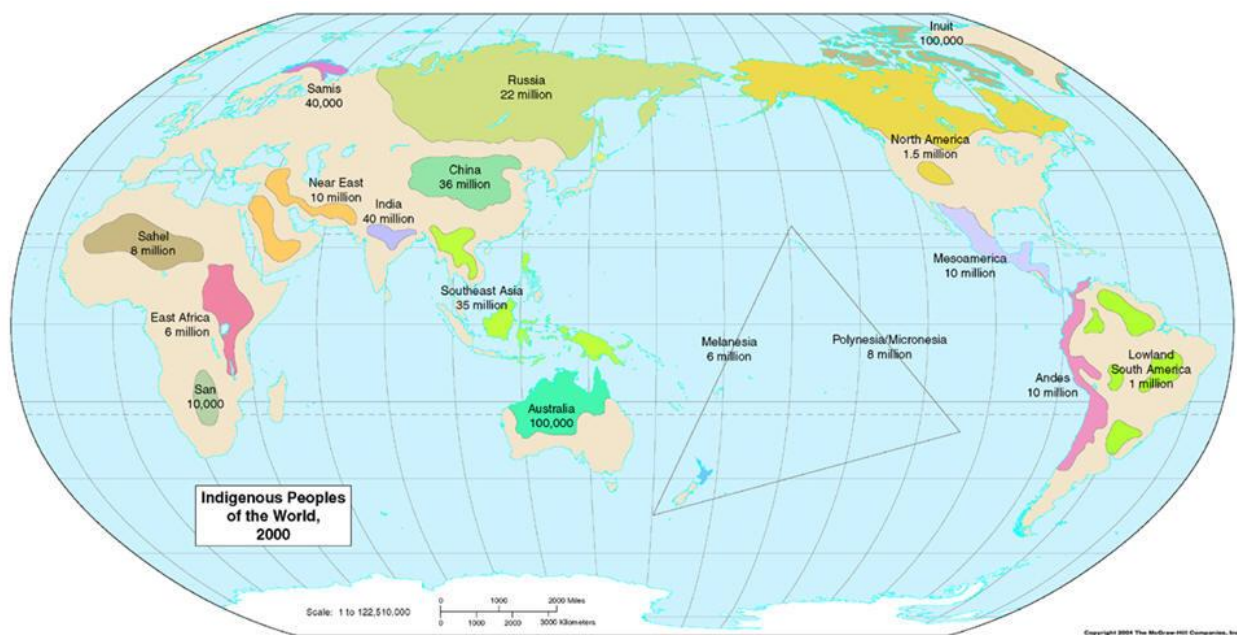


A tool for Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change © *Abridged Version*

Prepared by: Blake Gentry, MPPM
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Map of Indigenous Peoples of the World (2000)



http://www.westga.edu/~gvanvale/map_of_indigenous_people.htm accessed Sept.30 2013

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Part I: Concepts for Measuring Indigenous Vulnerability and Resilience

The UNFCCC in 2008 selected a set of methods and tools to *evaluate impacts of vulnerability and adaptation to climate change*. Updates and new frameworks are substantially moving evaluation methods for vulnerability - forward. Nevertheless, the UNFCCC called for the inclusion of “indigenous peoples, women and forest peoples” in a global framework to ensure forests are “conserved and benefits captured by marginal groups”. The Convention calls for their inclusion as an indicator for assessment of “efforts of the LDCs and their development partners in addressing vulnerability of the LDCs”.¹ UNFCCC’s identification of indigenous peoples as an indicator of participatory assessment stems from the difficulty in asserting international policy standards for indigenous participation to national level policymakers and national adaptation planners.

Indeed, governments are challenged as to how to include indigenous knowledge about climate. Their inclusion both informs and challenges top down national adaptation planning based on modeling with SRES climate scenarios. Indigenous have been identified by UN bodies as both among the *marginal and most vulnerable to climate change*², and as peoples who have *specialized knowledge about ecosystems impacted by climate change*.³ This tool attempts to positively address this asymmetrical status by measuring indigenous vulnerability and their capacity for adaptability to the impacts of climate change in order that they may contribute to the bottom and the top of the adaptation planning process. This measurement tool is proposed to help narrow the gap between consideration of indigenous as *subjects* of adaptation and indigenous as *agents* of adaptation.

