



JRC CONFERENCE AND WORKSHOP REPORTS

Outcomes from the 'Resilient Tenerife' Workshop: a proposal for action

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Contents

Acknowledgements2

Summary6

1 Introduction7

2 Objectives8

3 Actions9

Annexes 13

 Programme for the morning of 2 November 2017 13

 Programme for the afternoon of 2 November 2017 14

 Programme for the morning of 3 November 2017 15

 Programme for the afternoon of 3 November 2017 16

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*'We vote once every four years,
but we eat four times a day;
the act of eating is much more
powerful than the act of voting'
(Diego Rodríguez)*

Summary

On 2 and 3 November 2017, the European Commission's Joint Research Centre organised a workshop on resilience in Tenerife. It was attended by a variety of people (academics, social actors and members of the public) with expertise on both the definition of the concept of 'resilience' and the implications it would have for the island of Tenerife. For this purpose, presentations, sector-specific round tables, scientific visits and discussion groups were organised. This document sets out the main conclusions drawn, together with a list of actions in the form of a proposal to make the island more resilient to external and internal shocks, whether climate-related or socio-economic.

1 Introduction

Small islands have a major impact on climate change: they tend to lack effective systems for recycling and treating waste, and their energy consumption levels are higher than mainland regions, given their reliance on closed energy systems. Their resources are overexploited, especially water and soil, and above all they typically emit more greenhouse gases per capita, meaning they have a greater responsibility when it comes to climate change.

At the same time, climate change has a very significant impact on the islands, generally more so than on mainland regions, especially as islands are mainly coastal in nature. According to the Intergovernmental Panel on Climate Change (IPCC), coastal sectors are highly vulnerable to the trends indicated by climate models (beaches, dunes, mangroves, low-lying coastlines, etc.). In this sense, rising sea levels combined with the increase in extreme weather events have grave consequences for environmental values and socio-economic systems, especially within the tourism industry. Likewise, species endemic to many islands are at risk of disappearing. Furthermore, islands with Mediterranean characteristics – not only those in the Mediterranean basin itself, but also others such as the Canary Islands and Madeira – are already showing clear signs of environmental change.¹ In particular, heat waves are increasing, the rains are becoming heavier and droughts are intensifying.

The increased vulnerability faced by these islands, due both to their dependence on the outside world and to the particular impact of climate change, indicates that these areas are, in general, not very sustainable. The only way to mitigate the predicted effects of climate change on these islands is to work towards developing a broader and deeper level of resilience. Increasing resilience – essentially by introducing adaptation measures – is one of the key aspects highlighted in the IPCC's most recent report documenting impacts, adaptation and vulnerability (2014): the greater the level of resilience, the lower the risk from climate-related threats (flooding, heatwaves, coastal storms, etc.).

To achieve the required increase in resilience on these islands, particularly with regard to non-structural measures (legislation, education, raising awareness, sectoral and land-use planning, investigation, etc.), it is vital to work in accordance with the concept of governance to create communities that are more resilient to disasters. Therefore, the main points to focus on should revolve around greater social participation in all areas, in order to strengthen shared learning, social and political interaction, social empowerment and individual and collective responsibility.

To this end, on 2 and 3 November 2017, the European Commission's Joint Research Centre organised a resilience workshop in the Graduation Hall of the Faculty of Economics, Business and Tourism of the University of La Laguna, in collaboration with the Izaña Atmospheric Research Centre. The need for this workshop arose from a previous participatory process that took place in 2016 in Tenerife, the aim of which was to generate a robust social understanding with regard to adapting to climate change.²

These two days were attended by a variety of people (academics, social actors and members of the public) with expertise on both the definition of the concept of 'resilience' and on its specific implications for the island of Tenerife. For this purpose, presentations, sector-specific round tables, scientific visits and discussion groups were organised (see Annex).

The IPCC defines resilience as 'the capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways

¹ Dorta Antequera, P. (2017). 'Resiliencia en espacios insulares. Islas y Riesgos del Cambio Climático', presentation at the 'Resilient Tenerife' Workshop.

