# Questions & Answers Session 2

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: Is it possible to use QGIS for analyzing Drone Remote Sensing images?
Answer 1: It is possible. You may want to install QGIS plugins that help with specific analyses, for example, Open Aerial Map (OAM). Other open source software to consider is Mission Planner for planning drone missions, DJI ground control and DJI GO (specifically for DJI drones), Drone Mapper, which is a free image processing software, and CloudCompare, which is a 3D point cloud processing software.

Question 2: Do you have any suggestions for software which can combine satellite images with medium resolution with Drone images?
Answer 2: QGIS can definitely be used to view both of these types of imagery, as mentioned in the previous question. Other software like ENVI and ERDAS can be used, but licenses are very expensive. SNAP can also be used. Check out https://conservationdrones.org/ for more information and additional options.

Question 3: How can effective land management be achieved in the phase of paucity of high resolution satellite data especially in the developing world?
Answer 3: Effective land management can be achieved with moderate or coarse resolution data. These data sets even have many advantages over high resolution datasets. First, they are often free, second, they have higher temporal resolutions (repeat rate) so you can get more frequent looks at the landscape. This is particularly advantageous in very cloud regions like the tropics. Third, moderate to coarse resolution imagery are easier to analyze with open-source software. Often high resolution imagery requires specialized, and expense software.

Higher resolution is not always the best data option. It really depends on what features in the landscape you are interested in and how frequently you need to monitor the features.

Question 4: How can I estimate forest carbon percentage by using UAV and DSM,DTM?
Answer 4: Structure from motion is one technique to get an estimate of canopy structure from optical drone remote sensing. LIDAR is the prefered (but harder to come by) data to estimate canopy structure. Ground-based measurements of biomass is required to estimate carbon values for different canopy densities.

Question 5: What types of water quality (surface & groundwater) characteristics is available in and around tongo? There is also play a significant role for changing in land cover dynamics.
Answer 5: For additional information on water quality please look into ARSET's previous water quality webinars. For example: https://arset.gsfc.nasa.gov/water/webinars/ARSET-WQ-Overview. When this Q&A sheet comes out, you can follow this link

Question 6: How do you test whether a place on Earth observed by a satellite is what actually is? For instance, is it a forest or a grass land? is it a water body or a soil land with high moisture?
Answer 6: Field validation is key for remote sensing. It is prefered that someone goes to the location and collects the information of what is actually there. You are also use very high resolution imagery to visually interpret the image. You can trust what satellites can see, for sure, but to get truly accurate representations you need field validation. High resolution can also be used if you look at small areas and look at detailed information

ARSET training on classification accuracy: https://arset.gsfc.nasa.gov/land/webinars/18adv-land-classification

Question 7: For multispectral images, how can I make classification of rocks whether to be sedimentary or igneous or metamorphic based on spectral signatures generally and more specifically using decision tree classification. I know this can be done using hyperspectral images but due to limited availability of hyperspectral sensors I hope to know how to classify different types of rocks in multispectral images?
Answer 7: Landsat is used for classification of geology. However, we don't have much experience with satellite applications in that field.

Question 8: Does a stressed plant (which mean have a low chlorophyll concentration) have a reflectance necessarily for making an image classification for example a land cover map?
Answer 8: There are remote sensing indices specifically to monitor drought-stress in plants. NDVI is a common indice to monitor drought conditions. Landsat -8 OLI has a band designed for monitoring drought stress in agriculture
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EVI is the enhanced vegetation index can also be used.

Question 9: Which of the free tools mentioned are most user friendly for participants that are very new to RS?
Answer 9: If you're brand new to remote sensing, I would say - the Landsat Explorer application, while you can't do much analysis is a great intro tool. Just because it gets you familiar with the types of general analyses that can be done and can get you a visualization of what different bands do, how clouds affect imagery. After that - that's a great question. QGIS is not too complicated

to use if you're doing very simple processes. Some of the easiest software to use is the more expensive software. The SNAP toolbox is fairly easy to use, they have a lot of tools that can calculate an NDVI from the menus (we have an ARSET training on classification using SNAP) - all of the remote sensing softwares have a bit of a learning curve.

Question 10: Wondering the location of the land image on your cover page, and whether that image is an area of decreasing forest cover?
Answer 10: That image is of Bolivia. I am not certain of the forest change dynamics in the area.

Question 11: Is it possible that some of the satellite images are not accurate because they are blocked for sensitivity (e.g., military areas)? And how can you tell that's the case?
Answer 11: this is definitely the case sometimes. Unfortunately don't know a ton about sensitive data in regions, but know that it's possible.

Question 12: Is it possible to use remote sensing to calculate the carbon stocks of forests?
Answer 12: There are remote sensing products that estimate carbon stocks, such as Baccini et al. (2012) Aboveground live woody biomass density product. (http://data.globalforestwatch.org/datasets/8f93a6f94a414f9588ce4657a39c59ff_1). This is a global dataset and can be clipped to forest land cover data if desired.

