuulithilo wiimuna. Eshunopevi lyomvula otali yelekanithwa netopombanda lyoshikukuta osho wo eshunopevi lyomathimbo guututo. (Tala okatabela 1 kuuyeleele woshitopolwa kehe).

Iiningwanima yomvula onene ya shuna pevi olundji ashike oya ninga ondhigu



Sho ondjele yuupyu tayi yi pombanda yo omvula otayi shuna pevi moNamibia, omwaalu gwomasiku gomvula oyindji ogwa tegelelwa ga shune pevi miitopolwa mbi ya kukuta. Iitopolwa mbi ya kukuta unene inayi tegelelwa yi lunduluke moshinima muka. Omanga omwaalu gwomasiku gomvula ondhigu taga ka shuna pevi, omvula ndji tayi ka loka pethimbo lyomvula ondhigu noonkondo otayi ka kala oyindji. Pandjele yoshiyelekitho shoodigilii selsius 1.5 noshiyelekitho shoodigilii selsius 2, iitopolwa yokuuzilo mbyono ya kukuta otayi ka ndjenya noonkondo negwedhelo li li pombanda noopelesenda 5 osho wo oopelesenda 19 pashiyelekitho shoodigilii selsius 1.5 pomvula ondhigu naandjono ondhigu noonkondo omanga egwedhelo lyoshiyelekitho shoodigilii selsius 5 nopashiyelekitho shoodigilii selsius 2 komvula ndjono ondhigu noyindji noonkondo pashiyelekitho shoodigilii selsius 2. Omwaalu gwomvula ndjono tayi ka loka miiningwanima yomvula onene nomomasiku gatano ga landulathana taga ka gwedhelwa sigo opoopelesenda 5 noopelesenda 2 poshiyelekitho shoodigilii selsius 1.5.

Omanga iitopolwa yimwe tayi ka kala yi na iiningwanima yomvula tayi dhiginine yu uka pombanda, iitopolwa mbyono ya kukuta unene otayi ka mona ashike egwedhelo eshona nenge omvula tayi shonopala. Pomikalo ndhono omvula tayi dhiginine unene, iitopolwa otayi ka mona egwedhelo lyoopelesenda 15, ashike shino otashi ka shuna pevi yi ye komeho noopelesenda 3 pashiyelekitho shoodigilii selsius 3. (tala Okatabele 1 kuuyelegele woshitopolwa kehe).

Elunduluko lyiikwamafuta nomunkulofuta

Oshitopolwa shokomunkulofuta shaNamibia osha simana omolwiiyemo, tashi dhana onkandangala momangeshefelo, moohi nomuupashiyoni. Ondjele yuupu yomuuyuni pashiyelekitho shondjele yuupyu pashiyelekitho shodigilii selsius 1.5 nopombanda oya tegelelwa yi kale yi na enwethomo enene komahala gomafuta nominkulofuta dhoshilongo. Onkalo yuupyu kooha dhefuta komunkulofuta gwaNamibia oya konekwa ya talala pashiyeyekitho shoodigilii selsius 0.2 – 0.4 pokati komivo 1950-2011 (Potts et al., 2015). Elunduluko lyondapo yombepo noombinga nayo oya tegelelwa yi ye pombanda tayi endelegele komunkulofuta. Elunduluko mombepo yaBenguela otayi ka kala yi na enwethomo muunshitwe wiikwamafuta ndyono inali kwashilipalekwa nawa. Omatengeneke gamwe otaga fekele eteyo lyoohi lya ninga olindji niikwamafuta yilwe iipe tayi tembukile momeya gaNamibia (Potts et al., 2015).

