Revista Espinhaço interviews: Filipe Duarte Santos (University of Lisboa)

Introduction This interview with Mr. Filipe Duarte Santos (University of Lisboa) took place during his visit to Brazil, in order to attend the II Brazilian Conference about Natural Hazards, held in Belo Horizonte - MG (PUCMinas), between May 5th to 8th, 2014. The Interview was granted on May 6th 2014 and took place in the studios of Radio Itatiaia.

Revista Espinhaço: May you tell us a little about facts and circumstances which have led you to become interested as well as study climate changes?

My graduation, the first academic grade I have received, was at Lisbon University, on Geophysical Science, it was a course with very few participants. I registered first in Physic-Chemistry [Science of Physic Chemistry]. However, the course was heavy on chemistry and very little mathematic. Nevertheless, I enjoy more Physical and Mathematic. On that course, I was the pupil of Professor José Pinto Peixoto, who has influenced me the most. He was an expert in Meteorology and he has also gotten an enormous cooperation to MIT [Massachusetts Institute of Technology], in the United States of America. He [professor José Pinto Peixoto] has known and has worked with Edward Lawrence, among several others very well-known North American meteorologist. After that I become interested in Physic, pure Physic (and hard-hearted!), which leads me to graduate and get a PhD in Nuclear Physics at London University. This experience gave me an opportunity to access the knowledge frontier. It was a doctoring not properly about nuclear energy. It was mainly about Nuclear Physics, it was about nuclear reactions. It was so interesting e I have been thinking up to now that the majority published work is related to this field, of nuclear physics, of nuclear reactions. Only after I was at Wisconsin University in Madison, in the United States, I become interested by the possibility of climate changes. At that time I used to think that people was getting to the edge of climate cooling, which could according to some scientists (maybe in an excessive manner) lead us to a glacial era. The planet [Earth] is going through glacial period, interglacial and we (human being) are these days living in an interglacial period.

Revista Espinhaço: At what epoch was it happening?

It happened through the years of 1980-81. And it is interesting because the global media temperature of atmosphere, on the earth surface, has decreased since 1940s up to the end of 1970s. Most everyone would discuss about global warming, however, by having data of that period analyzed, figure has shown that there is a temperature decreasing tendency in a global level, and, hence, we (human being) were at the end of this tendency [in the 1980s]. There were people in the United States who discuss about this [the climate changes]. Their main idea was that [by having earth temperature elevating] it was resulting from aerosols, atmosphere pollution of these aerosols. I started, then, to become interested on these questions and also getting sensitized by understanding our development paradigm which was highly aggressive towards environment. In that case, this aggressively tendency, of environmental degradation, was probably to become worst in the future. At that time, [in the middle of the 1990s] my concerns related to the environment became stronger. I, at that time, was teaching Nuclear Physics to several students. It was hard to me as well as to my students, when I have decided to change my scientific carrier orientation. I shall say those orientation changes have already happened [towards others researches]. Several scientists have been through this transition. However, it is not well seen by our partners [from the academy]. I have continued working at the Physic Department as well as doing physics, even though; I have started to dedicate to climate changes. After that, in 1999, I obtained some financial backing in order to do a kind of mini IPCC [Intergovernmental Panel on Climate Change], it was a “working group 2”, which has dedicated to impacting study, of vulnerability e of adaptation in Portugal, this is, by taking a settings of climate scenarios, it was intended to evaluate of impacts e vulnerabilities on several sectors [in the country]. It was an enthusiastic project, gratifying, because we were a group of 60 scientists from different specialties, different backgrounds: Physicists, climatologists, engineers, biologists, sociologists, physicians, foresters, people from the fishing area. Indeed, a great variety of people who were convinced that climate changes were for real and it was important to know in which extension the impact of climate changes would affect Portugal. Several meetings were held every month. Everyone on its knowledge field used to present working they have been developing about this subject. It was really interesting! In the meantime I, from a certain way, fell in love with this theme [climate changes] and after that become more aware, and started observe climate changes in a general context, towards development challenges e towards energy provision as well as sustainability. Broadly speaking it was essentially my pathway.

Revista Espinhaço: I would like you to comment on how interdisciplinary, this is, by incorporating other knowledge and science into the climate changes study has been evolving, mainly into IPCC reports.

