LNG Social Acceptance

Deliverable D2.5

Enagás

Core Network Corridors and Liquefied Natural Gas

2014-EU-TM-0732-S

D2.5– ET.5 Final report on social environment and managerial risks of LNG

Due date of deliverable: March 2020

Actual submission date: March 2020

Start of project: 01 January 2014 Duration: 60 Months

Lead Contractor for this deliverable: Enagás

Revision: 1

Co-financed by the European Union
Connecting Europe Facility

Dissemination level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

Revision History

Deliverable Administration and summary		
Project Acronym: CORE LNGas hive		INEA/CEF/TRAN/M2014/1026196
Document Identifier: ET.5 LNG Social Acceptance		
Leading partner: Enagás		
Report version: 1.0		
Report preparation date: March 2020		
Classification: Public		
Nature:		
Author(s) and contributors: Enagás, Alexandra Issacovitch		
Status		Plan
		Draft
		Working
	x	Final
		Submitted
		Approved

The Core LNGas hive consortium has addressed all comments received, making changes as necessary. Changes to the document are detailed in the change log table below.

Date	**Edited by**	**Status**	**Changes made**

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Citation

Alexandra Issacovitch, 2020. Deliverable D2.5 – Final report on social environmental and managerial risks of LNG. CORE LNGas hive consortium, **www.corelngashive.eu**

Acknowledgements

The work presented in this document has been conducted in the context of the action INEA/CEF/TRAN/M2014/1026196 CORE LNGas Hive. CORE LNGas hIVE is a 60 months project started on January 1st, 2014.

The project consortium is composed by: Enagás Transporte, S.A.U. (Enagás), Sociedad de Salvamento y Seguridad Marítima (SASEMAR), Universidad Politécnica de Madrid (UPM), Universidade de Santiago de Compostela (USC), ENTE VASCO DE LA ENERGÍA (EVE), Autoridad Portuaria de Barcelona - Port de Barcelona (APB), Port Authority of Cartagena (PAC), AUTORIDAD PORTUARIA DE FERROL-SAN CIBRAO (APF), Autoridad Portuaria de la Bahía de Algeciras (APBA), Port Authority of Huelva (PAH), COMPAÑÍA ESPAÑOLA DE PETRÓLEOS S.A.U. (CEPSA), Regasificadora del Noroeste, S.A. (RdN), HAM CRIOGENICA, S.L. (HAM), BUREAU VERITAS IBERIA SLU (BVI), GUASCOR POWER SA (GP), IDIADA AUTOMOTIVE TECHNOLOGY S.A (IAT), FLOTA SUARDIAZ, S.L. (Suardiaz), ITSAS GAS BUNKER SUPPLY SL (ITSAS), COMPAÑIA DE REMOLCADORES IBAIZABAL, S.A. (IBAI), TERMINAL DE CONTENIDORS DE BARCELONA, S.L. (TCB), Terminal Catalunya, S.A. (TC), UTE REMOLCADORES DE BARCELONA-SAR, UNION TEMPORAL DEEMPRESAS, LEY 18/1982 (URB), ASTILLEROS ARMON, S.A. (AA), GAS NATURAL SDG, S.A. (GN), INSTITUTO ENERXÉTICO DE GALICIA (IEG), Fundación de la Comunidad Valenciana para la Investigación, Promoción y Estudios Comerciales de Valenciaport (Fundación Valenciaport) (FV), Planta de Regasificación de Sagunto, S.A. (PRS), MOLGAS ENERGÍA, SAU (ME), Autoridad Portuaria de Valencia (APV), SEAPLACE SL (Seaplace), BOLUDA CORPORACION MARITIMA S.L. (BCM), Autoridad Portuaria de Bilbao (APBi), RENFE MERANCÍAS S.A. (Renfe), Puertos del Estado (PdE), Dirección General de la Marina Mercante (DGMM), PORT AUTHORITY OF GIJON (PAG), Port Authority of Melilla (PAM), Santander Port Authority (SPA), Port Authority of Tarragona (PAT), Port Authority of Vigo (PAV), Port Authority of Santa Cruz de Tenerife (PASCT) and REN Gasoductos, S.A. (RENG).

More Information

Public CORE LNGas hive reports and additional information related with the project execution and results are available through CORE LNGas hive public website at **www.corelngashive.eu**

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1. Introduction

LNG Social Acceptance: main target was to seek a proper liquefied natural gas (LNG) promotion policy for the social acceptance of LNG as fuel in order to avoid inadequate social and political awareness rising on this kind of projects.

As there was not a clear existing picture of what was the situation on the starting point. This activity proposed first to identify the existing barriers, if any and strengths to the inclusion of LNG as alternative fuel in transport and to determine the target audience to whom addressing the awareness efforts. LNG social perception is a step previous to the design of effective messages and a tool for the awareness strategy. This was done by an LNG perception study that has been updated in 2019.

On the other hand, 2017 was intensified with a campaign sharing the benefits of LNG as a more sustainable fuel, especially in the maritime sector through a mobile exhibition.

2. LNG perception study

LNG perception study, was assigned and developed by an external consultant firm, Folia Consultores in order to provide knowledge of the situation in 2016. The social perception study was carried out based on data collected from:

- Analysis of secondary sources on the social perception of LNG as a marine fuel
- Collection of information from the different actors involved: experts, Administration, port area and general population.

Based on the data, the analysis and processing of the information was undertaken, and the final report of the results was drawn up.

2.1. Preliminary results

Preliminary results of the study showed a Swot Analysis, with different strengths; weaknesses; opportunities and threats. At present some of them are:

2.1.1 Weaknesses: ignorance; confusing name; complex understanding; long-term proposal

2.1.2 Strengths: environmental improvements; no risks; previous experiences in North Europe; strategic position of Spain.

2.2. For the future:

2.2.1 Threats: other options to transport than LNG; lack of support from administrations; renewables brake

2.2.2 Opportunities: only real option for boats; positive image easily developed; new employment opportunity; no real opposition: very positive for clean environment.

The messages and target audience results were an important asset of the LNG perception study that was implemented through the next steps.

Table 1. Study Results present and future

FOLIA STUDY RESULTS				
		PRESENT		**FUTURE**
NEGATIVE PERCEPTIONS	WEAKNESSES	▪ Acute lack of knowledge of LNG. ▪ Limited scope to improve CO2 emissions. Methane is a potent GHG. ▪ Air quality is not a top priority on the public agenda. ▪ Port authorities do not take a uniform approach to LNG. ▪ Stowage and cargo handling companies see the implementation of LNG as a distant possibility. ▪ The name is seen as technical, vague, confusing and disturbing.	THREATS	▪ LNG is not seen as the only marine fuel currently capable of providing a solution for the improvement of air quality. ▪ LNG carries risks, which easily create the perception of danger and rejection. ▪ Local authorities' lack of support for LNG. ▪ The time frame for implementation of LNG could give rise to the need for more immediate alternatives (electricity). ▪ Messages about the benefits of LNG might be regarded with suspicion if they come from a large energy company, and LNG could be seen as a barrier to renewables.
POSITIVE PERCEPTIONS	STRENGHTS	▪ LNG benefits air quality because of its role in reducing NOx, SOx and PM emissions, and the elimination of concentrated marine pollution caused by spillage and discharge. ▪ We know how to control the risks appropriately. ▪ There is no deep-seated fear of LNG among the maritime and port community. ▪ Implementation of LNG in Northern Europe as an example to follow. ▪ Port authorities see the extension of LNG from ships to port machinery as a natural and desirable development. ▪ Spain's good position in terms of LNG infrastructure.	OPPORTUNITIES	▪ LNG is seen as an alternative fuel with the potential for widespread use in the transport and maritime sectors. ▪ LNG is not yet in the social imagination, which allows space to create a positive image for the product. ▪ The creation of new and specialised jobs in the services sector and the consolidation of employment in shipbuilding. ▪ Environmental organisations are not fiercely opposed to the implementation of marine LNG. ▪ The likely tightening of air quality policy and regulations may create the right climate for its implementation. ▪ The implementation of LNG in stowage and internal transport companies.

Figure 1. Map of social perception by the general public

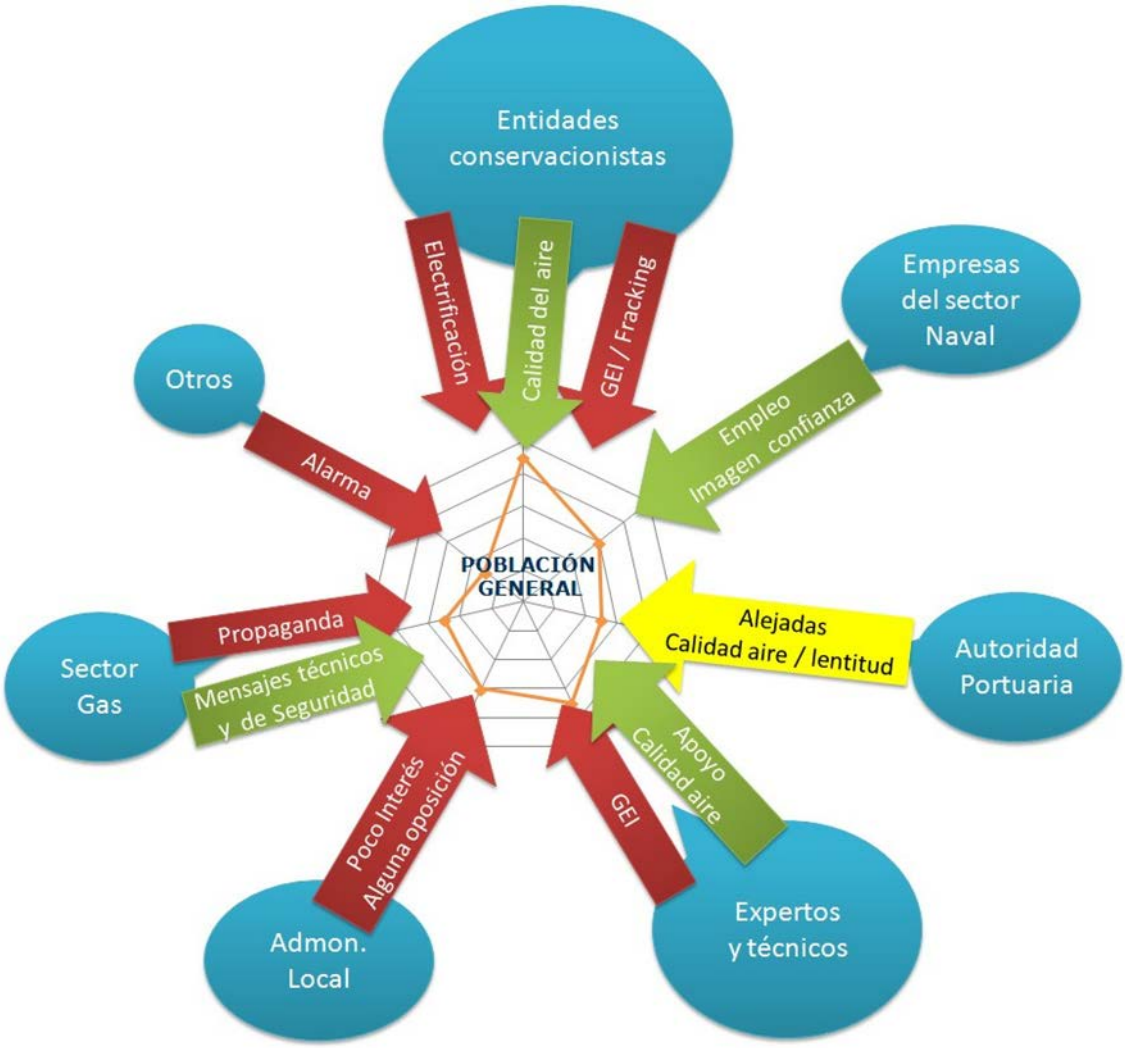
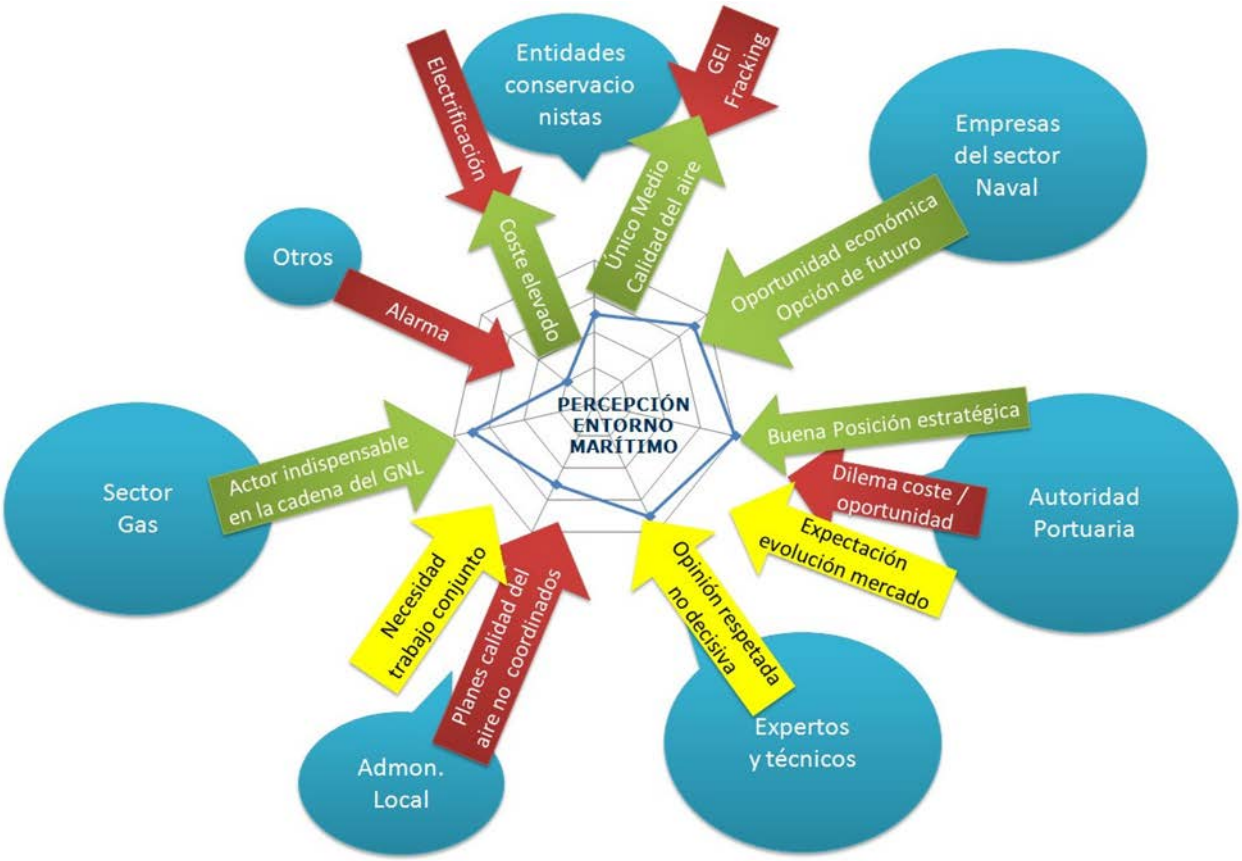


