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Geodesign and the future of landscape and urban planning

In December 2017 Prof. **Carl Steinitz** visited Brazil, with the support of IEAT/UFMG – Institute of Advanced Transdisciplinary Studies, Federal University of Minas Gerais - to the International Visitor Chairs Program. At that time, he coordinated important meetings with the students, professors and researchers, highlighting the participation in “Geodesign South America 2017”.

As part of his activities in Brazil, an interview was registered, and can be watched on youtube channel of Geoprocessing Laboratory from the School of Architecture, Federal University of Minas Gerais:

https://youtu.be/2VVm-64YukY

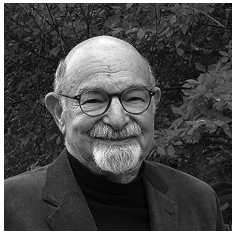
We invited the Architect **Rafael Lemieszek Pinheiro**, representing the group of PhD candidates, to conduct the interview.

We are very pleasured to share this document with you.

Best regards,

Prof. Ana Clara Mourão Moura

http://geoproea.arq.ufmg.br/



Carl Steinitz

Carl Steinitz is the Alexander and Victoria Wiley Professor of Landscape Architecture and Planning Emeritus at Harvard Graduate School of Design, and Honorary Professor at the Centre for Advanced Spatial Analysis, University College London. He began his affiliation with the Harvard Laboratory for Computer Graphics and Spatial Analysis in 1965. He received the Outstanding Educator Award for his “extraordinary contribution to environmental design education” and for his “pioneering exploration in the use of computer technology in landscape planning, especially in the areas of resource management and visual impact assessment.” He received the annual “Outstanding Practitioner Award” from the International Society of Landscape Ecology. He has been honored as one of Harvard University’s outstanding teachers and he is the 2015 recipient of the Jot Carpenter Teaching Medal of the American Society of Landscape Architects. Steinitz is principal author of “Alternative Futures for Changing Landscapes” and author of “A Framework for Geodesign”. He has lectured and given workshops at more than 150 universities and has several honorary degrees.

Rafael Lemieszek Pinheiro

Architect and Urban Planner from the Federal University of Minas Gerais. Master’s in architecture and Urban Planning at the School of Architecture of UFMG. PhD candidate Doctorate in the same institution since 2017. Founding partner and director of LZK Architecture and teaches at Pitágoras College. Has experience in the following subjects: zoning, city, market, architecture and urbanism. He was professor at the Federal University of Ouro Preto between in courses of architectural design, computation and graphic representation. He was Secretary-General (2006) and Vice-President (2007) of the Institute of Architects of Brazil - Section of Minas Gerais (IAB / MG), and member of the Superior Council of the National IAB in the same period.

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Geodesign,
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Rafael - *How do you see the profession of planning in the present day and what role does geodesignplay in the profession?*

