

Institution: Buckinghamshire New University		
Unit of Assessment: 7 Earth Systems and Environmental Sciences		
Title of case study: Effective management of natural resources resulted in climate change mitigation strategy		
Period when the underpinning research was undertaken: 2012 – December 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Prof Florin Ioras	Senior Lecturer Professor Conservation and Sustainability Director of Enterprise and Research	2002-2010 2010 to 2019 2019 to current
Dr Ioan Dutca	Research Fellow	2012 to current
Period when the claimed impact occurred: 2014 – December 2020		
Is this case study continued from a case study submitted in 2014? N		
Summary of the impact (indicative maximum 100 words) Research conducted at Buckinghamshire New University (BNU) has influenced decarbonisation, environmental and government policy and has led to improved management of natural resources. The research enabled the establishment of decarbonisation and climate mitigation schemes and facilitated private sector access to funds. It also led to changes in the EU, Ghanaian, Zambian and Malaysian Governments' decarbonisation policies. Effective natural resource management has thus resulted in international action to mitigate climate change. Our research demonstrated that decarbonisation approaches in the wood related sector, combined with effective measures of biomass, leads to mitigation of impacts on climate change. Consequently, the Malaysian Government, Ghanaian Government, European Islands Authorities and Romanian Government amended their national policies to motivate landowners and wood-based resource users to include mandatory Monitoring Reporting and Verification criteria. BNU researchers co-established with a number of businesses in European Islands, Ghana, Romania and Malaysia support for carbon mitigating plans, resulting in the total investment of £2.5 million towards the decarbonisation of rubberwood sawmilling in Malaysia, decarbonisation of coastal Tourism in European Islands, and the protection of forest in Romania (200,000 hectares) and Ghana (400,000 hectares). Our research underpinned a natural resources-based climate mitigation scheme resulting in the investment of an additional £1.4 million in decarbonisation initiatives.		
2. Underpinning research (indicative maximum 500 words) The world's natural resources influence climate through a complex set of physical, biological and chemical processes that affect the planet's energy balance, atmospheric composition and hydrological cycle. In turn, climate change impacts upon resource availability leading to interlinked interactions and feedbacks between natural resources and climate. Florin Ioras and Ioan Dutca have led research to improve the understanding of these processes, and this research has subsequently allowed decarbonisation initiatives to be crafted that effectively mitigate climate change. The terrestrial ecosystems, with special emphasis on forest ecosystems, are important components of the global carbon cycle. They contain immense reservoirs of carbon and can		

remove significant amounts of CO₂ from the atmosphere, so contributing to the mitigation of climate change. Although there has been some research into carbon storage in lowland tropical forests, observations in temperate ecosystems are limited.

Work conducted by Ioras in Zambia and Ghana on REDD+ (Reducing emissions from deforestation and forest degradation) between 2014-2016 has influenced the national Forestry act and enabled the country to trade carbon credits worldwide [1]. In 2016, Ioras co-authored a study on non-conformities in several EU countries including the UK, concluding that minor non conformities were more frequent and were influenced in occurrence in the majority of the cases by country economic development [2].

An article co-authored by Ioras in 2017 reported some of the first observations of carbon storage and sequestration in rubberwood in Malaysia. This paper demonstrated that the carbon sequestered by protecting and restoring forests is considerably greater than the carbon emissions avoided through the use of liquid biofuels. This research group was the first to highlight the large land-use carbon emissions that result if forests are cleared to make way for biofuel crops [3]. Further research on carbon footprint in Malaysia challenged the green label status of rubberwood because of the inefficient processing technologies.

Climate change also impacts forest ecosystems. In 2018, Dutca and Ioras led a project that calculated that effect and subsequently the impact of climate change. The research was based upon historical data on the relationship between site exposure and biomass values, and the predicted modelling patterns that are likely to arise as climate change proceeds [4]. In 2019, Ioras evaluated the extent to which practicing architects in Malaysia were familiar with timber products as a construction material [5]. This was the first study to use observations to demonstrate how, by boosting the material's use in the construction industry, architects can support a decarbonisation strategy in Malaysia.

In 2020 Dutca and Ioras co-authored an article which demonstrated that forest carbon estimations depend on the selection of sample trees. The results help partitioners selecting the sample trees characteristics in such way that prediction of biomass is accurate and precise [6].