Figure 2. Map of social perception in the maritime sphere



2.3. Mobile exhibition campaign

Specific campaign, through a mobile exhibition, to implement a proper LNG promotion policy towards the acceptance of LNG as fuel.

A mobile exhibition travelling in a LNG powered semitrailer built ad hoc for this initiative was in place for six months in 2017. The aim of it "to raise awareness of the benefits of LNG as a fuel". It started in April 2017 after three months of internal and external design developments done through a Road Show company, Alegria Activity. Furthermore, the semitrailer was towed by and LNG powered tractor unit on loan to Enagás from IVECO Company for this purpose. Two press releases were issued by Enagás to encourage the visit of the exhibit and three more issued by other partners whenever the exhibition was reaching their cities.

2.3.1 Main KPIS:

- Around 35 media hits were identified;
- More than 5.500 visitors
- 65 places of Spain and Portugal.

The mobile exhibition travelled also to events, conferences and took part at the Blue LNG Rally, within the sector in order to share the messages identified. Within this activity a video has been also created on the properties of LNG, based on experiments explaining how LNG behaves and its properties. Accessible through CORE LNGas hive website: **http://coreIngashive.eu/en/core-Ingas-hive-propiedades-del-gnl/**

The semitrailer route updated daily and its information is also accessible at:

http://coreIngashive.eu/en/mobile-exhibition/

2.4. Updated Study

Three years after the presentation of the study, and after the dissemination and awareness raising activities, as well as the implementation of the activities developed within the framework of the CORE LNGas hive Project, it was worth asking whether the project has had a positive impact on the social perception of LNG, and whether the conclusions of the study have varied in relation to the difficulties, threats, strengths, and opportunities established as a result of the work carried out on the social perception of marine LNG in 2016. Furthermore specific actions needed to fully implement and improve LNG social acceptance were identified.

To this end, an analysis of secondary sources has been carried out which could provide keys for interpreting how the social perception has evolved, and what its evolution could be in the near future. Work has been carried out to identify relevant documentary sources regarding LNG that have been published on the Internet over the last two years.

Firstly, it should be noted that, for the purposes of this report, it has once again been verified that information on LNG is highly dispersed and difficult to access for the general public. There is a lack of a unique portal that unifies the information and is accessible to anyone interested in the subject.

2.4.1 Some results

The idea of natural gas as a **clean energy source** is gradually becoming established among citizens.

One of the sources of information used in the previous work was that of Puertos del Estado, interviews were carried out in the ports of Ferrol, Bilbao, Barcelona, Algeciras and Gran Canaria. The current situation (2019) is much more favourable than that evaluated three years ago. In all these ports there are improvements with respect to LNG, or they have gone from a strategic decision in favour of LNG, as in the cases of Ferrol, Bilbao and Barcelona, to specific actions that improve their positioning (the Ferrol vocation to become the gas hub of the northwest of the peninsula is favoured by the already proven possibility of receiving large scale LNG ships at their facilities; In Bilbao, the first ship-to-ship bunkering trials have already been successfully carried out thanks to the already adapted Monte Arucas; while in Barcelona, in its decided commitment to LNG, together with the loading of tankers and other traditional services, it has technically adapted to offer other innovative logistics services, such as refuelling operations, on a small scale, LNG distribution by train and the supply of LNG as fuel.

Furthermore, no accidents or just one accident has been recorded regarding bunkering of LNG: **the perception of a safe fuel**.

2.4.2 General perception

All of the above outlines a picture of the present situation from which it can be concluded that the **social perception of LNG has improved**, both in terms of the general public and the maritime sector in particular.

The **improvement of air quality** is the most received positive message from all actors, and therefore appears as the key to the acceptance of LNG by the general population. However, this message loses strength when confronted with that of GHG emissions.

The ports support clearly the efforts being carried out as the improvement of their air quality.

It is important to continue to seek the support of local administrations together with the support of the naval sector in order to build on the achievements made.

Finally, the effect on employment, above all of an indirect nature both in shipyards and in new service companies created around the LNG and its needs, although it is not seen as an opportunity it is an important support for achieving a favourable climate for the implementation of LNG.

2.4.3 Action Plan

2.4.3.1 Need to create clear messages and arguments.

The activities included in each of the programs developed must be based on the arguments that are being developed.

2.4.3.2 Several programmes proposed

A total of four work programmes focussed on: the general population; the educational community; local administrations, and Port community including activities aimed to the stakeholders of the marine environment.

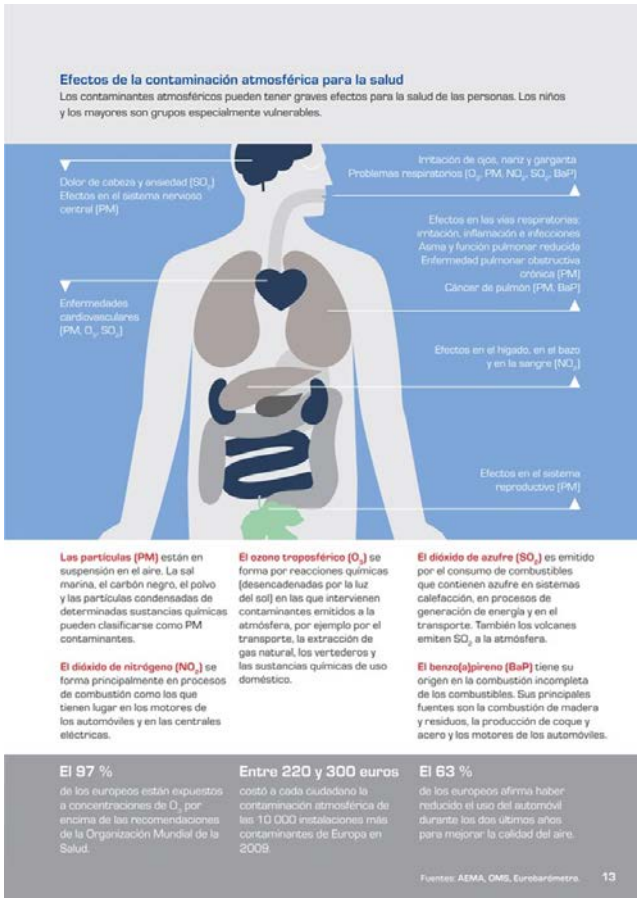
Towards the general population:

Media campaign to strengthen the role of LNG as a clean energy, available and present in multiple areas of activity. It would also help position the website.

These are impact and recurrent campaigns presented as advertorials and produced as animation videos with a duration of no more than five minutes.

Proposal:

> What we breathe when we breathe, effects of pollution on people. How LNG improves air quality



Source. Environmental European Agency

Towards the educational community

This program aims to provide practical tools for teachers to work on different air quality issues at different educational levels. Source: EDUforics

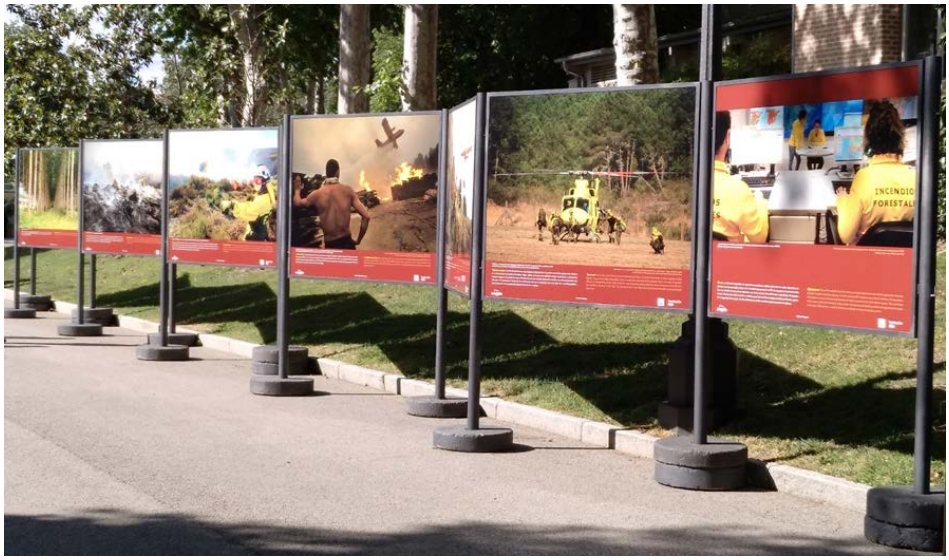
Towards local authorities

Local authorities represent an important support for the implementation of LNG because they are responsible for environmental and public health policies directly related to the air quality of their cities. There is a need to encourage a movement among them in favour of LNG as one of the solutions to the problems arising from pollution.

Towards port communities

Within this action it is foreseen as a base activity the installation, in all the ports whose port authorities participate in the CORE LNGas hive project, some information panels located in areas of easy access for the public and the workers of the port.

The content of the panels will be aimed at informing about the advantages of the use of LNG in the maritime environment (reduction of emissions and improvement of the environment) and the concrete actions developed by that particular port to make them a reality. The panels themselves will inform that more information can be found on the web.



Creation of claim: Clean port: "LNG a reality. Future prospects".

