

June_19_409_003

So thanks for spending this last hour with us. For the hotspot, stoplight, integrated modeling and mapping of climate risk, biodiversity loss, and urban expansion.

So I'm Andrew Rudd. I'm an urban designer, one of, I think, rather few in this august gathering. I work for UN Habitat. We are a very small agency of the UN focused on urban work, really quite a drop in the bucket compared to the very impressive and inspiring work at scale that we've seen the bank and others do here, hoping we have something complementary to add to the pot, so to speak.

I'm equally delighted to be joined by Matthias Bao, who is a professor of practice for architecture and landscape architecture at the Weizmann School at the University of Pennsylvania. And Anna Campos -Garcia, who is the lead disaster risk management specialist for urban resilience and land at the World Bank.

Thank you both so much for being here. Quick run of show. I will give a short framing of the issues that have inspired us to develop this stoplight, then pastimatize for a deep dive on the hotspot itself.

And then to Anna for reflection on all of this, particularly in light of complementary work that the bank itself is doing. And then Manuel Morales Alpizar, who is our key partner on the Costa Rican side, who unfortunately could not be here in person with us today, has recorded a video reflection on what this project has meant at the local level.

And finally, if we have time, we will do a bit of role play. So let's begin. At a planetary scale, I'm going to start with something very sobering, and that's to remind us that we definitely are facing a sixth extinction event with ecological collapse.

And in some ways, this could well be worse than that of climate change, because there are really no offsets available. Once biodiversity is lost, it's lost. We know that land use

change is a primary driver of biodiversity loss, and that's accelerating, especially because land use is becoming less and less efficient.

About 10 years ago, we worked with a group of partners, including the CBD in Montreal, on the first global projections of urban expansion. And that predicted that the global human -built footprint would more than double by 2030, implying more being built in 18 years than in all of human history.

Another very sobering fact. So against that backdrop, we have the world's 36 biodiversity hotspots. These are both some of the richest and most threatened places in the world. Our partners at the University of Pennsylvania did a study showing that 90% of cities in these 36 hotspots are expanding in direct conflict with biodiversity.

They've developed, then, something since called the Atlas for the End of the World. And this is looking at about half of those 36 largest cities in each of those hotspots. Where growth is projected to occur, we see a lot of risk in red in these critical peri -urban zones, which is a big impetus for this project.

I think it's worth mentioning that even more work worrying than the quantity of expansion is really probably the quality of expansion. And what we're seeing in terms of prevailing paradigm is more and more low density speculative development, particularly at the edge of cities.

And in some ways, it's corollary. Unreasonably high density, very informal settlements at larger and larger and larger scales, particularly in secondary cities. And this is the type of client with which my agency tends to deal most, a very particular set of needs.

And what that's yielding, unfortunately, at a landscape scale is both sprawl and segregation at a really unprecedented scale and pace. And what's interesting about this is that many mature, wealthy cities have frankly had the luxury to make mistakes and then to be able to retrofit and fix some of those mistakes.

But from an ecosystem perspective, restoration, as vital and critical as it is, it cannot keep pace with the scale of destruction. how to say inefficient fabric also cannot keep pace with the poor quality of what's actually being built.

A lot of emerging economies in the middle classes for whom these are being built really represent a tipping point for a lot of irreversible change. Many of these cities have massive infrastructural backlogs, very low capacities, one or maybe no planners at all, and they are making decisions every day about where and how to develop.

They will not have a second chance to get things right. They need foresight -based evidence right now. So at a societal scale, it's difficult, we've found, to get residents to really care about the loss of nature before the loss happens.

The SDGs adopted about a decade ago have been helpful, I think, in bringing attention and accountability to some of these issues, to new metrics around sprawl, green space, strengthening old ones around disaster risk reduction and protected areas.

In -house, the UN has tried to convene to see how we as specialized agencies can better support. I came up with two novel points of collaboration, one around improving the quality of cities, of expansion, and the other around integrated spatial planning.

However, a study that my agency, UN Habitat, did showed a big gap in both guidance and good examples related to preservation at the city and metro scale. There was a lot around restoration at the city scale, a lot of around preservation at the regional and national scale, but very little in that sort of sweet spot where a lot of this impact is going to be delivered in a critical next decade.