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

How Indigenous Vulnerability Differs from other Sectors

For indigenous identified as vulnerable to impacts in Latin American regions, collective adaptive capacity may only partially depend on income due to: 1) A large proportion of indigenous people are employed in the informal economy making income hard to measure, 2) They represent a more complex set of historical and current migratory responses often with stratified stages, 3) Aggregated income averaged from census data may obscure minority indigenous populations within non-indigenous populations (for example, at the municipal level in Mexico)⁴, and 4) Indigenous peoples' own organizational structures that coped historically with weak links to state political power and its incumbent legitimacy may exist outside formal markets and with little access to institutions.

As measures of collective capacity to withstand impacts, income levels do not capture adaptive knowledge and practices of indigenous peoples collectively. For example, higher income levels due to dynamic migration may indicate weaker community decision making capacity and less access to natural resources.

The temporal separation of the cause of climate impacts and their effects is exacerbated by a disintegration of mitigating actions and institutions in modern societies over time,⁵ however many rural indigenous cultures already inculcate low CO₂ emissions and sustainable land use practices. Also, given states' historical and institutional disregard for prior consultation on their social development in national planning, their capacity for social mobilization is a key domain for gauging indigenous adaptability. Indigenous often can make collective decisions only on collectively held land, and disparate income levels may disincentivize collective action. Deeper insights from social scientists about distributional differences point to the need for finer methods of measure that value the inclusion of indigenous' social and cultural life at the national planning level.

A simpler but more direct concept for measuring vulnerability is that adaptability is subject to exposure and impacts over time. Resilience under this definition is certainly a continuum. Both vulnerability and adaptability are values on opposite ends of the same adaptability range when a base line measure is taken. Over time resilience can then be calculated based on the initial findings. Thus when conceived of as a range, adaptability in light of known climate impact exposure can more robustly be measured.

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Vulnerability and Resilience

The UNFCCC adaptation policy initiatives are designed to assist developing countries prepare for adaptation on national and sectorial bases. Both climate science driven (climate modeling and scenario analysis) and national policy approaches (National Communications and National Adaptation Programs of Action [NAPA]) are promoted.⁶ National level planning largely determines what sectors are rewarded and which are denied programs for adaptation.

Though current methods consistently concede that determining vulnerability is fraught with “normative and subjective elements”, that indigenous will be adversely impacted compared to other populations is problematic.⁷ IPCC WG II contributing authors cite seven risk criteria for estimating vulnerability universally: magnitude of impacts, timing of impacts, persistence of impacts, likelihood of impacts and vulnerabilities measured by estimates of uncertainty with levels of confidence, potential for adaptation, and distributional aspects of impacts and vulnerabilities.⁸

Exposure and sensitivity to climate change impacts are key components of understanding how to assess the vulnerability to and the adaptive capacity of societies to climate impacts. Can we accurately measure the vulnerability and resilience of countries with considerable indigenous populations without integration of indigenous into adaptation planning to climate impacts? Given their knowledge of local environmental conditions, In Latin America, the evidence points to an extensive underutilization of indigenous knowledge as essential to garnering national level human and social capital for adaptation.

Without capturing that knowledge, from a statist point of view, under business as usual scenarios indigenous are routinely placed in the deficit category, instead of in an asset category. How can we distinguish indigenous societies’ knowledge of changes to natural capital across the spectrum, i.e. across the environments affected by climate change impacts?

Indigenous cultures fall within the ambiguity of “distributional aspects”.

They may receive adaptation instructions, but will disproportionately be

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

excluded from official planning - unless there is political will and a tool capable of measuring indigenous vulnerability and adaptability.

For indigenous peoples' adaptive capacity be fully realized, they must be part of a process for assessment of their vulnerability and adaptability to climate impacts through consultation. Their effective involvement necessarily requires going beyond "traditional knowledge and inputs from indigenous communities"⁹ being considered only at the local level, rather, they have a role to play at the national and sub-national planning level. Rural indigenous communities in total are more heterogeneous and complex than urban and peri-urban communities in relatively more homogenous human built environments. Most of the 47 million¹⁰ indigenous people in Latin America live in diverse ecosystems at risk for large impacts from climate change in: Chile, Bolivia, Ecuador, Peru, Brazil, Colombia, Guatemala, and Mexico. Vulnerability is multifaceted and culturally situated; a tool that only measures it for urban populations is inadequate for rural indigenous populations with unique social relations, languages, and land tenure.