The topics to be discussed would be:

- Green fuels versus HFO / MGO.
- Regulation. ECAs, emissions. Control of methane emissions in different engines. Prospects for the evolution of both maritime and port regulation.
- Emissions. Comparison of total emissions of the different green fuels. Emissions of NOx, SOx and PM.
- Reduction of LNG emissions based on experimental results and real experiences.
- Availability of LNG following tests carried out in the CORE LNGas hive project.
- Safety in the handling of LNG. Accident statistics. IGF Code. Other protocols for LNG operations.
- Future of LNG. Marine fuel for the near future 2020 – 2050

2.4.3.3 Portal web

Proposed to create a web, which was rejected as there would be an extra cost and CORE LNGas hive has a web that can be used for sharing “LNG clean messages”, at the same time a web was created within Enagás called: “Good new energy”.

2.4.4 Risks

Several reports question GHG emissions of LNG and a campaign against the use of LNG as a more sustainable fuel is strengthening.

Those reports are issued by consultancies companies such as: ICCT and Transport & Environment.

Such risk reinforces the need of clear, concise messages and arguments to be used to counterbalance.

3. Conclusions

The studies and activities carried out in order to share the benefits of LNG as a more sustainable fuel, a safe, secure and economic solution for the maritime sector had a positive outcome for the sector.

As a consequence, bunkering operations supplying liquefied natural gas (LNG) to ships tripled in 2019 in the Iberian Peninsula. 195 operations in 2019, compared to 60 operations carried out in 2018. Joining the whole portfolio of bunkering alternatives to meet LNG consumption, not only of ships, but of land modes that converge in the port, such as rail.

This growing trend continues in 2020, with 77 operations carried out. This increase has been possible thanks to the developments of the CORE LNGas hive project involving 42 partners coordinated by Enagás and the projects under LNGhive2 institutional strategy, Spanish flagship initiative for the LNG marine fuel market development promoted by Puertos del Estado and all of them co-financed by the European Commission.

The adaptation and new construction of LNG-powered ships, actively supported from the ports and these projects, will entail around 2-4 million tons CO2 reduction in the maritime sector over the next ten years.

The Iberian Peninsula stands as a benchmark in the supply of LNG as fuel for ships. This reality is a consequence of its geostrategic positioning and the infrastructure already in place, Spain is the country in Europe with the most LNG terminals-7. Those LNG terminals were adapted or are in the process of adaptation to provide small scale and bunkering services. Furthermore the 1st TtS bunkering was performed in Portugal in Sines in February 2020.

LNG is a sustainable fuel that meets the requirements of the International Maritime Organization (IMO) limiting sulphur content in fuel to 0.5% from January 2020. It also represents a step forward towards achieving the IMO's emissions targets, which are for a 40% reduction in CO2 emissions by 2030 and 70% by 2050, thus bringing about the decarbonisation of maritime transport.

Compared to traditional fuels, LNG reduces CO2 emissions by around 20%, almost completely eliminates emissions of sulphur oxides (SOX) and particles (PM) and substantially reduces nitrogen oxides (NOX). As an example, an LNG cruise ship reduces CO2 emissions equivalent to removing 10,000 passenger vehicles from circulation. Large ports such as Barcelona are already benefiting from LNG ships and cruise ships that dock there, improving the air quality of both the port and the city.

LNG as a more sustainable and environmental solution is well spread out, (only methane slips or GHG emissions should be further clarified). On the other hand, social and managerial risks should be combined with ET.6, training solutions and ET.1, Technical, Safety and Environmental specifications on LNG.

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5. List of Acronyms and Abbreviations

ECA: Emissions Control Area

ICCT: International Council on Clean Transportation

GHE: Greenhouse Gas Emissions

HFO: Heavy Fuel Oil

International Code of Safety for Ships using Gases or other Low-flashpoint Fuels

MGO: Marine Gas Oil

NOx: Oxides of Nitrogen

SOx: Oxides of Sulphur

PM: Particle matters

6. Annex

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STUDY ON PUBLIC PERCEPTION OF LNG AS A MARINE FUEL

CORE LNGas hive

Co-financed by the European Union
Connecting Europe Facility

enagas

February 2017

Madrid. C/ Encina 71. 28213 Colmenar del Arroyo (Madrid).

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STUDY ON PUBLIC PERCEPTION OF LNG AS A MARINE FUEL

February 2017

Inscrito en el R.M. de Madrid, tomo 11068, libro 0, folio 57, secc. 8ª, hoja M-174442, inscripc. 1ª. C.I.F. B-81486854

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1. INTRODUCTION

Within the framework of the **CORE LNGas hive** project's ET5 LNG Social Acceptance subactivity, a study of public perception of LNG as a marine fuel has been carried out in order to identify the barriers and strengths of including liquefied natural gas as an alternative fuel and to determine the target audiences for awareness-raising work.

The project's ET5 subactivity (LNG Social Acceptance) primarily aims to provide information and demonstrate the benefits of LNG in order to strengthen its positive perception in the maritime sector. Before carrying out activities to raise awareness, it is necessary to first ascertain public perception of LNG. This is the main goal of the study, which focuses accordingly on how LNG is perceived by the main stakeholders and society at large.

The CORE LNGas hive project is led by the Spanish Ports Authority, in close collaboration with public and private bodies representing the sectors concerned and under the coordination of Enagás. Specifically, there are 42 international, national and regional bodies from the industrial gas, port and maritime transport sectors participating in the project. The project will be implemented over the period 2014 to 2020; it has been allocated a budget of €33 million, primarily through private investment and co-funding (50%) by the European Commission's CEF funding instrument for TEN-T projects.

The main components of the public perception study are as follows:

- Analysis of secondary sources on the public perception of LNG as a marine fuel.
- Collection of information from the different stakeholders: experts, government authorities, the ports sector and the general public.
- Information analysis and processing; preparation of a final report on public perceptions.

Presentation of results: The public perception study was carried out by Folia Consultores' technical team in January and February 2017.

2. METHODOLOGICAL PROPOSAL FOR THE STUDY

How the public and society perceive and represent an issue is an essential step in laying the foundation for the work of decision-makers and communicators, etc. The 'social factor', or the way the public recognises, represents and perceives a particular issue, is key to making informed decisions and acting on them. Social representations, as shared cultural constructions that give meaning to reality and guide our actions within it, are key to the development of individual and collective attitudes and behaviours (FUNDACIÓN MAPFRE, 2013).

Authors such as Wynne, in his work 'Public Understanding of Science' (WYNNE, 1995), claim that there are three basic methodological approaches to studying the public's understanding of science, which can also be applied to the fields of technology and energy (FECYT, 2007):

1. Large-scale single-answer qualitative surveys to collect information about the public's attitudes, interests and evaluations of science and technology and their level of scientific literacy.

2. Cognitive psychology, or the reconstruction of 'mental models', used to ascertain the perception of people with no scientific training.

3. Qualitative research, used to analyse public and expert knowledge in order to explore different social contexts and understand their meaning. Through active observation and in-depth interviews, attempts are made to examine how context and social relations influence perceptions of science or a particular technology.

The main research studies available on public perception in energy-related matters are based on quantitative surveys with a statistical analysis of the results. This is the case with the Social Perception of Science and Technology Survey that the Spanish Foundation for Science and Technology (FECYT) has been conducting on a biennial basis since 2002; the seventh edition was published in 201 . The study, based on 6,355 household surveys, has a sampling error of +/-1.25% and a confidence level of 95.5%. Special mention must also be given to the study 'Spanish society's response to climate change' conducted by the Mapfre Foundation's Institute for Prevention, Health and Environment. This study, based on 1,300 face-to-face interviews, had a sampling error of +- 2.7%, a confidence level of 95% and was carried out for 2009, 2011 and 2013.

In the European Union, the European Commission has been conducting the Eurobarometer survey, which is also based on qualitative analysis, since 1973. Standard Eurobarometer reports are published twice yearly (autumn and spring) and consist of a series of general questions that are expanded in successive editions. However, there are also special thematic Eurobarometer studies, such as the Eurobarometer 2006 'Attitudes towards Energy', Eurobarometer 2010 'Science and Technology' and the Eurobarometer 2015 'Europeans' experience with using ships and perceptions of maritime safety'. The national version of this survey is conducted by the Sociological Research Centre (CIS) on a monthly basis, excluding August.

Other interesting experiences in public perception at an international scale include the World Wide Views (WWV) global citizen consultation initiative, where citizens and groups worldwide are invited to debate and vote on important issues. The latest edition of the WWV was carried out in 2015 for the COP21 in Paris, with the support of the United Nations Framework Convention on Climate Change and the French Government, which hosted the COP. The consultation focused on Climate Change and Energy, and in this case, voting results were analysed statistically, and voting took place after a process of information sharing and discussion in which 8,668 people from 76 countries participated.

In any event, the non-existence of specific studies on public perception in Spain of LNG as a marine fuel and the specific conditioning factors of this work suggested that efforts should focus on qualitative research techniques as the most appropriate means of obtaining information. Accordingly, the following tools were ultimately chosen for our social research study:

- Delphi method. To involve the participation of a panel of experts from universities, research centres, public administrators and conservation organisations.
- In-depth interviews (both in person and over the phone). For the participation of the main stakeholders involved, both at a general level and at selected port cities: port authorities, local government authorities, port companies, ship-owners, shipbuilders and fishermen's associations, research centres, etc.

- Focus groups. For the participation of the general public.

3. EXECUTION OF THE WORK

After presenting the team on 29 December and after the Christmas holidays, the methodology proposed for meeting the research requirements was finalised at a meeting on 11 January, as were the research tools to use and the stakeholders and towns best suited to achieving our objectives. Accordingly, the following geographical areas were chosen for the field work: Ferrol, Bilbao, Barcelona, Algeciras and Gran Canaria (in the latter case, interviews were conducted over the phone).

After completing the field work in the five towns, a follow-up meeting was held on 10 February to present the each town's preliminary findings and some general conclusions, and to outline the methodology to be used in the focus groups with the general public.

3.1. IDENTIFICATION, COLLECTION AND ANALYSIS OF DOCUMENTARY SOURCES

Most of the information about LNG and its uses in maritime transport came from the actors involved in its development and promotion: public authorities, gas companies, system operators, gas employers' associations, naval engineering companies and trade journals. These display favourable views about the use of LNG and underscore its benefits and development potential. However, as Enagás is already well acquainted with these views, they were not considered relevant to this study.

Therefore, during the secondary sources analysis process, we focused on finding other sources providing information on public perceptions of LNG for marine use and natural gas in general. For this purpose, publicly available information on digital media and various organisations' websites was used, in addition to the social media commonly used by these organisations (Facebook, Twitter, YouTube, etc.).

3.1.1. WORLD WIDE VIEWS

The global citizen consultation initiative, with the support of the UN and French Government, conducted a specific consultation on Climate and Energy in 2015 prior to the COP21 in Paris. Here, Spain participated in the World Wide Views consultation through the La Caixa Foundation and the Spanish Association of Scientific Communication. Some 8,668 international participants, including 117 Spanish citizens, took part in 97 debates in 76 countries.

The results can be downloaded from the consultation website for differentiated processing or in answer to specific queries about the results for a particular country. After analysing the results for Spain, the response to the question about how the world should deal with exploration of new fossil fuel reserves stands out, as 69.23% of respondents in Spain are in favour of stopping exploration for all fossil fuel reserves compared with 45.2% in the rest of the world. It is possible that the Spanish results were influenced by the participants' national origin, media coverage of prospecting in the Mediterranean Sea at the time and the suspension of the Castor project, although it is still indicative of part of society's perception of the issue.

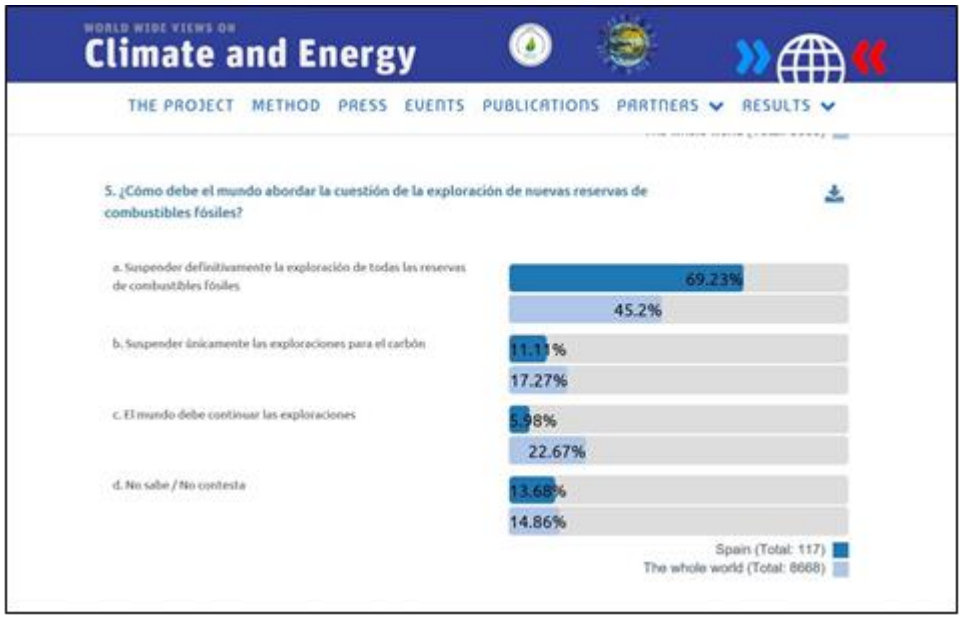


Figure 1. Responses to the question about the exploration of fossil fuels from World Wide Views about Climate and Energy consultation conducted in 2015.