Oondoolopa dhokomunkulofuta ngaashi Walvis Bay. Luderitz, Swakopmund naHenties Bay odha simanena omolwokupashiona, oohi nomangeshefelo. Uule womeya gokoWalvis Bay posasiona yoombautu ohaga dhana onkandangala yomangeshefelo moshilongo nokiilongo yopuushiinda. Kehe egwedhelo muupyu wopauyuni, omahala ngano gokomunkulofuta ohaga mono eyo pombanda lyondondo yefuta. Walvis Bay (Ombaye) oye unene ha kala omunkundi omolwothika ofupi pondondo yefuta nekunyuko lyomunkulofuta. Pokati kondjele pashiyelekitho shoodigilii selsius 1.5 nondjele pashiyelekitho shoodigilii selsius 2, eyo pombanda lyefuta mOmbaye otali ka kala pokati koosendimeta 14-26 (Climate Analytics, 2018). Osha pumbwa okukonekiwa kutya eyopombanda lyondondo yefuta ohali kondowala konima yeyopombanda lyonkalo yuupyu, nenwethomo li na sha neyopombanda lyuupyu ohali ka monika ashike nale koomvula dhokomeho. Epangelo lyaNamibia olya tengeneke eyopombanda lyondondo yefuta noosendimeta 30 ndyono tali ka etelela efundja miitopolwa ya simana yomOmbaye (Republic of Namibia, 2002). Shino osha hala okutya epupyalo lyondjele pashiyelekitho shoodigilii selsius 1.5 noshiyelekitho shoodigilii selsius 2 otali ka kala li na enwethomo enene komunkulofuta gwaMbaye. Omanga eyopombanda lyondondo yefuta koLiindili tali ka kala enene li vulithe mOmbaye (Okatabele 2), uule nomamanya kooha dhefuta oga ningitha ondoolopa yaa kale onkundi unene komanwethomo gondjele pashiyelekitho shodigilii selsius 1.5 nopombanda.



Trey Ratcliffe

Oshiyekitho shoodigilii selsius 1.5+: Enwethomo topolwa yankundipala yaNamibia

Eyopombanda lyuupyakadhi wonkalo yombepo oli na omanwethomo ogendji miitopolwa ya nkundipala moNamibia, tayi ningitha ompumbwe yokwiigilila uupyakadhi. Oshilongo oshi igilila nale oshikukuta nefundja. Otaku tengenekwa aantu ya adha nale poomiliyona 1.2 noomiliyona 1.1 moNamibia ya li ya dhengwa koshikukuta nefundja, unene, pokati komumvo 1996 nomumvo 2016. (AfDB, 2018). Onkee onkalo yuupyu yomuuyuni tayi yi pombanda nondjele pashiyekitho shoodigilii selsius 1.5 nenge ya pitilila po, etilitho lyoshikukuta nefundja otali ka geya moNamibia, kumwe nomashongo galwe ge na sha nonkalo yombepo.

OMEYA: Ethindakano lyu uka pombanda komulandu gu li nale momashongo

Namibia oku li meyooloko enene lyomvula pokati komathimbo noomvula, tashi ningitha oshilongo shi kale nomeya ga pumba, osho wo oshikukuta nefundja (Republic of Namibia, 2015).

Pashiyekitho shoodigilii selsius 1.5 noshi vulithe po meyopombanda monkalo yuupyu yomuuyuni, onkatulundululo monkalo yuupyu nomvula pashitopolwa otayi hingile ashike epumbo lyomeya kokule.

Okatabele 3: Elunduluko nomulandu gwomeya moNamibia

	Evaporation	Surface runoff	Streamflow	Groundwater recharge
1.5°C	+ 10%	- 19%	- 10%	- 33%
2°C	+ 14%	- 30%	- 20%	- 49%
2.5°C	+ 17%	- 40%	- 30%	- 66%
3°C	+ 20%	- 50%	- 40%	- 82%



Irene Kunamwene

Epwino lyomeya li li pombanda: Eyopombanda monkalo yuupyu otali etitha pombanda mepwino lyomeya moNamibia shono tashi thiminike omeya mokushonopaleka omeya kevi, omeya koho yeve neholokopo lyomeya kombanda yeve. Onkalo yuupyu muuyuni ya londa noshiyelekitho shoodigilii selsius 1.5 noshiyelekitho shoodigilii selsius 2 otayi etelele epwino lyoopelesenda 10-14 moshilongo neyopombanda lya gwedhwa po lyoopelesenda 20 nondjele yoodigilii selsius 3.