Domains for Measuring Indigenous Adaptive Capacity

Four socio-cultural domains are all affected by the domain of climate impacts where indigenous live in Latin America: Andean glacier retreat leading to water scarcity, prolonged drought in arid lands, severe flooding of lowlands, and coastal flooding from sea level rise. A second domain is the *ethnic and geographical identification of indigenous* where impacts occur: in Andean highlands, in warm inland and coastal tropical lowlands, in rainforests of Mesoamerica and the Amazon, and in desert regions in Northern Mexico and Southwest United States.¹¹ A third domain addresses *land use of the identified indigenous populations*. A majority of indigenous peoples in Latin America generate their household livelihoods from natural resources: forestry, agriculture and livestock, pastoralism, and fishing.¹² Losses in commercial agriculture due to extreme events in Latin America can serve as a *proxy for indigenous small holder subsistence producers* involved in agriculture, as demonstrated in regional impacts¹³:

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

- As a % of total sectorial damage, agricultural damage from the ENSO affect (1997-1998 in select Andean countries with indigenous populations was from 17% to 47% (Peru, Col., Bolivia).
- Hurricane Mitch (1998) damage to Guatemalan agriculture was 68% of the total sectorial damage.
- Future scenarios for coffee (by 2050) in Mexico project a reduction in production of 73%-78%, and in Brazil a reduction of 10% in cultivatable land suitable for coffee.

These trends, in addition to actual and anticipated shifts in crop production,¹⁴ magnify the negative impacts of extreme weather events on indigenous land use.

A fourth domain focuses on *the stages of migration and remittances generated by indigenous communities, whether it is seasonal, cyclical, transnational, iterative or permanent*. A fifth domain focuses on their *adaptive capacity and self-reliance in meeting basic needs*. Together, the five domains largely regulate indigenous life in Latin America. Indigenous communities receive widely different levels of governmental services or none at all, a practice that can make accurate assessments of readiness fraught with inequitable distributions of adaption funding.

According to a 2002 worldwide poll - rural poor consider *CBO's, Religious, and NGO's* the most effectual institutions, while government institutions of *health, education, police, municipality, and national ministries* as the least effective.¹⁵ Trust must be built to engender better collaboration given traditionally weak working relationships between government institutions and indigenous populations. An emergent example of trust building can be found in established mitigation projects where indigenous are engaged as forest managers with Andean governments in national REDD agreements. However, a 2010 study was critical of Latin American countries' REDD + proposals as lacking in mechanisms for indigenous participation, land tenure rights, and for REDD program transparency, accountability, coordination, and monitoring.¹⁶

In general, inadequate structures in civil society dominate relations between indigenous and Latin American governments. This business as usual scenario may replicate analyses of Indigenous communities from a deficit point of view, exclusive of the collective social capacity

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

of indigenous populations for collaboration, or skew resources to political forces. To resolve this socio-cultural reality, both an endogenous and an exogenous assessment of indigenous vulnerability and resilience are called for in order to measure their adaptive capacity. Indicators must be designed to capture both negative and positive values, i.e., *not only their vulnerabilities, but their resilience to climate change impacts as well.*

Five domains in the proposed tool attempt to balance measures of indigenous vulnerability and resilience by measuring by positive and negative values and by having perspectives from two unique stakeholders. The domains comprise a tool that rests on downscaled regional climate data coupled with a process for qualitatively estimating four social domains pertinent to indigenous communities. The first three domains approximate values for indigenous settlements in sub-regions of Latin America: regional climate change, ethnic identification, and the use of natural resources for livelihoods. The fourth and fifth domains measure relative ratios of exogenous and endogenous socio-economic support: migration and remittance, and adaptive knowledge and practice. Both the Regional Climate Change and Migration and Remittances domains produce negative scores by design given generally impacts produce negative results of indigenous communities living in marginal low yield lands increasingly exposed to physical risk of hazards and losses in agriculture, pastoralism, hunting, and fisheries.

The 2011 UNFCCC Nairobi Work Programme suggests that downscaling approaches are best informed by need, assessment and adaptation decision contexts, and access to resources and time.”¹⁷ This tool could be applied with the constraints of a down scaled 100 year climate change estimation for the period 2000-2100 or preferably with a 30 year estimation. Decadal estimates on the 100 year timescale can be calculated, but such estimates magnify the impacts by 87% for that period when viewed in 2013. However, as impacts are updated, and because they are expected to adversely disrupt indigenous nations, decadal re-estimation of domain values would optimize adaptation planning. In other words, establishing a baseline facilitates decadal re-estimations of domain values; a measure of resilience over time.

