



Remote Sensing for Monitoring Land Degradation and Sustainable Cities
SDGs
July 9-23

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 Amber McCullum (amberjean.mccullum@nasa.gov), Alex Zvoleff (azvoleff@conservation.org), and/or Monica Noon (mnoon@conservation.org)

Question 1: What differentiates land degradation from desertification? How can Trends.Earth be used to track desertification vs just land degradation?

Answer 1: [Alex] This is a great question - now I realize we didn't address in the first webinar. Desertification is a more specific type of land degradation. Desertification refers to arid or semi-arid areas where there are loss of soil, water bodies, and conversion of land to desert. In land degradation, there's a broader focus, looking at additional types - the UNCCD has started referring to DLDD (Desertification Land Degradation or Drought) so there's a recognition there's a broader set of challenges beyond the challenge of desertification alone. For that reason, we typically use the term land degradation than desertification, per se. Re: the second question: what you might look at here are 2 things, I would suggest looking in more detail at land cover datasets, looking at a custom land cover dataset to more accurately capture transitions to or from desert classes. Secondly, you might look at productivity indicator where you can try and include the impacts of climate on the signal you're detecting in productivity. That's something we don't go into detail in this webinar, but if you go to the Trends.Earth website, you can look at how you might pull out some of the climatic signals as well, which would be important in that case.

Question 2: Could you use very high spatial resolution images, for example from drones to analyze the indicators in a small area?

Answer 2: [Alex] I would say yes - you certainly could. Here, drone imagery would be most useful for land cover. For land productivity you'll need a longer time series to detect trends. You can measure NDVI from a drone, you won't have the long time series to detect trends. But you can use it to produce a high res map of land cover and import it into Trends.Earth using the process Monica described.



Question 3: I have installed the QGIS 2.18.28 and I don't know why I can't find the plugin Trends.Earth. After launching QGIS, and going to Plugins in the menu bar "Manage and install plugins" the plugin Trends.Earth is not available.

And I have this note (plugin repositories Unavailable--depot officiel des extensions qgis).

Answer 3: [Alex] Not sure what's going on there, but what I would encourage you to do is email us directly and we can look into what might be happening on your computer.

The emails are trends.earth@conservation.org - or emails at the top of this document.

[Monica] When you're installing a plugin, there are 2-3 options in a menu. There's - it may say "installed" so you may have it filtered by installed plugins on your machine.

When you're sending emails with questions, just include a screenshot of the error and what you've done to produce the error and we can better help you. But it may be filtered for already installed plugins, but that may be why you can't see it. Email us directly and we can help you out there.

Question 4: Can we forecast or project future land cover with Trends.Earth? For example, predicting land cover of year 2050 or even 2070 and 2100?

Answer 4: [Alex] Simple answer: no. We don't support LC projections. We're talking about developing tools to better support scenario analysis so you can analyze different scenarios of land change in an area not yet released, but we don't have a projection of land cover that far in the future right now.

Question 5: When will Trends.Earth be available in QGIS 3?

Answer 5: [Alex] Excellent question - something CI is actively working on. We have initial changes made. Certainly before the end of the year, but hopefully sooner. If you are interested in QGIS, I'd encourage playing around - there's a lot of great new versions in QGIS 3, esp. Maps.

Question 6: There is a need to allow for computation of land degradation at lower level of administration, for instance, Kenya moved from the provinces to county government, how will this be updated in the tool? Secondly, how can one compute LD for multiple countries and have the output as one QGIS Project layer?

Answer 6: [Alex] This is something we've heard from countries with decentralized governments that need to calculate indicators at a lower level and there's a request for PDFs at every county/ward. We do have a button in the tool that says "coming soon" so it's something we're actively working on. What we're trying to figure out is the best



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format for these reports so we can easily calculate it on your computer or the cloud when working with custom datasets. It's a need we're aware of and will support. Second question: It depends on what you need, but you can calculate multiple countries if you submit your own shapefile. If you have a shapefile with multiple countries you need, you can get a single map showing all of those countries. You can then run reports on each country individually or all 3.