Etondoko kombanda: Eyopombanda lyonkalo yuupyu nepwino osho wo eshonopalo lyomvula otali ka kala nenwethomo enene koonzo dhomeya gokombanda yeve. Etondoko kombanda yeve otali ka shuna pevi lwopoopesenda 19 noopelesenda 30 pashiyekitho shoodigilii selsius 1.5 noodigilii selsius 2 (Amell naGosling, 2013). Etondoko otali ka shuna pevi noopelesenda 50 pashiyekitho shondjele yoodigilii selsius 3.

Etondokelomeya: Enwethemo pashiyekitho pandjele yoodigilii selsius 1.5 nenge shi vulithe po otali eta ompumbwe yomeya, sho oonzo dhomeya tadhi shonopala. Omatondokelomeya oga tegelelwa ga shune pevi noopelesenda 10 nenge oopelesenda 20 pashiyekitho shondjele yoodigilii selsius 1.5 noodogilii selsius 2 (Doll et al., 2018).

Epono lyomeya koho yeve: Eyo lyomeya koho yeve moNamibia ohali mpwinyuka. Omvula ya shonopala, epwino olindji niikukuta ya ninga oyindji oya tegeleliwa yi nwehe mo epono lyomeya koho yeve moshilongo. Pandjele yoogigilii selsius 1.5 nopandjele yoodigilii selsius 2, epono olya tegelelwa li shune pevi noopelesenda 33 osho wo oopelesenda 49 (Doll et al., 2018). Eshuno pevi ndino otali ka kala li vulithe poopesenda 82 neyopombanda lyondjele yoodigilii selsius 3 monkalo yuupyu muuyuni.

UUNAMPYA NUUNIIMUNA: Eshunopevi meteyo lyiimeno niimuna

Oshitopolwa shuunamapya nuuniimuna moNamibia oshi na uunkundi uunene kenwethomo lyuupyu wondjele pashiyelekitho shoodigilii selsius 1.5 nowu vulithe po, oshiholelwa, ekalopo lyoonkalo dhoshikukuta momumvo 2018, oye etitha omaso 300 goongombe netembudho lyiinamwenyo 17,000 moshitopolwa shaOmaheke (Reliefweb, 2018). Onkalo yombepo onene ya kukuta ihayi gandja ompito kiinyangadhalwa yuunafaalama, mono uuniimuna owo wu li mo owundji moshitopolwa. Uupyu nekukuto tali tsikile otali etitha eyopombanda mekano lyiinyangadhalwa yuunamapya nuuniimuna.



Okatabele 4: Elunduluko muunamapya nuuniimuna moNamibia

	Agricultural land	Commercial crop productivity	Subsistence crop productivity	Livestock productivity
1.5°C	- 15%	- 5%	- 20%	- 5%
2°C		- 10%	- 40%	- 20%
2.5°C		- 15%	- 60%	- 35%
3°C		- 20%	- 80%	- 50%

Eshunopevi mevi lyuunafaalama: Eyopombanda lyakukukuta otali etitha evi lyuunafaalama lyaNamibia li shonopale. Embugaleko lyombuga otali etitha ekano mevi lyomwiidhi nomavi galwe gomaulithilo. Okwa tegeleliwa evi lya kukuta lyomuuninginino li kanithe oopelesenda 15 dhalyo dhokutaamba ko uuniimuna pashiyelekitho shoodigilii selsius 1.5 (Reid et al., 2011).

Eteyo lyiimeno: Eyopombanda lyoshiyelekitho shoodigilii selsius 1.5 nenge li vulithe po otali ka kala li na enwethomo edhigu kiimeno. Eteyo lyiimeno olya tegelelwa li shune pevi noopelesenda 5-10 pashiyelekitho shoodigilii selsius 1.5 nopashiyelekitho shoodigilii selsius 2 neshuno pevi lyoopelesenda 20 pashiyelekitho shoodigilii selsius 3. Ekanitho ndino otali ka kala enene kaanafaalama yopomahupilo mbono ya tegelelwa neshuno pevi lyoopelesenda 20-80 pokati koshiyelekitho shoodigilii selsius 1.5 nopashiyelekitho shoodigilii selsius 3 (Reid et al., 2008).