Limitations

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Indigenous communities with less or no publically available indicator data will be disadvantaged when using this tool unless technical assistance is forthcoming from governments and international climate change adaptation funders such as Global Environmental Facility, UNDP, UNEP, the Green Climate Fund, regional development banks, etc. Remote communities may require more time and resources to measure indicators for scoring. In general terms, a lack of data indicates greater social and spatial gaps between them and institutions involved in adaptation policy and planning, including universities. This is a significant limitation. This tool is inadequate for urban indigenous groups, though their existence as part of the migration and remittance domain may inform their home communities. This tool should not be used for very remote indigenous communities with little or no previous contact; only specialized anthropological teams should undertake such contact if necessary due to climate change impacts.

Part II: Tool for Measuring Indigenous Vulnerability and Resilience.

Methodology: The first domain, *Bio-Regional Impacts of Climate Change*, estimates the severity of negative impacts from regional climate scenarios for a 1-2⁰C rise in temperature by the year 2100 based on a 1980-1990 baseline¹⁸. Pre-assigned negative weights are built into the first domain estimation process for severity of impacts from four sub-regional climates based on confidence levels taken from Schneider et al. in Assessing key vulnerabilities and the risk from climate change.¹⁹ This tool uses estimated future impacts from the literature to engage indigenous and government stakeholders for preparing estimates on vulnerability and resilience of extant indigenous populations based on decadal projections for 2010-2020. If 2010 is used as a benchmark for estimated impacts, values for four socio-cultural non-climate domains can be estimated and thus they become assessments of indigenous adaptive capacity at the beginning of the ten year period 2010-2020. Given that some assumptions about how climate impacts will affect humans in the future, the 30 year near term downscaled models become more useful for no regrets adaptation planning.

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Limitations: The tool is currently limited by impacts reported for 100 year scales to year 2100 which over magnifies projected impacts before we experience them. However, as 30 year downscaled data becomes available, estimations on climates and confidence levels of impacts on sub-regions can be updated, thus making the impacts more manifest within shorter periods. To this author's knowledge, for indigenous populations in the identified Latin American sub-regions, only NW Mexico / SW United States for desert climates are reported for high end (SRES A2) and low end (B1) emissions scenarios *on a 30 year scale (2021-2050)*.²⁰

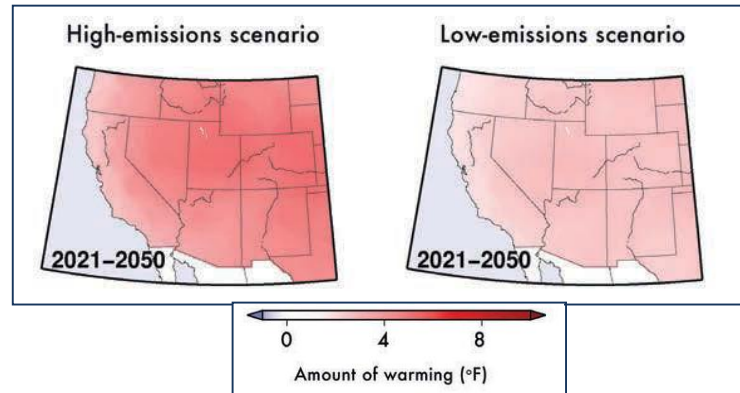


Figure 1.5 Projected temperature changes for the high (A2) and low (B1) GHG emission scenario models, Garfin, G., A. Jardine, R. Merideth, M. Black, and S. LeRoy, eds. 2013. Assessment of Climate Change in the Southwest United States

For example, in 2010, applying climate change estimates from models for the period 2000-2100 will produce an estimate that over magnifies future climate impacts by 88.8 % in 2010 down to 10% by 2100. However from the same 2010 snapshot measure, impacts from a downscaled 30 year model (for 2021 to 2050) give us estimates in climate, for example in regional warming as in the figure 1.5 above, with a shorter term horizon, and therefore less forward magnification. This produces estimates with over-magnification that reduces, *albeit unevenly*, from 75% to 25% over a timespan / time period (2021-2050) that ends 50 years sooner. Thus the murky picture for adaptation from trying to use a 100 year scale, is made clearer with 30 year (2021-2050) downscaled estimates. As climate modeling improves, near term estimates on climate impacts and the confidence levels that climate scientists assign to them also improve.

