Ossian House
2 Coal Neuk Corner
Tranent
East Lothian
EH33 1BF

24/04/2020

National Planning Framework 4

Dear Sir/Madam,

NPF4 CALL FOR IDEAS: BIOCARBON* AND CAPTURE

Please find attached my submission for The National Planning Framework 4.

The proposal is set out, in brief, together with responses to the questions in the submission.

This is a Climate Change Proposal. The target of Scotland being "Carbon (Dioxide) Neutral" by 2045 is an ambitious one. My view is that, without multi-stream efforts, the target will be missed. I am also concerned that the target of Scotland being carbon (dioxide) neutral is a fundamentally 'inward-looking' one. Climate change has no boundaries. Scotland led the way in use of fossil fuels. Now it is time to deliver answers to stabilising climate change (reversing it is unlikely) that can be applied internationally.

Becoming carbon negative is going to have to be the real target. In fact, we in Scotland have an international responsibility to help other countries, particularly less developed economies. We can contribute, perhaps by "gifting" our 'negative carbon dioxide' to them. For example, by twinning Scotland with Malawi, the joint objective would be to make both countries carbon neutral in the 2045 timeframe.

My proposal is one that delivers a homegrown solution that could be replicated in other countries (with economic benefits). It has the twin aims of being "low-tech" and, just as important, being relatively low 'energy-hungry' compared to other "high-tech" carbon and capture storage techniques.

I am going to be honest and say that the "planning" aspect of my proposal is a secondary one to climate change. I know that planning is a criterion for consideration. However, although the proposal is 'light' on the planning element, it would require, in future, a great deal of planning, change of land (and marine) use, and so the panel will please bear that in mind. These ideas potentially have continental scale.

In the first instance, my proposal will require designation of a physical plot of land and buildings which can be on repurposed land. I would like that to be in East Lothian, probably the proposed Cockenzie Energy Park. Later in the consultation process, the planning aspect can be addressed in more detail. I would need assistance

* This proposal uses trees as a baseline; it describes alternative biocarbon capture methods.

with that. Funding will also be needed. Investment in low-tech solutions to climate change is just as valid as high-tech ones.

My ideas are unconventional and cannot claim to be unique. However, to my knowledge, no one else has made a similar detailed proposal. Have they?

We need a free-thinking element to climate change, which is a good example of a wicked issue. Wicked problems are not solved by, do not yield to, conventional thinking or just collecting “more data”. My written proposal has been prepared in a short timeframe, although a lot of thought has gone into it. It is not an exhaustive list of all of the benefits of long-term carbon capture, income generation, food production and employment.

In conclusion, please read and enjoy the proposal.

Yours sincerely,

Michael Allan B.Sc., Ph.D.

Water*Pro* Environmental Limited

Biography of Dr Mike Allan

https://www.linkedin.com/in/dr-michael-mike-allan-waterpro-3162534a/

Cockenzie is an ideal location for Biocarbon research – land and marine access.

PROPOSAL FOR NATIONAL PLANNING FRAMEWORK

DR MICHAEL ALLAN, WATERPRO ENVIRONMENTAL LIMITED

PRIVATE AND CONFIDENTIAL

A National Centre for Biocarbon* Capture and Storage

Executive Summary

Climate change is here to stay. Tackling climate change in a practical way has only really just begun. In this short proposal I want to bring forward an idea that I have been thinking about for some time. To summarise, this is an early stage, but exciting, proposal of **Carbon Dioxide Capture At Ambient Temperature and Pressure**. It qualifies as a National Objective due to its climate change relevance and because it also meets the criteria of being a longer-term project with global significance.

Author Biography

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I trained as a geologist at Dundee University and went on to get a PhD in geochemistry. I have been surprised at the lack of engagement geologists appear to have had regarding climate change as a "game changer" in the respect of effect on population, rural and urban environments and the global economy.

In this proposal the term CARBON is used in the sense of CARBON DIOXIDE, one but not the only greenhouse gas.

In my professional life I have excelled in problem-solving by unorthodox thinking. I specialise in "thinking out of the box", tackling "wicked" problems and identifying relatively simple solutions to complex problems. In that respect I am tenacious. I am also, I believe, pragmatic and realistic, meaning ideas that I propose are thought to be viable, can be shown to have value, but may need developed and modified to suit their purpose.

This "Call for Ideas" allows me the opportunity, as an individual, to share the outline of my ideas. May I ask that the ideas proposed be respected as being private and confidential and as the intellectual property solely of myself. I present my ideas in "bullet" form and will be happy to provide more detail should the idea go forward.

