



Global Environmental Change: Economic and Labour Market Implications for Small Island Territories

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Rising sea levels threaten coastal communities and trigger wholesale evacuations. Changing atmospheric conditions reduce rainfall and exacerbate flash floods. Ocean acidification leads to the collapse of fish stocks. Salt water intrusions prejudice water supplies and jeopardise crops. Most predictions of environmental change portend a significant impact on island environments throughout the world, including the extinction of endemic species and the wholesale depopulation of island communities (e.g. Tompkins et al., 2005). Stark impacts include the wholesale ‘drowning’ or ‘disappearance’ of such small island states as Kiribati, Tuvalu, the Marshall Islands and the Maldives (e.g. Farbotko, 2010).

Already susceptible to environmental impacts, and with fragile economic systems, the world’s numerous small island states and territories are likely to experience large-scale shifts in their economies and labour markets as a result of the impact of global environmental change. Given their geographical parameters, agriculture (including viticulture), fisheries, tourism and transportation cut across most small island states and territories as four critical economic and labour market sectors, deserving special research and policy attention. So much is at stake.

How, then, does a policy maker, an industry investor, an employer or a trade union official in a small jurisdiction like Malta make sense of the considerable data and science about environmental change (including climate change) in order to make smart decisions about future trends and needs? How can we develop a better understanding of the implications of global environmental change on tourism, air/sea transportation, agriculture and fisheries in Malta? And how does this knowledge and methodology help develop a template that can also

be profitably utilised in other small island states and territories?

To attempt a tentative but legitimate answer to these burning questions, an international symposium was held at the Valletta Campus of the University of Malta from December 1–5, 2014 (CLS-IES, 2014). The event was based on a collaborative effort between the Centre for Labour Studies and the Institute of Earth Systems, both at the University of Malta; along with the University of Prince Edward Island, Canada (through its Climate Change Lab); the University of the West Indies, Caribbean; and the Smithsonian Conservation Biology Institute, Washington DC, USA. This symposium brought to bear leading-edge environmental science *not* for its own sake, but in direct and specific application to the economic and labour market predicament of Malta as a small island state, facing the brunt of the impacts of global environmental change.

Four speakers of international repute flew into Malta to present keynote addresses: Dr. Adam Fenech (Prince Edward Island, Canada) on climate change; Dr. Tony Shaw (Ontario, Canada) on viticulture; Dr. Daniel Scott (Ontario, Canada) on tourism; and Dr. Keith Nurse (University of the West Indies, Barbados Campus) on climate change in the various small island states of the Caribbean region. At the Malta end, four carefully selected local experts were commissioned to prepare dossiers about the specific local implications of environmental change on four distinct socio-economic sectors: air/sea transportation, tourism, fisheries and agriculture (inclusive of viticulture). These four resource persons – Prof. Maria Attard, Prof. Andrew Jones, Dr. Leyla Knittweis and Mr. Tony Meli respectively – have subsequently revised and edited their dossiers to fit the remit of this journal, also in light of comments

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by anonymous reviewers. We have, after successful peer review, also accepted the manuscript submissions of two other presenters at the same symposium – Dr. Saviour Formosa and Dr. Charles Galdies – bringing the total of papers in this collection to six.

In its frenzied pursuit of economic growth, society faces one of its greatest hurdles yet: the fight against the continuous, and seemingly unstoppable, depletion of non-renewable resources. Such rapid economic growth coupled with an advance in technology began in earnest with the industrial revolution. Subsequently, this has had a tremendous toll on the natural environment. Small, often island, economies are bellwether sites for witnessing the impact of such exploitative and extractive pursuits (Bahn & Flenley, 1992; Vincent, Panayotou & Hartwick, 1997).

Mass transportation, increased agricultural throughput, the extensive use of fisheries as well as synthetic chemicals are some of the numerous factors which, although accounting for the highly advanced lifestyle that modern society enjoys, are equally responsible for much of the environmental degradation society now faces. In hindsight, one may easily recognise that economic growth has been hastily obtained at the significant detriment of the environment (Costanza, 1992). Such a trade-off between economic growth and environmental quality cannot be carried forward into the future.

The resolution to such a challenge is to recognise the critical relationship between economic activity and the environment and by using such information to make better and wiser decisions. It is granted that an element of trade-off will persistently remain. Sadly, we can no longer expect to have perfectly clean air or completely pure water. Nonetheless, neither can modern society continue to grow economically without any regard to the future supply, and the state of, natural resources.

Researchers have approached this dilemma by creating a compromise of sorts. Firstly, an acceptable level of environmental quality must be decided upon (Kneese & Bower, 2013), following which appropriate adjustments in our market behaviour must be made in order to sustain the quality of the environment whilst society continues to develop.

As society modifies and manipulates the environment to support its own growth, it in turn creates extensive threats, the effects of which are echoed worldwide. Such threats are termed ‘global pollution threats’ and are indeed difficult to control, because of both the associated range of effects as well the sheer impossibility of solutions to global threats based on single-issue campaigns or disconnected policies.