Institutionally, we know we need to evolve. We put out a white paper two years ago that really argued the UN going forward is going to have to not just be fixing mistakes once emergencies arise, but needs to really reinvent itself for prevention, not just in terms of peace and security, but also in terms of development.

And so in this paper, we've argued that the line between built and natural can't be treated as a binary or as something static. There's a lot of bleed. The frontier is consistently, or maybe inconsistently, shifting.

And somehow we have to get to grips with that change before it starts happening. So we proposed four P's to address this. One, project spatial growth. This is something cities need to be able to do. Our partners at Penn had gotten this started.

Two, they need to be able to predict where land use conflict is most likely to happen. Three, to prioritize where to develop, which places portend the least harm and yet have the most suitability for human purposes.

And then ultimately and fourthly, to prevent replication of mistakes before they happen, because we won't be able to fix many of these in near future. Then with our partners at University of Pennsylvania and funding from Swedish CETA, we tried to put all of this together, layering these three projections into a unified map, which we did very early versions of in three LDCs.

This is in Honiara and Solomons, Morondava and Madagascar, and Lilongwe in Malawi. And this was really the first map we generated based on open source data, which a very rough scale, Matthias is going to go much more deeply into the refined product in about a minute.

But it begins to show really where the highest risk for biodiversity is forecast to 2050 in red at the edge and the highest risks from climate in purple, more toward the center. And this was the first very crude stoplight that we produced, what we're now calling a hotspot stoplight, which is really showing no go areas in red, proceed with caution in yellow and areas encouraging in green.

Something that Ross Eisenberg, I think much more elegantly yesterday explained as restricting conditioning and promoting. So really, at the end of this, our conceptual aim is to be able to provide a foresight -based evidence base so that these smaller, poorly -capacitated, really fast -growing cities can make these on -the -spot decisions, along a

spectrum of activities from creation all the way through to preservation appropriate to the kind of urban transect from the core,

where we needed a lot more retrofits to the periphery, where we need a hell of a lot more preservation and conservation. We presented this at COP 15 of the CBD, which of course adopted the global biodiversity framework very excitingly with two complementary targets, quite germane to all of this, one on increasing quantity and quality of green space within cities, that's actually target 12, and then another target,

one which is looking at spatial planning much more broadly in a complementary way. And then very pleased to say that with the support of the governments of Costa Rica and Colombia, we have the UN's first resolution on urban biodiversity, and that tasks me and my colleagues and all of us at Habitat to produce innovative tools and to provide assistance to interested countries, such as Costa Rica with whom we're working.

And this really resulted in the Hotspot Stoplight, the tool which I will now pass off to Matthias to talk about how it works and what we've learned from it. Thanks very much.

Thank you, Andrew. And so after that first iteration, we spent the last year in developing that tool a bit further. And the idea of the tool is to really use simple publicly available data sets to map and project into the future, climate risk, biodiversity risk, and urbanization risk and to see where there are overlays and to do that in such a way that it can be accessed and is affordable or essentially,

in an ideal way, wealth free for use for all those thousands of smaller cities in low and middle income countries. And for us to be involved as the University of Pennsylvania, it seems to be work that is very logical within our history.

We are the university and the program in which Ian McCark, the professor who wrote the book *Design with Nature*, has sort of set up the idea of suitability analysis, the idea of layering information at a regional scale so you can get a systemic approach.

And that has basically become the precursor of GIS, which, of course, our university has also played a role in. And so for us, it was really interesting to bring that work to a more global scale through the collaboration with UN Habitat and specifically to work on that as a design school and not so much a planning school, but a design school that really has these ambitions to work at a global scale.

If man is messing up the earth at a global scale in the Anthropocene, landscape architects also need to start thinking about our practice at a global scale. So we developed a team from people from urban planning, landscape architecture, the spatial analytics with whom we have been spending the last year coding.

So this is an image that tries to sort of summarize the challenge, right? Low and middle income countries are home to much of the world's biodiversity and remnant habitat, but we're also expecting the largest rates of population growth.

And all of that is going to be impacted by an accelerating climate crisis. And in those places, geospatial data is often scarce. And without actual data, it becomes very difficult to think about conservation and climate adaptation.

So using data sets, as we've already said, with global coverage, we try to introduce machine learning and data processing to develop a number of workloads that allow us to intersect and overlay these three components now and into the future.