INTRODUCTION

Scotland played an absolutely fundamental role in the establishment of geology as an applied science. It was James Hutton in his “Principles of Geology” who first laid out how the Earth had evolved, by simply looking around him and trying to work out how the rocks he saw had been formed. I am of the opinion that we in Scotland have a duty to lead the world in climate change stabilisation (if not reversal). Scotland was one of the first industrialised nations, and we have played a large part in the initiation of climate change through early adoption of fossil fuels and so production of large quantities of carbon dioxide. True, Scotland is now only 1% of the contribution of emissions, and we are making great strides in harnessing renewable sources of energy.

I would argue, however, that Scotland should, if possible, go much further and not just achieve “carbon neutral” by 2045, but go carbon negative. I see huge potential in the investment in technologies that could be applied globally to counter increases in carbon dioxide levels. This proposal is a “low-tech” version of carbon (dioxide) storage and is one which could, through international cooperation, have some considerable long term additional economic and social benefits. Carbon (dioxide) capture and storage is thought to be a “trillion dollar” industry of the future. That, in itself, merits any idea coming forward and being explored for its viability.

Tackling climate change is a major theme of NPF4. Scotland is a leading light in being innovative in many ways. I think that Scotland can and must be open to ideas for carbon (dioxide) capture that have global potential. The planning part of the proposal will be to be establish as large working laboratory in the East Lothian area, probably in one of the former “Salt Pans” (e.g. Cockenzie) together with the necessary buildings and facilities required. I am setting out my idea in brief. Further detail can be provided, if requested.

BRIEF OF PROPOSAL

Most of the proposed methods of “carbon capture and storage” are high-tech and expensive to establish and operate. Many are, themselves, energy intensive. Such energy as is required to capture carbon dioxide then has a knock-on effect to the extra generation capacity required. That is a vicious circle. One could rightly ask if the net effects of high-tech CCS are really even beneficial.

What is need is a low tech, low energy way of capturing carbon. By carbon I mean carbon dioxide. It must be permanent capture. It should not place unnecessary extra ‘energy burdens’ on the energy generation infrastructure.

Any energy that is required should be waste energy, or renewable. Part of the planning application might be for the positioning of small-scale wind turbines.

A by-product of the CCS should, if possible, have commercial value. It could subsidise the costs of CCS.

The method should be achievable at “ambient temperature” or as close as possible. Energy may be consumed seasonally (e.g. winter).

Any new method should have global potential and be capable of being deployed anywhere. A key part of this idea is that Scotland *may* be a place to prove the concept, but other parts of the world may be better disposed. A commonwealth can come in handy.

Trees as carbon stores are not considered here. Deforestation and population pressures rule out their contribution to future carbon capture potential. More rapid methods of carbon capture are required.

1. INORGANIC METHOD. Crystalline calcium carbonate (calcite & aragonite).

   Throughout geological history, LIMESTONES have been the repository of, still are, vast amounts of atmospheric carbon (dioxide) locked up as calcium carbonate $CaCO_3$. Apart from their commercial value as a building material they are simply a “given” of the natural landscape.

   The natural, geological, formation of limestone is an extremely slow process, and a synthetic proposal is likely to be too energy intensive and so be unsuitable for carbon capture and storage.

   https://www.frontiersin.org/articles/10.3389/fenrg.2017.00017/full

2. BIOCARBON ORGANIC METHOD 1.

   Invertebrates with a calcareous shell are a different proposition. There is an invertebrate for practically every “climate”. These are living organisms that are, fast growing and are natural ‘factories’ for carbon (dioxide) extraction from the environment.

   The calcareous shells of micro-organisms, of snails, of marine bivalves (muscles, oysters) are not only a permanent repository of carbon dioxide, but the organisms themselves – the chemical factories if you will – are edible. In addition, marine bivalves are filter feeders, meaning they actively scavenge water and clean it as they extract nutrients from their surroundings.

   It ought to be possible to create “artificial” environments in which the right type of invertebrate can be grown, rapidly, and harvested. The edible portion can be processed as food. The carbon containing shell can be set aside as waste, possibly repurposed as a building material.

3. ORGANIC METHOD 2.

Certain algae and plants are very fast growing and are natural ‘repositories’ for carbon (dioxide). For example, many weeds and in fact Rhubarb can grow exceptionally quickly.

The organic (and sugar) content are either foods or fuels. It ought to be possible to create “artificial” environments in which the right type of “plant” can be grown, rapidly, and harvested. The edible portion can be processed as food. The carbon containing nonedible parts can be used as biofuels. At present biofuels tend to be monocultures of crops that are potentially not great for the environment, compete for land use with edible crops. They are also susceptible to “disease” and therefore a range of biofuel sources is the best option.

ORGANIC METHOD 2 has some drawbacks in being light dependent (50% efficient): meaning, during the day these organisms fix carbon, while at night they respire and do not.