How to Use the Tool

Indicator Measurement

Qualified parties for assessment activities include both indigenous [**I**] (communities, networks, nations, or federations) and government [**G**] institutions (local, national, or international) and an Independent Advisory Body appointed by the UNFCC to review submitted assessments. Both

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

I and G are tasked with estimating values for each of five domains. Indigenous communities, nations, and federations may use their traditional representative bodies, or ad hoc organizations to assign their own experts for estimating values for each indicator; expert NGO's and or scholars with technical expertise known to indigenous organizations, and chosen by them. Findings must be previewed and approved by representative indigenous organizations.

Given the complexity and diversity of indigenous contexts, government agencies are best served by referencing their domain estimates according to international standards for each domain; they should not rely on long standing funding mechanisms, outdated data, nor pre-determined values for indicators. Governments, for example, may not use native language capacity as a sole indicator of indigenous identity, or disaggregated poverty indexes that exclude indigenous as demographic units. Each party may use technical assistance for its own estimates on indicators for each domain.

Scoring

Domain specific instructions are found in the domain tables below. The values for domains no. 2 through no. 5 represent expected social changes that occur from the impacts of climate change for estimated values in the first domain. Domains no. 1, no. 3, and no. 4 require one indicator be estimated for the entire domain score, whereas domains no. 2 and no. 5 require estimates of values be averaged from all indicators. 3) A single composite score for the defined indigenous group is then calculated as the average of the five values from the five domains and expressed as a percentage from 0-100. If domain composite scores vary more than 15% between I & G, subsequent harmonization may occur if both parties agree to review the estimations jointly, but only after separate assessments are completed and submitted.

Indigenous Community Assessment Review Body (ICARB)

Submissions can be sent to national level body appointed by UNFCCC with indigenous and government participants not directly involved in the particular assessment activity. The review body is tasked with assuring the methodology for the assessment was completed to the written standards outlined in the tool. Members appointed to the body are drawn from these areas: 1) Land management experts, 2) Indigenous cultural experts/social anthropologists,

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

3) Native linguists, linguistic expert, 4) Indigenous organization administration (with prior policy or community level work history), 5) Work Specialist: farmer, pastoralist, fishers, etc. according to the predominant natural resource activity which affected indigenous populations engage in, and 6) a climate scientist with expertise on the climate of concern. Both I and G can use the same source. Since there is no UNFCCC legal mandate for an Independent Review Body, fast tracking priority is to be offered for projects where assessments use this methodology to incentivize its adoption.

Interpretation of Results

Domain scores represent positive values of 0%-100%. Domain scores allow for pinpointing specific and general strengths and weaknesses for each unique domain. Higher values show more resilience, and lower ones, more vulnerability. At a gross level, composite scores can facilitate comparisons between indigenous groups, while at the domain level; scores are more useful for adaptation planning for a particular indigenous population. Composite scores for group comparisons are contextually based and therefore their distribution across domain scores provide for disaggregated data for adaptation planning with specific indigenous populations. For example peri-urban indigenous communities may have higher *Adaptive Knowledge and Practices values*, but lower *Land Use for Subsistence/ Livelihood values* than indigenous with more intact *Land Use values*, whereas indigenous communities undergoing *Migration/Remittances* may have higher *Land Use Values* compared to communities that were historically disposed of more than half of their land base. Indigenous communities with their own internal extant census for population and speakers of their native language may have higher values for indigenous identification than those that are used by a government institution that relies out of date or ill-defined demographic data and vice versa.