[Monica] Limit on size

[Alex] There is a limit on the size (of the shapefile) you can run in terms of area. Do let us know if you need to run a large number of countries, so we can make sure you can do that successfully.

Question 7: The platform is quite good however it accepts only assessment of at least a period of 10 years. How can I calculate SDG's 15 for 2 or 5 years?

Answer 7: [Alex] We limit you - you will get an error message if you try and run an analysis for <10 years. We do that because productivity analysis is based on trends, and we're trying to prevent analysis of short time periods where you're likely to have a lot of noise in NDVI due to climate variations. Technically, there's no reason it couldn't be run. But we have that limitation to make sure that a large number of cases will get valid results. If you want to look at SDG 15 for 2 or 5 years, I would suggest you not. You need sufficient productivity data to get a meaningful trend. You can always email us and we might have some suggestions about what might make the most sense. But in general, for SDG 15, we suggest allowing 10 years to make sure you have enough data.

Question 8: Do we need to submit our QGIS exercise results to you for the homework?

Answer 8: That will not be necessary. We will have a Google Form available next week for the homework. [Monica] open-ended questions are for our curiosity about the tools, so there are no right or wrong answers.

Question 9: Is it possible to join the three indicators analyzed with the NDVI with other spectral indices?

Answer 9: [Alex] Certainly you can do that. You'd need to do that directly within QGIS. We don't support that in Trends.Earth. I think we just support NDVI - not EVI - but it's certainly possible, but you'd need to do it in the software. But QGIS is a full GIS system (and ARSET has a few other trainings on calculating other indices)



Question 10: I work in Mongolia where data is difficult to find at finer scales. If I want a fine scale land cover for an area, would I have to classify the area twice, covering an old date with a recent date? Also the map that Alex showed with red dots for cover classification, did you create training polygons around those locations for land cover classification?

Answer 10: [Monica] Since we are looking at actual transitions to classify degradation and land cover, you will need 2 maps at different points in time. Preferably at beginning and end of dates in your analysis. You referred to a map Alex showed for LC classification - I think what you're referring to [Vital Signs data sampling protocol](#). We've used this in several African countries - it's a randomized sampling approach. We ran a randomized point sampling within the land cover types proportional to land cover types in the country. We were creating LC maps and used existing LC maps to determine which proportion of LC existed in the country and then proportionally took samples in those different LC categories. We can also follow-up and send you a link to the vital signs website - it's vitalsigns.org that shows how we create those protocols.

<http://vitalsigns.org/sampling-frame>

[Alex] There's other red or black dots that show rapid roadside assessments. Those are places where in the field we conducted a quick assessment in an area since there are several different classes to validate LC maps for that area. But more info is on the website.

Question 11: The Caribbean region is usually not covered in the Global Data set. What alternative is there that captures degradation in the Caribbean? besides the ESA 300m?

Answer 11: [Alex] What this is referring to - and we didn't talk about this in detail - there's 2 datasets in Trends.Earth one is derived from JRC called [Land Productivity Dynamics](#) - that's the default dataset released by UNCCD to support reporting during the last cycle. The second is a dataset produced by the Trends.Earth tool to assess land productivity and that draws on different datasets. Trends.Earth is 250 m, the JRC is 300 m - it's in km so it's a coarser dataset going into that layer. I'd suggest looking at Trends.Earth dataset, the resolution may look the same, but the JRC is resampled and is a coarser dataset. We also have a new research project soon that will be using Landsat and Sentinel data to map productivity at 20-30 m resolution - given the needs



that you mention, that's something that will be coming out in the next year and will be supported within Trends.Earth.

Question 12: How can QGIS/Trends.Earth be linked to gathering data about the natural capital, the amount/value of natural resources and the percentage of natural resources overexploitation to measure the Inclusive Wealth (IW) metric?]

Answer 12: [Alex] Trends.Earth is focused on assessing degradation, so i think it would be most useful for land condition. There's additional info beyond that you want to draw on to understand ecosystem services provided by a given area as well as where beneficiaries are located. You want to bring in other info, and there are other projects focusing on that. There's some work CI does - Trends.Earth could be very useful as an input layer for land condition, but you'll want to bring in additional information from other tools.