It is hard to establish a date to this; however, let us say that in the first half of last century studies have characterized [disciplinary]. The university self-organization and also scientific works were highly dissociated into subjects, the same discipline which were created by August Comte and that, as a matter of fact, has obtained a hierarchy: It was considered that Physic was superior to Chemistry; Chemistry and biology, and so on. After so, "Sociology was set in a very lower level". And yet, Sociology was the science who [Comte] created the name. I think this time has completely been out of date because nowadays the challenges are in a global scale. Why are there global challenges? Because our interference, human being interference, homo sapiens interference towards environment is not only affecting locally. [In the past] it was only considered at a local level. Nowadays, it has also been considered at a local level, but now due to not only to the population (population dimension), as well as to the natural resources consumption which everybody depend on. [in addition], there is also the question about energy which is central, even though I think we are going to talk about it [during this interview] Due to all these questions there is a impact in a global scale, a impact into the "earth system" now a day. Here maybe there is the concept that in a certain way fundament and justify this interdisciplinary that you are referring to: it is important bearing in mind that there is a "earth system", with different compounds, that have been evolving throughout 4.5 billion years of our planet history. Right now we, collectively, every one (humanity) has been causing some impact on this "earth system". It is important speaking about climatic system, this system which carries several components: atmosphere, hydrosphere, cryosphere, the cold part (the glaciers, the polar ice caps). It is also important speaking about biosphere as well lithosphere! Nevertheless, there are effectively challenges in the global scale. There are global changes which are systemic or cumulative. Systemic when one is involved, as a fact, the whole system. [An example] are climate changes; another example is the stratospheric ozone lower; another example yet is related to the earth albedo alterations, and this is due to in part because deforestation and desertification. Those are property of albedo which, consequently, is an earth characteristic. On the other hand, there are the cumulative global changes that, even though there is no much significance to the global scale, global changes happen in several places in the world which ending into a status of global expression. Let us consider water, for example; questions linked to desertification, to the deforestation; to the isotope cycle – interference that we have been causing to the isotope cycle of phosphor: because of all fertilizes components which are necessary to grant [earth] productivity, human being has disturbing in a gigantesque manner a cycle that once was happen naturally. [It is possible to say yet] aerosols that, up to now, in certain regions in the world, in China, for example, aerosols in China are a high complex problem, with great negative implications over human being. On the whole, I think that interdisciplinary is a result of the fact that there are global problems.

Revista Espinhaço: Professor Filipe, altogether with your mini IPCC, have you become focus towards actions in the adaptation field in a momentum and global contexts where agenda of international researchers was mainly concerned about mitigation. What may explain the option for this agenda of specific research?

This is a very good question. In the year 2000, the European Union rotative presidency was granted to Portugal. My group and I were called to participate over negotiations, in Brussels, about climate changes, IPCC subject of study, but, above all to treat of board convention of unite nation related to climate changes and Kyoto protocol. At that time, [Kyoto protocol and the convention board] were not set in force, and neither ratified towards sufficient numbers of countries. It was only discussing mitigation; it was only about emission reductions. It was politically incorrect, for European Union, at that time, considers adaptation. People convictions who participate of those officials negotiation with representative people of United Nation Convention Board were that it would not be [necessary] cave in to pressure [adapt to], because we were going to get emission reduction in a way to control climate changes. I have always been very suspicious [laughing], and this vision is something very intriguing, if humanity is really going to get or not to reduce its dependency of fossil oil. It is time for not provoking a dangerous interference over the climate! Nowadays, the fossil oil dependency, as primary energy resources, represents 80% [of the energetic matrix] all over the world. It is a gigantesque value! Of course, there are some countries that [this proportion] is higher, in others, lower. In Brazil, it is much lower than 80%. The European Union, on its count, get the media of 80%, even though all effort they are spending towards renewable energy. [But] is it possible that human being will get a chance to stop consuming this gigantesque amount of fossil oil, which is the mainly cause of climate changes? Another cause is effectively deforestation and what about, countries like Brazil, Indonesia, and others with great extension of forests, evidently, has got a very important function to redeem, stopping deforestation. However, by considering fossil oil is a doubt I have taken to me, if we are really going to get [diminishing our dependency] or not.

Revista Espinhaço: Professor Filipe, I would like that you also comment about energy concerning. Brazil, nowadays, has got a fantastic potential, however, we are living in a kind of energy crisis, even though, after discovering oil at pre-salt layer in the ocean. What can you say about it?