3.1.2. TRANSPORT & ENVIRONMENT

Transport & Environment's mission is to promote a transport policy based on the principle of sustainable development at an EU and global level. Established in 1990, T&E represents more than 50 organisations from 26 countries across Europe, mostly environmental groups and campaigners working for sustainable transport policies at the national, regional and local levels. The organisation is a member of the Clean Shipping Coalition (CSC) and carries out numerous studies and research reports on sustainable transport.

T&E has a specific campaign for maritime transport, given that this is a growing source of transport GHG emissions.

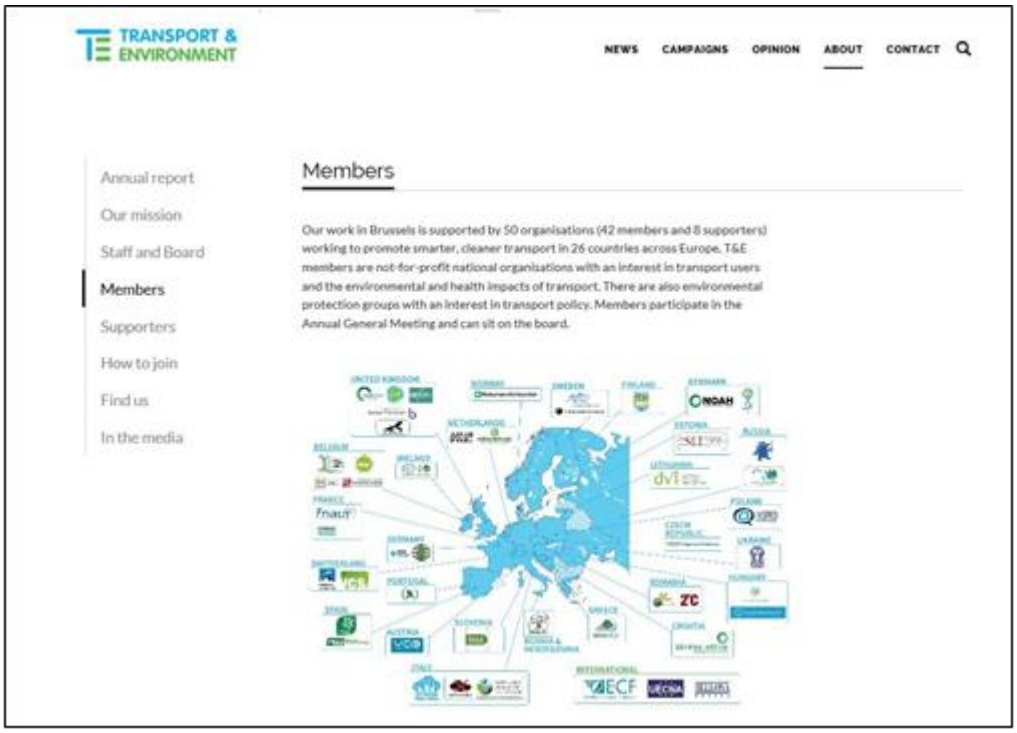


Figure 2. European member organisations of Transport & Environment.

In the field of natural gas, it has produced specific publications on the use of LNG in shipping: 'Natural gas in ships' (2016), 'NOx controls for shipping in EU seas' (2016), 'Natural gas in vehicles – on the road to nowhere' (2016) and 'Road to 2030: how EU vehicle efficiency standards help member states meet climate targets' (2015).

In the reports, special emphasis is placed on the overall calculation of methane emissions throughout the natural gas life cycle, reducing the scope of CO2 emission savings in the final combustion of LNG and natural gas. The natural gas in vehicles (NGV) report is even more critical, claiming that natural gas for road transport does not constitute a bridge towards other technologies but, rather, leads to a dead end.

Because of T&E's high level of specialisation and research scope, it was one of the expert groups chosen to participate in the Delphi study, and provided interesting insights into the pros and cons of LNG in maritime transport.

3.1.3. CLEAN SHIPPING COALITION

The CSC is the only global environmental organisation that focuses exclusively on shipping issues. It promotes policies aimed at the protection and restoration of the marine and atmospheric environment. In 2010, the CSC was granted observer status at the International Maritime Organization (IMO).

CSC has produced publications and opinions including the 'Air pollution from ships' report (2011) and 'Historical trends in ship design efficiency' (2015). In its report on air pollution from shipping, it cited LNG as one of the technologies capable of reducing SO2 emissions almost to zero and significantly lowering NOx and PM emissions (by more than 80%). While stating that LNG is more of an option for new ships, it acknowledged that some conventional ships have also been retrofitted for LNG.

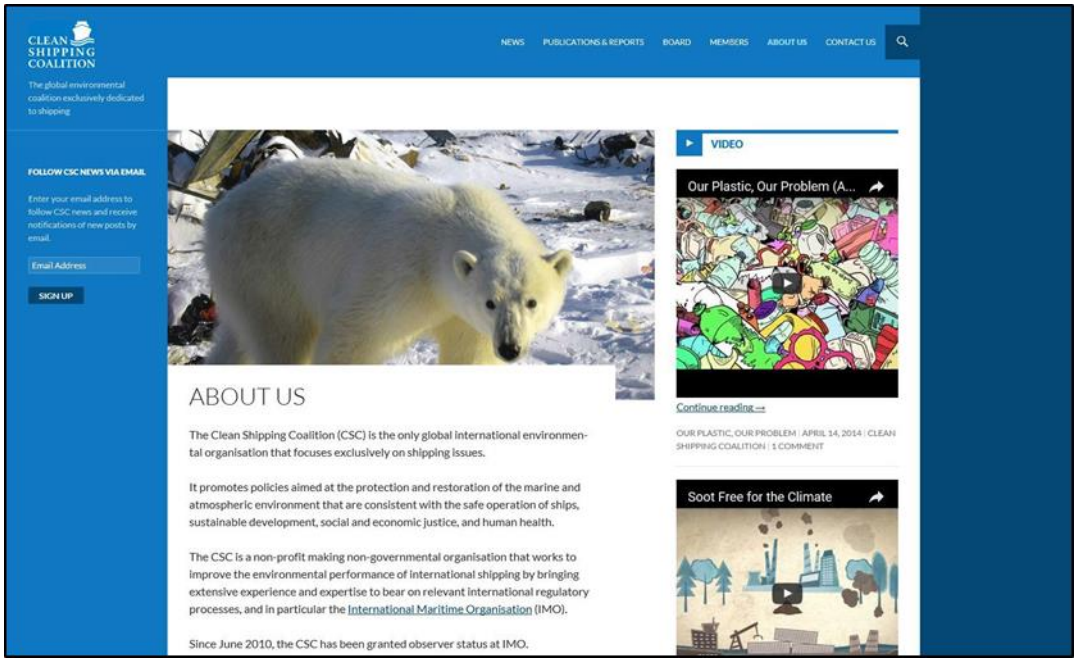


Figure 3. Website of the Clean Shipping Coalition organisation.

3.1.4. RICARDO ENERGY & ENVIRONMENT

Ricardo is a global energy and environmental consultancy firm with a long track record in the hydrocarbon sector. It conducts reports and analyses on behalf of the European Union and organisations such as Transport & Environment on a relatively frequent basis.

The firm has produced reports on gas and its uses in transport, such as 'The role of natural gas and biomethane in the transport sector' (2016) and 'SULTAN modelling to explore the wider potential impacts of transport GHG

reduction policies in 2030' (2016). The SULTAN (Sustainable Transport) model is a complex tool which helps to estimate the impact of various transport policies on the EU, focusing primarily on energy use and GHG emissions, but also on costs, energy security, and NOx and particulate emissions.

In line with Transport & Environment publications, the reports produced by Ricardo minimise the CO2 emission reductions estimated for natural gas and LNG compared to conventional fuels, as they take account of methane losses throughout the gas life cycle. However, they do recognise that, as a shipping fuel, LNG has a lower environmental impact than conventional fuels (HFO and MGO), reducing NOx emissions by as much as 85.6%-85.8%, SOx by 100% and PM by between 96% and 83.5% relative to HFO and MGO (source: IMO, 2015).

3.1.5. FUNDACIÓN ECOLOGÍA Y DESARROLLO (ECODES)

Based in Zaragoza, the ECODES Foundation specialises in urban efficiency and sustainability. The Foundation's Climate Change and Energy Department has produced a joint report with Transport & Environment entitled 'Recipe for Spain: How to start decarbonising Spanish transport' (2016). The report focuses on road transport, recommending the improvement of energy efficiency standards for vehicles, internalisation of external freight transport costs, an increase in diesel fuel taxes and public awareness campaigns to promote fuel-efficient driving. However, the report does not specifically address other types of transport, such as maritime transport, or the use of alternative fuels such as LNG.

3.1.6. AMIGOS DE LA TIERRA

Amigos de la Tierra (Friends of the Earth) is a Spanish environmental NGO and member of the international Friends of the Earth organisation. In May 2016, the organisation's European branch published a report on the ' Winter Package' gas supply agreement, where it harshly criticised the new proposed European regulations for the following key reasons:

- The European Commission unambiguously promotes the development of new gas infrastructure (pipelines and LNG terminals), risking the creation of a new fossil fuel lock-in and potentially drawing political and financial priorities away from renewables and energy efficiency.

- The EC is promoting a sector which:
  - Is in an extended decline - gas demand in Europe has slumped by 23% in 5 years - and which will continue to decline given existing energy efficiency objectives.
  - Has existing infrastructure with massively under-utilised capacity.
  - Is already able to respond to many different possible disruption scenarios without the need for any new infrastructure.
  - Cannot become more secure through diversification because of economic and political constraints on potential new suppliers; even with a diverse supply, member states will continue to be attracted by Russian gas because of its competitive price.

- While recent scientific studies show that the impact of gas on climate change is comparable to coal because of its important methane leakages, the EC barely mentions climate change and does not adequately address the impact that gas has on climate. Gas is a fossil fuel and there is no such thing as a clean fossil fuel.

3.1.7. GREENPEACE

The environmental organisation with the longest-standing maritime tradition is the one that mentions the use of gas and gas products for transport the least. The organisation's commitment to energy is expressed in its well-known reports on the transition towards 100% renewable energy: 'Energy [r]evolution. A sustainable EU 27 Energy Outlook' (2012) and 'Energy 3.0. An energy system based on intelligence, efficiency and 100% renewables' (2011), which barely mentions the use of fossil fuels, such as natural gas, in its future projections.

Few references to LNG and natural gas as an energy vector can be found on Greenpeace's website and communications, and we were only able to find an old entry from 2011 paraphrasing an article by *The Economist* on natural gas's ability to improve air quality but not to mitigate climate change, 'Gas: Cleaner, not cooler', as well

as a generic entry on the impact of fracking.

Figure 4. Generic article about gas on Greenpeace's website.

Greenpeace was one of the organisations invited to take part in the Delphi panel of experts , but it declined to participate as this is not one of the campaigns it is actively working on at the moment.

3.1.8. ECOLOGISTAS EN ACCIÓN

The Ecologistas en Acción (Environmentalists in Action) organisation brings together more than 300 environmental groups from all over
Spain. Because of its geographical reach and diverse member composition, it is one of most active and opinionated organisations. This is true of matters concerning energy and, in particular, natural gas, where we can find a large number of references to the subject, topical publications and opinions in other formats such as TV documentaries.