Eteyo lyuuniimuna: Eyopombanda mondjele yuupyu otali nwetha mo naye eteyo lyuuniimuna omolwegwopevi lyiikulya yiimuna, eteyo lyomahini, okutaandela nokutegelelwa li gwe pevi noopelesenda 5-20 pashiyelekitho shoodigilii selsius 1.5 noodigilii selsius 2, neshuno pevi lya gwedhelwa po lyoopelesenda 50 pashiyelekitho dhoodigilii selsius 3 (Reid et al, 2008).



UUKOLELE WAANTU: liponga ya gwedhwa po

Eyopombanda lyonkalo yuupyu nelunduluko lyomitungilo dhomvula ndhono dha tegelelwa dhi holoke pepupyalo lyopashiyelekitho shoodigilii selsius 1.5 nenge dhi vule po otali etitha okuvuka kwomikithi. liponga yuukolele (niitopolwa yonkalo yombepo) ngaashi omanyutu, malaria, omikithi dhomomuligu noshimela ndhono hadhi kwata unona naakuluntu odho omukundu omunene moNamibia. Eyopombanda lyonkalo yuupyu lyoshiyelekitho shoodigilii selsius 1.5 noshi vulithe po, otali etitha omukundu gwepumbo lyomeya nomanyutu tashi etitha eyopombanda lyendangalati lyomikithi moshilongo (von Oertzen).

Okatabele 5: Elunduluko lyomikundu dhuupyu moNamibia

	Exposure to heat stress (days)	Malaria exposure (months of risk)
1.5°C	+ 11-30	-23%
2°C	+ 31-50	-34%
2.5°C	+ 31-50	-44%
3°C	+ 80-296	-56%

Edhengo lyuupyu: Onkalo yuupyu wu li pombanda otayi tula oshigwana moshiponga shuupyu owindji mbono tawu ningitha aantu aankundi keso lyombanda nokoshihoya shuupyu. Aantu mbono ye li nale moonkalo ndhono noshigwana shokomikunda shono kaashi na omayakulo gopaunamiti otashi kala sha kwatwa ko noonkondo (von Oertzen).

- Pashiyelekitho shoodigilii selsius 1.5 konyala oshilongo ashihe otashi mono eyopombanda lyelondodho lyedhengo lyuupyu omasiku 11-30, mono iitopolwa mbyono ya kukuta tayi kala pombanda momasiku 31-50. Pashiyelekitho shoodigilii selsius 3 omasiku ngano otaga ka ya pombanda 80-296 (Garland et al., 2015).
- Pashiyelekitho shoodigilii selsius 3 otapu ka kala eyopombanda enene momalondodho niiponga yomasiku (unene tuu miitopolwa ya kukuta unene) 82-138 nomasiku 104-164 (Garland et al., 2015).



Okatabele 6: Euliko lyuupyu (Ombelewa yomayakulo yopashigwana).

Elandulathano lyonkalo yuupyu	Engundupiko	Ekwato kolutu
27°C – 32°C	<i>Elondodho</i>	Eloloko tali holoka ethimbo ele nomiinyangadhalwa palutu
32°C – 39°C	<i>Elondodho lya dhiginina</i>	Eso lyombanda tali etwa kuupyu, omanzane neloloko tali holoka ethimbo ele miinyangadhalwa palutu
39°C – 51°C	Danger	Omanzane guupyu, eloloko nosho wo eso lyombanda tali holoka ethimbo ele miinyangadhalwa palutu
51°C	<i>Oshiponga oshinene</i>	Eso lyombanda tali holoka olindji

Eholokopo lyoMalaria: Eyopombanda lyuupyu muuyuni pashiyelekitho shoodigilii selsius 1.5 otali etitha etaandelo tali endebele lyoomwe. Ependulopo lyompandakani nuuzigo woMalaria ohali ende kashona nakashona nolya pumbwa uututo. Moonkalombepo dha pupyala, ethimbo lyomvula yoomwedhi ndatu odha gwana okuyambidhidhwa ethimbo lyoMalaria omanga onkalo yoombepo dhopokati dha pumbwa oomwedhi ntano dhomuloka (Craig et al., 1999). Eyopombanda lyuupyu otali yitha pombanda euvoko lyoomwe moNamibia notali etele etaandelo momahala omape. Nonando, egwopevi lyomuloka ogundji otagu vulu okuyona etaandelo lyoomwe tashi eta eshunomonima lyoMalaria moshilongo. Eyopombanda lyuupyu muuyuni pashiyelekitho shoodigilii selsius 1.5 noshiyelekitho shoodigilii selsius 2, aantu mbono ya kwatwa komalaria komwedhi kehe oya tegelelwa ya shune pevi moopelesenda 30 osho wo oopelesenda 34. Eyopombanda lyuupyu pashiyelekitho shoodigilii selsius 3, etindo ndino otali ka gwa pevi nuule woopesesenda 56 meholokepo (Tanser et al., 2003).

