Questions & Answers Session 1

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Karyn Tabor (ktabor@conservation.org) or David Hunt (dhunt@conservation.org).

Question 1: Are active projects which are using remote sensing to monitor canopy disturbances and reporting on them at a regular interval to indigenous communities so that they can use that data to ground truth and verify illegal forest use and violations of reserves, etc?
Answer 1: Yes, we present an example of monitoring illegal logging in the Alto Mayo in Peru. We are also aware of examples of these monitoring and reporting methods with indigenous communities in Brazil. We would also love to hear from participants on today's call about their experiences using remote sensing monitoring data to report and deter illegal forest activities.

Question 2: Will this training have application for American Indian data in North America?
Answer 2: While the focus of this webinar is South America, the data and methods discussed can be applied anywhere in the world. As you noticed, the focus of this webinar is very much South America but the data and methods can be applied anywhere in the world.

We can offer additional resources for mapping in North America. Google Outreach has provided some here:
g.co/earth/imw18 and https://www.indigenousmaps.com/

Question 3: What is the difference between Geographic Information System and Geographic Information Science?
Answer 3: Geographic Information Systems is a method to collect, store, organize, and analyze geographic data. Geographic Information Science is the research behind the application of Geographic information Systems. GIScience researchers are interested in research questions of how GIS influences society. There are many schools of thought with GIScience including realism, participatory GIS, and critical GIS. These follow scientific epistemologies. Feminist GIS is a subcategory of critical GIS. Feminist GIS researchers focus on representing previously marginalized or underrepresented (groups) in GIS analyzes, data, and usage.

Question 4: What is a life plan?
Answer 4: I life plan is a development plan for the community. The community sets goals for development to ensure future growth while sustaining future generations, spiritually, culturally, and with ample natural resources.

Question 5: Anyone doing participatory mapping with open-source tools such as QGIS?
Answer 5: QGIS can definitely be used to store and manage GPS coordinates of collected data and create maps. CI uses QGIS. In general, in this webinar series we are presenting open source tools and methods so everything that you learn about today for the most part is open source. We will review some of these tools in session #2.

Question 6: How is TEK (Traditional Ecological Knowledge) protected in the mapping process?
Answer 6: That's an excellent question - Traditional Ecological Knowledge, or TEK, is an indigenous knowledge about ecology and natural resources and the relationship between humans and the environment. TEK can sometimes be interpreted through traditional songs, stories, and beliefs. TEK is often very sensitive in nature. How TEK is protected depends on how researchers engages the community and how well communities know their rights. The researcher and communities need to discuss ownership of the data and how the data won't be made public if the community doesn't want it to. With many of these tools, even if they're open source, you can choose to make the mapping info public or not.

Question 7: How to assure that the knowledge of these biological systems and resources is not abused? Indigenous communities have had this knowledge for centuries, so who are they actually producing the maps for?
Answer 7: That's an excellent question - and this is why we're really doing this webinar series. We want to empower the communities with the tools and knowledge so they have control over the information and how they want to use it. As we mentioned in one example, policy makers and national governments do need geographic info to do land management and delineate territories. This information needs to come from the communities as well, but the ideal situation is that they [the communities] have control to manage that information.

Question 8: In the video with the cultural map, I didn't understand the carbon credits/trading it in the market part that was mentioned in the video. Can you clarify?
Answer 8: In this particular example, this group - the Suri people - their plan was to get Carbon credits to establish a site on their territory to generate revenue to reduce deforestation. That was where that part of that video was referring to. It was referring to the community's plan to generate revenue.

Question 9: Do these communities have computer resources or support people with computer skills so that they can instead use open-source tools such as QGIS?
Answer 9: It depends and it varies. Many communities have representatives through IP organizations and often at these levels of the organizations, there's access to computers and

internet. Some of these orgs may have GIS technicians, but it varies a lot. The ideal is that somebody who is a representative of a community can have access to these tools.

Question 10: Are there programs you are aware of that use the Google Earth Engine database and or data resources like PLANET's research credit?

Answer 10: So - these are excellent resources. I know PLANET's research credit is available for students, and perhaps you may know better if indigenous communities can also apply. That is to access free, very high res imagery from PLANET. But I'm not particularly aware of that. But we can research it and get back to you. About GEE - not aware of orgs that we're working with using GEE. CI is developing tools in GEE. One of our tools that uses QGIS - it's a plugin called trends.earth (http://trends.earth) and the back end is GEE. You don't have to have a GEE account to use it. Conservation International and many other orgs are working in developing tools that have a better interface so others can use it. In response to this webinar, I can also send some more info about the orgs utilizing GEE.

Google Earth Engine was used to create a couple of easy-to-use platforms that participants without coding expertise can try out http://earthenginepartners.appspot.com/science-2013-global-forest
https://sustainability.google/projects/forest-watch/
https://www.globalforestwatch.org/

MAPBIOMAS: Brazil land cover and change platform runs on GEE
http://mapbiomas.org/

Land Degradation monitoring tool from CI
http://trends.earth

Question 11: do you think it's better to start with sketch maps on blank paper, or to start with a community drawing on top of a prepared base map (maybe already showing remotely sensed land uses)?