And then what we have done in this initial iteration is really looked at, does this tool work by ground truthing it, but also using that ground -truthing mission as a way to work with stakeholders and to see how this tool can be used.

Simple things to say, there are many limitations. I've heard it earlier, say, like all models are wrong, but some are useful, as a really good quote. Data simplifies reality. We need to understand that.

If you project into the future, uncertainties are compounded. And so we need to understand that. And I heard that in another room as well. These are conversation starters. But they are important conversation starters to have.

For this initial run, we worked on the city of San Jose in Costa Rica, and it has to... that is sort of argued by the fact that even though San Jose is not one of the target cities per se, it is a place where you can, because there has been so much investments in understanding biodiversity, understanding conservation, there is an incredible local capacity to have conversations about these things,

it's a good place to test. So we've been doing modeling and analysis, then ground through thing and one of the things that we hope to pick up more in the next year is to have that lead to design ideation, not just planning but also design ideation.

But I'll first start with the modeling and analysis part, where we basically sort of created an algorithm to be able to map climate risk by combining grid at human population with climate hazard probabilities so that we could identify that risk.

I cannot go too much in the technology, I'm too old for that, I apologize, but my student colleagues and research assistants are very happy to talk into that. But we have been able to create a climate impact risk index.

In flood risk, for instance, we have been using Google Earth engine to look at historical flood data, we've been looking then at adding some conditioning factors and using that to train and test a learning model able to project it into the future if you layer on the climate risk.

And so this for the climate risk index and then we have something similar for the biodiversity risk index in which we looked at biodiversity in technos, land cover change probability to have that biodiversity loss risk, we used the machine learning algorithm to, based on I'm blanking on the name, to give the land cover change probability and to also map using satellite data by diversity intact, so we get that into index as well.

And then the third one, we have been sort of adding the issues of urban suitability, as well as expected urbanization, there are some great algorithms about that developed, for instance, by Karen Seto, in order to develop that into a sort of suitability map in which we layer these on top of each other in the metropolitan area of San Jose.

And with that, you start to see particular areas where you see these different issues intersecting and that are the ones that warrant further conversation. And one of the things that we did is in this stoplight, we really try to not only work with red in the stoplight, but also very much are able to identify green in the spotlights, areas where you are able to urbanize over time.

And then in the ground through thing, we selected a number of municipalities to talk this through and to look locally at what is happening, maps the various types that we could generate from this analysis, areas suitable for densification, suitable for infill development, areas suitable for urban expansion, areas where we think nature -based solutions are opportune and areas where conservation or restoration,

for instance, to create corridors and connectivity, are at stake. And so that caused a number of areas of interest that we then used in going on the site and having a local exploration to see if our models worked, because this was all done at a distance from a sort of abstract room in Philadelphia or abstract numbers of rooms around Philadelphia.

And we wanted to sort of figure out is this actually working, not only based on the models that the folks in Costa Rica have, but also when walking around in those areas. And then after that, we perform an open space assessment with the UN Habitat's open space team to look at those opportunities further.

And so we're now working towards an expert group meeting later. Those site assessments were really interesting. We discovered that, to a general extent, the model works, but they also really allowed us to have a sort of dialogue about what we saw, but also about what we can do with local stakeholders supported by a questionnaire.

And the things that we are planning to do in the future is also to look at some other tools to measure biodiversity better, for instance, through audio sensors or through the capture of local samples for water that would allow us to firm up the biodiversity analysis.

So here's some of the lessons that we are learning at this moment. We unexpectedly see that the response, and maybe that's because it's a relatively high capacity place in a place like San Jose, Costa Rica, has been really engaged.

There's a lot of people who have sort of bought into the idea and it has engendered a number of really interesting conversations. One of the things, and we want to talk to you about that, is what you see if you look at the metropolitan scale, the challenges and opportunities are unevenly distributed.

That brings a lot of challenges on a governance level, half the municipalities in the metro area of San Jose do not have any land use plans. At the same time, for others, a land is really scarce. As I said earlier, the stoplight needs to be as much about the green light as about the red light.

If you talk locally to specifically government officials and politicians that green light is what they're after, they're also really often not only planning instruments but ideas for projects and ideally ecosystem -based adaptation of projects.