EYOOLOKO POKATI KIIMENO NIIMUNA MBYONO YA TALIKA KO YA SIMANA :Egwo Iya ya pombanda Iyekano Iyiimuna niimeno ya simana

Namibia egumbo Iyiimuna niimeno ya simana ya yooloka. Eyopombanda Iyuupyu muuyuni pashiyelekitho shoodigilii selsius 1.5, owa tegelelwa u kwate ko nayi etopolelathano Iyiimuna niimeno ya simana ya yooloka moshilongo. Uumeneno wa simana moKaroo Biome (moshitopolwa sha kukuta kuuninginino) owu na uunkundi kenwethomo Iyeshonopaleko Iyomuloka (Midgley et al., 2005). Enwethomo kiimeno niinamwenyo ya simana ohali yi moshipala eteyo Iyiimuna (omolwuulithilo wa shonopala/wa nkundipala), omanyutu niilonga yuupashioni (Reid et al., 2008).



Dian Spear

Okatabele 7: Elunduluko meyooloko pokati kiimeno niimuna

	Desert encroachment	Species loss	Endemic species extinction	Endemic species endangered
1.5°C	+11%	+30%	+6%	+4%
2°C	+18%	+40%	+9%	+6%
2.5°C	+18%	+50%	+12%	+7%
3°C	+43%	+60%	+15%	+9%

Embugaleko Iyombuga niihwa: Uupyu muuyuni pashiyelekitho shoodigilii selsius 1.5 owu na enwethomo enene komushitilovi gwaNamibia, mono evi Iyomwiidhi IyaSavanna tali kanitha uushona walyo kombuga nokevi Iyihwa. Uuninginino owu na uunkundi kembugalo Iyombuga neshunopevi enene momuloka. Okwa tegelelwa embugaleko Iyombuga tali yi pombanda noopelesenda 11 osho wo oopelesenda 18 pashiyelekitho shoodigilii selsius 1.5 nosho wo pashiyelekitho shoodigilii selsius 2. Egwedhelo ndino otali vulu okukala olindji noopelesenda 43 pashiyelekitho shoodigilii selsius 3 (Midgley et al., 2005).



Charles J Sharp

Eshunopevi Iyomaludhi ga gamenwa: Eyopombanda pashiyelekitho shoodigilii selsius 1.5 muupyu womuuyuni otali etitha etindo miimeno nomiinamwenyo ya simana yaNamibia sho omahala taga ka kala gaa shi omawanawa nomaludhi gamwe po. Ekanitho Iyomaludhi olya tegelelwa li ye pombanda noopelesenda 30 osho wo oopelesenda 40 pashiyelekitho shoodigilii selsius 1.5 noshiyelekitho shoodigilii selsius 2. Pashiyelekitho shoodigilii selsius 3, eshonopalo ndino otali ka ya pombanda noopelesenda 60 (Midgley et al., 2003). Omaludhi ga simana otaga ka igilila kashona omudhingoloko, ashike natango otayi mono iihuna keshonopalo, mono omaludhi ga simana oopelesenda 69 ga tegelelwa ga hule po nomaludhi ga simana goopelesenda 4-6 ga gamenwa unene pashiyelekitho shoodigilii selsius 1.5 noshiyelekitho shoodigilii selsius 2. Pashiyelekitho shoodigilii selsius 3, omwaalu gwiinamwenyo ya simana gwa yalulwa tayi hulu po nenge ya gamenwa otagu yi pombanda noopelesenda 15 osho wo oopelesenda 9 (Midgley et al., 2005).