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Tool for Measuring Vulnerability and Resilience of Indigenous Communities to Climate Impacts in Latin America			
Domains (1-5) and Indicators (a,b,c, etc.)	Estimations of vulnerability and resilience		
1st Domain: Bio-Regional Impacts of Climate Impacts	[Negative Values]		
<p>Bio-regional impacts of climate impacts measures confidence in known CC impacts from indigenous experience and from 100 yr. scale modeling to 30 yr. down-scaled modeling. (Note: Only one indicator (a-d) is estimated.) (For confidence levels in value scale, see endnote no.12.) Values are averaged. The higher the confidence in the predicted impacts, the better the information for adaptation, even if impacts are more intense.</p> <p>Numeric Scale: L = 5 to 25 %; M= 26% to 50%; H - 51% to 75 %, VH = 76 to 100%.</p> <p>Value Scale: Low: if <u>either</u> govt. (G) or indigenous (I) planners have little or no estimable data or experience Medium: when <u>either</u> G or I are confident about data quality, but the other is not high: when <u>both</u> reach consensus about type of impacts, but not on timing or magnitude very high: when <u>both</u> G & I concur on impacts, their timing, and magnitude.</p>	(I) Indigenous estimate	(G) govt. estimate	total estimate
a. Warm inland and Tropical lowlands and rainforests (Mesoamerica and the Amazon) Inland flooding from tropical storms. - 16 (% score= 9 %)	-__	-__	-__
b. Highlands (Andes) Glacier melts threaten water shortages. - 39 (% score= 22 %)	-__	-	-__
c. Arid Desert Lands (NW Mex. / SW US,) Heat, drought reduces livelihoods, increases mortality rates] -61 (% score= 34.5 %)	-__	-__	-__
d. Coastal Lowlands Sea level rise on coastal areas threatens potable water access, - 61 (% score= 34.5 %) increased storm surges, hurricanes.	-__	-__	-__
1st Domain score (5-100%, coverts % to 5 -100.)	-__	-__	-__

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Domains (1-5) and Indicators (a ,b ,c, etc.)	Estimations of vulnerability and resilience		
2nd Domain: Indigenous Group/Nation	[Positive Values]		
Indigenous Group/Nation measures estimated confidence (from 0-100%) in indigenous as defined by ethnicity, land tenure, language, and population. Indicators estimated by traditional and contemporary indigenous governance structures with assistance from specialists in: environmental networks, linguistics, anthropology, development, and UN DRIP standards. Note: all indicators are estimated.	(I) Indigenous estimate:	(G) Govt. estimate:	Total Estimate;
a. Delineated ethnic group: ___ (name) over a defined geographic range _____ in _____ hectares squared. (0 to 100%) [Most up to date land area calculation is used]	+__	+__	+__
b. Current Land tenure relationship: <i>Notes: only one sub-indicator (b1-b3) is scored. Use best fit. Sub- Indicators b1, b2, and b3 are for changes older than two generations) Ancestral Homeland = AH.</i> b1. Most population is Living in AH; 55-100% of population _____ b2. Partially dispossessed or displaced from AH; - 10 to 45% of population from AH _____ b3. Permanently removed from AH; 5% -55% of population from AH. _____	+__	+__	+__
c. Language family and language ___ & ___ (Lang. family & language name in Indigenous language. note: language, not dialect. Estimate is in the % of speakers of an indigenous language within resident population. For (G), estimate requires linguistic specialist. (0 to 100%)	+__	+__	+__
d. Population counts for group size _____ and unit counted geo - graphically bound community, cluster, tribe/nation) _____ (score is confidence of estimate, 0 to 100%)	+__	+__	+__
2nd Domain score (Value of 0 -100: average of a-d)			

Domains (1-5) and Indicators (a,b,c, etc.)	Estimations of vulnerability and resilience		
3rd Domain: Land Use for Subsistence/ Livelihood	[Positive Values]		
Land use for subsistence/ Livelihood measures % (0-100) of indigenous families engaged in land use for subsistence / livelihood activities in one type land use 1-5. Estimates are averaged for the measured unit of population: community, clan, indigenous tribe/nation in the pre-defined language/ geographic area. <i>Note: Only one indicator (a,b,c, or d) is estimated.</i>	(I) Indigenous estimate:	(G) Govt. estimate:	Total Estimate
a. Tropical Forest rubber, fisheries, swidden (slash & burn) agriculture, building materials.	+__	+__	+__
b. Highlands: silviculture, agriculture, silviculture livestock	+__	+__	+__
c. Desert / savannah: pastoralism, livestock, grain and/or feedstock Production.	+__	+__	+__
d. Coastal Lowlands <i>Sea level rise on coastal areas threatens potable water access, increased storm surges, hurricanes, damage to fisheries.</i>	-__	-__	-__
d. Symbiotic Ecosystems: combined from two of the above as the dominant indigenous land use.	+__	+__	+__
3rd Domain score (value of 0 to 100, Chose one: a,b,c, or d.)	+__	+__	+__