It's really for us that next step is what we are really interested in and we've also seen some fantastic tools here at the World Bank that are being developed for that. I think I'll leave it at that.

We hope to maybe come back in two years and have made this step about the design ideation because we feel that using this to create an initial project, the very first steps of a project pipeline could be very promising but that's still something that we are not ready for.

Another element that we think is really important over time is to say we have now developed these instruments for areas that are very typical to... like these tropical

environments to Costa Rica, our algorithms have worked on that, but we now need to adjust for different climate zones and different types of vegetation and other things, dry environments, et cetera.

So we really need to do a lot of work to make sure that it's more university applicable so that it can be used in multiple urban regions. And then I think there are some steps, but we're not there, which really are about sort of, if you would then intervene, what could the benefits of those interventions be?

It's been wonderful to be here at understanding risk because you're doing all this stuff way better than we do, but we really love it to pick your brain and to see how we can continue with this work.

We can share all the data sources. They are open. They have the protocols that you can use. I saw a fantastic presentation yesterday about the Nature -Based Solution Opportunity Scan. I think comparing notes at some moment would be super.

I will leave it here and maybe give the floor to Anna to sort of reflect a bit about what this could potentially mean within the context of all the fantastic work that you're doing. Thank you so much.

Thank you very much. And thank you for the opportunity to be here. It's really very interesting how we all are trying to aim the same thing. How we use the global data, the technology, to help our governments and our counterparts, our clients, to develop better tools for risk management, biodiversity conversation, and land use plan.

I wanted to reflect a little bit on the tools and the approach that the bank has been developing, and probably you have seen also in the other rooms, like the nature -based opportunities, a scan, how they are using global data to identify the areas that have to be protected and that can be an opportunity to be developed, to develop nature -based solutions to reduce the different risk.

How we have the serious scans also that are integrating different elements for climate adaptation, climate mitigation, and risk reduction to create awareness. And how we use that global data and those entry instruments to create a dialogue with our clients to engage in a farther detailed engagement for the investments and for the land use planning.

We had yesterday also the session on land use planning and how we are integrating in a similar approach of what you are trying to do, planet, prosperity, people, and resilient infrastructure. Those are the four pillars that we're trying to use for the integrated land use planning process.

How we go from this global data approach to our intermediate or more local level data approach really to conduct those resensitive land use planning exercises. You had different languages, but also you mentioned it, the similar approaches on how we are trying to promote, control, and incentivize the development in the different areas using the different instruments that land use planning process have.

So that also, there is a lot of similarities in relation to this. One thing that I want to reflect based on our experiences in the countries. It's very important to review what are the policies and the regulations that exist at the national level for the land use planning process.

Because I had the experience of trying to go with some of these tools to the government on helping how to incorporate risk in the land use plans when I find that they don't have a physical or land use plan regulation process, or where they have a land use plan regulation process, but there is nothing in that regulation that says that biodiversity and risk reduction has to be incorporated, and the physical plan is more seen as a process of developing the physical infrastructure,

but not incorporating all those criterias. So from the bank perspective, some of the elements that we are trying to do is work also at the national level on how we influence those policies. The second element is how land use plan complements with development planning.

And land use planning process has to be a long term process. It has to go beyond the terms of the mayors. It has to be three or four periods of a major government. So covering what three or four majors are going to do, or even longer term in the future.

So that short term vision of the government side versus the long term vision that we're trying to promote from the planning perspective. And I can tell you about the experience from Colombia specifically.

The land use plans were developed for three governmental periods and were mandated that the development plans that each mayor comes with to implement in each government have to be kind of linked to that territorial planning process.

So in that sense, there are conditions that make them adjust to that long term vision. Otherwise, every mayor is going to come and change the land use plan to the government program. So that's another.

aspect important on simplicity versus complexity. We are talking about, I mean, a city is a combination of a lot of variables and a lot of complexities that we have to think, but how simple these plans can be done and how complex they can be done depends a lot also on the size of the city.

And one interesting approach that I have found is in countries, in some Latin American countries, for example, cities from 100 ,000s above have to develop a very complex master plan. But between 50 and 100 ,000, they have to an intermediate level complexity and below 50 ,000, they have another level of a more simple approximation.