You can calculate additional types of soil carbon and there's one tool that effectively does this in QGIS called trends.Earth. You can calculate Carbon and Carbon emissions. (ARSET has an upcoming training later in 2019 on trends.Earth). You take biomass in deforested regions and calculate carbon emissions as well.

Also, please see the ARSET webinar series: **Remote Sensing of Forest Cover and Change Assessment for Carbon Monitoring, https://arset.gsfc.nasa.gov/land/webinars/carbon-monitoring-2016**

Question 13: How can I measure NDVI using Landsat 8 images with maximum accuracy? As in my sample area, there are no images for some months with less than 10% clouds coverage.
Answer 13: Clouds definitely pose a problem, and sometimes, unfortunately, that will interfere with analysis. You can use coarser resolution datasets. MODIS or VIIRS. MODIS has an NDVI/EVI product you can download from EarthExplorer but it's fairly coarse (250m resolution). If you have a large enough time period/sample size you could look for many different types of imagery - use Landsat, Sentinel - to try and get as many different types of imagery as possible.

Question 14: What drones maker/model can you recommend to work in the tropics (Caribbean sea, amazon basin)?
Answer 14: That can depend a lot on your research question and budget. Increasingly, commercial drone manufacturers are developing drones that are sophisticated enough for many conservation applications and are reasonably priced. A few good companies to check out are DJI and Parrot. DJI models like Phantom 4 pro and Mavic 2 pro are good options for the tropics. The phantom 4 pro is more resistant to the wind than the Mavic, but both work great for photogrammetry and monitoring.

Another thing to think about here is the type of drone that is best for your application; multirotor drones have more control and can be more flexible with different payload, but have shorter flight times and therefore may not be able to map as large an area of be as useful for long-range monitoring. Fixed wing drones on the other hand have very long flight times but are more difficult to control and land and may require more practice to deploy.

Question 15: how should i pick the timing of conducting the fieldwork for the validation when i don't know if the satellite image will be affected by clouds or no?
Answer 15: best bet is to do field work during the dry season
It's easiest to work in the dry season, that way you have an easier time in the field, but you'll be able to more effectively compare your results to RS data since it's less likely clouds will get in the way.

Question 16: Which band combination in Landsat Explorer are best suited to study developing urban sprawl patches, going further than monitoring the shrinking of the green coverage?
Answer 16: There's actually an urban index that's build into Landsat explorer that you can use. We didn't go over it in the demo, but it will be discussed in the homework a bit .You can definitely use things like a vegetation or agriculture index to see shrinking/expanding ag. But there is an urban index specifically designed for urban sprawl.

Question 17: Are there cases of indigenous-led participatory mapping and use of drones either supported (positive action) or obstructed or even forbidden (negative action) by national laws in any country? Can indigenous/local organisations use these technologies freely anywhere in the world?
Answer 17: Good questions, there are definitive policies in different cities regarding drone use. For example, drone are not allowed to be used in the DC area where I live. I don't know how these policies. This is an excellent question - where we live in the DC-area you aren't allowed to use drones at all because of military installations. I'm not sure what regional laws globally are,

but there can be issues using drones if some governments don't like using drones. It's definitely an interesting question and something we could try to ask more of our team that work with indigenous communities and drones and see if they've come across any of these issues. (David) The only thing to add to that - at grad school in Univ. of Edinburgh you need a license to operate drones. If you have any specific questions you can either look online or reach out to us and we can ask a local field office.

DC No Drone Zone Laws:
https://www.faa.gov/uas/resources/community_engagement/no_drone_zone/

Question 18: Can you, suggest me the most effective atmospheric correction process of Landsat imageries? I have used FLAASH atmospheric correction of ENVI but some regions of my mountainous area become blank after doing the especially on the mountain slopes area
Answer 18: we typically use pre-preprocessed landsat imagery that is available through USGS.
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They have pre-processed Landsat imagery available on EarthExplorer so you don't typically need to do the corrections yourself
(Karyn) It's been a couple years since atmospheric correction techniques. But I know at one point we were using an open source correction [] But we can ask around to some of our colleagues and see what they're using and see what they recommend
(David) Sentinel-2's atmospherically corrected product is still in beta, so you'd need to correct that in the SNAP toolbox.

Question 19: Do you suggest any version/extension of qgis for drone data analysis?
Answer 19: QGIS is excellent software for remote sensing in general, but there are not a lot of plugins for QGIS that will allow you to do drone specific analysis. There are many good free softwares available that let you do a variety of drone analysis however. These open source software include is Mission Planner for planning drone missions, DJI ground control and DJI GO (specifically for DJI drones), Drone Mapper, which is a free image processing software, and CloudCompare, which is a 3D point cloud processing software.