Global warming for example, which was amply discussed and referred to during our symposium, occurs due to the increased release of greenhouse gases that

are capable of trapping and maintaining an additional amount of heat in the atmosphere. According to the latest climate models considered by the Intergovernmental Panel on Climate Change (IPCC), such disruptions are highly likely to bring a detrimental decrease in the productivity of agricultural regions, extreme weather conditions, changes in the level of the earth’s oceans as well as a disturbance to global ecosystems. These events could all result in a shift in the availability and distribution of living resources; all these impacts are truly worldwide in scope.

A suitable adjustment to the above threats is difficult; even more so when taking into account the uncertainty in the current scientific understanding of global environmental threats. As a society, we are still learning about nature, market behaviour and the vital relationships that link the two together. Therefore, one task that faces us as professional researchers is to contribute to this learning process by first proposing and applying effective analytical tools, and then communicating the results obtained with such tools just as effectively.

In this thematic collection, we aim to demonstrate our support towards these assertions by formulating simple yet powerful models able to illustrate the link between economic activity, labour market dynamics and the changes we are currently witnessing in small island environments, particularly Malta. The accompanying papers illustrate convincingly how fundamental changes to the environment, such as climate change or depletion of living resources, can influence market behaviour as manifested by employment and investment decisions, among other things.

According to IPCC (2013) estimates, the global mean sea level rise for 2081–2100 relative to 1986–2005 will likely be in the range of 0.45 to 0.82 m for the worst case scenario (RCP 8.5; medium confidence), with a maximum rise of 0.98 m by the year 2100 (IPCC, 2014). Such a scenario would see nations such as Kiribati, Maldives, Marshall Islands and Tuvalu become inhabitable, while a large portion of the population of many other small island developing states could be displaced. In the case of Malta, if the observed trend in ambient air temperature at the rate of +1.1 °C for the period 1951–2010 (Galdies, 2012) continues in the future, then it could well lead to detrimental impacts on local agricultural practices as well as on the current varieties of temporary and permanent agricultural crops.

By virtue of their physical distinctiveness, remoteness and peripherality, small islands are often poorly connectable to external economic markets, continental energy grids and other production and/or distribution systems. Efficient logistical communication linkages are therefore mandatory for a thriving island economy: something which can also be seen as an opportunity (as

in the case of tourism). But such a drive to enhance connectedness is often at the mercy of the local environment, micro-climate and atmospheric conditions that can potentially affect the level of connectivity. Environmental changes that could induce the increased occurrence of strong winds and adverse sea conditions are some examples which could restrict transportation linkages and hence accessibility, unless strong investments in permanent physical links, if at all possible, are made available.

Serious environmental changes that are becoming highly significant to insular environments are arising from the ever-growing tourism industry; this is especially true for Mediterranean island tourism. It is obvious that such a growing demand on tourism opens new opportunities for the development of Mediterranean islands, including an increase in the real income and the generation of employment and wealth. This explains why island governments continuously see tourism as a promising opportunity to alleviate island communities from poverty, to maintain vibrant social welfare by also functioning as an investment to modernise the economic base and possibly to attract foreigners through increased employment. Viewed in a positive light, this path makes traditional tourism development inevitable in ‘warm water’ islands. However, such factors as uncontrolled tourism expansion, landscape transformation and degradation, as well as increased waste generation as a result of tourism expansion are inherent disadvantages.

In our December 2014 symposium, one significant concern to small island communities was given particular attention: the pervasive influence and attachment to a ‘globalised culture’ by islanders, despite a keen awareness of the need to preserve the local culture base and traditions. Lifestyle changes usher increased pressures on small island environments due to the intense need, distribution and consumption of more energy, space, natural resources and material goods. The increasing use of private vehicles, and ensuing traffic gridlock, on many small islands, is a case in point (Warren & Enoch, 2010). At the same time, globalisation does provide an opportunity to islanders to affiliate themselves and participate actively in regional and international socio-cultural fora and related movements in the wider political arena. For Malta, its lobbying as a member state of the United Nations (UN) in 1967 triggered the process which culminated in the adoption of the Convention of the Law of the Sea on 10th December 1982 (Baker, 2011). Malta also tabled the issue of climate change as a political item on the agenda of the 43rd Session of the UN General Assembly in 1988 (Scerri-Diacono & Cremona, 2009).

Sound planning policies are crucial to the wise management of available island resources that should typic-

ally target the maintenance of the well-being and entrepreneurial disposition of islanders as they pursue a better quality of life. Such policies must also address the management of risks arising internally (such as those arising from shifting demographics, topography, land use, and infrastructure) or externally (such as global warming). In Malta, expected environmental change impacts arising from increased incidence of torrential rains, flooding and severe storms include increased incidence of injuries and immobility as well as damage to transport infrastructure and to the local economy. Sea level rise is another impact, and is expected to increase coastal inundation, erosion, inland migration of beaches, enhance potential damage from storm surges and reduce slope stability (MRA, 2015).