So I think these are aspects that we have to combine from the policy level and the simplification of the tools with the complexity of the cities that we are working with. So it's not the same to try to apply, and I work in the context of Africa, where a lot of the countries are starting the development process and are starting the development of the first or second land use plans.

So in that sense, there is a lot of opportunities to incorporate this from the beginning to go to some countries that have regulations for land use planning from long term ago, and we have to enter and modify the existing plans.

So in those countries, we need a more detailed, more complex approach and a very localized information because the global data is not going to be able to give us the resolution that we have. So I think those are some of the elements that I wanted to bring, the importance of combining regulation with the implementation of the local level, how we can inform those process depending on the size and the information availability of the countries and the type of decisions we can take depending on those contexts.

Thank you very much.

Wonderful. Thanks so much, Ana. And let's see 20 minutes left. We have a very short video from our partner in ministry of housing and human settlements in Costa Rica, if that's available in queued, could we.

Hello, my name is Manuel Morales. I'm an advisor at the Ministry of Housing and Human Settlements in Costa Rica. This country faces significant challenges in urban planning and land management. Even though 27% of the country's natural habitat is protected, still less than half of its land is covered by regulatory plans and where such instruments exist, we still have work to do in terms of providing them with a more strategic vision and means of enforcement towards its effective implementation.

The vulnerability of our territories and ecosystems to climate change is increasing, which means our local governments must make decisions every day about where and how to develop since the effects of climate change on people in urban centers and the effects of development on biodiversity and the expanding peri -urban edge of cities is accelerating dramatically.

Following the adoption of Global Biodiversity Framework, Costa Rica and Colombia co -championed a first -ever UN resolution on biodiverse and resilient cities, which calls for the production of an innovative toolkit and provision of technical advisory services to interested governments.

UN Habitat, the University of Pennsylvania and the Ministries of Housing and Human Settlements, Environment and Energy and External Relations of Costa Rica are now undertaking the project Citizen Nature, planning for the future along a spectrum of ecological preservation, conservation, restoration and creation.

Its cutting -edge risk mapping methodology is now being applied to the greater metropolitan area of San Jose for refinement. This spotlight raster projects biodiversity climate and urban risks to 2050 and provides an evidence base for constituent municipalities to decide where and how to develop with minimal risk to people and nature.

This tool is important for Costa Rica as it is for expanding cities worldwide, especially those that are expanding in close tension with biodiversity hotspots. It opens conversations on preventing potential degradation in the peri -urban edges by discussing densities and containing urban sprawl to prevent encroachment and by introducing strategies for the implementation of nature -based solutions for ecosystem restoration.

Costa Rica is proud to have championed this UN resolution and is committed to continue collaborating with UN Habitat and all stakeholders interested in joining efforts for the promotion of the conservation and restoration of biodiversity in urban areas.

This, in addition to the efforts that the local housing sector has been making in terms of improving land use, urban planning and access to suitable habitats, such as the guide for the integration of disaster risk and climate change action in continental regulatory plans and the strategy for comprehensive neighbourhood improvement among other instruments, initiatives and actions.

We hope this session will be engaging for all participants and will serve to generate initiatives and further synergies around our joint work. Thank you very much.

Terrific, thanks. Before we move to activity, a quick, I hope fun activity. Any questions from Matthias or Anna? Any Costa Ricans in the audience? Yes, two at the back, first toward the center. Yeah, yeah, yeah, questions are fine.

No need to be Costa Rican for questions. Thanks, please.

Thank you so much for sharing such interesting work. I'm actually coming from more of a public health background. And I was looking at the sort of factors involved in the hotspot mapping, which perfectly coincide with zoonotic spillover at the introduction of novel diseases into humans based on the interface between animals and people.

And I was wondering if this work has been applied in that kind of one health or human health perspective, because it feels like really ripe for that kind of co -interaction.

It hasn't. So we've looked at public health indices to look at climate risk, of course, and then specifically heat stress as a public health concern. But we haven't looked at biodiversity and techness.

And this challenge of, indeed, things jumping off from those land use changes, as we have seen with some of the recent epidemics. So it's super interesting. And we would love to have some guidance on how to have that conversation.

We can look in the university, but it's always better to also have some outsiders on this. So thank you.

There was another at the back on this side. Thanks.

Hi, thanks for the presentation. I'm just wondering from the scan or the possibilities you have seen, how have you seen the participation from the local offices, from the municipalities? How has it been?