The organisation's primary focus is the fight against fracking and other unconventional extraction methods, an area in which it is one of the most active and strongly opposed entities. It has also opposed the arrival of gas to the Canary Islands and marine drilling for fossil fuels through its local member organisation Ben Magec - Ecologistas en Acción Canarias.

It could be said that the organisation adopts a double approach: on the one hand, its grass-roots groups tend to have stronger opinions more closely tied to local issues,, while the administrators at the organisation's head office tend to see the larger picture and take a more qualified view of the discourse. Representatives of the organisation participated as experts in the Delphi study, where they made interesting contributions and recognised, albeit with certain limitations, the use of LNG in certain areas such as maritime transport.

Figure 5. Recent opinion piece on LNG as a fuel for maritime transport and El Musel regasification plant.

Members of the organisation's international team advised the UNED TV channel on the production of a five-part documentary series entitled 'Dismantling Energy', which was shown on TVE's La 2 channel in 2016 and featured titles such as 'Petroleum Bites', 'Petro-Politics', 'Renewable Illusions', and so on. However, the documentary did not directly address the alternative uses of LNG but instead focused on the fact that it is a non-renewable fossil fuel derived from oil and gas and the perception of unconventional extraction methods as dubious.

The documentary is available to view on YouTube via the following link:
http://www.ecologistasenaccion.org/article1084.html

3.1.9. TVE PROGRAMME EL ESCARABAJO VERDE

Due to its subject matter and content, special mention should be given to the documentary 'Cruceros con muchos humos' ('Cruise Ships with Fumes'), made by TVE's La 2 *El Escarabajo verde* environmental programme. This documentary, broadcast in September 2016, is an interesting study of the cruise ship industry in Barcelona and the socio-environmental problems associated with it. The documentary featured a large number of the stakeholders involved (CSIC researchers, the port authority, neighbourhood associations, environmentalists, etc.), concluding that use of LNG could well be a short-term solution for the sector.

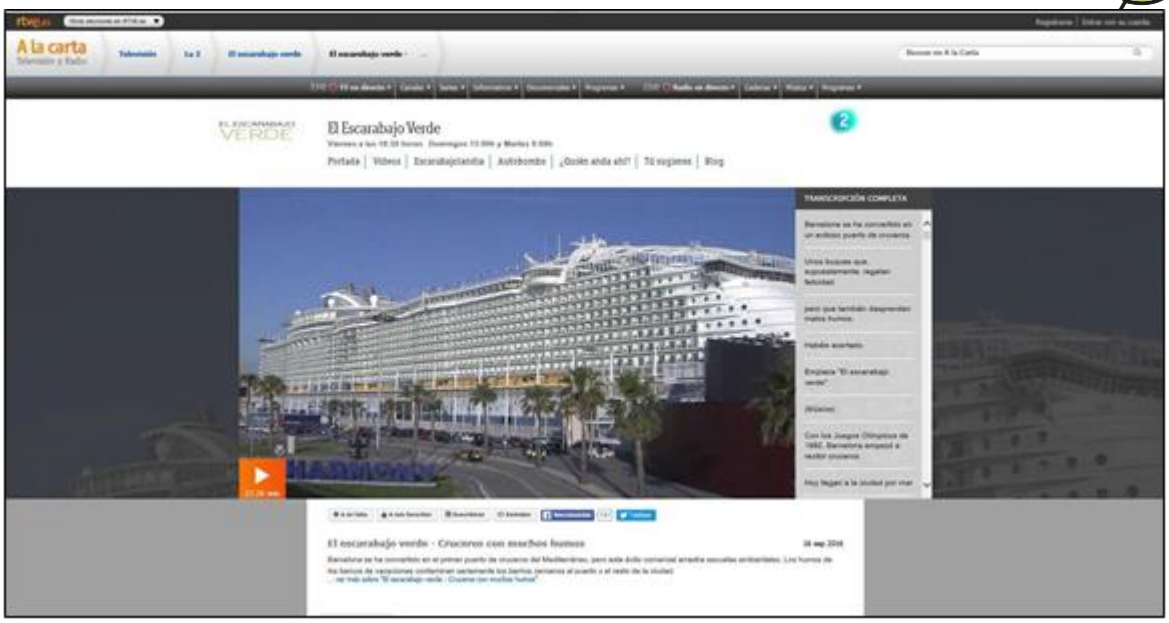


Figure 6. TVE's on-demand application with the *Escarabajo verde* documentary on cruise tourism.

The Ecologistas en Acción representatives who appeared on the programme (and who are also spokespersons for the Barcelona Air Quality Platform) argued that ships should adopt LNG as a marine transport fuel without delay, a statement that has been substantially rolled back by the Platform's latest statements opposing the new Air Quality Plan for Barcelona Port, which envisages the use of LNG at the port and requests that cruise ships immediately be 'plugged into' the power grid while at port.

Figure 7. The Platform's stance on the New Air Quality Plan for Barcelona Port.

3.2. INFORMATION GATHERING TOOLS

3.2.1. DELPHI METHOD WITH EXPERTS

Twelve experts from universities, research centres, public administration and conservation organisations were invited to participate in the panel of experts. Responses were received from six participants:

- Spanish Office for Climate Change (MAPAMA). Guillermo Martínez. Technician.
- CIEMAT. Yolanda Lechón. Energy Systems Analysis Group.
- Comillas Pontifical University (ICAI). Pedro Linares. Professor.
- Polytechnic University of Madrid/Spanish Shipowners' Association (ANAVE). Manuel Carlier. Professor of Vessel Operation and D.G. ANAVE
- Transport & Environment. Faig Abbasov. Head of Shipping and Aviation
- Ecologistas en Acción. Luis Cuena Barrón. Expert in transportation and energy

Two preliminary remarks:

- Although we contacted experts in the area of energy and climate, marine LNG has so many particularities and is so little known that the experts sometimes found it difficult to give an opinion on certain matters.
- In the conservation sector, some organisations declined the invitation to participate because this was not currently a priority campaign (e.g. WWF and Greenpeace).

3.2.1.1. DELPHI RESULTS

After receiving the completed questionnaires, Folia compiled a single document setting out the experts' main contributions. This was then returned to them to give them the opportunity to provide additional nuance or information. The result of the process is as follows.

1. Based on current changes to environmental regulations that limit the use of conventional fuels in the maritime sector, what, in your opinion, are the potential advantages and disadvantages of LNG as a clean fuel in the short and medium term compared to conventional marine fuels (heavy fuel oil (HFO) and marine diesel oil (MDO))? And compared to other alternatives (electricity, exhaust gas purification systems (scrubbers), liquefied petroleum gas (LPG), biofuels, etc.)?

Advantages

The majority of experts agreed that LNG has benefits for air quality due to its significantly lower pollutant emissions (SOx, NOx, PM) compare to current fuels. In addition, the use of LNG can be particularly beneficial in minimising the potential for fuel spills (HFO) caused by navigation in the Arctic.

However, views differed on the climate benefits of reduced GHG emissions. Experts agree that if only final combustion (tank-to-propeller) is analysed, the reduction in CO2 emissions relative to other fuels is around 20%. However, when the complete production process (well-to-propeller) and average methane loss of 1.8% from leaks, venting and incomplete combustion are taken into account, the differences between LNG and oil-based fuels are far less.

Although not all experts regard LNG as a clean fuel due to its GHG emissions, they do agree on its potential as a transition fuel towards the general electrification of transport.
They believe that adapting shipping infrastructure for LNG use is more feasible in the short and medium term than for other fuels, such as hydrogen and electricity, as the latter require more drastic changes and, moreover, a good number of experts do not consider these to be a real alternative at this point in time.

The effect on food markets and the corresponding CO2 emissions due to ILUC (indirect land-use changes) that would occur if biofuels were used is avoided. It is agreed that Spain has good LNG infrastructure and a well-developed supply network, giving it a strategic advantage over competitors in the international market.

Disadvantages

Greater space requirements for on-board fuel storage (2-3 times higher than for HFO).

The costs of retrofitting the current fleet or building new tankers equipped for LNG.

The need to maintain the cold chain for fuel and what this entails in terms of safety measures.

Uncertainly over the availability of supply and possible price increases and volatility due to LNG's indexing to crude oil prices.

Higher CO2 emissions than with biofuels (not accounting for ILUC) and the fact that electricity can be used, at least at the present day, while docked at port.

Energy dependence and the gas market are maintained with unconventional extraction methods (fracking), which some experts regard as highly controversial.

2. Of the possible risks associated with the use of LNG as a marine fuel, which, in your opinion, are the most significant and/or difficult to manage?

In no order of priority, experts point to the following:

- Explosion.
- Fire.
- Spills into the sea or cryogenic damage to people and objects.
- GHG emissions due to unintended leakages.
- Impact of new regasification plants and expansion of port areas.

They also point to the additional risk of technology lock-in if governments overwhelmingly support LNG implementation and allocate public funding for its development, possibly creating idle assets if market trend forecasts fail to materialise.

3. How do you think the use of marine LNG could influence compliance with the commitment to reduce emissions by 2030 and 2050 in non-ETS sectors such as transport?

Experts are generally quite cautious about the role of marine LNG in reducing overall CO2 emissions and therefore its contribution to fulfilling international commitments.

On the one hand, even taking emission reductions of 20% into account, the maritime sector accounts for less than 3% of total emissions; thus, its contribution to mitigating climate change, even considering only non-ETS sectors, is very limited.

On the other hand, as mentioned previously, the origin of LNG and the leaks associated with the upstream/midstream sectors could, according to some experts, mean that its climate benefits over present-day fuels will not last beyond 5-10 years on account of the modifications (scrubbers, etc.) that will need to be made to tankers with oil-based fuels to enable compliance with global emission reduction regulations.

Little is known about the efficiency of LNG engines in the marine environment; however, compared to road vehicles, the extra weight of LNG vehicles per kilometre travelled means that CO2 reductions with respect to diesel and petrol engines are small.

Some experts believe that, after 2050, zero-carbon technologies (hydrogen, electric batteries) will replace LNG and that the logical timeline for LNG development will be 2020-2050.

4. To what extent could the use of marine LNG create new economic and employment opportunities for the ports sector and other industries?

In the ports area, there is a good deal of consensus on the impact that LNG could have on employment and economic activity, as it seems likely that operators or companies currently working with oil-based fuels will adapt their infrastructure to switch to LNG.

In the short term, there are likely to be opportunities in consulting because of the need to draw up procedural manuals and provide training courses, etc.

In general, however, LNG is not expected to have a significant economic impact on ports or shipbuilding in the medium term, although some experts do see some potential in the retrofitting of equipment for LNG use and scrubbing in connection with pollution control systems for conventional fuels.

The introduction of lower port taxes for LNG tankers and a maritime transport tax policy that reduces tolls for alternative fuel supplies will play a key role in facilitating its implementation.

In any event, experts definitely see an economic opportunity for Enagás, which has 7 of Europe's 22 regasification plants, 36.5% of its total LNG storage capacity and 90% of the EU's truck loading capacity.

5. Given the impact of atmospheric emissions from ports (tankers, auxiliary vessels, port terminal machinery and land transit) on the air quality of the surrounding areas, what should be the priorities for regional and local emission control plans?

On this point, the experts showed more significant differences of opinion. Some claim that this only requires IMO regulation, given that maritime transport is an international activity; they hold that the EU and national, regional and local authorities should merely transpose and apply the IMO rules and refrain from introducing additional regulations such as the EU's MRV Regulation or the proposal to include maritime transport in the EU's Emissions Trading System (ETS), which the maritime sector opposes.

Conversely, other experts argue that the EU and other authorities should play a more active role in regulation, arguing that, despite being an international transport operation, 84% of navigation routes are within the Exclusive Economic Zone (EEZ) of the coastal countries (200 nautical miles) and that, therefore, air pollution from maritime traffic has a significant regional impact. In comparison, the control of air pollutants from land-based sources is much stricter than even the most ambitious IMO measures for 2020, leading some experts to conclude that EU regulations to limit NOx and SOx levels would be more effective in improving the air quality in coastal areas.

On the subject of greater regional and local control, some experts believe that the network of stations to measure the air quality in cities should be adapted and relocated in order to include port areas, given that the current system focuses more on measuring the urban background than motorised traffic and industrial emissions.

With better knowledge of actual emissions, regional and municipal regulations can be developed to promote fuel switching and power supply at ports. For cruise ships, this regulation could set out the conditions of the stay in port depending on current atmospheric conditions and pollution levels (similar to how road traffic in some European cities is beginning to be regulated).