A small-scale development would seek **to prove or disprove the capability** of methods 1, 2 and 3. Large scale versions might, in future, use the waste heat and CO_2 of conventional power stations.

SUMMARY

My proposal, for (Non-arboreal) **Biocarbon Capture and Storage**, is an alternative permanent carbon storage mechanism. Carbon (dioxide) locked in a shell and in limestone is forever. We need ideas like this to become substantial, if necessary, public, industries, and to be the new normal.

Sustainable economies for a planet with in excess of 10 billion people will need strategic planning. We need to invest in, and take reasonable risks on multiple, mostly feasible, but also some longshot, ideas. We were responsible for the beginnings of global warming when we kick started the industrial revolution, exploited coal, gas and oil reserves, and colonised the world. Now we need to export answers and take a lead in finding the carbon store that stabilises our way of life for generations to come.

Scotland can prove the principle. The idea is fundamentally valid, can pay for itself in the long run. It can be exported. Scotland can provide ideas for carbon stores that far outweigh our 1% carbon dioxide contribution to the atmosphere. Food production is a demonstrable by-product of one or all of the biocapture processes. I propose that biocarbon stores are the buffer of choice, the way forward. They are an insurance policy for the reality that human activities will never be carbon (dioxide) free.

All of these ideas have the potential to be exported.

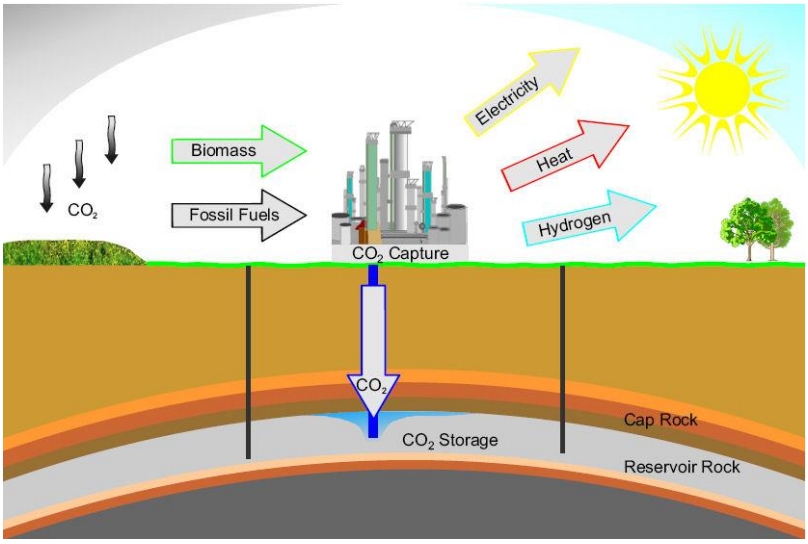
As well as funding for a Biocarbon Research Facility, land and marine areas will need to be designated as biocarbon stores in future. In the first instance, the former COCKENZIE power station site can be home to my planned research and proving facility. It has the attributes of already being part of a plan including an energy park and is coastal for the marine research.

NPF4 is the right mechanism to focus on starting this journey.

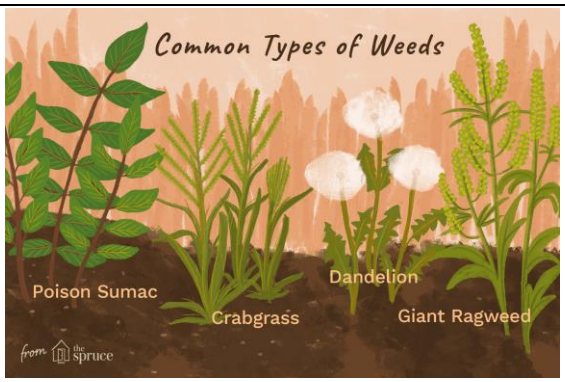
Time is of the essence. We do not have the physical space onshore in the UK for industrial carbon capture and storage: the inherent risks of that activity on land or in a marine environment seems unattractive. Non-arboreal biocarbon capture and storage is not energy free, but it is low risk and compatible with human habitation in the UK. It has very long-term sustainable potential. The proposal has global continental scale objectives.

Cockenzie Site: planning for a Biocarbon Facility will be needed.

Appendix



Expensive, High-Tech, Energy Intensive (Risky) Carbon Capture and Storage.



Inexpensive, Low-Tech, Low Energy, Low Risk Carbon Capture and Storage.

When the first high-tech CCS reservoir ruptures and releases millions of cubic metres of CO_2 back into atmosphere, mankind will wish the low-tech options were used. In fact, both solutions will most likely be needed, and are, in some respects, complementary.