What has been the experience? And have you guys involved, like, or are you thinking of involving like this, come on, so this is, since it's been done. Yeah, like citizen, the

participant of citizen, because we have seen it in other cities, how they feed the information or the models with the citizen participation.

So I'm just wondering if, are you guys considering it? Have you driven some of this data?

Thanks, both great questions. Participation and interest from municipalities has been highly variable. So we chose seven out of 35 or so in a very fragmented metropolitan region because of their highest risk, as in a way projected by the algorithm.

It's hard to say why some immediately jumped on board and joined us on the ground, true thing. I think in some cases it's municipalities who didn't yet have a plan, but know they need one, and the additional support can be helpful.

We'll go back again next month and do deeper outreach to directors of planning in each of the seven. And I think we'll know more then about the depth and the kind of legs of the work to catalyze these kinds of conversations about the trade -offs involved in the different places.

Citizen Science, the July mission will bring in our public space team, which has a much more tested assessment, a citywide public space assessment. So what they do is literally, how to say, survey every potential open space within a municipality on the basis first of satellite imagery, but through the recruitment of 30, 40, 50 students, usually post - grad students of architecture or geographic background.

They use a Kobo toolbox -based mobile app to geolocate every open space, and then deliver, Ty's talked a little bit about this, a qualitative survey of users in the spaces to ascertain ownership, occupancy, perceptions of safety, of amenity, and we're excited to be adding a biodiversity layer this time around, which will look at some vegetative characteristics, but pull in some of the more novel measuring techniques that Matias talked about,

the passive audio capture and the water DNA kit. So yes, and hopefully more as of next month. Work in progress. Thanks. Anything else? No. Let's play a quick game then. A very quick one. Ah, there is one more, yes, please.

First of all, thank you for a great presentation. It was so interesting to see how you approached those global risks that we all are facing. As an urban planner, I would be keen to know, did you have discussions or have you been negotiating with urban planners in San Jose?

And what were your experiences? Because, of course, the most important thing is to have all those studies and outputs incorporated in new urban plans. Thank you.

And thank you for that question. That is really an ongoing process. We've had urban planners come with us when we drove through the city, visited the sites, did the ground through thing, tried to understand if what we mapped and what we saw was actually there.

But with that, we also learned, and I think that's where the little exercise comes from, a real discrepancy in the availability of tools between different urban planners and different municipalities.

And that is, and I think Anna talked about that as well. And we really feel that if you want to think like there's always the scalar issue, right? For biodiversity and techness, you need to look at the larger scale.

So you need to look also at the scale of the metropolitan area or even more the resource shed of a particular city. And figuring out how now to work in this multi -scalar way with urban planners who have these different sets of instruments is something that we hope to, well, maybe test with you now, but really hope to work through when we go on our next mission there.

Because that is, I think, going to be critical for success and adoption.

And I think that's a unique opportunity to bring the environmental agencies, the regional planners, with the local planners, because there has been a big debate on the basin level planning, on the biodiversity planning versus the city level planning, and how those instruments can be combined.

So it would be good to understand the Costa Rican context and how you can bring them together in the conversation.

And I think that's really what we're after, right? Like, the reason we are so interested in this project is we saw how climate risk and biodiversity risk were when we started these separate conversations.

Urbanization risk is also, like, these areas, specifically within the UN, are sort of in separate worlds. And then we also, so we said, we need to start linking those and creating the understanding that these things are intrinsically connected.

And I think as we have developed this tool, this sort of multi -scalar thing, becomes then another challenge for connectivity, but also equally critical in order to do this work in an integrated way.

Given the time, I think rather than a role play, and in response to this latest round of comments, I'm just going to present the two situations that I think in a way exemplify some of the challenges and tensions between different municipalities.

And we'll see if it prompts any further questions in the last five minutes or so. You saw through the draft stoplight that the risks are very concentrated and differentiated in different parts. So to the extreme periphery, as you can see here in the west, the red indicates a very high risk of biodiversity loss in the city center, San Jose proper, high levels of purple, risks of effects of climate change,

flooding, extreme heat, et cetera. So we've put up here two very different municipalities, Atenas at the extreme west, San Jose in the center itself, and wanted to propose to you the differentiated challenges and opportunities in both to see if that would prompt really any reflection about how some kind of collaboration might be forged between the two.

