European Research Council erc

Step 1 Evaluation Report

CONFIDENTIAL

Call reference	ERC-2011-AdG
Activity	ERC Advanced Grant
Funding scheme	
Panel name	PE10 - Earth system science
Proposal No.	290889
Acronym	WATERGY
Applicant Name	Demetris Koutsoyiannis
Title	WATer pathways towards the non-deterministic future of renewable enERGY

PANEL MARKS

1. Intellectual capacity, creativity and commitment of the PI *To what extent is the Principal Investigator's (and any Co-Investigator if applicable) record of research, collaborations, project conception, supervision of students and publications ground-breaking and demonstrative of independent creative thinking and the capacity to go significantly beyond the state of the art?* *Is the Principal Investigator strongly committed to the project and willing to devote a significant amount of time to it (they will be expected to devote at least 30% of their working time to the ERC-funded project and spend at least 50% of their total working time in an EU Member State or associated country)?*	**3.0 / 4**
2. Ground-breaking nature and potential impact of the research; feasibility *To what extent does the proposed research address important challenges at the frontiers of the field(s) addressed?* *To what extent does it have suitably ambitious objectives, which go substantially beyond the current state of the art (e.g. including inter- and trans-disciplinary developments and novel or unconventional concepts and/or approaches)?* *To what extent does the possibility of a major breakthrough with an impact beyond a specific research domain/discipline justify any highly novel and/or unconventional methodologies ("high-gain/high-risk balance")?* *To what extent is the outlined scientific approach feasible?*	**2.25 / 4**
Total mark	**5.25 / 8**
Has the proposal passed the thresholds (2/4) for criteria 1 and 2?	**Yes**

PANEL COMMENT

This evaluation report contains the final marks awarded by the ERC review panel during the first step of the ERC Advanced Grant review. The panel based its appraisal on prior individual reviews conducted by panel members.

The panel closely examined all the individual review reports and, while not necessarily subscribing to each and every opinion expressed, found that they provide a fair overall assessment. The comments of the individual reviewers were the basis for the panel's discussion. In addition to these individual reviews the final conclusion of the panel is included in this Panel comment.

The PI is extremely well known internationally, with an excellent publication and citation record and important international scientific responsibilities, and is recipient of prestigious awards.

The proposal is difficult to understand and it is unclear to see what work will actually be done. Many of the statements are more philosophical than technical, and no details are given on how the different activities will be connected. The important role of water as an energy source is unquestionable, but what is the novelty of the work to be done? Similarly, the concepts of entropy, or the stochastic description of hydrologic phenomena, are of fundamental importance, but the panel could not understand what the proposed work will do to improve the current application of such concepts to reality.

Overall, the panel considers the proposal of good quality, however not at a sufficiently high position in the ranking order to be retained for Step 2.

REVIEWER COMMENTS

The following individual reviews have been carried out independently prior to the panel meeting and do not necessarily reflect the panel's final opinion

Reviewer 1

1. Intellectual capacity, creativity and commitment of the PI:

The PI is extremely well known in the hydrologic community. He is a leader in the field of stochastic hydrology and extreme events. He is currently full Professor at the University of Athens in Civil Engineering, and has made several important contributions with original ideas about uncertainty, entropy and representation of hydrologic reality in a stochastic framework. He has been associate editor of prestigious scientific Journals, like Water Resources Research, J. of Hydrology, etc. He has published about 85 papers, with a total citation of about 1046. He is the head of a good group (staff of 18) in his University, and has directed 9 Ph.D. He is often an invited speaker at international conferences (the next one is in Melbourne in July this year), and has organized a large number of conferences. He is well prepared and innovative for receiving an ERC grant.

2. Ground-breaking nature and potential impact of the research; feasibility:

The real content of the project is very difficult to understand, it may be necessary to go to step 2 and have the full proposal to really figure out what is the scientific content of the proposal. The initial argument is that water is implied in energy production, and agriculture, domestic use etc. For energy production, the applicant insists on water storage in twin-dams, where water is pumped up and turbined down to produce electricity, with an excellent efficiency. He insists that such equipment must go in pair with the development of solar and wind energy, which is absolutely correct. But where is the originality ? This has been advocated for years. His second point is that hydrology (and climate dynamics and modelling) is by nature stochastic, and cannot be treated by deterministic models, as is the case today. Stochastic hydrology is the key area of expertise of the applicant, and this must be considered very seriously. To develop this concept, the proposal is more philosophical than technical, and thus very hard to follow. He advocates the use of the concept of entropy in hydrology, but this is not new, e.g. one of my students defended a thesis on hydrology and entropy 20 years ago. In my view, modelling natural phenomena like climate and hydrology is a combination of deterministic modelling and stochastic concepts. It is true that turbulence, for instance, can be modelled by a combination of stochastic rules (e.g. in the lattice-gas models). It may well be that the applicant has in mind some kind of revolutionary concept to develop a new kind of models, but it is not clear from what I read. I suggest that this proposal should be accepted for step 2.

