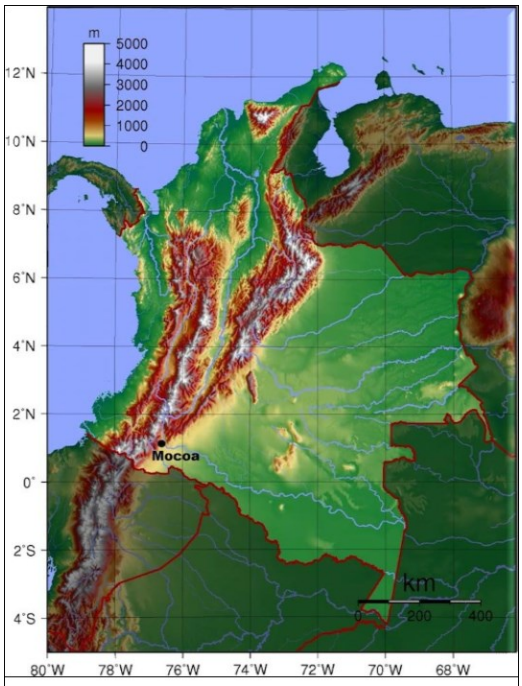
Mocoa's Lessons for Indigenous Communities and Adaptation

By Blake Gentry

The following report is a desk review of the climate events and adaptation response for Mocoa, Putumayo, Colombia. All opinions expressed are of the author only.

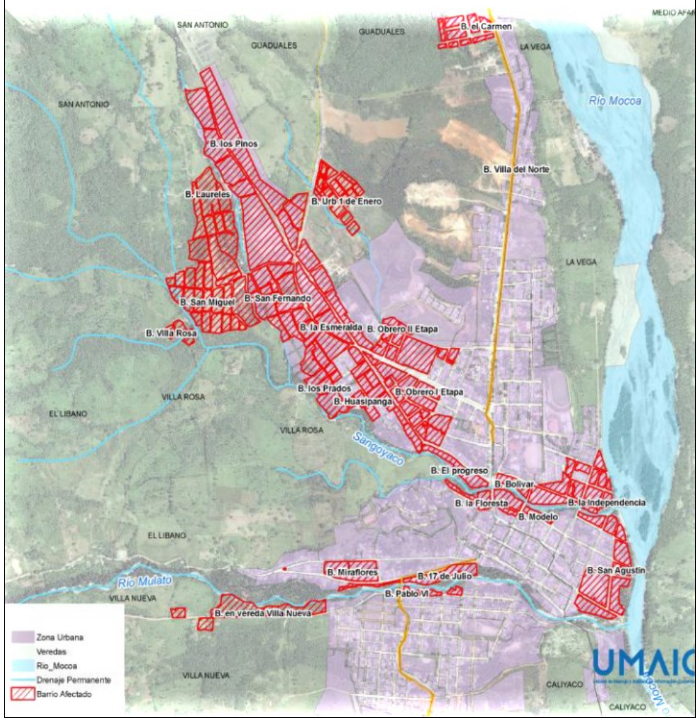
Mocoa Climate Event: April 1, 2017

Mocoa, Putumayo, Colombia, situated on the eastern slope of the Andes in southern Colombia, is home to eight unique indigenous communities. On March 31, 2017 from 11 PM to 1 AM Mocoa was inundated with 130 mm (5.1 in) of rainfall. One cause of the downpour was the 1°C (1.8°F) higher than normal sea surface temperatures driving moist air in the Eastern Pacific tropical zone creating a slow-moving mesoscale convective complex in that area of Southwestern Colombia. In the month leading up to the deluge, Mocoa had experienced 50% more rainfall than the average March. Indeed, from January – March of 2017 most of the Southwestern Andean Range countries, including Colombia, Ecuador, Peru, and Chile, experienced above average rainfall that produced flood-related disasters and multiple deaths (see table 1 below). Given the preponderance of indigenous communities in the region, Mocoa represents a strong case for climate



Map 1. Mocoa department of Putumayo, at approx. 2000 mt. On the eastern slope of the mid Andean Range in Colombia, South America. Map Courtesy of Wikipedia and Dr. Jeff Masters.

Map 2. Neighborhoods adversely affected by flooding in Mocoa, Putumayo, Colombia.



adaptation in some of the vulnerable communities in the Americas.

Mocoa is bordered by one river on the east and is intersected by another two. By 3 am on April 1st, extraordinarily heavy accumulative rainfall impacted areas of deforested hillsides, abandoned mines, and physically vulnerable neighborhoods built close to these waterways. The topography of Andean hillsides includes radically steep drops and deep ravines from which large boulders, called *huaycos,* can be dislodged under extraordinary flowage and come crashing down the mountain in mudslides.