3. References to the research (indicative maximum of six references)

1. Ratnasingam, J., Ng'andwe, P., Ioras, F. and Abrudan I.V., 2014. Forestry and forest products industries in Zambia and the role of REDD plus initiatives. *International Forestry Review*, 16(4), pp.474-484.
2. Halalisan, A.F., Ioras, F., Korjus, H., Avdibegovic, M., Maric, B., Malovrh, S.P. and Abrudan, I.V., 2016. An analysis of forest management non-conformities to FSC standards in different European countries. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, 44(2), pp.634-639.

This article was selected as the Best paper by the *Notulae Botanicae Horti Agrobotanici* Journal for outstanding contribution to knowledge on sustainable resources management in Europe.[J]

3. Ratnasingam, J., Ramasamy, G., Ioras, F. and Parasuraman, N., 2017. Assessment of the Carbon footprint of rubberwood sawmilling in peninsular Malaysia: challenging the green label of the material. *BioResources*, 12(2), pp.3490-3503.
4. Dutcă, I., Mather, R., Blujdea, V.N.B., Ioraș, F., Olari, M. and Abrudan I.V., 2018. Site-effects on biomass allometric models for early growth plantations of Norway spruce (*Picea abies* (L.) Karts.). *Biomass and Bioenergy*, 116, 8-17.
5. Ab Latib, H., Cheong, L.W., Halis, R., Kasim, M.R.M., Yi, L.Y., Ratnasingam, J. and Ioras, F., 2019. The Prospects of Wooden Building Construction in Malaysia: Current State of Affairs. *BioResources*, 14(4), pp.9840-9852.

This article was selected by the *Bioresources Journal* Publication Award for Industrial Impact as one of the three top articles for 2019. [J]

6. Dutcă, I., Mather, R. and Ioraş, F., 2020. Sampling trees to develop allometric biomass models: How does tree selection affect model prediction accuracy and precision? *Ecological Indicators*, 117, p.106553.n

4. Details of the impact (indicative maximum 750 words)

Established forest-based climate mitigation schemes leading to government and environmental policy change

BNU co-supported and implemented forest protection projects to access funds from private forest owners in Romania. Working in partnership with the Transylvania University and Private Forest Owners Association the Public Private Partnership (PPP), and launched in co-operation with the World Bank, these initiatives brought together national business, non-governmental organisations and academia to drive climate change mitigation. In Romania, the General Manager of Husqvarna states that the partnership enabled '*...rural tourism operators in forested areas to access renewable energy*' and that it provided '*...support for different levels of energy access through a forestry based mitigation scheme*' [H]. Collaboratively, with these organisations, BNU had established a database of forest protection projects, which is used to match EU businesses interested in carbon sequestration to the most relevant forest protection projects in Romania. BNU supported a detailed assessment of these projects against community, climate and biodiversity criteria. This thorough academic assessment has given confidence to private sector investment in forest protection through environmental security outputs.

The Public Private Partnership Project [C] has allowed the Ghana Forestry Commission to generate significant awareness that has, according to their Director of Operations '*...yielded a number of new investors in the sector and contributed positively to support carbon sequestration policy at national level*' [C]. In 2016, Ioras was invited by the Ghana Forestry Commission to write quarterly market reports on tropical timber markets to support national policy underpinned by REDD+ (Reducing emissions from deforestation and forest degradation) for carbon sequestration [C]. The Director of Operations acknowledges that the reports by Ioras have '*...promote[d] our lesser known timber species and our country ambition to reduce emissions from deforestation and forest degradation*' [C]. The Project Manager of The Forest Investment Programme continues: '*At country level this project has been instrumental in supporting [Ghanaian] policy on de-carbonisation through agro-silvopastoral initiatives around the cocoa plantations*'.

In 2014, Ioras provided research evidence and debate (1) to contribute to a decision in December 2017 by the Zambian Forestry and Forest Industries Corporation to amend the Finance Law. This was to include outcomes and recommendations made to facilities for carbon credit brokerage such as the trading program called the Clean Development Mechanism (CDM), which, for the first time, address carbon benefits from the forestry sector with encouraging results. The Director of Corporate Communications at the Corporation acknowledges that the project '*has been successful indeed*' and that '*The outcomes and recommendations have been adopted and the results has [sic] been encouraging*' [G].