Answer 11: My answer is - it depends. It depends on your research question. If you only need spatial information, then you can just collect information on a satellite image. If you want to understand the knowledge systems and spatial relationships from the perspective of the people in the community, then you need to start with a blank map. Also, if the community has already been exposed to mapping and information and is familiar with cartographic representations, then you can use satellite imagery to map some of the areas of interest. However, if the community has never seen satellite imagery or maps of their land, it's preferable to start with a blank map so that they can draw their own features on their ground representation and spatial knowledge of rivers and areas of interest. First, you do not want to change their spatial representations with western

cartographic representations. Also, you do not want to introduce satellite data because it could be received as surveillance of their lands that they don't have control over. This may perpetuate power imbalances.

Question 12: How can TEK and conservation be combined in cases where communities are losing their TEK?

Answer 12: So this is, I think, where mapping resources can help preserve TEK. And also, I think that there's a lot of value to particularly monitoring with particularly TEK that needs to be emphasized more. Say there's drought conditions or high fire risk conditions - there may be TEK of monitoring of certain plants - when you see a certain plant wilt, the drought conditions are at a certain level and there's a high risk for fires to spread. We need to use - put more emphasis and value on different kinds of monitoring. Those integrated monitoring pieces will be much stronger together and we can have better information and forecasting systems about ecological conditions.

Question 13: Do cold-call PGIS outreach efforts to indigenous communities tend to be successful, or are most PGIS collaborations a result of the indigenous community initiating the conversation around PGIS?

Answer 13: I think that, obviously if the indigenous community initiates the conversation it's much more successful. CI, in general, when we're engaging indigenous communities, it's a long-term engagement that's been established over many years. The examples we've shown where we're doing participatory mapping, we've been working with those communities for 5-10 years prior to that. It's preferable to have a long-term engagement and after the mapping as well - so it's not just do a map and get out. There needs to be established connections. If you haven't worked with a community previously, be sure to partner with groups that have long-term relationships with the community.

Question 14: Is that only one place where this program is running (you mentioned Surui....something) or any other places....?

Answer 14: This is regarding the google earth video? - talking about google Earth cultural map? I know Google Earth outreach is engaging other indigenous communities, but I'm not sure where exactly off the top of my head. The Surui is probably their highest profile engagement that was really successful and it's the one they have most of the materials on Google Earth.

Other examples:

https://sites.google.com/view/az-consultation-toolkit/home

Question 15: Have you ever recorded Indigenous story telling over time (i.e. not a single point in time) digitally into a map and how did you represent such TEK land-use change?

Answer 15: This question is an excellent question - I don't have experience with recording indigenous storytelling, but we do have on the EO4M - we have anthropologists on the project and a team in Ecuador and Peru that has experience with digitally recording interviews and TEK. I will ask them and get back to you on this question.

Our anthropologist used google earth to embed photos and audio. You may be able to represent change through an animation, or imbed the recordings in two places of the same map. It's important to be careful about whether you are sharing these recordings with the public since TEK is often very sensitive in nature.

I do know researchers are using GIS to capture TEK from storytelling. The University of Auckland has worked with the **Māori on this.**

Question 16: Do property rights to maps and information rest with the communities or co-owned or what other ways?

Answer 16: Property rights to maps - it's a good question and it really should be with the communities. And this is something that needs to be established when you're setting up your project. Who has the rights to the info and what's the privacy of the information. If you haven't worked with indigenous communities before - or haven't done interviews or participatory mapping - there's a lot of research guidelines in engaging different groups and handle and manage data. Our team had to be certified in human research ethics - if you're working with communities or people at all in research - you **must** get certified (https://about.citiprogram.org/en/series/human-subjects-research-hsr/). That'll help you think about the risks, how do I set up the project, how do I handle PII, who owns the info - all those questions need to be handled in advanced. There are a lot of guidelines available to help with that process.

Question 17: How do you deal with land and/or social conflicts that can be triggered or aggravated in mapping processes?

Answer 17: That is a difficult question to answer - the best way is to try to avoid any aggravation. Being prepared, knowing the risks going in, establishing rights of information, knowing who you're working with really well - all of that is in the preparation for when you're doing the mapping work.

Question 18: This case study is quite interesting particularly using Drone. They are 2 dimensional. Does 3D PGIS use in your project area? What is your opinion on 3D PGIS?

Answer 18: I'm assuming with 3D we're talking about monitoring over time - or are we talking about spatially 3D (like LIDAR/height of the canopy, stuff like that) - if you can clarify 3D space and time or 3D mapping for canopy structure. Either way - we haven't used LIDAR for 3D mapping because sensors for LIDAR drones is expensive and really heavy.

Question 19: The map with Carbon credit, what are the basic datas did you use to produce this map and what's tool or software?
Answer 19: This question here - the carbon credit - are we talking about the map in Brazil? That was all done with Google outreach and I'm not sure what software they used to produce those maps besides what we showed that you can do some of the mapping in Google Earth or in MyMaps.