Carl - I've seen in my career, which began in the 1950's, ebbs and flows in planning. From physical planning to economic planning, to regional planning, to urban planning and urban design, to administrative planning, and back toward regional and physical planning. What is interesting is that in some of these periods, the schools were ahead of the profession, and in some of these periods the schools were behind the profession. Right now, if I look at Europe and North America, what I have seen in South America and what I've seen in China and India, mainly in those countries, the schools are a little bit ahead of the profession. And the reason for that is we are in a period in which administrative rulemaking and regulatory approaches are dominant. What's happening in the schools is a mix that some schools and some countries are more producing administrators. And some schools are recognizing two things: one is that the systems in which these administrators are being trained to work are changing very rapidly. The second thing that they're recognizing is that the amount of urban change that the world faces in the next thirty years, let's say, is enormous. The World Bank estimates that we are building the equivalent of a city of a million people every week. That's not building a whole city, it's adding to the existing cities. But the scale of physical change and systems change is very profound. Some schools are recognizing that we need to educate people to manage these systems which are changing fast. And which are changing through entrepreneurial means rather than bureaucratic means. Ideas like separation of functions in the city by zoning are less and less now in forward looking cities. Complexity is greater, diversity is greater, and so the idea that you can manage a city through rules is getting less. And so the question is: well, how do you manage it?
It's much more related to multidisciplinary design. Adaptation. Temporary aspects of cities becoming. more important. And geodesign is in the middle of that, in the sense that it's not treating a city and an urbanistic environment like a building, and it's not treating it like a science: it's a mixture of those. And there's a very powerful consequence of that: normally, in both practice and in education, we're more focused on producing specialists. But fifty years ago, sixty years ago, planners were much less generalists: they had to know a lot about a little, as opposed to a little about a lot. And what we're now beginning to see, largely through geodesign - but not only through that - is a greater attention to multidisciplinary ways of thinking and practicing. And we're producing more generalists, because I think we need them. We need ten thousand people who are more generalists, we need them in the next ten years and the universities are the only place where they can come from. But their practice will be different from the practice of specialists who know their specialty but don't work very well with the next specialty.
And those are changes, those are, I think, very profound changes, and very healthy ones and the work that I'm trying to do is in the middle of that. Because I consider myself a generalist. I have my specialties, but I can talk to lots of people. And my students are trained not to make one design by one student, but to make one design for fifteen students, and to see how you manage that process.
So, I find it a big challenge, and in the last ten years I've spent my life teaching teachers. Because they're not trained, because of their education, to produce generalists. Because they skipped a generation. Your faculties around the world are specialists, much more.
And I think that's important, by the way, but it's not enough, it's not enough to solve the very difficult problems that the world faces.

Rafael - *On the same topic: as you know, we have no landscape planning courses in Brazil…*

Carl - I think it's terrible. It's stupid and it's terrible. Because your country is going to be destroyed by the landscape being destroyed. I have a friend, a very good friend, he says if the landscape is wrong it's all wrong. If your landscape is destroyed, your water system is destroyed, if your water system is destroyed, forget about the city.
Period, finished.

Rafael - *You mentioned there is this division between entrepreneurial activities and bureaucratic activities and geodesign. How do you see that: is there a middle ground?*

Carl - I think there's a negotiation ground, and that's why I focused in my talk, while I was here, I focused on the idea of negotiation as a design method, and that's not the tradition of design. The design is my design, not your design, as opposed to our design, but when you're thinking of a region or you're thinking of a large part of a city, nobody knows enough. There is no one profession that knows enough, so it has to be collaborative, it has to be multidisciplinary, it has to be negotiated. And furthermore, the people you're designing for: who you are designing for, when you're designing for thirty years, those people maybe not alive yet, and the people who are there now may all be dead, so how do you negotiate between clients who you think know what they want, but who are going to be in a changing environment during their lifetime, and certainly in the next generation's lifetime. And none of us knows the exact answer for that, so we have to figure ways of designing that are robust, resilient, flexible, adaptable, not grand conceptual. That's not what's being done in practice, and it's not what's being done in the schools. It's being done in some, but not in the majority of schools.
I've been, in my career, in one hundred sixty-five universities, almost all of them schools of planning design, urban design, architecture and landscape schools. They're all relatively similar, as they're all teaching: a site, a client and a project. And I'm interested in: I don't know who the client is, the site is huge, and the projects are one hundred fifty projects in one project, so it's much more diffuse, much more complex, much more fuzzy. And I'm interested in how that process begins and how do you even think about it. And in that way, I'm influenced by the teachers that I had sixty years ago. Kevin Lynch, mainly.

Rafael - *And do you see any precautions that are important for governments, universities and private companies, for them to work together and not to get overwhelmed by one another?*

Carl - That's an easy thing to see and a difficult thing to do. Because right now, in most cities – not all countries and not all cities – they're seen as antithetical to each other, and sometimes when they're seen as collaborating, it's because of corruption. So, it's difficult on either extreme. And so, I don't have many examples to point to.