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

Domains (1-5) and Indicators (a,b,c,etc.)	Estimations of vulnerability and resilience		
4th Domain: Migration and Remittance Structure	[Negative Values]		
Migration and Remittance Structure measures 0-100 % of indigenous population's stage of migration, if any. Note: Only one indicator (a-d) is estimated. If no migration, value = 0%. HH = head of household	(I) Indigenous estimate:	(G) Govt. estimate:	Total Estimate;
a. Low - Incipient migration of - 5 to -15% of community members/communities; more single youth migrants, less head of household (HH), not the most poor.	-__	-__	-__
b. Medium Low: Catalectic migration for - 15% to -25% of families experience regularized individual migration or start of family migration, changes in migrant demographic, mix of youth and HH, remittances sent periodically, system established.	-__	-__	-__
c. Medium: Patterned and Cyclical Migration for -25% to - 40% of HH receive individual or family livelihood from remittances frequent not periodic, reduced community participation and educ. enrollment. Maximum of this stage is the tipping point for community's economic displacement. This is considered tipping for local economy.	-__	-__	-__
d. Medium High: Remittance dependency for - 40% to -60% of HH remittances on par or overtaking HH income/livelihood, hollowed out male gender effect, community decision making stagnation, social structures emerge in intact immigrant community	-__	-__	-__
e. High: Transformative Migration for -75 to -100% of families rely on migrant remittances, cyclical migration acutely decreases. Community is path dependent on outside capital, land tenure vulnerable to outside acquisition, community based decision making collapses.	-__	-__	-__
4th Domain Score: (value of 0 to 100, average of: a – e.)			

Domains (1-5) and Indicators (a,b,c,etc.)	Estimations of vulnerability and resilience		
5th Domain: Adaptive Knowledge and Practices²¹ for CC adaptive planning and implementation	[Positive Values]		
Adaptive Knowledge and Practices for CC adaptive planning and implementation measures the capacity for acquisition of five basic services and inherent cultural capacity as positive % of self –reliance for each indicator a-e. Partially acquired services are indicated by degree of coverage for population. The composite average of the five indicators is the domain score. Each indicator is scored separately on a 0-100% scale.	(I) Indigenou s estimate:	(G) Govt. estimate:	Total Estimate
a. Shelter (% of population with access to durable shelter)	+__	+__	+__
b. Access to Water (% of population with access to potable water)	+__	+__	+__
c. Use of natural resource materials (% of population w/ access to use natural resources.	+__	+__	+__
d. Health (% of majority with access to adequate health services)	+__	+__	+__
e. Traditional knowledge regeneration (% of confidence that indigenous experience and traditional indigenous knowledge and customs in land use practices, knowledge of climate, and flora provide capacity to regenerate knowledge for youth)	+__	+__	+__
5th Domain Score (value of: 0 -100: ave. of: a - e)			
Total Unique Composite Score (all 5 domains for Indigenous vulnerability and Resilience) = 0 – 500.	+/- __	+/- __	+/- __

Measuring Vulnerability and Resilience of Indigenous Communities to Climate Change Impacts in Latin America

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- ⁶ UNFCCC, Climate Change: Impacts, Vulnerabilities And Adaptation In Developing Countries, 2007:15-16.
- ⁷ See Schneider, et al. Chapter 19, 2007: 784. *See endnote 1 for full citation*.
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- ¹⁷Ibid, UNFCCC, 2011, 28.
- ¹⁸ Schneider, S.H., S. Semenov, A. Patwardhan, I. Burton, C.H.D. Magadza, M. Oppenheimer, A.B. Pittock, A. Rahman, J.B. Smith, A. Suarez and F. Yamin, 2007: Assessing key vulnerabilities and the risk from climate change. 1997, table 19.1, 787..
- ¹⁹ Schneider, et al, 1997, r.e. TAR 19.3.7 from 781, Regional Systems table 19.1 in 788, and 789. *See endnote 1 for full citation*.
- ²⁰ Garfin, G., A. Jardine, R. Merideth, M. Black, and S. LeRoy, eds., 2013, *Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment*. A report by the Southwest Climate Alliance. Washington, DC: Island Press <http://swccar.org/sites/all/themes/files/SW-NCA-color-FINALweb.pdf> , 10.
- ²¹ Adapted from: Galloway McLean, Kirsty, 2010, *Advance Guard: Climate Change Impacts, Adaptation, Mitigation and Indigenous Peoples— A Compendium of Case Studies*. United Nations University – Traditional Knowledge Initiative, Darwin, Australia.