The Mountains on Mocoa's western side shed its fast falling rain and exposed dirt, which mixed into an enormous cascade of water and debris. Flooding and a huge mud slide spilled from one river to the next before inundating the lower lying inhabited areas of Mocoa, crushing and then burying structures in its wake. Within five days, at least 320 -700 persons had perished, approximately 30% of whom were children, and over 400 had been injured. The wide ranges in the estimate of the deceased and missing is attributable to the fact that many inhabitants were not registered with the government as residents of their poor neighborhoods.

The cumulative death toll of 497-877 from flooding and slides in the Andean Corridor over the period Dec. 2016 – May, 2017 is summarized in table 1.

Table 1.	Period	State(s) and Countries	Death toll
	March 30-April 1, 2017	Putumayo, Colombia	320-700
	December 1, 2016	Cali, Colombia	6
	Jan. – May 17, 2017	Guayas, Los Ríos, Manabí, Ecuador	40
	late-February 2017	Santiago, Chile	18
	January – March 2017.	9 states in Peru	113

Following the 2017 Mocoa disaster, the National Organization of Colombian Indigenous (ONIC) reported that of the 320 reported dead, 115 were indigenous peoples of unique ethnic groups: Siona, Cofán, Inga, Kamentsá, Quillasinga, Pastos, Murui, and Yanaconas. An additional 90 of the 400 reported injured - were indigenous.

> *While nearly 40% of deaths and 22% of the injuries were to indigenous peoples; indigenous peoples comprise only 18% of the municipal population. In crude terms, indigenous peoples in Mocoa, as a result of the disaster, died at a rate of 2: 1 compared to non-indigenous peoples.*

ONIC also critically noted that eight *Cabildos* (traditional governing bodies[1]) had been effectively disbanded through loss of personnel.

[1] *Cabildo*, according to the Colombian Ministry of the Interior, is a "special public entity, whose members are members of an indigenous community, elected and recognized by it, with a traditional sociopolitical organization, whose function is to legally represent the community, exercise authority and carry out the activities attributed to it by laws, their uses, customs and the internal regulations of each community."

As was expected, transnational and Colombian NGO's, UN agencies, and the Colombian government responded. By April 4th, 22 agencies and organizations had mobilized with water provision, electricity, restoration of internet cable, and other relief and recovery measures. Some 1,400 soldiers and 800 police officers physically searched debris for survivors. Of note is an instruction from an April 5th report regarding shelters in the relief effort:

> "In a transversal manner, the need for an ethnic approach in the management of shelter, registration and education in emergency, stands out"
>
> *UN OCHA April 5, 2017 bulletin.*

Former Colombian President Manuel Santos said in an official communique that climate change was responsible for the flooding at Mocoa. He promised a rebuilding effort, pledging that the hospital would be rebuilt, water treatment plants would be set up temporarily, and electricity would be back up in ten days. Even the opposition FARC rebels, legally restricted to rural camps under the recently enacted national Peace Accords, offered to help rebuild Mocoa.

Graphic 1. Mocoa, post- flooding. April, 2017. Photo: Colombian Army

Mocoa Climate Event: August, 2018

During the nights of 11 and 12 August, 2018, intense rainfall and flooding in Mocoa's three rivers (Mulato, Sangoyaco, and Mocoa) occurred again, requiring evacuations in 12 neighborhoods,

Impacts included four people injured, 169 families affected (597 people, of whom 171 were minors and 25 elderly), 169 homes in the urban area were affected by flooding, mud and debris, and 14 houses destroyed. Impacts to infrastructure included damage to a vehicular bridge, two collapsed pedestrian bridges, and access roads, two key aqueducts responsible for intake and distribution networks, an energy tower, and thee educational institutions all suffered from flooding. At least one pedestrian bridge, and one recently replaced vehicular bridge originally damaged in 2017, were damaged. Including persons from the two smaller nearby communities of Villagarzón and Puerto Guzmán, some 30,000 people were evacuated.

In the aftermath of the 2018 flooding, the Colombian Minster of the Environment, Ricardo Lozano, commented:

> "It is very important to preserve the reserve of the upper watershed of the Mocoa River, to slow down the cattle frontier that is rising and this is the reason why we have landslides, that we leave it devoid of plant protection down to the rock, which is very unstable because it is a highly seismic area. In an extreme downpour, the population will always be exposed to danger." (translation by author).

He added that in the downstream Mocoa area, there are families living in nearly 4,000 properties that are also at risk given land ownership for cattle ranching favors felling of trees for open pasture land which increases water flowage downstream and the risk for adjacent populated areas.