Question 20: Is it possible to make time-lapsed cultural maps that reflect seasonal patterns and associated knowledge over time?
Answer 20: I think there are ways to create some of these maps that show seasonal patterns and changes over time. This is a good question that might mean a more dynamic map or a way of representing that seasonality - or trends in the map. There's also interesting ways to show information instead of just a map. For instance, if you're familiar with story maps - ESRI has a story map platform that allows you to interact with a map and tell a story and talking about elements in the maps. There are different ways of communicating the info rather than just a static map. (https://storymaps.arcgis.com/en/)

Question 21: Have you ever looked at how open data (e.g. LiDAR datasets) and Indigenous data sovereignty can work together? Or are they completely contradictory? For example, OCAP™ here in Canada outlines data sovereignty principles.
Answer 21: Not familiar with the example in Canada, mostly because CI works in the tropics. But in general we don't have open datasets - like LIDAR, which is extremely expensive - there's now LIDAR on the ISS with GEDI. That could be an interesting dataset for us to take advantage of in the tropics, but I can't comment particularly on indigenous data sovereignty and the LIDAR.

Question 22: Are ritual practices also recorded as part of participatory mapping?
Answer 22: Yes, if that's something of interest to the researcher & community. It can be recorded with mapping. GIS can store a variety of data from GPS coordinates to audiovisual recordings.

Question 23: What is the best platform to develop a simple interactive map that we can share our participatory mapping?

Answer 23: I think the easiest platform is the one we're working on for the homework. It's really easy to create an interactive map, you can share it and make it publicly available. I definitely think Google Earth and MyMaps are the easiest to use.

Question 24: Can drones be used for a province-wide mapping? Let's say 100,000 ha in area?
Answer 24: That's a large area for drone coverage - I can ask our expert in Peru his thoughts. He's the most familiar with using drones. [] It depends on the drone. You can get an expensive drone that covers a large area, but if you have a cheaper drone it can't go as far. There's a cost element, but 100,000 ha is pretty large for a drone.

David: Next session we do talk a bit about drone mapping. We talk about using acoustic sensors to target locations that we deploy drones. If you have a large range, you can do something like that as well.

Question 25: Does it ever create issues when indigenous people map their territories and resources and the governments try to suppress that information? And how do you manage that situation?
Answer 25: I know that there's definitely historical issues and possibly continuing issues, we don't tend to manage that situation. Our project particularly is focused on tools & technology. We have a partner with dedicated Mechanism for Indigenous Communities and Local Peoples- that's a World Bank funded program that's a knowledge sharing platform for IP globally (www.dgmglobal.org). The focus of that platform is promoting the policy and legal mechanisms to advance indigenous rights. That's more of the platform where indigenous representatives try and address issues like getting rights to their lands and can learn about mechanisms to do that..and what are the funding sources..what are their our legal rights. There are other platforms for those sorts of issues between governments and organizations.

Question 26: Do you find that starting with a blank sketch map maybe elicits more interesting things about a community's "mental maps," versus starting by showing them a land use map from remote sense imagery?
Answer 26: I definitely do think blank maps allow for more freedom and can bring out more information, especially info about TEK and different knowledge system can be captured on a blank map versus constrained to a cartographic map of satellite data.

Question 27: Could you please name some software that can be used for Land Use Classification other than ENVI (because it is a paid software)? Is ERDAS a good one?
Answer 27: ERDAS is an excellent software for land use classification, it is proprietary and can be expensive. You can do land cover mapping in QGIS; R is another a fantastic open source software for land cover mapping. *There's an existing ARSET training on both QGIS and R on*

the website for land cover classification: https://arset.gsfc.nasa.gov/land/webinars/adv-change18

David: we go into this more in the next session. SNAP is another one - its ESA's open source software - you can do a bit of analysis with that as well. It's - SNAP and QGIS are some of the best options for free software to do

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Question 28: How can I calculate the forest canopy layer by using RS?
Answer 28: There's different way to get at forest canopies - the easiest way is extent. RS can be used to estimate biomass of the canopy. If you're looking at structure and density, that's where we really need LIDAR remote sensing. LIDAR is usually something that's an airborne platform on a plane or large, expensive drone. But also just recently with GEDI we'll be getting LIDAR data from space that will be free.

Question 29: Can you please suggest the best remote sensing index to map urban sprawl of a region?
Answer 29: There's a couple indexes to use - I'm not so familiar with mapping urban areas. The easiest, quickest one would be using NDVI, but there are many indices out there. In the next session, we're going to do a demonstration using an online - ESRI has a platform online where you can view and classify and do some indices - some RS indices and they have a bunch of predetermined indices, including an urban index. Next session you can play around with a bunch of different type of indices to see which capture urban sprawl. CI was developing a tool in GEE that also kind of captures urban sprawl. I believe its part of our trends.Earth tool, but I can follow-up next session about it.