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I really don't. I'd say Western Europe might be the cleanest of that circumstance. Some parts of America. But it's very rare, actually, because there's a lot of money to be made. I don't have an answer for that. I really don't. I think that's a function of political science and democracy, to some extent.

Rafael - *I think geodesign can probably play a very important part on that: geodesign tools, like GeodesignHub.*

Carl - The tools the tools make it easier to be more democratic and more equitable, but they don't guarantee behavior. People have to understand that.
The ideology may be more equitable and more democratic. The tools may support that, by making negotiation easier, but that doesn't mean that human behavior is equitable and fair and democratic. I have people that I know who are trying to do geodesign in tyrannical governments, I know them. And it's very very hard. And I know people who are working in corrupt governments, and it's very very hard and very frustrating, but those things change also, and I hope for the better.

Rafael - *In your Brazilian experience, what are some of the obstacles you see to overcome to achieve territorial planning?*

Carl - The obstacles are probably in three different realms. One is overpopulation and under-income. I mean, the destruction of Amazonia is the obvious one that the world is very much aware of. But it's also government not enforcing laws that it has. And I think the schools are to blame as well, because the schools are still in a pipeline of specialties. Nobody's doing this. You have an architecture school here, and I imagine that they're very good at having their students designing buildings, and very bad at having them designing all of Minas Gerais. And yet, they think professionally that the architect is responsible for designing Minas Gerais. And I think that that's outrageous and stupid, fundamentally stupid. Now the question that follows from that, is why should it be in the architecture school, why shouldn't it be in the agronomy and the architecture, and the civil engineering, and the hydrology, and the ecology, and the sociology school, and taught as a collective across the university. I've advised many universities along those lines. And then the question, of course, is that the architecture group works collegiately, the same as the engineers and the hydrologists. They are all wrong, they're just all wrong.

Rafael - *Do you think is rather a question of making the current courses more multidisciplinary?*

Carl - No, no, no. Working on projects inside the university that require multidisciplinary work, and that the students and the faculties teach each other what they know, so that the students have a broad experience in a project that needs to have a solution. You may remember that a year and a half ago we gave a workshop here on a very important problem of whether the mining in Minas Gerais by 2050 should stop. And we had people from many disciplines, including from the mining industry, from the city, from the region, from hydrology, from ecology: we had a very broad group of people. And they had to act in their own interest but negotiate with each other.
I would never hesitate to give the same problem to thirty students from across the university: solve this problem. They would learn a lot. And have ten faculty members, each presenting their own perspectives as professors of ecology, hydrology, mining, economy and history, for example. As opposed to only architecture. That's a big difference. And those students would have a very different experience, that doesn't mean that they shouldn't have a specialty, also. But not just a specialty. They have to have this. And they are not having this.

Rafael - *What does that mean for the way universities are currently structured?*

Carl - I taught for almost fifty years at Harvard, which has a huge advantage: it's the richest university in the world. And about ten or twelve years ago, the president of Harvard, who controls a large budget, said what he's going to do is he's going to identify the world's most important problems, and only give central university money, that he controls, to teams from across the schools. So, we created a very powerful center for the environment, a center for the brain, a center in public disease, a center, by the way, in early education. There are five or six of them. And what he did was this: imagine a distribution of faculties: one faculty, another faculty, another faculty… Let's call this architecture, let's call this science, let's call this engineering, let's call this law, and that's called business, etc. And he said: I'm going to identify a series of problems. I'm going to put the money that I have into these problems, and one of them is called "environment". And I know that this university has that structure, but the difference is that these schools, they have faculty, and they have students, and they do research. In depth. And these people are faculty, students and research: in breadth. Sometimes they come together, but sometimes not.
So, these institutions this way are very powerful. They can make appointments, they can give degrees. And the university is focused on disciplines and problems. And the difference is that disciplines might stay for two hundred years, and the problem might stay for twenty-five years, and then disappear and a new problem comes. So that these people have double responsibilities, and that's very important. It means that if you have the national problem of Brazil, one of the national problems of Brazil. I can see two of them: every city that's now five million will become ten million, and every other tree in Amazonia will be lost.
Those are big problems. Don't tell me for one minute that any one of these can solve that problem. The question is who's going to solve the problem? Where are these people? They are not being prepared…