In any event, there are experts who, despite recognising that emission control in port areas may be important for some cities, believe the top priority is still road traffic and that mitigation efforts should focus on this area.

3.2.2. PERSONAL INTERVIEWS

The individual interviews can be classified into two groups by type:

General interviews (2 telephone interviews)

- Ministry of Energy, Tourism and Digital Agenda. S.G. for Hydrocarbons. Arturo Alaejos. Energy Programme Coordinator.
- Ministry of Economy, Industry and Competitiveness. S.G. for Industrial Sector Policy. María Luz Peláez. Head of Sustainable Industrial Development

Interviews in port towns:

- Ferrol (6 face-to-face interviews)
- Bilbao (4 face-to-face interviews)
- Gran Canaria (2 telephone interviews)

- Algeciras (4 face-to-face interviews)
- Barcelona (2 face-to-face interviews)

3.2.2.1. GENERAL INTERVIEWS

Two telephone interviews were conducted with technical staff from the two Spanish ministries involved: the Ministry of Energy, Tourism and Digital Agenda (MINETAD) and the Ministry of Economy, Industry and Competitiveness (MINECO).

The main opinions collected during these interviews are set out below.

3.2.2.1.1. MINISTRY OF ENERGY, TOURISM AND DIGITAL AGENDA (MINETAD) ARTURO ALAEJOS. ENERGY PROGRAMME COORDINATOR

Full support from the Ministry to the CORE project and the implementation of LNG. These technologies will stimulate demand for gas, thereby increasing sector revenues and avoiding a deficit.

- The MINETAD believes that the retrofitting of vessels for LNG will be slow, but permanent, and will likely be a definitive move for the sector.
- The availability of refuelling points could give rise to a vicious circle similar to that seen with electric vehicles. Engine conversion is very costly and LNG will have to compete price-wise with scrubbers and other filters.
- In addition to the chief advantage of reducing emissions, the MINETAD sees other advantages to switching to LNG, such as longer equipment life due to better combustion and, possibly, improved supply security deriving from the fact that gas and oil come from different places.
- The MINETAD believes that the number of low-emission zones will gradually increase. There will be zones in the Mediterranean and Cantabrian Seas. However, this is less likely to happen in other international regions, particularly in developing coastal countries. The Mediterranean is probably a more complicated case because it requires consensus between numerous European and African countries. This may be easier to achieve in the Cantabrian region because it is exclusively European territory and close to regions that have already been declared low-emission zones, such as the North Sea.
- The MINETAD does not expect opposition to marine LNG from environmentalists because of its benefits for the environment. However, they may oppose NGVs on the grounds that it is not necessary to switch from one fossil fuel to another, and because of their full support for the electric car.
- Where public awareness is concerned, it may be advisable to run a campaign to avoid negative perceptions of the new tanks that will be installed in port areas. The public should also be informed about the benefits to city air quality; this campaign which should be more intense in Barcelona due to the city's specific problems.
- The Ministry has received a complaint about current access tolls for large tankers. The Order it issued on this topic received an adverse report from the National Commission of Markets and Competition (CNMC), which the Ministry is currently trying to remedy.

1.1.1.1.1. MINISTRY OF ECONOMY, INDUSTRY AND COMPETITIVENESS (MINECO). MARÍA LUZ PELÁEZ. HEAD OF SUSTAINABLE INDUSTRIAL DEVELOPMENT

María Luz Peláez was a member of the team that coordinated and drafted the National Action Framework for Alternative Energies in Transport (MAN) and, therefore, has in-depth knowledge of the same. She is also familiar with the CORE project, has attended meetings and has promoted and referenced it in the MAN. She seemed somewhat suspicious of Enagás in relation to the development of the CORE project. One of the project activities involved the preparation and submission of regulatory and tax barriers to the Ministry, which to her knowledge has not yet been submitted. The State Ports Authority has negotiated specific aspects of the port regulations with the MINECO but not the regulation scheme as a whole. It is assumed that work on modifying the regulations is underway, but that it has not been completed.

- Natural gas is expected to play a key role as an alternative to conventional fuels. The Ministry, as a government authority, must take a neutral stance on technology and not favour one solution over another. A number of efforts are required regarding pilot projects and regulation, but it will ultimately be

the market that decides which option is implemented most successfully.

- The MINECO has its doubts about the actual emissions of marine LNG engines. There are not enough conclusive studies on LNG's benefits in relation to CO2 emissions. The data that appears in the MAN was provided by the State Ports Authority and has not been endorsed by the MINECO. Therefore, these issues need to be analysed in more depth.
- On the other hand, the Ministry believes that LNG will be used relatively soon in heavy road vehicles (there are already 250 LNG-fuelled IVECO trucks weighing over 40 tonnes in circulation). In this sector, improvements with respect to current heavy transport are considerable and LNG is likely to be implemented progressively and play a role in the future.
- The designation of low-emission zones (ECAs and SECAs) is heavily influenced by geopolitics and national interests (the Baltic due to its latitude and the more severe effects of climate change, the USA, etc.) and, on this point, the election of President Trump may lead to a change in priorities.
- With regard to the impact on employment, new jobs will require higher qualifications and bring added value, but the overall number of jobs in port areas will likely fall due to mechanisation and technological advances.
- The maritime sector will require ten times more investment than the road sector, which is why ship-owners are understandably cautious when making decisions about LNG.
- The Ministry recognises that there are regulatory barriers. Regulatory changes are required to accommodate LNG bunkering.
- Where public awareness is concerned, the Ministry believes that the stakeholders (ship-owners, shipping companies, port authorities, etc.) must be made aware of these developments. An appropriate and specific marketing strategy is required for each target audience. It is believed that general public awareness is not that important for implementation.

3.2.2.2. INTERVIEWS IN PORT CITIES

3.2.2.2.1. FERROL

Photo 1. Aerial view of Ferrol Port and Estuary.

Face-to-face interviews were conducted with the following entities:
1. Ferrol Port Authority. Javier Gómez Calviño. Operations Department.
2. Reganosa. David Cheda. Media Relations.
3. Navantia. Higinio Moro. Project Manager.
4. SAGEP Ferrol. Ildefonso García. Manager.
5. Pérez Torres Marítima. Santiago Menéndez. Deputy Manager.
6. Marine Biology Station of La Graña. Victoriano Urgorri. Director.

In addition, attempts were made to interview the Ferrol City Council, but it was not possible to get an appointment.

Photo 2. Docks of Ferrol Port as seen from La Graña.

Ferrol Port has a long naval and shipbuilding tradition and has had LNG infrastructure since the Reganosa regasification plant (Mugardos) was built 10 years ago; it is set to become the gas hub for the north-western peninsula.

3.2.2.2.1.1. KEY IDEAS FROM THE INTERVIEWS

- The Port Authority believes that the steps taken to regulate and promote LNG, first through the Galician HUB project and later the CORE Project, are sufficient. However, demand needs to be stimulated. With regard to risks, vessel-to-vessel transfer (bunkering) is seen as the most delicate, as it is the least familiar step and therefore draws the most attention.
- Reganosa is actively working on influencing public perception by changing pejorative terms such as 'bunkering' for words with less negative connotations such as 'provisioning'.
- An average of 20 to 25 cruise ships dock at Ferrol each year, much less than at other Galician ports like Coruña and Vigo, but some activity, nonetheless. Indeed, 4 or 5 multinational cruise ships have stopped at Ferrol. Increasing this type of tourism will depend not so much on the availability of gas but rather the tourist attractions offered on land.
- Ferrol City Council is not at all on board with the project or the implementation of marine LNG; not before, with the previous corporation, nor with the new one. To date, the City Council has taken no clear stance on the matter. However, the Regional Ministry of Industry does support this type of initiative.
- Several bodies are calling for the stimulatory and trend-setting effect one might expect from the authorities, such as a LNG reconnaissance boat owned by the Galician regional government or a LNG tug boat provided by the port authorities.
- In general, stowage and cargo handling companies have very little information about LNG and its potential uses and would be grateful for information, both in written and face-to-face form (talks, training, etc.).
- Reganosa sees the following potential economic activities with the implementation of LNG: a need for 'provisioning' vessels, greater influx of ships, promotion of shipbuilding beyond Navantia and even the implementation of satellite LNG plants on the quays of small ports for towns to which it is not possible, or not feasible, to transport natural gas by pipeline.
- Reganosa also believes that economic incentives should be provided to encourage fleet operators to switch to LNG and quay operators to provide some sort of incentive to LNG tankers. All these incentives should be temporary until the sector has matured.
- Speaking about the willingness of the shipping sector to consider LNG, SAGEP states that ship-owners and shipping companies in Spain are poorly represented and that the key players are in Greece, China, Denmark and other countries. Accordingly, Spain will go along with whatever is done abroad.
- Navantia, as a repairer of methane tankers and a potential retrofitter of vessels, needs clear guidelines and procedures to be able to work with LNG (similar to those provided for diesel).
- Navantia also regards natural gas as a safe fuel, but one which poses an environmental problem because it has the side effect of causing a greenhouse effect due to leakages of methane gas, not only during exploration and production but also during combustion (leaks, etc.). The use of LNG is an environmental necessity at present, but methane leaks must be controlled.
- The air quality in the urban area of Ferrol is not considered a problem by the public or according to the statistics of the measuring stations. The Atlantic climate, with high rainfall and prevailing winds, and the open estuary aid the dissipation of pollutants.
- Ferrol does not have a strong fishing industry. The sector is mainly comprised of shellfish-gatherers who travel on foot or in small boats; they are self-employed and small-scale. The main problem they encounter is the organic pollution of the estuary because waste water is not treated, causing toxins in the shellfish and making them difficult to sell. It is one of the most polluted estuaries in Galicia.
- Public opposition was stronger before the construction of Reganosa regasification plant, mainly on account of its location within the estuary. Nowadays, the activities of the 'Planta de gas fora daría' (Gas Plant Get Out) and 'Comité Cidadán de Emerxencia' (Citizen Emergency Committee) groups have a more limited reach.

3.2.2.2.2. BILBAO

Photo 3. Aerial view of the bay and port of Bilbao.

Face-to-face interviews were conducted with the following entities:
1. Bilbao Port Authority. Luis Gabiola. Director of Operations, Commercial Development and Logistics.
2. Basque Shipowners' Association (ANAVAS). José Antonio Martínez. General Secretary.
3. Bergé Marítima. Gerardo Elorriaga. Operations Manager.
4. Santurtzi Fishermen's Association. Adolfo Onaindia. Secretary.

In addition, attempts were made to interview the councillors directly involved from Bilbao and Getxo City Councils, as well as the ELA-STV trade union, but we were unable to get an appointment.

Photo 4. Fishing port of Santurtzi.

Bilbao is the port with the most advanced LNG infrastructure: regasification plant, storage capacity, retrofitting of the vessel Monte Arucas for bunkering (as part of the CORE project), fleet of LNG trucks at port and adaptation of the docks for small-scale vessels. The port is currently assessing the economic viability of building a new electrical substation to service cruise ships docked in Getxo.

3.2.2.2.2.1. KEY IDEAS FROM THE INTERVIEWS

- The port authority has already issued a tender for the transport of LNG over land (Molgas) and is currently preparing a tender for the supply of LNG by sea for when the bunkering vessel, currently being retrofitted, is operational. It believes that oil spills are more dangerous and polluting than LNG spills and that the general risk of working with gas will be lower.
- The port used to have a barge for diesel bunkering, but since the advent of double-hull tankers, this fell into disuse and is no longer in operation. Consequently, the arrival of LNG and bunkering needs will result in increased economic activity which may also affect other ports in the vicinity such as Pasajes and Hendaya. In any event, the economic impact will be moderate.
- First the economic crisis and then the designation of ECAs and SECAs by the IMO slowed the construction of LNG tankers in favour of fitting scrubbers to existing ones to comply with the regulations, but it is expected that there will be new orders for both.
- ANAVAS believes that it will not be possible to meet the high energy needs of ships with renewable energy sources alone. Accordingly, it believes that LNG will play a strong and lasting role in the maritime sector and will fill a long-term market niche.
- ANAVAS also believes that, with an international fleet of 50,000 vessels and a fleet turnover rate of 10-15 years (vessel life cycle), the retrofitting of current vessels will have to be considered if gas is to have an impact on the sector. The creation of new LNG vessels alone will be too slow to generate a sufficient pace of growth.
- Stowage companies see LNG as an interesting option, but believe that coordinated action on the part of all cargo handling and stowage companies is required for its widespread implementation.
- Where port machinery is concerned, mobile cranes are considered to be more suitable for adaptation to LNG. They are more versatile than fixed electric cranes and stowage companies are hoping that they will become available on the market so that they can compare costs and make informed decisions. On this point, they are requesting more information about technologies and the costs of retrofitting old and purchasing new machinery.
- The fisheries sector in the Bay of Bilbao consists of just two associations with 12 fishing vessels (only two large ones) and around 40 sailors. Fishing activity is restricted due to increased activity at the port, which is forcing them (exclusion zones) to fish farther and farther from the estuary. Because of the models and age of the fleet, they are not a priority target for adaptation to LNG.
- The quality of the air is not regarded as bad by the public or the results taken at measuring stations. On the contrary, it has improved significantly since the era of the Altos Hornos de Vizcaya ironworks because of the removal of heavy industry and compliance with environmental regulations
- In Bilbao, the greatest perceived danger by the public is the risk of explosion. This is due, particularly among the older generation, to the gas (butane and propane) explosions that occurred in various Basque towns 30 or 40 years ago. This is an important factor to take into account when considering public awareness.
- There, it does not appear to be public opposition to LNG-related activities. Basque society in general is particularly conscious of the environment and usually waits to see if things work before opposing them.