Post-disaster Relief

In the aftermath of the 2018 flood, the German Government announced on 13 August in association with a local NGO, the Alliance of Weavers of Life of Putumayo, a rapid financial aid package to assist with micro-projects worth 60 million pesos ($US 19,107) to restore small businesses and subsistence projects for women affected by the 2nd avalanche in a year and a half.

As well, the Putumayo Government's Secretariat of Productivity and Competitiveness, on 16 August, 2018 surveyed and registered commercial premises, hotels, and residences affected by the torrential flood of August 12, 2018 for water damage to infrastructure, supplies and equipment used in family economic enterprises in neighborhoods of: La Reserva, El Progreso, Bolivar, July 17, San Agustin, El Peñón, among others. Those efforts by private foreign aid, local NGO's and government are clearly post disaster socio-economic adjustment aid projects.

After the 2017 and before the 2018 disaster, adaptation was called for in Mocoa at a January 2018 Conference by the Colombian Ministry of the Environment and Sustainable Development, Ricardo Lozano.

After visiting the confluence of the Taruca and Taruquita creeks, the Minister proposed to divert flowage to the San Antonio creek and the El Carmen neighborhood. He announced an investment of 130,207 million Colombian pesos (US$ 41,650,000) in a project to mitigate the risk of torrential flows from the Taruca stream affecting Mocoa's downstream urban area. He was accompanied by delegations from the Department of Urban Planning of the Massachusetts Institute of Technology (MIT), the World Organization for Migration (OIM), Corpoamazonia, local environmental authorities, and from institutions belonging to the Environmental Technical Board.

The week prior, representatives from those institutions worked to identify climate change adaptation strategies that might respond to national environmental protection policies and also to the socioeconomic needs of communities living in vulnerable areas.

Deforestation

Environmental Minister Lozano commented on the extant "current situation of deforestation in the department of Putumayo"; In Putumayo, 9,000 hectares of forest was cut. To address the environmental challenges Minister Lozano installed an Environmental Bureau of Departmental and Municipal Support as part of the Committee on Disaster Risk Management which includes delegates from the Ministry of Defense, the National Planning Department, the National Unit for Disaster Risk Management, Government Secretariat, Corpoamazonía and the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM). Despite the appointment of a delegate rich response committee, the long term trend of deforestation in Colombia, and around Mocoa - is not new.

> During the (floods) of 2010 and 2011... 71 percent of the flooding happened in pasture land that had lost its trees
>
> Christian Euscategui, Director, Weather Warning System for the Colombian meteorological institute. El Tiempo, reported in phys.org. 4 April, 2017.

Precedents of Economic Development

However, according to Liliana Madrigal of the Amazon Conservation Team, the exposure of indigenous families in Mocoa to disaster risk was due to a development plan that promoted the installation of a road which created a freeway for the transportation of minerals now to be mined in a region ripe with mining activity. Other sources at ONIC point out that deliberate denuding of forests by clear cutting for cattle operations to create grass lands was allowed unfettered. The clear cutting destroyed needed natural barriers, e.g. vegetation and trees, to slow down and stop the most dangerous debris during flood events.

That larger scale pro-development strategy was apparently left unaddressed at the post disaster conference and begs the question of the effects of mining infrastructure and flooding on clear cut areas beyond such practices for pasturing cattle.

Another source (ONIC) noted that indigenous peoples native to the area are not generally found in the more physically vulnerable neighborhoods located on hillsides, which instead tend to be inhabited by transplanted indigenous people who have been displaced by civil war-related conflict or for economic reasons from other regions.

Government Adaptation Planning

The Colombian Government's climate adaption planning in this scenario with multiple related development issues impacted by climate events driven by ocean warming and heavier precipitation in unprecedented downpours, faces several challenges; one is that it rewards incentives for securing scarce state resources which favor short term relief over longer term planning. It also appears to ignore the social organizational capacity of indigenous organizations;

those communities in physically vulnerable downstream neighborhoods and communities which are disproportionately – indigenous. To the federal government's credit, the diversion plan created in 2017 accomplished the following:

- **A Post Disaster Risk Map based on percentages of exposure to flow deposits from torrential rains** for rural and urban parcels. Deforestation mapping was made accessible (see Map 3 below) which revealed extensive deforestation above the Rio Mulato and between the Rivers Mulato and Sangoyaco at Mocoa. [May, 2017; key organization: the Minister of the Environment and Sustainable Development (MADS)].