² Hernandez, Y., Guimarães Pereira, Â. and P. Barbosa (2018). 'Resilient futures of a small island: A participatory approach in Tenerife (Canary Islands) to address climate change', *Environmental Science & Policy*, 80, 28-37.

that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation'.³

Following the workshop, and throughout the participatory activities organised, the conclusion was reached that, for Tenerife to be able to 'maintain its essential function, identity and structure' in the face of potential 'hazardous events, trends or disturbances', whether climate-related or socio-economic, the following objectives must immediately be pursued. These objectives represent the key conclusions of the workshop.

2 Objectives

The conclusions of the round tables and discussions carried out as part of the various activities organised indicate the need to:

- Enhance climate governance by the Council of Tenerife in its role as the public coordinating authority of the Covenant of Mayors for Climate and Energy. This is a commitment made in writing by the Council of Tenerife itself to act as regional coordinator for the Covenant of Mayors.⁴ The aim is to enhance the technical assistance given to municipalities with fewer resources and skills, for the purposes of identifying and implementing long-term measures to reduce greenhouse gas emissions and adapt to climate change.
- Achieve energy sovereignty by improving energy efficiency and developing renewable energies. According to the *Anuario Energético de Canarias 2015* [2015 Canary Islands Energy Yearbook], published by the Canary Islands Ministry of Economy, Industry, Trade and Knowledge,⁵ renewable energy currently accounts for 8 % of total electricity production, both in Tenerife and in the Canary Islands. The aim is to limit the potential vulnerabilities associated with changes in fossil fuel prices, drastically reducing greenhouse gas emissions and driving a change in the production model.
- Reduce the high levels of inequality and the high incidence of poverty. Spain currently has one of the highest proportions of people at risk of poverty and social exclusion among the EU economies (see, for example, the *Séptimo Informe AROPE de la Red Europea de Lucha contra la Pobreza y la Exclusión Social en España* [Seventh AROPE report by the EAPN in Spain]).⁶ The Canary Islands stands out as being one of the Autonomous Communities with the worst records (as well as the above-mentioned report, see the case study on the Canary Islands entitled *Desigualdad, Pobreza y Cohesión Social en Canarias. Análisis de su Incidencia y Distribución entre la Población Canaria* [Inequality, poverty and social cohesion in the Canary Islands. Analysis of their impact and distribution among the population of the Canary Islands]).⁷ According to the *Encuesta de Ingresos y Condiciones de Vida de los Hogares Canarios* [Survey of Income and Living Conditions of Households in the Canary Islands, EICV-HC]⁸ carried out by the *Instituto Canario de Estadística* [Canary Islands Institute of Statistics, ISTAC], the province of Santa Cruz de Tenerife tends to have the worst problems in the archipelago in terms of inequality, poverty and exclusion. According to data from the most recent EICV-HC survey, in 2013 approximately 24 % of the population of Tenerife was under the (regional) poverty threshold: 17 % were in moderate poverty (between €228 and €456 per month) and 7 % were in severe poverty (less than €228 per month). For

³ IPCC (2014). 'Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change' [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf.

⁴ https://www.covenantofmayors.eu/about/covenant-community/coordinators/overview.html?scity_id=1151

⁵ CEICC (2016). 'Anuario Energético de Canarias 2015'. Consejería de Economía, Industria, Comercio y Conocimiento, Gobierno de Canarias. <http://www.gobiernodecanarias.org/ceic/energia/doc/Publicaciones/AnuarioEnergeticoCanarias/ANUARIO-ENERGETICO-DE-CANARIAS-2015.pdf>.

⁶ <http://www.eapn.es/estadodepobreza/descargas.php>

⁷ <http://www.qobcan.es/cmsqobcan/export/sites/presidencia/INFORMES/INFORME-DESIGUALDAD-Y-POBREZA.pdf>

⁸ <http://www.gobiernodecanarias.org/istac/jaxi-istac/menu.do?uripub=urn:uuid:54e5839b-6b7e-4572-94e2-db7cd8b16c6d>

some time now, the social sciences have provided us with plenty of evidence that want and poverty not only increase people's vulnerability, but also reduce their resilience.