3.2.2.2.3. GRAN CANARIA

Photo 5. Aerial view of the port of Las Palmas on Gran Canaria.

Telephone interviews were conducted with the following entities:
1. Las Palmas Port Authority. José Daniel López and Cesar Martín. Department of Competitiveness and Innovation.
2. Ben Magec - Ecologistas en Acción Canarias. Luis Sánchez. Spokesperson and former Chairman of the Group.

In addition, attempts were made to interview Gran Canaria Island Government, the Island Council for Energy, and the Regional Ministry
of Industry, Energy and Trade of the Government of the Canary Islands, but we were unable to get an appointment.

Photo 6. Docking area for cruise ships in the port of Las Palmas.

The Canary Islands do not yet have LNG and plans to introduce it (two Enagás regasification plants) were met with strong public and political opposition, especially on Gran Canaria.

3.2.2.2.3.1. KEY IDEAS FROM THE INTERVIEWS

- The biggest handicap in the case of the Canary Islands in general and Gran Canaria in particular is that it would require the arrival of gas to the Islands where, to date, the primary energy source has been oil-based fuels (fuel oil thermal plants, but prepared for gas). Accordingly, the starting point and obstacles to be overcome are very different from other areas that already have gas.
- The environmental conservation sector and a number of important political representatives (Gran Canaria Island Government) believe that the arrival of gas may slow the development of renewable energy. The Port Authority informed us that the President of the Island Government may be relaxing his anti-gas

stance, at least where marine LNG is concerned, but we were unable to confirm this with the Island Government because we could not get an interview.

- The environmental movement has taken advantage of the mass mobilisation campaigns against Repsol's oil prospecting to also oppose gas as a non-renewable fossil fuel.
- Local industry's expectations in relation to the advent of LNG have given rise to an invitation to tender for the supply of natural gas to hotels in the south of the island; other companies, such as Bimbo, are interested in its industrial uses.
- The Canary Islands' strategic location gives them access to the north-south shipping lines best suited to adaptation to LNG, as well as other, currently less heavily regulated lines (China, Africa) that could be affected if emission restrictions are imposed.
- The port authority does not see LNG as a substitute for oil in the maritime sector but, rather, envisages the two as coexisting and competing for a share of the market in the medium term. Connecting vessels docked in the port to the electrical grid is not considered an easy task because of the operations this requires. In the port authority's opinion, this will be a difficult matter for cruise ships to resolve.
- With regard to the shipping sector's willingness to adapt to LNG, most shipping companies are not particularly interested in idea, with the exception of Fred Olsen, which is more forward-thinking. They will wait until the last moment and do their calculations to see if it is worth their while. The second-largest ferry company in the Canaries (Armas) does not think it is financially viable to switch to LNG. At the moment, switching to gas is not viable because of the price; therefore, special regulations and lower tolls to incentivise its use are needed.
- The Canary Islands is an international tourist destination and, with 548 cruise ships and 1,252,052 passengers stopping there in 2015, it has a thriving cruise industry. The use of LNG in cruise ships could well serve to demonstrate its sustainability in the tourism industry.
- As in other ports, air pollution from the port is not perceived as a pressing problem by the public, largely thanks to prevailing trade winds that do not allow emissions to remain in the urban area. In any event, the Islands' flourishing tourist industry means that the added value of low-carbon maritime transport is a factor that should be taken into account.
- Thinking from a strategic perspective, the port authority believes that if at least one of the regasification plants originally planned for the Canary Islands were to be built in Tenerife, bunkering operations could be managed with barges.

3.2.2.2.4. ALGECIRAS

Photo 7. Aerial view of the port and bay of Algeciras

Face-to-face interviews were conducted with the following entities:
1. Port Authority of the Bay of Algeciras. Juan Pablo Pérez. Projects and Works.
2. Port Authority of the Bay of Algeciras. Manuel Moreno. Sustainability.
3. Port Authority of the Bay of Algeciras. Luis Arriaga. Port Security.
4. Port Authority of the Bay of Algeciras. Ignacio Ibisate. Maritime Operations.

It was not possible to conduct interviews with Algeciras City Council and the Stevedores Society (SAGEB) at the Port of Algeciras.

Photo 8. Container dock at the port of Algeciras

Algeciras does not have a regasification plant, but it does have a station to supply LNG to trucks outside the port area. It recently carried out three small-scale LNG supply operations to vessels using tanker trucks. Special mention must be given to the heavy traffic in the Strait of Gibraltar (more than 100,000 vessels/year) and years of pollution caused by bunkering in the bay. The air quality in Algeciras and, indeed, the whole coastal area is poor, primarily due to two factors: heavy sea traffic in the Strait of Gibraltar and emissions from industries in the area. The measuring stations in the area frequently report worrying pollution levels.

3.2.2.2.4.1. KEY IDEAS FROM THE INTERVIEWS

- There are no plans to build a regasification plant in Algeciras, but there are plans to install a 'small' refuelling infrastructure in the medium term. A direct refuelling station in the port area of Campamento is being considered as is, at most, a small barge. The port could easily be adapted for power supply as it has a new electrical line, but no change is expected in the foreseeable future.
- They cannot clearly see the link between the implementation of LNG and environmental improvements in the port and surroundings. However, their financial concerns are evident, both where ships and port management is concerned, and they question the opportuneness of LNG implementation. They know that they will have to take the plunge at some stage, possibly when stricter regulations come into force, but they want to wait for the right moment and not invest too soon in something for which there is low demand; however, neither do they want to wait too long in case their direct competitors pre-empt them.
- They have reasonable doubts as to the safety of LNG operations. Of the two types of maritime traffic for which LNG could be implemented more easily, Ro-Ro and RoPax, in the latter case and, more importantly, in Algeciras, the current situation (maximum two hours in port) would make it impossible to refuel at Campamento terminal because it is too far away, thus requiring hot refuelling at the passenger terminal. This gives rise to serious safety concerns and reluctance on the part of the departments responsible for all aspects of port security.
- Ferries appear to afford the earliest opportunity for LNG use, but only Balearia seems to be willing to take the step. Trasmediterranea is in a difficult situation and the German-Moroccan company has conflicting

opinions, but may be willing to accommodate it. The other Moroccan shipping companies are not a target for LNG as their vessels are obsolete and they have no plans to upgrade them. The fact that the companies are engaged in a price war poses a real economic problem.

- While they do not plan to take immediate steps towards adapting port machinery and trucks for LNG, they do not rule out this possibility once it has been installed for ships. In any event, this will depend on the service companies.
- The opening of a new LNG refuelling service is not expected to lead to significant job creation (only direct jobs are considered, not indirect ones), although they do recognise that this will be the case during the construction phase of the facilities.
- They are in favour of stricter environmental regulations, given that, in addition to economic factors, they are the only ones in a position to do something about the pollution of the bay. Ideally, higher port taxes should be levied on polluting vessels.
- They welcome the introduction of campaigns and activities related to LNG because they anticipate mass panic over the fear of explosion, but on two conditions: firstly, that the campaign gain momentum gradually, alongside the installation process, and secondly, that the current situation not be demonised in order to minimise the pressure on the port.
- Although they all agree on the benefits of LNG for the environment, aside from some doubts about the smell, the port authority is not greatly concerned about air quality (SOx, NOx and PM content) and still less about the pollution caused by maritime traffic.
- The public becomes alarmed at the slightest hint of a smell, but is relatively unaware of other types of pollutants.
- Environmental groups are ambivalent. On the one hand, they anticipate local improvements in air pollution and reduced water pollution from a decrease in the number of refuelling operations with conventional fuels. However, they still have their misgivings about a fossil fuel derived from natural gas and the 'hazard' this poses.

3.2.2.2.5. BARCELONA

Photo 9. Aerial view of the port of Barcelona

Face-to-face interviews were conducted with the following entities:
1. Port Authority of Barcelona. Jordi Vila. Head of Environment
2. Barcelona Air Quality Platform and Ecologists in Action. María García.
In addition, attempts were made to interview the Local Energy Agency of Barcelona City Council, the Federation of Neighbourhood Associations of Barcelona (FAVB) and Barcelona Air Quality Platform, but we were unable to get

an appointment.

Photo 10. Docking area for cruise ships in the port of Barcelona

Barcelona has some of the worst air pollution of any European city, and air quality has become a topic of community concern and action. Cruise ships are seen to be a clear source of pollution, although, based on the pollution data available, the biggest culprits are cargo and container ships. The port has an Air Quality Plan in which LNG is poised to play an important role.

3.2.2.2.5.1. KEY IDEAS FROM THE INTERVIEWS

- Unlike other interviewees, the Port Authority of Barcelona recognises that LNG is the only viable fuel in the medium term to enable compliance with environmental regulations and sufficiently improve the air quality in port cities. Therefore, improvement of air quality should be an essential part of promoting the use of LNG.
- However, it does not foresee widespread substitution of HFO and MGO with LNG. CEPSA and REPSOL are not sure how the market will develop in the short term and, while they do expect to see an increase in MGO, they do not expect the combined figures for the two to decrease. At the same time, there is uncertainty as to the widespread use of scrubbers.
- The port authority is not currently planning to 'plug' ships into the power grid, despite public support for such a move.
- LNG carries risks, which therefore requires the adoption of very strict standards and thoroughly proven and stringent procedures for use. They believe that having these would significantly contribute to their competitiveness.
- Workers at the port would require the appropriate training in LNG, not just for current skilled and unskilled workers, but also future employees, who should have this included in their induction training (driving licence, etc.).
- They expect to see a tightening of European regulations, but see the designation of SECAS or NECAs in the Mediterranean as unlikely because of the number and variety of countries affected. And, while a review of European regulations seems inevitable, this is likely to result in the Mediterranean being divided into two zones: north and south.
- A significant impact on employment is expected, not so much direct as indirect, because a new, hitherto non-existent network will be created, including suppliers of materials and equipment, maintenance, security experts, training, specialist staff, etc.
- The public is mobilised and very much aware of air quality problems. Barcelona's Air Quality Platform, which encompasses 72 organisations, including environmental groups and neighbourhood associations

(Barcelona and Catalonia), is very active and organises numerous public events with the participation of the media and experts.

- The strategic objective of the port is to promote the improvement of air quality; accordingly, it has presented an Air Quality Plan for Barcelona Port, demonstrating that the port authority is taking a united and firm stance on this topic. It is estimated that port activity currently accounts for between 5% and 10% of pollution; however, there are plans to drastically reduce road traffic (restrictions, electrical vehicles) that may be implemented quite soon, meaning that the figure could soar to 30%, causing unsustainable pressure. A plan is needed to ensure that this does not occur.
- Local government, focused on resolving the problem of traffic pollution, is pursuing electrical solutions; they see LNG as an interim or medium-long-term solution at best.
- Environmental groups and the Platform see LNG as an option in the medium-long term, but a largely ineffective one unless stricter regulations, such as a pollution tax, are introduced. However, they have moved from supporting LNG to requesting immediate investment in electrification (plugging ships into the power grid while in port), in line with the approach of local government. Therefore, the Platform will contest the recently presented Air Quality Plan for Barcelona Port.