- **Technical watershed and hydraulic studies which identified areas for de-channelization, and bank stabilization of** the Mulato and Sangoyaco rivers, and the banks of the Taruca and San Antonio streams. The presence of heavy machinery and the mapping of definitive impacts from torrential fluvial routes and property damage would, it was hoped, facilitate rapid decisions on housing and infrastructure location. Planners also thought it could facilitate a process of creating protected areas and watershed restoration. Technical progress on such recovery plans were to be reported to Corpoamazonia, The Regional Autonomous planning corporation. [Maps prepared by 25 July, 2017; Key agency: Mass. Institute of Technology's (USA) assistance with hydraulic and environmental protection works.]

- **Formulation of an environmentally sustainable Basic Environmental Territorial Plan for the Municipality of Mocoa** which included environmental determinants; terms and conditions set by the environmental officials to guarantee the environmental sustainability of land-use planning processes. The plan was designed to ensure proper use of territory and sustainable use of renewable natural resources in its jurisdiction. Proposed types of environments for consideration under the new Basic Plan included: protected areas, forest management, páramos and wetland management, and watershed management. Specifically mentioned were the Parque Nacional de la Serranía de Los Churumbelos Auka Wasi, and the Protective Forest Reserve of the Upper Basin of the Mocoa River. [Announced: 3 August 2017, Key Agencies: MADS and Corpoamazonia].

- **Twelve thousand (12,000) linear meters of channel restoration and bank stabilization of the Mulato and Sangoyaco Rivers, in addition to the Taruca and San Antonio streams.** In close proximity to all those flowages (except San Antonio), 1,327 properties were categorized as 90% - 100% flooded and or left with debris. High risk areas along San Antonio and El Carmen streams indicated decisions needed to be made regarding population resettlement or re-location. Some 5 million pesos (US 1,696 @2/10/17 rate) were leveraged for environmental restoration in Mocoa. [Announced on: 2 October, 2017, Key Agency: MADS].

- **Construction of Check dams designed** to reduce the speed of water, mud and rock flow, and the channeling of Taruca and Taruquita streams were released. [Feb., 2018 Key Agency: Corpoamazonia]

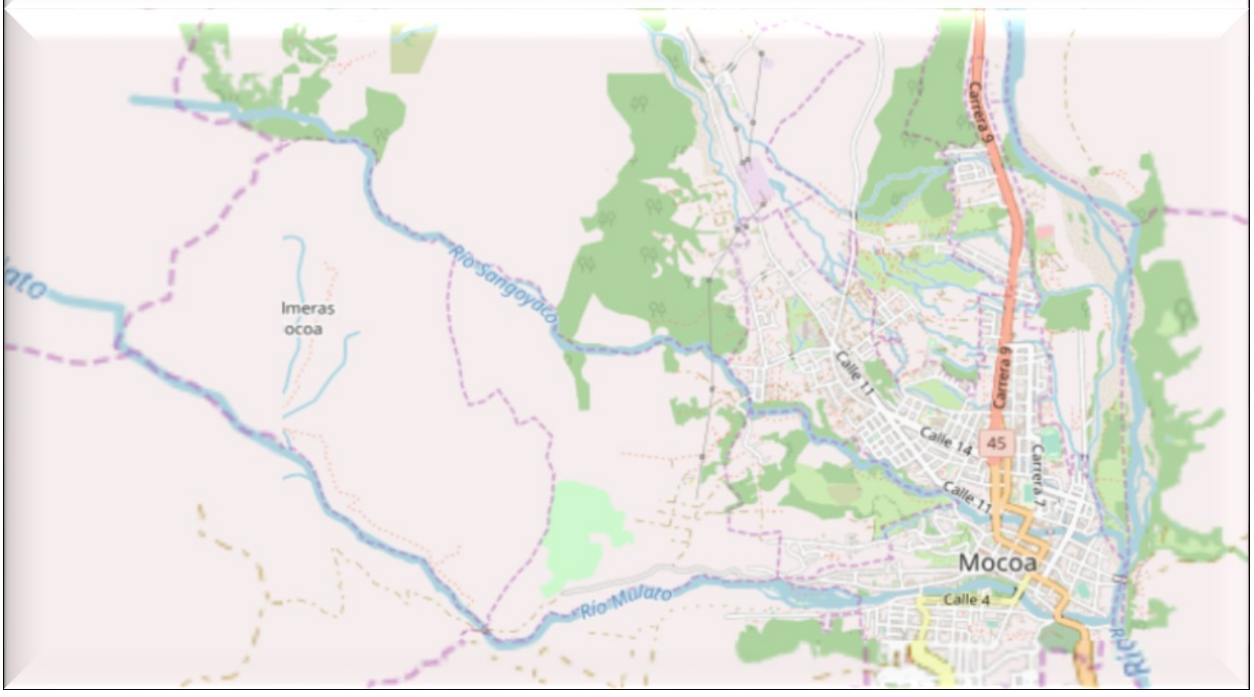
- **Reconstruction of the aqueduct, a Child Development Center, and an early warning system by the, and a MADS plan to finance** 130 million col. pesos (US 41,476). Progress was made for implementation of a Forest of Peace in the El Carmen neighborhood which could protect 90 families from future flowage and debris, as well as 198 families from seven villages in the rural area of Mocoa [Announced: April 2nd, 2018, Key Agencies: University La Javeriana, MADS]