So I'll just present this and see what comes up from all of you. On the left with Atenas, we have a very high risk of biodiversity loss, but it's not immediately obvious. It's a very, very green place.

The risks are very hidden. The town prides itself on having so -called perfect climate. It's very cool. It's also very attractive to retirees, expats, leapfrog -gated speculative compounds, and because global coffee prices have plummeted, it's not so profitable to farm, which means it's very tempting to sell and to subdivide.

And we also have a group of topographers who make their money off of commissions from subdivision, and they have lobbied very hard against any plan for this municipality. So those are the set of challenges for Atenas.

In the center is, of course, San Jose proper. They've got a plan, but their challenges are really around high risks, as we've said, of climate change, flooding, heat. They have very high ground coverage, very high imperviousness of surfaces, low densities with very high ground coverage, very little green space, certainly insufficient public transit, which leads to high car usership, congestion, poor air quality,

et cetera. So in some ways, we have very different but potentially complementary opportunities for both. If we look at the kind of selective opportunities for densification and for pocket parks, restoration of green riparian corridors in San Jose, and then think about preservation of larger green patches, we also need to think about how, I think, to incentivize preservation, particularly in a place like Atenas,

because the last thing they want, of course, is to forfeit investment. Why take on, for the greater good, the burden, so to speak, of preserving land if it means it's not coming in? So with that, and you see the key, the different types of interventions we're proposing,

any reflections from anyone here on how some kind of inter -municipal collaboration might be promoted or any further thoughts on pluses and minuses either way?

Maybe I can call on you, Matthias, to get things started. Ah, yes, please, we need to pull that as a microphone.

Yeah, I mean, I'm not sure if I have ideas about the intermunicipal collaboration, but I just have a question actually more about this approach, because first of all, thanks, I think this is super interesting.

As you know, yeah, we worked with the team on the MBS Opportunity Scan that was already mentioned. What I find interesting about this approach is the urban design angle, but I just have a bit of a question about how you approach biodiversity risk in link to those zones for investigation or link to those solutions.

So I was thinking when I saw this, I was thinking about, I don't know, in like land use science and ecology, you have this land sharing, land sparing debate, right? So like, you know, should you preserve all nature in one place or should you like achieve some sort of mixed use landscape where everything can thrive or something?

So I wonder how I'm just trying to understand a little bit how you look at biodiversity in the sort of denser urban areas in this approach and how you prioritize between sort of urban expansion and sort of densification from a biodiversity point of view.

That was my question.

I need a microphone, apparently. So we've been looking at a number of different indicators. And there are different sets, you probably have found them as well, of how to measure biodiversity rights. And you have measures about the inspiring species or insect densities.

You have ecosystem intactness. And what we have come across, and we need to dive deeper, is that we realize that ecosystem intactness combines with land use change, let's say predictions, susceptibility to land use change, those could come from proximity to roads, or terrain, or whatever, is at this level, for us, the best indicator of biodiversity risk.

And so we try to, and that's always the challenge, is how complex do you make your model, and how sophisticated do you make your model? And in earlier versions, we realized that the model was more complex.

And we have gone through a process of simplification in order to be able to create that tool that is accessible. But then again, we all realize that that comes with its own limitations. But it does create the highest level of robustness in the tool.

And happy to talk offline deeper, because I really admire the work that you're doing. And I find it very exciting to think that where this is a little bit different to that work is that it takes the future, and also informal urbanization into accounts, which is something that specifically for a lot of the secondary or smaller cities in the lower income countries is going to be really critical for success.

Do you want to conclude?

Maybe just a tiny refinement to say that in terms of the green light places where we are suggesting conversations around development. There are obviously places where Biodiversity and TACNIS is relatively low but where the suitability for urban growth is high and then we kind of Disaggregated that into the the top three of the green yellow and blue densification in fill and expansion And that really came again High suitability low risk,

but for densification. It's it's already built plots that are Relatively low density given their proximity to transit public transit, for example infill same but for vacant lots and expansion Places not built but with proximity To other areas of growth Road networks, etc knowing full well that in a place like a tennis where we're really pushing hard for

Large amounts of preservation there need to be places where investment can be made at low risk.

So that was the reason for the Disaggregation of the three Any final questions?