Influenced the Romanian government and partner organisations to consider Climate Change and forest-based climate mitigation schemes both in policy and practice

As a result of their research into allometry (6), Dutca and Ioras contributed to the drafting of scientific policy documents for the Romanian National Panel on Climate Change [A] and their work conducted on forest protection and reforestation supported the integration of sustainable development principles into their definition and implementation. Similarly, through Norwegian FORCLIMIT programmes, Dutca and Ioras provided presentations and draft policy documents to staff responsible for informing Romanian government bodies on climate change; these included EC DG Research and Innovation, the European Science Foundation and the International Union for the Conservation of Nature. As highlighted by the UNECE report '*The influence of the research carried out by the carbon group at Buckinghamshire New University has ensured that forest policy, and the potential of carbon*

sequestration trades, are now being considered in depth alongside potential solutions to the problem such as improved biodiversity conservation and the role of Carbon resource for Romanian [sic] economy'[I].

The research has also been used as evidence in drawing up the Romanian FORESTRY Act in 2018; and has been incorporated into national and international strategies (e.g. National Research Council of the National Academies 2010). In Romania there was explicit reference to Buckinghamshire New University's carbon sequestration and allometry work by Dutca (http://www.mmediu.ro/app/webroot/uploads/files/2015-09-24_Raport_Mediu_CRESC_final.pdf) in advice received by the Romanian Government on drafting a biodiversity and conservation and forestry-based climate mitigation scheme for private landowners. The Romanian Academy of Scientists acknowledge that *'A number of IP components developed ... in the field of forest certification, biodiversity conservation and carbon sequestration have improved the sustainable management of forest, the performance of carbon sink and facilitated the transfer of carbon credits value to land restoration projects'* [A].

Supported EU and Malaysian economies through decarbonisation of sport marinas, carbon storage in temperate forests and the mandatory use of timber in housing policy

The underpinning research has impacted both the EU and Malaysian blue economies respectively. After the reports on socioeconomic impacts in European islands for 2030–2100 were published [D], Ioras was invited to lead a project on decarbonisation of sport Marinas in Europe, where he argued that climate change impact on sport marinas combined with decarbonisation initiatives will bring benefits to the marina and the surrounding areas [E]. As the President of the Associacao Comercial E Industrial Do Funchal, Madeira attests, *'[BNU's]...teamwork with over 20 national and international organisations has enabled our Marinas to deploy a pro-active resources [sic] management approach, based on sustainable water use and adaption of waste management systems aided by green technology.'* The President continues *'The Madeira Chamber of Commerce and Industry...'* estimate the *'...financial/economic output as a result of collaboration has a total... estimated value of around Euro 1.1 million. This takes account [sic] of the environmental security outputs and the sustainability of our marinas'* [B].

The research that quantified carbon storage in temperate forests [3] supported the Romanian Government to develop the *'...protection and administration of environment[al] components for sustainable development'* and to make *'improvements... [to the] monitoring system of environment[al] factors'*, all key elements of the Romanian National Development Strategy [A]. Over the period 2015 to 2019, the scheme has resulted in the investment of over US\$1.6 million in forest protection and reforestation activities across Romania [A], of which the Brasov County Councillor *'...acknowledge[s] a total value of avoided emissions of about 620,000 tons of carbon dioxide'* [C]. About the work delivered by the team at BNU he concludes *'Your team work on sustainable management that support [sic] our national initiatives for meeting the Paris Agreement is commendable'* [A].

In 2018, Ioras provided research evidence and debate to contribute to a decision in December 2018 by the Malaysian Government to amend the House Law to include mandatory use of timber based products in their housing policy, which for the first time addresses carbon emissions from this sector. The Senior Director involved states *'Your work on timber use in domestic dwellings has been instrumental to support the amendment of House Law. The department... is undertaking the necessary steps to evaluate the existing policy related to the matter'* [F]. This policy amendment ensures that the timber-based products used in Malaysian properties contribute to the sustainable use of natural forests due to 7% increase in wood use in 2020 [F].

5. Sources to corroborate the impact (indicative maximum of 10 references)

- A.** Letter from RNP, Transilvania University & Romanian Academy, Brasov County Council.
- B.** Letter from Madeira Chamber of Commerce.
- C.** Letter from Ghana Forestry Commission and Ministry of Finance Ghana.
- D.** Soclimpact Report.
- E.** Project Award letter NA
- F.** Letter from Ministry of Housing and Construction Industry Development Board
- G.** Letter from Zambia Ministry of Forestry
- H.** Letter from Husqvarna
- I.** UNECE report
- J.** Journal Award Letter *Notulae Botanicae Horti Agrobotanici Cluj Napoca* and Journal Award Letter *Bioresources*.