This special thematic section of Xjenza offers an opportunity to explore these ideas in considerably richer and greater detail. We start with a comparative piece by *Galdies* which looks critically at the presumed future impact of climate change on two Mediterranean locations that are also tourist destinations: the Venice lagoon, Italy, and the Maltese islands. Results derived from meteorological observations suggest that the level of comfort experienced by visiting tourists over the long term is deteriorating when it comes to the increased heat stress, particularly in the peak summer months. Based on the least harmful climate model scenario (RCP 2.6), results show an expected local increase of 2.2 °C in the air temperature by 2070. A similar increase in magnitude is also expected for the Venice lagoon. On the other hand, the worst case IPCC radiative scenario (RCP 8.5) generated a future human bioclimatic comfort index that is expected to reach critical conditions during what are currently the peak visiting months (July and August) at both destinations. This could imply a required shift, as a form of adaptation, of the visitation periods at these two destinations.

We move on to *Formosa* who regales us with a detailed and visual investigation of the impact of sea level rise on various locations in the Maltese archipelago. His paper offers an opportunity to appreciate the wealth of data resulting from a coordinated spatio-temporal analysis of current and future climate change scenarios which integrate environmental, spatial planning and social data. Scenarios include the analysis of areas that will be inundated, in line with a series of sea level rise estimations (the most dramatic being 13 metres). This study suggests that a wide range of thematic aspects can impact on a small island, including population growth and movement, building development, agriculture, transportation infrastructure, tourism activity archaeological sites, heritage and protected sites. The high mixed use and land cover of the Maltese islands obliges the recognition that sea level rise can dramati-

ically affect both natural and urban ecologies, with the result that communication modes are severed, population migration needs to be planned for, whilst heritage and protected sites risk being degraded and lost.

The remaining four papers look at the presumed and predicted impacts of global environmental change on specific industrial and infrastructural sectors. Starting with agriculture, *Meli* argues that, with the onset of drier and warmer conditions in the Mediterranean region, about half of Malta's total utilisable agricultural area – dedicated to wheat, olive and vine crop types – could be rendered economically unsustainable, and productivity could fall dramatically by almost a quarter from current levels. Such heavy losses could jeopardise the sustainability of rural farming systems and livelihoods.

Turning to the (mainly artisanal) Malta fishing effort, *Knittweis* advises the industry to be flexible and better able to effectively market and promote new marine products as and when they emerge. Available information suggests that the overall impacts of climate change on the Maltese fishing industry may prove to be positive; however, the implications of climate change on commercially targeted fish stocks in the Mediterranean are not very well known, and the results of stock assessments need to be continuously assessed and updated in light of ongoing developments.

The need for flexibility is also highlighted in the contribution by *Jones* with respect to the impacts of global environmental change on tourism in Malta. His conclusions discuss the nature and efficacy of current predictions and how tourism infrastructure and destination management issues should be tailored to more strategic policy responses from all key tourism and environmental stakeholders in both the private and public sectors. The evidence suggests that tourism in Malta will inevitably have to adapt to changing patterns of tourism growth, with probable shorter summer tourism seasons and longer spring, autumn and winter tourism seasons. Consequently, changes in the resulting socio-economic and labour market demands and operations would need to be identified and implemented.

Finally, it is clear that global environment change will pose threats to Malta's transport systems. As much as 10% of the key arterial road network is prone to flooding. The contribution by *Attard* indicates how a significant share of roads and port infrastructure in Malta – not so much in Gozo – will be affected by sea level rise and extreme weather events. A major flood relief project is underway to divert flash flood rains; but more needs to be done, particularly in closing a skills mismatch in the fields of transport and logistics engineering, freight movements and passenger services.

These disparate but inter-related issues raise the need

to search for an integration of the commonalities underlying islandness, connectedness as well the 'local-global' or 'island-mainland' nexus, along with the role of research, policy and planning in approaching and supporting the progressive well-being of small island communities.

The papers emerging from this timely thematic symposium identify the need to conduct a series of 'risk assessments' of the island's natural as well as socio-economic, political and cultural environments (e.g. *Holling, 2001*), with the intent to then communicate both the applied methodology and the resulting findings in as clear and concise a manner as possible to Maltese society and various stakeholder groups. Hotel and restaurant owners, travel agents, fishers and aquaculture managers, farmers and livestock breeders, ferry and airline operators in Malta, etc.; these people, their investments and their employees are being, and will be, impacted by environmental change. Through our symposium and training sessions, and now this edited selection of papers, we hope to be able to provide these actors, and associated bodies (such as trade unions, chambers of commerce and industry associations) with a better grasp of what is happening, and what they could do about it.

As co-conveners of the 2014 symposium, and now co-editors of this thematic section of *Xjenza*, we fervently believe that this translation and transposition of hard (and, let's face it, at times obscure) science into digestible economic and policy indicative observations is crucial for the minimisation of related adverse environmental risks, to Malta as much as to other, similarly small and islanded, states and territories. By some recent estimates, ignorance, delusion, short-termism and incompetence have already led to a failure in having climate science serve and speak to public policy (*Jamieson, 2014*). We beg to differ, hoping in earnest that it is still not too late to act, and with resolve. Our future may depend on it.

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