After experiencing Colombia's third worst recorded natural disaster in 2017, the local Mocoa government vastly improved its early warning and evacuation system response for all Mocoa residents. Without any fatalities in 2018, that measure saved hundreds of lives when compared to the losses of 2017.

Medium to longer term planning for upstream amelioration of risks were undertaken but with a tendency toward bureaucratization and slow "shovel ready" on the ground response.

By August, 2018, a year and a half had passed, river channeling and embankment strengthening and afforestation projects near high risk neighborhoods were carried out. Nevertheless, check

Map 3. Deforestation and Carbon Map of Mocoa, Putumayo, Colombia. Col. Min of Environment. Rendering by author.



dams for feeder streams in the upper reaches of the Upper Putumayo Watershed were not constructed to protect elevations in the Middle Putumayo Watershed. Those locations and the built environment were still vulnerable and at great risk before the second flood event occurred. As well, time spent on shoring up the Mocoa River watershed's environmental protections in national parkland on Mocoa's Eastern and north eastern watershed was laudable but that side of Mocoa was not the center of mudslides - given much of forested area was already under federal protection.

While critical technical resources were mobilized from a variety of institutions, planning lagged the risk of reoccurring climate events. The public engagement campaign carried out by the Ministry of Environment, while generally creative and multi-pronged, reflected on going coalescing of some of the needed stakeholders. It appears to have used a building *success-upon-previous success as a strategy, while pushing out timelines for basic planning to be carried out.*

In addition, From Dec. 15, 2018- Jan 2019 Colombia witnessed increased forest fires as a result of the EL Niño with reduced levels of precipitation in the region; 195 wildfires spread in 122 municipalities nationally. That represents a second climate change challenge as droughts increase with increased terrestrial warming.

In summary, Southwest Colombia is overburdened with on-going effects of "abnormal" anthropogenic caused climate change originating in warmer sea surface temperatures that produce torrential downpours cycling in the context of the normal variability from the ENSO (El Niño Southern Oscillation) and concurrent drought effects from the down cycle of La Niña of 2017-2018. (NOAA 4/11/15)[2]. Compared to previous decades, bimodal increases in precipitation and drought acted like a ripsaw, scarring the region with extreme impacts from climate change.

The then current climate adaptation planning by Mocoa authorities was based primarily on revegetation and watershed re-channeling and did not meet the challenge posed by the combined threat of torrential rains and drought-induced wildfires. Both of those climate impacts, one primary and the other secondary, were intensified by a development model that historically disregarded the effect of built infrastructure on downstream watersheds.

Under this scenario, robustness of adaptation design becomes paramount in shorter timeframes than normal state planning accommodates.

Indigenous Voices and Adaptation Lags

While foreign aid offered short term assistance for subsistence livelihoods, and their cooperative implementation by a local NGO and local Government were needed to address socio-economic

[2] See: "Climate Prediction Center – Monitoring & Data: ENSO Impacts on the U.S. – Previous Events". Cpc.noaa.gov. 2015-11-04. Retrieved 2017-01-03. http://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php)

loss and damage, they did not address the structural physical vulnerabilities neighborhoods and community. The downstream population remained in a highly altered landscape which had historically favored cattle and mining interests. Those immediate relief efforts actions which targeted human needs came to overshadow the pressing need to evaluate the physical fragility of the landscape and the vulnerability of downstream populations to another climate event. Though more than a year had passed since March 31, 2017, measures taken to that end were not robust enough.

The issue of inclusivity of indigenous for development and adaptation planning was hinted at as early as the post 2017 disaster relief effort unfolded. In the 2017 OCHA bulletin, the short term need to "transversally ethnically organize" relief efforts in shelters, heralded a larger problem of social compartmentalization by disaster relief specialists unfamiliar with or unwilling to deal with indigenous organizations. The National Indigenous Organization of Colombian (ONIC) founded in 1982, readily identified losses of indigenous lives as significantly greater than other ethnic groups' losses. Yet there appeared to have been little communication with local indigenous groups in the post disaster relief-to-resettlement transition for adaptation planning.