Rafael - *So, you think it`s more of a question of creating researches that are cross disciplinary, more than proposing new courses on landscape planning?*

Carl - That's exactly what I'm saying. I think it's a much more serious problem. It's a national crisis actually, and it's not just in Brazil: it's in many countries. You can understand how conservative faculties are:
faculties fight for money, they fight for power, they fight for prestige inside the university, but in the long term that's the death line of the University.

Rafael - *I`d like you to talk about your most successful workshops, the most successful case studies in geodesign…?*

Carl - I'll give you two different definitions of success: one is where we made the most important sort

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of intellectual advances in supporting activity with the tools that we're designing, and then I'll give you a different example where we had the greatest effect in the real world. The most interesting one was the coastal zone of Georgia, which Rossana Rivero presented in the conference Geodesign South America. In this case study we had ten counties in the state of Georgia, and the regional agency that had to coordinate them, and we had ten different teams making their own designs and then negotiating a regional design. That was very important, because almost always you make a set of models that operate across a region, but we said: "no, these counties are different, they have different priorities, each have their own ways of working, and you have to respect that ". But they also need relationships with each other that they have to negotiate and then in the end they have to be coordinated. So, we were matching the political reality of making a large plan. That was a very important thing: we were not overly simplifying. Another comparable example was the project in Mulroney, in Ireland, where we had a village that wanted to make their own plan: no professionals, no computers, no nothing, no GIS (Geographic Information Systems). They wanted just to make their own plan. They spent four years. They got nothing. They asked us through a friend to come in, and they used our software and they made a plan in two days. And it's a real plan and then they're happy with it. We demonstrated there that you don't have to be a planner to make a plan: everybody can make a plan, but you have to be able to articulate what's important to you. And these people could articulate it. It`s the same thing that Ana Clara Moura and her group showed last week, during the conference in Brazil. After we did the project here on the mining Iron Quadrangle, participants from pu-blic administration that Ana Clara and her people trained, they went into the "favelas", and they trained 14-year-olds to use the software to help their parents make a plan. And I think that's extraordinary. That's an extraordinary accomplishment and very important. Because what you're doing then is you're bringing decision making, that's really important to people, to those people, and having them participate as equals, if not superiors in the process. I think that's exactly what should be done.
In the real world the most successful example is a workshop that we did was a whole study using geodesign principles, in 2002, in La Paz, which is in Baja California, one of the main cities in Baja California in Mexico. Part of that study area is the most beautiful beach that I've ever seen. We made a study and we made a very big public presentation, and one of the outcomes of the study was that the beach was threatened by a huge resort development. The study that we did caused a group of people to protest against the beach development, and a consequence of that was that the mayor created the first public beach front park on the Sea of Cortez. I consider this to be an enormous professional accomplishment, not because we built something, but because we stopped something being built. And that's still the case now. It's still a public beach where everybody can go swimming free and you don't have to just go to the beach. There was a project in which a billion U.S. dollars were going to be spent on a piece of land that was stolen by a former president of Mexico. It was public land stolen for the private benefit of a former president of Mexico. Everybody knew this, and so the project was killed because of the study, and I'm very proud of it.

Rafael - *So, you think this is an important tool for redistributing power?*

Carl - It can be, but, again, it doesn't guarantee it. I want to make that very clear. Methods and tools can be misused. They can be used for public good, they can be used for public bad equally. If you tell me what design, you what I know that I can maneuver the tools to give you your design. But that's true of any design of any plan, so that's not different in that sense. On the other hand, the ideas which surround geodesign, which people are promoting, are basically based on the diagram that I designed for the cover of my book: the people, the sciences, the design professions, and the information technology working together. The people are part of that process, and they should be part of that process, they should be the most important part of that.