- Halt and reverse the decline in the rate of self-sufficiency, in order to improve security of supply, preserve the rural environment, assist in the fight against climate change and enhance food quality with local fresh products. The aim is to limit the vulnerabilities linked to excessive reliance on food from outside.
- 'Cultivate soil and water' in light of the vulnerable situation which sees 80 % of soil on the Canary Islands at risk of desertification.⁹ This would make it possible to protect and restore biodiversity, work together in closing nutrient, material, water, carbon and energy cycles, help to mitigate and adapt to climate change and improve resilience to floods and droughts, which should also involve an increase in appreciation and social and economic recognition for agricultural professionals, and inspire a new water culture.
- Improve the sustainability of the land transport system, which is essential for the energy sector and for beginning to mitigate the effects associated with private transport (congestion, air pollution, noise, accidents, land consumption, climate change, etc.).¹⁰
- Explicitly include the conservation of biodiversity as an essential part of the fight against global climate change and as a priority measure to increase the islands' resilience. The Canary Islands are part of one of the most biodiverse regions on the planet (a biodiversity hotspot). As this biodiversity is exposed to the effects of global climate change, any plan to improve the resilience of natural ecosystems must include conservation of natural heritage as an integral part of its strategy.

In order to meet the above objectives, the following actions should be adopted as sectoral public policies by the island's respective government agencies.

3 Actions

1. Covenant of Mayors for Climate and Energy

- (a) The Coordinator of the Covenant, a public authority – in this case the Council of Tenerife – should provide technical assistance to municipalities that have signed the agreement, in particular the smaller municipalities, so as to ensure that action plans are drawn up effectively (for both mitigating and adapting to climate change). It would be useful to develop common indicators for all signatories to the Covenant.
- (b) Tenerife should urgently design an island strategy to address climate change, updated and led by its Council, which will allow for well-defined cohesion between the municipalities and obtain the support of the Canary Islands government, the Spanish Climate Change Office of the Ministry for the Environment (National Plan for Adapting to Climate Change), the two public universities on the Canary Islands and the two main social actors in Tenerife.
- (c) The regional coordinator, the Council of Tenerife, should support and inspect the way in which the action plans of the Covenant's signatories are implemented and monitored.

2. Energy

- (a) By 2050, the energy sources for Tenerife and the Canary Islands could and should be predominantly renewable. This scenario has been shown to be feasible, according

⁹ Corral Quintana, S., Legna Verna, C., Tejedor Salguero, M., Jimenez Mendoza, C.C., Díaz Peña, F., Rivero Ceballos, J.L., Hernández Hernández, J., Romero-Manrique de Lara, D. and D. Legna-de la Nuez (2018). 'Dealing with desertification in the Canary Islands: a strategic planning methodology for complex *problematiques*', ARETHUSE Scientific Journal of Economics and Business Management, 80, 33-54.

¹⁰ Hernández González, Y. (2014). 'Una Evaluación Integrada de Modelos Alternativos de Transporte Terrestre para Viajeros', University of La Laguna, San Cristóbal de La Laguna.

to the recent study *Carbon neutral archipelago – 100 % renewable energy supply for the Canary Islands*, published by the German Aerospace Center.¹¹

- (b) It would require specific public policy action in the following areas:
- i. raising energy efficiency standards in buildings (both newly built and renovated) by using bioclimatic strategies and integrating renewable energy sources, such as solar and photovoltaic panels, together with pumps for heating and cooling buildings;
 - ii. promoting and incentivising the installation of renewable energy sources and removing administrative barriers;
 - iii. promoting and incentivising the use of renewable energy for personal use and in the transport sector;
 - iv. promoting joint action to identify medium- and long-term projects in the field of geothermal energy, and beginning to use concentrated solar energy or pumped hydroelectric storage, which will become increasingly important for system security in situations where renewable energy is widely used.
- (c) The strategy for switching to renewable energy must include conservation of the natural environment as an essential measure, so as not to affect the resilience of the ecosystems. This should also be reflected in the Energy Plan of the Canary Islands.

3. Poverty

Reducing inequality and the incidence of poverty should be seen not only as an instrument in itself, but also as a tool for achieving other objectives, including the resilience of people and society as a whole.

The effects of climate change (and those linked to economic disturbances) are not felt evenly throughout the population and across different social groups. The fight against climate change and its consequences therefore has a clear social dimension, and must also be seen as a way of reducing inequality and dealing with problems of exclusion.