Reviewer 2

1. Intellectual capacity, creativity and commitment of the PI:

The PI is a well respected hydrologist having won the Henry Darcy Medal of the EGU in 2009. The PIs work ranges broadly, and in his own wods, he works to debunk ingrained scientific dogma when it is incorrect. The PIs citation statistics are modest, although his citation rate has apparently been increasing rapidly in recent years.

2. Ground-breaking nature and potential impact of the research; feasibility:

This is a highly ambitious project aimed at completely rethinking the climate change problem and its solution. In the intitial stage, the PI wishes to debunk what he views as a series of climate change myths, the chief aspect being that climate change is predictable and that currect thinking is an impediment to progress. In stage 2, the PI wishes to construct a new paradigm demonstrating the utility of water as a sustainable energy resource. While ambitious and potentially important, the PI bases none of this research on current understanding and wishes us to accept that brand new thinking is required in all aspects of the proposed work. I find it difficult to accept that decades of climate change and hydrologic research have proven nothing useful

Reviewer 3

1. Intellectual capacity, creativity and commitment of the PI:

Although he has produced interesting papers most of them as first author D.Koutsoyannis' work has still a relatively limited impact.

2. Ground-breaking nature and potential impact of the research; feasibility:

The idea of developing a project examining the central role of water in renewable energy production in parralel to its other uses is interesting. However, the proposed approach based on "a novel mathematical framework to quantify uncertainty in nature" including the development of "a new hydroclimatic theory" is not, as described, fully convincing.

Reviewer 4

1. Intellectual capacity, creativity and commitment of the PI:

The PI has a good research output as evidenced by the volume of papers and the quality of journals they have appeared in, and ny bibliometric indicators. The number of doctoral theses supervised (at least 9) seems modest given the period over which the PI has been a member of academic staff and the size of the research group that has been supervised. The level of research funding seems patchy – despite the statement of "generous funding from Greek authorities" it seems that current funding is small ("one other research project, which has a small budget and will end in 2013"). There is good evidence of international peer recognition (mostly via journal editorships) and one major international prize.

2. Ground-breaking nature and potential impact of the research; feasibility:

This is a poorly-structured research proposal on a number of levels.

First, in order to promote one's own research area it is not necessary to attack other research areas, especially when that attack seems unjustified. One of the research activities listed is "demonstrating that climate and the impacts of climate change cannot be deterministically predicted". This does not need demonstrating as it is very widely understood in recent times (and not so recent times) and at least three levels of uncertainty are frequently incorporated in predictions – initial value uncertainty, scenario uncertainty and model uncertainty – and characterising, rather than attempting to eliminate, uncertainty, is a defining feature in much recent climate research. Much of the material in the introduction to 1d seems a distraction.

A second, and more serious, concern is the lack of specificity within the proposal, both concerning the tools that will be used and the data that will be exploited. As example, Activity D talks of quantifying "the interdependencies between water availability and climatic conditions" – but what data will be used for this, for what regions and for what periods? And then in the same section the plan is to "integrate hydrometeorological models for short term prediction of wind and sunshine and link their results to the management of renewable energy production". But, again, what models will be used, on what scales, and what tools will be used to link these to management of energy production? The word "model" is, without qualification, almost meaningless as there is such a large hierarchy of concepts and tools that can be classed "models". And in Activity E it is proposed that a "unique large-scale hydrosystem extended in two major river basins interconnected through diversion projects will be explored". Again, which river basins will be used (surely the PI knows) and precisely what will be unique about the assessment? For all these examples, there is ample room for brief descriptions of the methodology, especially given that there is quite a lot of unnecessary information given (for example, the quotations and see point 1). Without this information, the proposal scope, ambition and feasibility of the proposal remain unclear.

Finally, some parts of the proposal disconnected. As an example, there is certainly some value in exploring entropy constraints, but no detail is given in Activity A and B on how it will be implemented in the context of this particular proposal, and how this will feed into other activities. Another example is that the introduction to the synopsis makes strong statements on the potential for pumped storage schemes, as if they were to play a key role in the proposal. These are hardly mentioned explicitly again in the proposal, even in Activity E, where a proof of concept is proposed. It would have been desirable to present some elementary estimates here, to establish how much "unused" solar and wind energy was likely to be available for pumped storage, and the kind of volumes/heights of water that were envisaged to be exploited, to establish general scale and feasibility.

The work would, potentially, have a large impact beyond this research domain, especially in renewable energy engineering.