Before that [answering your question] I would like to say that energy is a fundamental element of our development paradigm. Our development model is each time more globalize. We have traveled from continent to continent, as I traveled yesterday from Europe to South America, and cities are the same. The paradigm is the same: we have got the

same kind of buildings, transportation, infrastructure; this is Asia, or even Africa (in great Africa regions, nowadays), or in North America. In order to support this paradigm it is essential to use energy, it is necessary to have a relatively easy access to energy sources and this sources might be relatively cheap. Nonetheless, without this paradigm [maintenance] it is not possible. Hence, [I will answer your question] Brazil has got a very comfortable position, because in terms of produce electric energy, there are considerable hydrous sources. Brazil capacity of generates hydroelectric energy is higher! On the other hand, in terms of liquid fuel, [Brazil] has got ethanol, which is a very important energy source. It still has got petrol resources at the pre-salt that, even though, they are very difficult to exploit harder than petrol wells from Saudi Arabia, [The latter are in a shallow place than Brazil's wells], [the exploitation] seems to be more a question of organization and investment, than something else. Brazil has got a great capacity of renewable energy, principally, solar energy, aerial energy in the northeast (I have not been well informed, however, I think that it will happen in the northeastern), and, evidently, Brazil has already gotten some amount of nuclear energy. I consider that it is very important diversifying energy resources as well as aligning them. In order to give a concrete example, there are people who defend that Europe should go on to become only dependent of renewable energy. However, there is Norway which is an extreme case. It can be said that it is much more extreme than Brazil in terms of energy availability, of hydroelectricity, of hydroelectric production capacity, of aerial energy exploitation and of solar energy (those are sources that has got intermittency problems). There is still the question related to the daily energy cycle of consumption. It is possible to take Norway, however, as an energy provider [to Europe]. All in all to affirm that is very important to diversify all forms of energy as well the energetic mix. Overall, by considering Brazil, I think to bet on renewable energies and less on oil fuel which mainly contributes to a sustainable planet, with a more benign climate towards future generations.

Revista Espinhaço: Professor Filipe, What are your expectations to the fifth IPCC report?

I have participated of the preparation of this fifth IPCC report, in the work group 2, about impacts, vulnerabilities, and adaptation measurements, more specifically on the chapter about costal zones. I should reaffirm that there was an effort truly Hercules, I should say, from who lead the report preparation process, in the sense of grant that pronouncement made were qualified pronouncements. By considering uncertainty questions related [in this process], it is very important in order to know the existence of climate changes, they were quantified as "extremely probable", "very probable" and "probable", etc. Other posture adopted in the report is that affirmation done were "tresable", which means that the reader by reading this information can be able to know which its origin is, track its origin. The great consideration was, however, demand that from authors and from professors that all affirmation should be done following some reference, mainly from a scientific paper, which allow a later consult after reading the report [in case of the reading preference]. There is a third aspect to be presented towards the report composing which was related to "attribution". This is, all phenomena studied must to be clearly attributed or linked to climate changes, this is, and its relationship of cause and effects must be established in a very clear way, identifying everything which was really a consequence of climate changes. For example: the impact of heat waves over human health, the impact of men over temperature, distribution related to certain diseases transmitted by vectors (as Dengue, Malaria), and yet the impact of climate changes over the risk of forest firing. There are several things [phenomena], admittedly, that there is no relation to climate changes.

Revista Espinhaço: Professor Filipe, in order to finish our interview, Could you summarize a few ideas that you have shown us, leaving a final message to our readers?

Well, I will use for the first time an expression that I haven't used yet and lastly, it will be one the themes of the next book I have been writing. It is the following: One the human relationship characteristic is solidarity. It is one of our species characteristics and it is what we have got to the base of moral code. The problem is that we have share the same kind of feeling or practices towards future generations. We have got an enormous difficult to project what will be happening from 100 years from now, which there is no direct relation to us. We do not know what our grandsons will live at this moment [of human history and earth], in short a little more than this. We wish all sons and grandsons will have a happy life, but this will happen in a different time. We are worried, mainly, with our generation. We are solidary considering our generation, everything else which we should designate as "pos-solidarity", this is, an solidarity towards future generations, is not the same.

Revista Espinhaço: Professor Filipe, we, from Espinhaço Magazine, appreciated indeed for this learning moment as well as for the interview you granted us with. Thank you very much!