Rafael - *One of the problems that the experiencein Savannah that you mentioned brought to my mind is the problem we've been facing in Belo Horizonte very strongly, and, I think, in many Brazilian cities and likely in other countries as well, which is the problem of jurisdiction. The urban areas often move across city lines, state lines, sometimes country lines…*

Carl - Absolutely, that's right. This is not a new problem, it's the history of London, it's the history of Boston and it's the history of adjusting governmental responsibility and civic responsibility to meet the geography and the systems that have to be managed. If you have a water system that goes across state lines, they have to be coordinated. If it's all in one watershed, you can't have one state flooding another state without repercussions, it has to be managed as systems, related to the scale that they operate on.
Brazil, like most countries, has planning and implementation responsibilities, based on political jurisdictions. But real planning in the future is not going to be that way at all, it's going to be based on watersheds, it should be based on watersheds because water will disappear faster than urban jurisdictions. And we don't plan transportation by metropolitan area, we plan it by the pieces, and those are just foolish, because now there's a lot of power and a lot of influence by these local governments, but they don't work at the scale of the metropolitan areas that are now are coming into the world: cities of twenty, thirty, forty million people, but that's absurd, it's absurd to run those at the local level. It's not absurd to run everything at regional level, but some things should be regional, some things should be local.

Rafael - *From your Mexican experience, it's obvious that geodesign tools are very important for opening up processes for what the people have to say. Is there any kind of precaution, or any kind of measures that should be taken to keep these processes from being taken over by specific interests? Is there any way to manipulate people using "open" processes?*

Carl - Sure, yes, the answer is yes. If you're inclined to manipulate people, the tool can allow you to do that, and I fully understand that. But, the experience that we've had so far, and the experience of most of the people that are using geodesign ideas and tools, not just the tools but the ideas behind it, are involving ordinary people in the design of very complicated situations, as opposed to making a design professionally and then just showing it for approval or disapproval, maybe not even disapproval, just showing it. It tries to redefine the concept of what public participation is. Now, there are shortcomings: when we do a project, we might have thirty

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people, thirty out of thirty million, and that it still raises the question of "who are the people who are participating?", "how did you pick them?", "are they random?", "is it crowdsourced?", "what are their roles?". There are all kinds of very serious problems. But you have to compare those problems against the problems of not doing it that way, and you'll see that it's probably an improvement, or at least I hope it's an improvement. I must say that so far, with GeodesignHub®[1] as one group of tools - because there are other sets of tools, believe me, there are - but the group of tools that I'm helping to implement, we've done about one hundred projects, and I don't think any of them have been a failure, nobody is gone away really angry. And that's pretty good. If you had one hundred plans you'd have a lot of angry people, and we haven't. And if we ask people - and we have, almost always – "do you feel that you've had your voice in this process?". And they say: "not all, but enough, and we're satisfied" - because the end product is a negotiation, and they're part of that process. It's not that I'm imposing my design or your design on these people, it's a very different psychological aspect of being part of a plan. And it's appreciated, so far – it can always change - but so far.
It's a promising movement, with a set of promising tools, and a set of promising ideas, and there are an increasing number of people interested, which I'm very happy about.

Rafael - *My experience with participatory processes in general – when there are criticisms, and there often are – they're usually either that the process is not open enough, or that it is too open. If it is not open enough you can't do certain things, you're restricted to a certain kind of interaction. And sometimes it is too open and it doesn't engage people, people can't relate to it because it's too open...*

Carl - My view of the world's participatory processes is that they're boring. And there's one reason: because in most cases they are run as a meeting in which one person speaks at a time, unless they're yelling at each other. The tools that we're designing for geodesign are quiet, and everybody's working, so that they're talking in terms of the substance of the policies and projects, which are the basis of the design. And it's a much more civilized process, because everybody in the workshop is making a design and then they have to figure out a way to make something come out the other end that is one design. More than likely, they don't have to, but that's the usual product. And there's no one person dominating the discussion, which is very purposeful in the way we work with the tools. So if you come in and join us, you're immediately put to work. You're listening to a small number of people, mixed people, that are working toward a single objective, and then you have to merge your objectives. I think that's very useful.