The costs associated with the fight against climate change and its effects are also distributed unevenly throughout the population. Accordingly:

- (a) all measures aimed at mitigating the effects of climate change and/or fighting it at source should embrace their potential redistributive effects, ensuring that the costs do not fall on the most vulnerable sections of society.
- (b) from the above, it follows that all studies on the impact of climate change and on the mitigation measures adopted should always be accompanied by detailed analyses of their most likely redistributive effects, along with related measures to ensure that the most vulnerable groups do not see their situations worsen.

4. Primary sector and food

- (a) Design an explicit strategy to improve food self-sufficiency in the Canary Islands, paying particular attention to the aspects of supply (production), demand (consumption) and the institutional framework (POSEI, PDR).
- (b) The objectives of agricultural policy should include looking after soil and water and improving the health and nutrition of Canary Islanders so as to reduce the high rates of obesity and overweight, with a focus on managing agricultural systems that maximise ecological and nutritional functions. Public parks hold great potential when it comes to establishing areas where physical activity and urban allotments

¹¹ Gils, H. C. and S. Simon (2017). 'Carbon neutral archipelago – 100 % renewable energy supply for the Canary Islands', *Applied Energy*, 188, 342-355.

can be integrated, helping to mitigate the effects of climate change on the population.

- (c) Agricultural policy should ensure that the use of soil, as well as being sustainable, is compatible with the preservation of natural (non-anthropogenic) biodiversity in the region.
- (d) The various research centres and agricultural, livestock and forestry institutions should meet the need for alternative local crops, varieties and strains capable of adapting to new climate conditions, including water requirements.
- (e) Promoting the production of quality fresh food also provides knowledge of consumer preferences in the Canary Islands concerning the products' perceived value. This knowledge, which is still emerging, would help to improve the design of campaigns promoting these products.
- (f) A special focus should be placed on supporting the expansion of production which is organic and has a low environmental impact. This support includes increasing its value on the island food markets by cutting out intermediaries (e.g. consumer cooperatives, use of available technology) and using growing practices which are more respectful of the natural environment (such as permaculture, i.e. systems that incorporate plants, animals, landscapes, buildings, technology and human settlements into harmonious and symbiotic systems).

5. Land transport¹²

- (a) The first premise to be taken on board is that mobility requirements can and should be reduced by way of two medium- and long-term strategies in the form of projects, plans and programmes. Cities should return to being compact (yet porous, with green areas and controls on density) and an economic model that creates local employment (avoiding the dual polarity of the metropolitan region and the tourist areas in the south) should be favoured.
- (b) Urban mobility should hinge primarily on travel on foot and by bike, and secondarily on public transport. Infrastructure suitable for these forms of transport should therefore be established where possible, thereby providing a transport alternative. This infrastructure should also be linked into a network to allow for connections with forms of public transport.
- (c) HOV and bus lanes should be made operational without delay, on both the TF-5 and the TF-1 motorways. These lanes could take the form of reversible lanes in order to make better use of the road available.
- (d) Once point (c) has been implemented, the interurban public transport available should improve significantly, with more frequent buses and better connections with the collection points. The number of bus and taxi lanes, where compatible with urban streets and avenues, should also increase.
- (e) While implementing points (b), (c) and (d), measures should also be introduced to dissuade people from using cars, both for urban transport (parking fees) and interurban transport (park and ride schemes). Both measures should be introduced simultaneously and in both directions, i.e. disincentivise the use of cars and, at the same time, improve public transport conditions and mobility on foot and by bike. These are what are known as 'carrot and stick' policies.
- (f) E-mobility should account for the bulk of both public and private transport. The way to start this transition is to promote this combination of energy and transport by encouraging the use of plug-in electric vehicles as the share of renewable energy increases. Once these vehicles have reached a considerable number, strategies

¹² Sanz, A., Navazo, M. y M. Mateos (2010). 'La Estrategia Española de Movilidad Sostenible y los Gobiernos Locales', Federación Española de Municipios y Provincias. http://gea21.com/publicaciones/la_estrategia_de_movilidad_sostenible_y_los_gobiernos_locales.

should be implemented to manage the demand from electric vehicles, such as smart charging or interruptibility systems regulated by load management operators. The next step is to convert electric vehicles into a massive energy storage system. The use of systems such as vehicle-to-grid or vehicle-to-home will provide services such as system frequency management, voltage management in different grid nodes, services for supporting renewable energy and the introduction of energy during peak hours. These services will democratise the use of electricity and help to drive distributed generation, mainly in the form of photovoltaic energy. Finally, a range of technologies should be used, such as vehicles powered by biofuels or hydrogen.^{13,14}

¹³ Ramírez Díaz, A., Ramos-Real, F.J., Marrero, G.A., and Y. Perez (2015). 'Impact of Electric Vehicles as Distributed Energy Storage in Isolated Systems: The Case of Tenerife', *Sustainability*, 7(11), 15152-15178.