Question 13: We can find all county data for calculating land degradation in Trends.Earth tool? Such as Uzbekistan or Kyrgyzstan?

Answer 13: [Alex] Yes, it's a global tool. So you should be able to find data for both those countries in Trends.Earth.

[Monica] We have a disclaimer at that step in the process under area - you can select in the drop down, but that's from the [Natural Earth dataset](#) selected due to licensing - it can be publicly distributed. If you have an administrative boundary you would like to load that yourself. You can select the area from file and load a shapefile using that area of interest. There's lots of resources where you can download boundaries like [GADM](#), but we can't distribute that due to the licensing.

Question 14: While using custom 30 m land cover data, by keeping SOC and land productivity at 300 m resolution, how does it improve the accuracy when default data are at still lower resolution?

Answer 14: [Alex] There's 2 things I would say: first, if you do use custom land cover data, we didn't have time to demonstrate, but you can use that data to calculate SOC at the same resolution. You can calculate 30 m SOC using your custom data - we recommend that so you can have the same data for SOC as LC. The second part: you're correct, the land productivity data will be at 300 m. So you aren't gaining any accuracy by using custom LC data. It would be better to have all the input data at 30



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m, but as I mentioned - we're working on that for productivity, but there is still benefit for using a custom land cover dataset.

Question 15: Is it possible to calculate the SDG for very small scaled area? such as Quaternary catchment? On the other end, can one run for the whole of Canada? Is the area too large?

Answer 15: So, in response to this, the answer is yes for both. You can run it for a small scale area and a large area, though we do put a limit at the high end. You will be fine for Canada. On the low end, the data is 300 m resolution, so if you're running for a very small area, you won't have as much data available. Be cognizant of the spatial scale.

Question 16: Do you see a possible enhancement and development of tools for land use change evaluation in URBAN AREAS (higher resolution with a set of such a diverse spectral signatures)?

Answer 16: [Alex] There's definitely need to better capture changes in urban areas, certainly, right now for UNCCD, those areas are all artificially mapped, so there isn't a lot of differentiation in terms of classes we put in the tool. I think there would be a benefit, but you'd need to think about whether or not those additional classes are needed to ID changes in degradation. In most cases, unless you're specifically interested in degradation within urban areas and you have a very high res map, you'll probably be fine with global data. But in small areas, you'll need higher res data to get a higher number of classes. I'd encourage you to listen to the 3rd part of this webinar.

Question 17: Is it possible to correlate land degradation / land cover change to extreme climatic events (droughts and extreme rainfall) using Trends.Earth?

Answer 17: [Alex] Trends.Earth would provide input data you need, so you'd produce maps of land cover data. You can download a number of climate datasets, but you'd need to do additional processing. You'd need to calculate extreme events. In QGIS it isn't something we support natively.

[Monica] Future work with droughts?

[Alex] The new research project will have to do with supporting indicators on drought vulnerability, and there will be new datasets we'll be making available.



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Question 18: How are the default datasets selected in Trends.Earth, given that there are many other options available from NASA, USGS and ESA?

Answer 18: [Monica] We selected the default datasets using the [Good Practice Guidelines](#) adopted by UNCCD. A report provided by CSIRO in Australia that recommended this methodology we have available in the toolbox. We start the project - we did an evaluation led by partners at NASA over the [methodology we could use productivity as a proxy for land degradation](#). They reviewed residual trends, EVI trends, rain use efficiency (RUE), water use efficiency - these are all available in the toolbox as well - you can select a different option if you run custom productivity on its own. At the end of the project, our NASA partners identified NDVI trends as the recommended methodology to use for productivity.

[Alex] The other consideration is the length of the time series. As we alluded to going for, we'll have higher resolution data given satellites we have in the sky, but back in time we're limited by what's up there. We're drawing on MODIS that goes back to 2001, and AVHRR which goes back to 1982. We also look at what's available historically to calculate trends.