Pashiyelekitho shoodigilii selsius 1.5+: Omathenekodhiladhilo gomilandu dhaNamibia noahenda yehumokomeho

Ompangela yEhumokomeho yoPashigwana ontintano yaNamibia (NDP) oya tungwa koongudhi dheyokomeho lyiiyemo, elunduluko lyopankalathano, ekwatelopo lyomudhingoloko nepangelo ewanawa. Omanga elunduluko lyonkalo yombepo inali kwatelwa mo mo-NDP, enwethomo lyuupyu pashiyelekitho shoodigilii selsius 1.5 konkalo yombepo yopashitopolwa otali kala li na omashongo kiitopolwa yaNamibia ya nika uunkundi notashi ka ya komeho oonkondo dhoshilongo mokutsakaneka omalalakano gehumokomeho. Omulandu gwopashigwana kelunduluko lyonkalo yombepo ndjono ya li ya totwa momumvo 2011. Otayi ngongosheke oonkondo dhaNamibia mokuyambula po eigililo nokushunitha pevi uunkundi maakalimo nomiitopolwa. Eholokopo lyuupyu muuyuni tali thiki nokupitilila pashiyelekitho shoodigilii selsius 1.5 momimvo omulongo tadhhi ya olye shi ningi sha pumbiwa opo epangelo lyaNamibia li iyuthe konkato yeigililo yeendelela kukwashilipalekwe kutya iitopolwa ya nika uunkundi otayi vulu okuthikama nokwiigilila omathanekolunduluko ngaka.

Uupyu wa londa nomuloka gwa shonopala otagu mpimbilike ompumbwe yomeya nokweetitha oshikukuta sha nya kegonga nedhengo lyuupyu. Eholokopo lyomuloka ogundji oli na

enwethomo komudhingoloko notali etitha eyopombanda lyefundja, osho wo iinima yilwe iwinayi ya kwatelwa mo. Opo ku yambulwe po ehumokomeho lya tokoka neningomatokolo otashi pula epangelo lyaNamibia li ninge oonkambadhala dheitulomo dhokupendutha nokwaandjaganeka uyelele kombinga yetengeneko lyelunduluko lyonkalo yombepo nemwethomo lyalyo miitopolwa noondondo adhihe dhepangelo.

Oshitopolwa shuunamapya muNamibia inashi simana ashike omolwiiyemo, ashike omweithano lyaakalimo yopamikunda oyendji woo. Onkalo yaanafaalama yopamahupilo naambono aashona ohaya mono nale omayambidhidho gopashimaliwa noopenzela, naagundjuka oyendji otaa tembukile koondoolopa opo ya ka konge omahupilo gamwe. Uupyu muuyuni pashiyelekitho shoodigilii selsius 1.5 nowu vulithe po, neshonopalo lya tegelelwa li na sha nuunafaalama, otali gwedha po omashongo kiikulya nekalekopo lyoonkalo dhaanamikunda oyendji. Oonkatu dhomaigililo tadhhi opalele, osho wo oompito dhonkalo dha gwedhwa po noompito oompe dhiiyemo otadhhi dhana onkandangala metungo lyuuhupilo.



Sophie Lashford

Ekalekopo meigililo miitopolwa ya nika uunkundi yaNamibia otali kwashilipaleke kutya iitopolwa mbyono ya nika nale uuhwenge, ngaashi uunafaalama nomeya inayi kwatwa unene kedhengo lya gwedhelwa po. Omashongo gamwe ngano ongaashi oshikukuta nefundja, ngono taga vulu okukondjithwa komayakulo ga kola okuza kepangelo ndyono ihali etitha uunkundi neikwatelelo kekwatho ashike ohali hwepopaleke endiki nomukumo gwaakalimo ya kwate ko oonkalo dhiilongadhalwa yokukale ka po. Iputudhilo ya kola/omandiki geigililo lyelunduluko lyonkalo yombepo olya pumbiwa miitopolwa ayihe nomoondondo dhepangelo ku kwashilipalekwe etopolelathano lyonkambadhala yokungambeka enwethomo kiitopolwa ya nika uunkundi.