Rafael - *Do you expect the tools - GeodesignHub and the other tools that are used for geodesign - to evolve over time?*

Carl - Oh yeah, absolutely. They're evolving every day now. Whether they're commercial and being improved - of which there are several - or whether they're a mixture of open source, people are collaborating together and they're improving very rapidly. I know that almost every week we make a change in what's available through GeodesignHub®, and I know that ESRI® is improving its system substantially, I know that CitiEngine® is doing the same thing. There are very highly competitive - not competitive in a sense, but it's a highly adapting set of technologies with people collaborating all around the world, because the internet allows. Hrishi Ballal, who is the main person behind the GeodesignHub®, is working with people in many countries, building A.P.I. applications that can interact with the core software.
The core software has no content, it's just basically managing a design process, but the process that it's managing is based in large part at least on work that I and a few other people collaborating with me have done for fifty years.

Rafael - *Brian Orland talks about a learning loop – when people participate and they learn how to participate – and there's a douple-loop, where they feed back into the platforms...*

Carl - Right. That's exactly what happens. We've had many people come take a workshop with us and say: "we think that this could be improved in the following way". They make an improvement, we take it in and keep going, absolutely.

Rafael - *Do you see the open source culture as a re-levant part of that?*

Carl - The open source culture is definitely a relevant part of it. But there are other technological changes. For example, these are ultimately going to be open source, but they have to feed people, so there's a business involved as well, but the business is to rent services rather than to buy software or license software. It's a very different business model, and nobody's going to get very rich. The other thing that's true: although it's not predictable, exactly, is the half-life of software systems. They may end up being shorter and shorter and shorter, and that's because of hardware changes and computer theory changes as well. There's a very important set of issues related to artificial intelligence: the question of whether you can define a problem sufficiently, so that an A.I. machine can make a better design than you can. If it can play chess better, why can't it make a design better? And those are all very interesting questions and I suspect in the next decade we'll have lots of experiments along those lines.

Rafael - *Some people support the idea that if there's any actual artificial intelligence being developed, it should be open – such as Elon Musk's OpenAI initiative.*

Carl - Well, I happen to agree with that, but it's nonetheless, not likely to be totally that way. And you also have the very complicated relationship between military and civilian research and development, in which the military generally is a decade ahead, and secret, besides. You have these situations in the world that you're really not sure how it's going to turn out, but you can bet that the experiments are being made even right now. And I'm skeptical, by the way. I'm skeptical that if you have a computergenerated design and you present it to the same people that you'll have to deal with in participatory things, whether they'll accept it coming from a computer rather than from a professional. I have my doubts.

Rafael - *A very important part of the geodesign processes seems to be the gathering and processing of information that is going to serve as the basis maps for the actual processes. When you have a very short time to work on very large-scale projects, you have to have data that is reliable, that you can trust.*

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Carl - We can trust more or less. Not perfectly. No data that is available is perfect, because it's by definition, the past. So, it's more relevant, less reliable. I'm happy with that.

Rafael - *At the same time there are a lot of city-level initiatives of open data, and a lot of cities seem to be struggling about the fact that they have open data portals, and people don't use them, or don't interact with them enough. Do you see that match in there?*