Corpoamazonia is the regional autonomous state planning organization dedicated to "Sustainable Development of the Southern Amazon". Though its public vison statement strives to be "ethnically" inclusive, out of its 33 publicly listed functions, not one mentions indigenous peoples in its work. It has publicly documented no effort dedicated to indigenous participation. Unless specifically planned for, visions generally do not constitute actions. The lack of transparent participatory forms of adaption planning involving the indigenous *Cabildos* and their nine *resguardos* (indigenous land reserves approved by 2011) demonstrate a relief-to- reconstruction agenda heavy on technical planning and weak on local indigenous participation.

Given indigenous communities in Putumayo are home to some 9,882 persons with their organizations (Cabildos) and social groups within resguardos (territory) (see below: Mocoa *resguardos and cabildos*) were the most devastated population. In the post 2017 flooding, the pattern of non-consultation became not just an iterative policy failure, but led to devastating consequences for all parties after climate impacts revisited Mocoa in 2018.

Their exclusion as social groups in Mocoa's adaptation planning was a critical policy failure.

Internationally, national governments which espouse support for principles of indigenous communities, but continue with business as usual for climate adaptation planning raises the question of the integrity of their governments as signatories to UN's 2007 Declaration of the Rights of Indigenous Peoples. Colombia, like all other signatories, had 10 years to mainstream consultation practices in the appropriate ministries serving indigenous peoples.

Adaptation for the Future

While post relief adaptation planning is the responsibility of the federal and state government, it is more often the sub–regional and local configuration of institutions and economic interests

which have to change and overcome business as usual practices to create an alternative path to implementation of adaptation plans. The shared cross-sectoral goal must be rebuilding infrastructure robust enough to withstand the next climate impacts and to safeguard vulnerable populations.

> *The silent social response to indigenous at federal planning and provincial policy levels requires a change in national political will, a will demonstrated by initiative from the affected ministries. They must provide guidance for a more inclusive local adaptation planning process in order to produce an equitable implementation of adaptation projects.*

Given indigenous that the vulnerabilities of residents in downstream Mocoa are shared by hillside and resguardos indigenous communities in the upper Putumayo watershed and middle watershed, post-disaster aid could integrate indigenous communities into adaption capacity building and on – going monitoring of Mocoa's climate impacts.

Some indigenous families living in the adjacent mining and oil transportation areas may not have been immune to the lure of natural resource exploitation themselves, and if such economic activity involved them, that requires presenting research and public reflection on losses and damages in the communities themselves - as well.

In a positive approach, their inclusion in adaptation planning requires public education about climate impacts. Their indigenous environmental knowledge, if solicited, can often help further inform adaptation planning officials on local conditions. Their involvement in climate observations can also motivate their mobilization in favor of medium and long term responses to extreme climate events. Mocoa however, is not an isolated case in Colombia.

Concurrent regional catastrophic losses extended beyond Colombia to four Andean Corridor countries in 2017. A farsighted inclusive short term social response is needed to build toward filling the gap between post disaster socio- economic relief, and measures for prevention of losses and damages; especially in infrastructure and agriculture. In 2017, 182 other Colombian municipalities were on high alert for landslides.

For example, employing hillside indigenous communities in Mocoa, Putumayo, Colombia to restore vegetated hillside watersheds could prove a better investment than offering micro-projects only for family businesses in Mocoa's urban plain that will once again be shut down by another round of torrential rains and flooding. Consultation with the eight unique indigenous communities in Mocoa appears left out of the federal government's response. That consultation would necessarily need to consider the unique features of each community including languages spoken, where appropriate. See table 2 below.

Table 2. **Indigenous Group** (name variants)	Language
1. Inga. (Variant Group names: kamsá, camsá, sibundy-gache Camentsa)	**Camentsá language**
2. Cofin. Known as "Sages and teachers of the spiritual world" (Variant group names: Kofán Cofan, Kofane)	**A'ingae language**
3. Siona. (Known as "The people of the Rio de la Caña Brava". Group variant names: Ganteyabain, ganteya, ceona, zeona, kokakanú o Katucha-Pai)	**Siona language**
4. Quillasinga (Known as " Children of the Moon")	**Indigenous language is extinct.** (Spanish)
5. Pastos	**Indigenous language is extinct** (Chibcha language family related) (Spanish)**.**
6. Muina Murui – Witotos, known as the **"children of tobacco, coca and sweet cassava".** Variant group names: Huitoto, Witoto, Murui, Muinane, Mi-ka, Huitoto, Mi-pode. Wuitotos – Uitotos.	**Huitoto** (five dialects)
7. Kamentsá (Variant Group names: kamsá, camsá, sibundoy-gache Camentsa)	**Camëntsá language**
8. Yanakuna (Variant Group names: Yanacona, Yanakuna, Yanacuna.)	**Indigenous language is extinct** but related to a variant of Quechua (Runasimi) which is the community is attempting to reintroduce. (Spanish).
Source: ONIC, Colombia. https://www.onic.org.co/pueblos	