¹⁴ Ramírez Díaz, A., Ramos-Real, F.J., and G.A. Marrero (2016). 'Complementarity of electric vehicles and pumped-hydro as energy storage in small isolated energy systems: case of La Palma, Canary Islands', *Journal of Modern Power Systems and Clean Energy*, 4(4), 604-614.

Annexes

Programme for the morning of 2 November 2017

Time	Rapporteur	Institution	Activity
9.00-9.20	Yeray Hernandez	JRC	Orientation and objectives of the workshop
9.20-9.40	Paulo Barbosa	JRC	Resilience and climate change in the European Union
9.40-10.00	Emilio Cuevas	AEMET	Evolution of climate change in the Canary Islands
10.00-10.30	Ângela Pereira	JRC	Resilience since post-normal science
10.30-11.00	Break		Coffee
11.00-12.15	Ezequiel Navío	Canary Islands Climate Change Observatory	Round table: What is resilience and what does it involve? What does it mean for the region?
	David Padrón	ULL	
	Jorge Bonnet	Council of Tenerife	
	Pedro Dorta	ULL	
12.15-13.40	Break		Lunch

Programme for the afternoon of 2 November 2017

Time	Institution	Activity
13.40-15.00	Izaña Atmospheric Research Centre	Transport from ULL to the Centre
15.00-15.30		Talk: history and tasks of the Centre
15.30-16.30		Scientific visit to the Centre
16.30-17.00	Break	Coffee

Time	Rapporteur	Institution	Activity
17.00-17.30	Yeray Hernández	JRC	Three resilience scenarios for Tenerife 2040: <ul style="list-style-type: none"> - Scenario 1: 'Turning a blind eye' - Scenario 2: 'Wake up!' - Scenario 3: 'Collaborative communities'
17.30-18.15	Public participation		Citizens thoughts on the scenarios: <ul style="list-style-type: none"> - What can we do to achieve the desired scenario and avoid the unwanted one?
18.15-18.30	Silvia Rivas and Ângela Pereira	JRC	Final conclusions from the first day
18.45-20.00	Transport from the Centre to ULL		

Programme for the morning of 3 November 2017

Time	Rapporteur	Institution	Activity
9.00-9.30	Sonja Simon	DLR	A 100 % renewable scenario for the Canary Islands
9.30-11.00	Manuel Cendagorta	EDF	Round table: scenarios for energy sovereignty
	Araceli Reymundo	Px1NME	
	Juan P. Sánchez	Gorona del Viento	
	Laura Piñero	Som Energia	
11.00-11.30	Break		Coffee
11.30-13.00	Javier Davara	CIATF	Round table: scenarios for water and food sovereignty: water, agriculture and food
	Dirk Godenau	ULL	
	Juan Sánchez	Finca El Mato Tinto	
	Rita López	Ekogrillo	
	Jonay Díaz	Ecotribu	
	Diego Rodríguez	San Borondón	
13.00-14.30	Break		Lunch

Programme for the afternoon of 3 November 2017

Time	Rapporteur	Institution	Activity
14.30-16.00	Sergio Rodríguez	AEMET	Round table: scenarios for sustainable mobility
	Rosa Marina	ULL	
	Alfredo Ramírez	ULL	
	Miguel Becerra	Council of Tenerife	
	Francisco Roda	TxB	
16.00-16.30	Break		Coffee
16.30-17.00	Silvia Rivas	JRC	What is the Covenant of Mayors for Climate and Energy?
17.00-18.30	Debate between the Mayors of Tenerife who have signed the Covenant of Mayors for Climate and Energy (moderated by José Antonio Valbuena)		
18.30-18.45	Silvia Rivas	JRC	Final conclusions from the second day

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