Question 19: High resolution datasets usually have larger errors. How are these errors accounted for in land degradation mapping?

Answer 19: [Alex] They're not accounted for that well. If you're talking about reporting - accuracy isn't directly taken into account other than evaluation of datasets and products prior to usage and reporting. But there's no methodology to consider accuracy of a given map and how it might influence the ultimate results you use in reporting. Certainly, I agree - with high res data this is something you need to be aware of. We recommend you do a full accuracy assessment of any products you use - if you're using custom datasets - the other thing to think of is not just accuracy, but one advantage to global datasets is that they're constructed to be consistent in time. That's not going to be the case for maps that are independently constructed.

Question 20: Our main interest is to map changes in land use management practices towards (or against) regenerative agriculture or land management, so we would need to set up our own classes. For example crops under conventional till (input) to crops under conservation till (output class). Otherwise, is it something that's going to be available in future versions?



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Answer 20: [Alex] In terms of - I think the question is, can you alter the LC classes is what I believe you're asking. You cannot now. It wouldn't be too hard to integrate, so it's something we can put on the list.

[Monica] If your question is addressing these LC changes - you can use the tool if you just need to produce a quick LC change map. If you're trying to use default datasets and differentiate two different classes, I don't think there's a way to do that without field data. If you're finding that the change - the two categories are mapped differently, you could break those out. But you'd still have to aggregate.

[Alex] You can kind of fake it, but we can definitely add this to the list.

Question 21: Can you suggest us any published research work done by you to understand the tool and its outcome?

Answer 21: [Alex] If you go to the Trends.Earth website and click on publications link on the far left, it'll give you a list of recent publications. There's more we need to add, but we keep that list up to date.

<http://trends.earth/docs/en/about/publications.html>

http://trends.earth/docs/en/background/report_overviews.html

Question 22: Can we run land degradation for specific area (state or county) in a country with Trends.Earth? Also, where can we find custom data for such analysis?

Answer 22: [Alex] Yes you can - you can run it for any country as Monica mentioned earlier. We have some default spatial layers included you can select depending on county, unit. We recommend you access your own national level maps since that'll be a more accurate polygon. Custom data - you can reach out to your ministry of environment or statistics or department of remote sensing - depending on where you are, there may be regional centers like SERVIR partners that have produced land cover maps. You can also commission or produce a custom dataset yourself.

https://www.nasa.gov/mission_pages/servir/index.html

<http://geoportal.rcmrd.org/layers>

Question 23: What map projection can one use for Trends.Earth? Especially for imported data.

Answer 23: [Alex] Projection needs to be defined and needs to be something QGIS can interpret. Easiest way to check is drag data into QGIS and see if it opens in the right place. If you get an error message, then Trends.Earth also won't be able to recognize



the dataset. You can also google QGIS guidance on defining projections. Provided it is defined, it should work fine. It will ensure areas are captured accurately.

Question 24: Has the tool been validated over West Africa?

Answer 24: [Alex] We did work in Senegal as one of the partners for first phase of the project. We've been working in Ghana, Liberia, soon to be Nigeria (in a few weeks), so it's been used although most of our initial work was in East Africa, we also worked in West Africa.

Question 25: Adding to Q18, was the use of ensembles of trends based on different indices investigated? What do participants think about this option for further development?

Answer 25: [Alex] Great idea - no, we don't use ensembles of trends based on different indices, but I think it's a good idea. And we did mention - if you're just referring to productivity or more broadly - in response to the last webinar in a question I mentioned the world atlas for desertification uses a process to bring together a large number of datasets. So that's something I suggest you look at. But it's a great idea.

Question 26: How do we see how updated the datasets are in Trends?

Answer 26: [Alex] You can if you go to the download data tool in Trends.Earth, it's one of the icons on the toolbar. There's a screen that will show you starting and ending for each dataset. And that will show available years and resolution for datasets in the tool. We try and keep things updated when new data is released. Productivity has a lag. We just added data up to 2018. Once this year is done, we'll add 2019. Updates for other datasets depend on producer.