Policy Alignment: Development, Climate Change, and Disaster Relief

Mocoa provides for some important lessons in future adaption planning. A better informed federal policy response might first consider how to align Colombia's country-level policy processes by integrating a unified approach for its Paris Agreement responsibilities and its adherence to the Sendai Framework for Disaster Risk Reduction, and then finally by harmonizing it with the 2030 Agenda for Sustainable Development. Together the integrated frameworks can enhance adaption planning in places like Mocoa as part of a sub-regional plan for Putumayo and beyond in order to advance "climate-resilient development". (NAP Global Network: Aug. 2018). A more painful step however is required. An integration of the federal government's operational response of planners and relief aid is needed. Climate informed adaptation planners, disaster relief specialists, and economic development specialists need operational alignment.

Federal policy and operational alignment can open the door for integrated rapid response to future local Mocoa events to reduce competing interests within and outside the government.

Mocoa is a good technical example of why climate analysis is now a paramount driver for development and adaptation where extreme climate events reoccur. Verification of climate trends for ocean warming and associated inland flooding impact was sorely needed after Mocoa's 2017 flooding event.

Precipitation projection, flooding, and drought induced wildfires based on scenario modeling for ocean warming after the 2017 climate event, were not referenced in public documents released

by the Colombian Ministry of the Environment. Federal Colombian funds expended in 2017 for the adaptation of Mocoa's infrastructure appear to lack a robust climate impact derived planning model based on probabilities for future loss and damages from climate events. Longer term adaptation projects for Mocoa and elsewhere compel better and more timely analysis of sub-regional climate change. Mocoa's experience nevertheless offers lessons for how to better technically inform adaptation planning and development.

Learnable Lessons

1. To assess climate change impacts at a regional scale, for example beyond Putumayo's Mocoa Municipality, a larger scale impact assessment of climate change which tracks the Eastern Pacific Ocean temperature change and the frequency of associated mesoscale convective complexes, is a critical unaddressed need.

2. Federal national level planning ministries operating in silos are unable to forge a comprehensive and effective responses to extreme climate impacts given separate agendas for development, disaster relief, and climate change, all of which operate in difference timeframes and are dominated by interests of unique sectors. Post disaster alignment into an integrated approach is likely to fail and the most vulnerable are will again be inequitably impacted during the next climate impact. What is needed, is pre-disaster event operational integration of the ministries into a body capable of assessing climate and vulnerable population data for medium and long term adaptation planning. Early identification of vulnerable populations, such as indigenous populations, is paramount for success.

3. Given post disaster agricultural research elsewhere demonstrated that annual revenue losses related to extreme climate events in agriculture of "up to 50% per event" were possible (Acclimatize: July 2018), any economic assessment of post disaster aid should consider future losses in agriculture; and specifically agriculturally related livelihoods of affected indigenous communities. While the 2018 Acclimatize study valuates investment and re-investment, it lacks a valuation mechanism for infrastructure rebuild and renovation of impacted agricultural enterprises - based on adaptation models - and not BAU. That gap can be filled by the Vulnerability Reduction Credit Standard Framework (Higher Ground Foundation: 2017).

4. While small family enterprises relied on the physical secured infrastructure to safeguard poor affected neighborhoods, indigenous peoples were not identified by government authorities as part of the necessary early economic relief effort. However, by ignoring local indigenous subsistence economies beyond the urban periphery into the countryside where livelihoods were also reduced by climate impacts, the economic model excludes indigenous who are then less able to purchase goods and services in the same urban economy.

5. Without direct consultation with indigenous communities on both local environment and climatechanges based on international standards and stronger socio-economic assessments which use participatory approaches, all affected local populations lose financial and social security.