Carl - Yeah, I do I think that's true. I think that the technological assumption that people want to spend their entire day on the computers, so that they can participate in everything that they basically elect people and professionals to do is foolish. I think it's a waste of people time. They have other things they have to do, including feeding their family and playing with their children. And I think that that's a mirage of the technological people. I think it's nonsense, actually.
My view is this: If you if you know why you're doing the study, and you've answered the "why" questions in my framework, you have to go to the "how we are going to work" questions. It's very important for you to define that the ten or so systems that you're going to be dealing with. And then go up the framework questions and eventually you'll say "what's the data that we need to do the studies that we need to do" to get to an answer. And at that point, my view is get the minimum data, not the maximum data. And I have not yet found an inability to find public sources. I've had some difficulty in some countries where data is secret, but in general I've never found a real problem in acquiring the data that I would need to do the beginning strategic stages of a very complicated design. And I really believe that data needs to be collected only when you have a purpose and use for it. So, I have no patience whatsoever with simple data collection. None. I think it's a waste of energy, of money, of everything. It's ridiculous, actually.
And that's one of the things that, at CASA [1] - I told you, before we had this interview, about the conference that we had about Smart Cities and Big Data. The people who understood and developed a cynical attitude towards Big Data, are the people who really talked about how much data we are going to be collecting on the upgrade of all the sensors. And there's no way that a human being can understand it, so it has to be artificial intelligence. And that intelligence doesn't exist yet, because they don't know what the questions are. So, I think that this is technical companies selling stuff that is a waste of money and human intelligence. I'm not in favor.

Rafael - *On the Smart City topic, there seems to be two different views – one of them is that few, very rich companies are going to dominate data gathering and whatever decisions are being made through that data, and there are those who talk about public empowerment through being able to gather, process and propose over open data…*

Carl - I think there's a huge difference between gathering and proposing. And I think it's easy to gather, it's hard to propose. I don't believe either of those two models. I think that the big companies will try, but whether they succeed or not, I'm skeptical, and I certainly am skeptical to everybody collecting everything about everybody. And what does it mean, it means you've collected data stored somewhere in the cloud, or in a huge machine somewhere, but it's not going to be useful. It might be useful for some things, by the way. But if you if you want to see what a public danger might be of manipulating people, that's where you should start to look.

Rafael - *You talked about designing the world, and how usually when you are looking at a data you are looking at the past. Do you think geodesign is a way of people collaborating and imagining new futures together?*

Carl - I think not just imagining new futures, but, yes to what you said. But those futures are in part rooted upon their experience and their hopes for something different, perhaps. So, yes, I think that's what its main purpose is. Its main purpose is to change the trajectory that many people feel of things going badly, and so if you are modeling something that's going badly, you have to turn it around this way. And the question is how you turn it around this way. That's the problem.

Rafael - *It`s more about proposing than understanding?*

Carl - It's both. It's definitely about proposing based on your understanding, but it's your experience of understanding and the data, not just the data, and not just artificial intelligence. It's a human process supported by data, and not a data process manipulated by humans.

Rafael - *That's very important.*

Carl - It is important, I agree.

Rafael - *We talked a little bit about the institutional aspect of planning, of how it should be integrated. What do you think that means for the professionals in planning?*

Carl - I have a very long-term answer to that. If you're a university student, you should know a lot about a little and a little about a lot, but not just a lot about a little nor just a little about a lot. Therefore, I think that you can't have education without time. The people who start in-depth and then move across disciplines are fine, and the people who start across this way and then discover that they want to become specialists are also fine. But the people who only move across disciplines, or who only become specialists in one discipline, are not going to be as effective. One of them might win the Nobel Prize, but they won't be the minister of environment.

Rafael - *Maybe they will be, just not very good ones…*

Carl - Maybe they will be, you never know. But that's what I believe, I believe you need to know something that somebody else doesn't, but enough to talk to lots of people in different fields. The people who are going to survive professionally, in a changing profession environment, are not the people who are experts in one piece of software, or in one detail of how to build windows, or in one material. It's not going to be that way, because the professions are going to change much more rapidly, and they have to be themselves adaptable.

Rafael - *I`d like to thank you very much –unfortunately, we don't have the rest of the day tokeep talking about all of this…*

Carl - My pleasure. Fine. I'm happy to be here. I've enjoyed most my visit, very much. I think you've asked me some very good, profound, difficult questions. Very good, thank you.