Enwethomo enene lyuupyu womuuyuni pashiyelekitho shoodigilii selsius 1.5 nowu vulithe po moNamibia otawu vulu okudhenga unene iitopolwa yiyemo ayihe, nokunkundipaleka okukala nuukalinawa waakalimo. Opu na ompumbwe yeendelelo yokupendula po omukalo nendiki lyaakalimo okwiigilila elunduluko pashiyelekitho shoodigilii selsius 1.5 tashi pitile mokunkondopeka omudhingoloko gweigililo kaakalimo, epangelo otali kwashilipaleke kutya aakalimo yokomikunda yi ikalekelwa, mboka ye na uunkundi uunene otaya vulu okwiigilila komalunduluko gonena nogomonakuyiwa.



Birgit Ottermann

OMAGWEDHELOPO: Omikalolongo

litopolwa yonkalo yombepo oya li ya totwa po kaanongononi yonkalo yombepo pakutopola iilonga miitopolwa yi ikalekelwa yuukukutu taku longithwa oshuuliko shuukukutu muuyuni (taku longithwa eendele lyomukukumvula neendele lyepwino komvula). Onkalo yuupyu wokomvula, eendelo lyomuku nomaudhigu gonkalo yombepo oga li ga konakonwa taku longithwa uuyebele wa za kendiki lyuuyebele wonkalo yombepo okuza koWorldClim Global Climate Dataset.

Omitungilo dhonkalo yombepo odha li dha kuthwa moprograma yoprojeka ontintano yoCouple Model Intercomparison Project (CMIP5). Egwedhelopo lyo 24 CMIP5 GCM ko-RCP olya li lya longithwa okuukilila eityo lyonkalo yuupyu nomuloka, osho wo iihololi yomaudhigu gonkalo yombepo (uudhigu wuupyu nomuloka) mbono hawu ukilile lela uunkundi wu na sha nelunduluko lyonkalo yombepo pashitopolwa pakulongitha oomvula 1861-1900 onga ethimbo lyonkalo yopakulonga, oomvula ndhono o-RCP 8.5 tayi adhika po pashiyelekitho shoodigilii selsius 1.0, 1.5, 2.0, 2.5 noshiyelekitho shoodigilii selsius 3.0 shuupyu womuuyuni oya li ya fatululwa pandondo yopailonga.

Kehe momutungilo omwa za oshilyo, ethimbo lyoomvula omilongo 31, olya li lya longithwa momusholondondo gwethimbo alihe. Uukwatyankalo wombepo wa gandjwa pashiyelekitho shuupyu muuyuni owa li wa fatululwa nomvula ndjono ehololo tali adha oshiyekitho shono shuupyu muuyuni notashi kala mpoka shi vule po itashi inyenge. Pashiyelekitho shonkalo yombepo moshitopolwa kehe. Otwa yalula eityo lyonkalo yombepo pehala lya lalakana kondondo dhuupyu womuuyuni dha gandjwa opo ku hololwe elunduluko lya pambathana noondondo dhopakulonga. Okakonakono kaa na sha nondjalulo koWilcoxon Paired Signed Rank (WPSR) ko-RCP8.5 oka li ka longithwa ka konakone esimano lyeyooloko pokati ketopolelathano ndyono lya thikamena po iyelekitho yoodigilii selsius 1.0, 1.5, 2.0, 2.5 noshiyelekitho shoodigilii selsius 3.0.

Enwethomo kiitopolwa mbyono ya nika uunkundi olya li lya monika pakukonaakonwa iinyolwa ya pita nale mono enwethomo tali vulu li kale lya tulwa peyopombanda li ikalekelwa lyuupyu womuuyuni nenge iiholelwa yepititho (SRES no-RCP) osho wo uule wethimbo otawu vulu okweetela eyopombanda lyontumba muupyu womuuyuni. Emwethomo lyedhengo lyuupyu kehe olya li lya hololwa kwa longithwa oshimetitho sholinear regression taku longithwa osoftware yo-R yomatopaatopo gomayalulo.

Efatululo muule lyomikalolongo ndino otali adhika kepannja lyo-ASSAR kointaneta.



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