6. Useful tools to ensure an economically sound and socially inclusive adaption planning approach are implemented, use of the Higher Ground Foundation's VRC Vulnerability Framework, including its Standards for Indigenous Communities' Consultation, is recommended. As well, a data gathering and reporting tool from the Global Framework for Climate Sciences (GFCS). The GFCS offers a User Interface Platform to gather and display survey data for national and regional adaptation planners to assess local exposure, and its adaptive and coping capacities. It sets up a local feedback response reporting mechanism utilizing local monthly reporting by affected citizens who offer observations on climate and agriculture. (MeteoSwiss / Senamhi, 2018). On a provincial level, early mapping of climate impacts and affected populations' vulnerabilities, can improve robust design and prioritization of protective actions for built infrastructure, reinforcement or restoration of advantageous landscape features, and if needed, for population resettlement. Establishment of international standards for adaption planning is enhanced by application of these tools.

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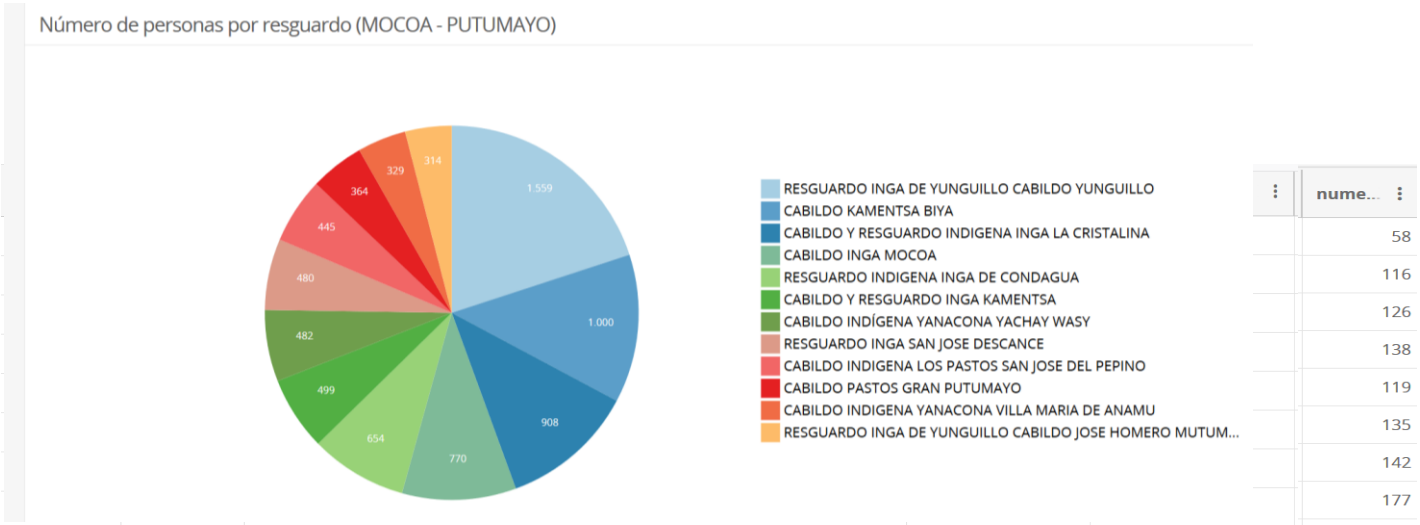

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MOCOA	86001	RESGUARDO INGA DE YUNGUILLO CABILDO JOSE HOMERO MUTUMBAJOY			58
MOCOA	86001	CABILDO INDIGENA YANACONA VILLA MARIA DE ANAMU	No. 027	15 de diciembre de 2004	116
MOCOA	86001	INGA PAKAY DE PUERTO LIMON			126
MOCOA	86001	CABILDO INDIGENA LOS PASTOS SAN JOSE DEL PEPINO			138
MOCOA	86001	CABILDO INGA SAN JOAQUIN	No. 228	2010	119
MOCOA	86001	RESGUARDO NASA SAT KIWE LA FLORIDA	No. 0012	Febrero de 2011	135
					142
					177
					329
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					196
					364
					482
					445

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resguardocabildo	resolucionacuerdo	fecha	num
CABILDO INDIGENA LOS PASTOS SAN JOSE DEL PEPINO	No. 003	21 de enero de 2011	445
RESGUARDO INGA SAN JOSE DESCANCE			480
CABILDO INDÍGENA YANACONA YACHAY WASY	No. 0067	20 de agosto de 2009	482
CABILDO Y RESGUARDO INGA KAMENTSA	No. 03917	8 de agosto de 1994	499
RESGUARDO INDIGENA INGA DE CONDAGUA	No. 115	21 de septiembre de 1993	654
CABILDO INGA MOCOA	No. 027	10 de abril de 2003	770
CABILDO Y RESGUARDO INDIGENA INGA LA CRISTALINA			908
CABILDO KAMENTSA BIYA	No. 000026	Julio de 1998	1.000
RESGUARDO INGA DE YUNGUILLO CABILDO YUNGUILLO			1.559