3.2.3. FOCUS GROUPS WITH THE GENERAL PUBLIC

As a final tool to complete the field work, three focus groups were held with members of the general public. This technique involved group dynamics and the provision of information in a staggered manner, based on the main ideas put forward by the different experts and people interviewed. The aim was to identify preconceived ideas, reactions to the information provided, potential resistance to LNG and the opportunities it poses as an alternative fuel. The primary goal of the tool was not to raise participant awareness or influence opinion, but to collect information on the feelings LNG arouses among the general public.

Of the three focus groups held (two in Madrid and one in Barcelona), the first one (in Madrid) served as a test to allow us to fine-tune the information-gathering tool and adapt questions and content as needed for the next two groups. The two groups in Madrid were made up of members of the general public and the one in Barcelona was arranged through Barceloneta Neighbourhood Association: as a result, the participants were people living in the port district.

In total, 19 people (14 women and 5 men) took part in the three focus groups. All age groups and education levels were represented, with a predominance of the 30-50 and 50-65 age groups and secondary and higher education graduates.

In order to collect both spontaneous and thought-out perceptions quickly and easily, we used a PowerPoint presentation that included a video on LNG's properties, where the information content and questions were presented, and an 'I agree/disagree with the statements' system using colour cards (red-yellow-green), which participants were asked to raise in response to the questions. After using the cards, a short debate was held to collect information on the reasons for their opinions.

A typical session would be as follows:

- Thank the participants for attending and introduce the research work without giving any information on the content so as not to distort the first questions asked. Give participants the profile data sheets and colour cards and explain how to use them.
- First question asked after showing a slide with the acronym 'LNG' only. **Do you know what LNG is? Does it sound familiar to you, or mean nothing?** Participants answer using the colour cards and subsequent comments.
- Second question asked after showing a slide with the words 'LIQUEFIED NATURAL GAS'. **Does this fuel arouse your disapproval, interest or indifference?** Participants answer using the colour cards and subsequent comments.
- Information block where the basic features of LNG are explained and a two-minute video shown (excerpt from ConocoPhillips' promotional video) to make the main features easier to understand. Explanation of the main risks associated with its use and the control systems in place to address these.
- Question three. **With this information, do you think LNG is a safe or unsafe fuel, or are you not sure?** Participants answer using the colour cards and subsequent comments.

- Second information block about air quality in cities, the main air pollutants, their sources and the benefits of LNG in terms of pollutant emissions.
- Question four. **With this information, does LNG make you feel rejection, interest or indifference?** Participants answer using the colour cards and subsequent comments.
- Third information block on the possible uses of LNG in road, rail, public (CNG) and maritime transport.
- Question five. **Now you know a bit more about LNG. Based on this information, does LNG make you feel rejection, interest or indifference?** Participants answer using the colour cards and subsequent comments.
- Participants provide final comments.
- The group is thanked for participating and given a small gift courtesy of Enagás.

The average duration of the focus groups was between 45 and 60 minutes.

3.2.3.1. RESULTS OF THE FOCUS GROUPS

- With regard to prior knowledge of the acronym LNG, 15 of the 19 participants did not know what it was, 2 said it sounded familiar and 3 knew what it meant. This result is indicative of the public's lack of awareness of technical issues relating to energy and, more specifically, LNG.

- After learning what LNG stands for, but without being given more information, most participants (12) showed an interest in it, 3 were indifferent and 4 were somewhat wary about the fuel. Their initial interest was sparked by the fact that it is somewhat novel, and that gas inspires a certain degree of trust as a fuel without causing rejection. Participants who have gas in their homes see it as just another fuel, one you have to take precautions with, but which is safe if used correctly. However, the word 'liquefied' was not understood, and most people did not grasp its scope or meaning. Moreover, it was repeatedly confused with other fuels, such as CNG and LPG.

- Despite this, after explaining the features of LNG and the associated risks, only 4 participants regarded it as a safe fuel, whereas most participants (13) were unsure and 2 regarded it as clearly unsafe. Despite the low risk of explosion and the low probability of an accident of this type occurring, the danger of an explosion is the public's chief concern. Participants instinctively associate gas with something potentially explosive (largely influenced by LPGs), and this idea remains with them even when it is in liquid state and therefore not explosive on its own. Despite seeing it in the video, they found it difficult to grasp that large storage facilities and tanks of LNG cannot explode because the gas is in liquid form. Moreover, the very name liquefied natural gas makes it difficult to drive this idea home and be assimilated by the public. One participant was somewhat alarmed when they learned that many of the buses in their city carry CNG in their roof tanks. There is no doubt that a different name for LNG, one that is less technical, more commercial and provokes less anxiety and resistance from the general public, could produce good results.

- After explaining about air pollutants and LNG's role in minimising them, participants' responses varied between taking an interest in this aspect of LNG (9) and remaining neutral (10), which in this particular case does not indicate indifference, but rather uncertainty. The groups in Madrid were able to see more clearly the benefits of LNG for air quality; it is interesting, however, that it was the group in Barcelona that expressed the most concern on this point (5 of 6 votes neutral). This could be due to the thorny problem of pollution in the city, the resulting mobilisation of the public and its resolute support for the electrification of transport over other alternatives. In the specific case of cruise tourism, participants requested the immediate connection of ships docked in port to the power grid, even if they used LNG while sailing. As mentioned previously, while improved air quality was welcomed, the lingering issue of greenhouse gas emissions and their contribution to climate change, as well as fracking, cancel out any improvements to atmospheric pollutants. Reasonably perceived as a cleaner fuel than the currently used HFO, LNG's contribution is welcomed, and its implementation as an interim fuel is appreciated. However, participants refuse to give up the preconceived idea that it will ultimately be replaced with a renewable source of clean energy and that it can already be replaced in ports by '*plugging*' ships into the power grid.

- In response to the last question after all the dynamics, most participants said they would be interested in LNG (11), 6 still had their doubts and 2 reaffirmed their rejection of it. Participant support was due to the perception of LNG and natural gas in general as an alternative energy source and a bridge solution between today's oil-based fuels and a future founded on renewables.. They were also concerned about

prospecting and production methods, particularly in relation to non-conventional fuels. We therefore believe that further efforts should be made to avoid methane leakage during the gas life cycle in order to minimise GHG emissions. The uncertain participants were those who, despite perceiving the benefits of LNG, still had reservations as to its safety for everyday use or who believed, in short, that it is still a non-renewable fossil fuel that produces GHG emissions. Participants who rejected LNG outright were looking for a rapid transition to a society with low emissions, and saw LNG as a barrier to renewables. They believed that it is not worth the investment in terms of sustainability and that we should go straight to low-carbon transport, skipping the intermediate steps. The fact that countries in northern Europe are using LNG was seen as an endorsement.

- In all groups, at some point, participants were more or less openly critical of the energy oligopolies, their control over the market, the current vulnerability of consumers and their inability to have a say in matters they consider important, such as private consumption. There is the widespread belief that renewable energies are not yet available in the market because it is not in the economic interests of the large energy companies. Therefore, the time lag between the availability of renewable energy and appropriate techniques for its implementation is perceived, but underestimated and, moreover, seen as perfectly surmountable: '*If they wanted, it could be available tomorrow*'. Under no circumstances do we see it feasible to secure majority public support for the implementation of LNG. '*If we have to back something, it'll be renewable energy*'.

4. CONCLUSIONS OF DOCUMENTARY SOURCES AND INFORMATION GATHERING TOOLS

4.1. CONCLUSIONS: DOCUMENTARY SOURCES

- The environmental conservation sector and, to an extent, a share of the public, group natural gas with other fossil fuels (oil and coal), and do not consider the advantages and disadvantages of each one in depth. This could be a stumbling block for its public image.
- General opposition to natural gas focuses on the fact that it is a non-renewable fossil-based energy source, an argument that is further strengthened by unconventional extraction methods (fracking) and the GHG emissions associated with the value chain.
- In a future where energy will come from renewable sources, the strategic decision to continue to back combustion-based energy production which is not GHG-free is frowned upon by these types of organisations.
- In terms of GHG emissions, a good share of the secondary sources we consulted support the comparative calculation of GHG emissions, which takes account of the full life cycle of the fuel and, thus, does not show appreciable differences between LNG and oil-based fuels.
- With regard to the maritime transport sector in particular, they see LNG as one option for reducing polluting emissions, but not the only one.
- The intensity of activities and campaigns in relation to natural gas and LNG varies from one environmental organisation to the next. Some of them refuse to engage in the debate because this is not a strategic priority for them; others, who are more willing to listen, may take different stances at different levels of the organisation. Local branches tend to be strongly opposed to it, while administrators and the countrywide office often take a broader perspective and a more flexible stance.

4.2. CONCLUSIONS: DELPHI

- Advantages/disadvantages of LNG. The greatest perceived advantage of marine LNG use is improved air quality due to reductions in polluting emissions. However, there is less consensus on its role in ameliorating climate change by reducing GHG emissions, with many experts claiming the reductions are not that significant on account of methane leaks during the fuel's life cycle, not dissimilar to the emissions produced by conventional fuels.
- Nevertheless, they all regard gas as a transition fuel between oil and renewable energies
- Risks. Aside from the known risks associated with marine LNG (explosion, fire, spillage, cryogenic damage, GHG emissions caused by leaks, etc.), there are two other risks: those associated with the impact of new infrastructure (regasification plants, tanks, etc.) and those associated with the loss of public funds in the

form of industry subsidies, should activity not take off.

- Reduction of GHG emissions. Experts are generally quite cautious about the role of marine LNG in reducing overall CO2 emissions and, hence, its contribution to fulfilling international commitments on account of its small impact on total emissions (3%) and the GHG emissions associated with its life cycle, as mentioned above
- Employment and economic activity. No major impact. We are more likely to see jobs and companies that currently work with oil switch to LNG. There are likely to be some activities associated with consultancy services (manuals and training) and shipbuilding for retrofitting or scrubbing.
- In any event, it is recognised that Spain and Enagás are strategically positioned in the overall marine LNG market.
- Taxation. The introduction of lower port taxes for LNG tankers and a maritime transport tax policy that reduces tolls for alternative fuel supplies will play a key role in facilitating its implementation.
- Air quality. With regard to the air quality in port areas, some experts advocate a single IMO regulation, while others believe that the EU and local government should play a more prominent role in regulation, particularly in cities where pollution is a growing problem and can affect sectors such as cruise tourism.

4.3. CONCLUSIONS: INTERVIEWS

- LNG is perceived as an alternative fuel with the potential for widespread use in the transport and marine sectors, and a genuine option for the future.
- There is an acute lack of knowledge of LNG in all sectors of society, not just among the general public (which was to be expected and was confirmed by the focus groups), but also in the actual port areas themselves and among the energy experts we consulted.
- The greatest perceived benefit of LNG is its impact on air quality, and the more critical the problem of air quality for a particular city (e.g. Barcelona), the greater the importance attached to it; this is also true when maritime traffic is a greater contributor to pollution than road traffic.
- The benefits in relation to lower CO2 emissions are not clearly perceived, but its role in reducing NOx, SOx and PM emissions - key elements for air quality - and the elimination of marine pollution caused by spillage and discharge is.
- LNG carries risks (these are more intuitively perceived than based on knowledge or hard facts), but we now know how to control these appropriately. Nevertheless, the idea of refuelling in the presence of the public is frowned upon.
- We noticed a certain reluctance on the part of the local authorities (City Councils, Island Governments) to take a public stance on LNG. It was not easy or possible to interview most of the City Councils in the chosen areas.
- There is no uniform approach to LNG across port authorities, nor indeed within each port authority. Each one is at a different stage and influenced by local circumstances, which is why some are proactive and others are reactive.
- Although they are not opposed to the idea of LNG implementation, stowage and cargo handling companies see it as a distant possibility. Port authorities see the extension of LNG from ships to port machinery as a natural and desirable development.
- Environmental organisations are not fiercely opposed to the implementation of marine LNG. They value the improvements it can bring to air quality in port cities and environmentally sensitive maritime traffic zones, but at the same time, they do not consider it a clean fuel because of its non-renewable fossil nature and because of the unconventional methods used to extract it (fracking). They view the slow pace of implementation negatively. They recognise its role as a bridge fuel for certain uses, such as in the marine sector. Greenpeace's absence in the debate is worth mentioning, considering it is the most active NGO on marine issues.

4.4. CONCLUSIONS: FOCUS GROUPS

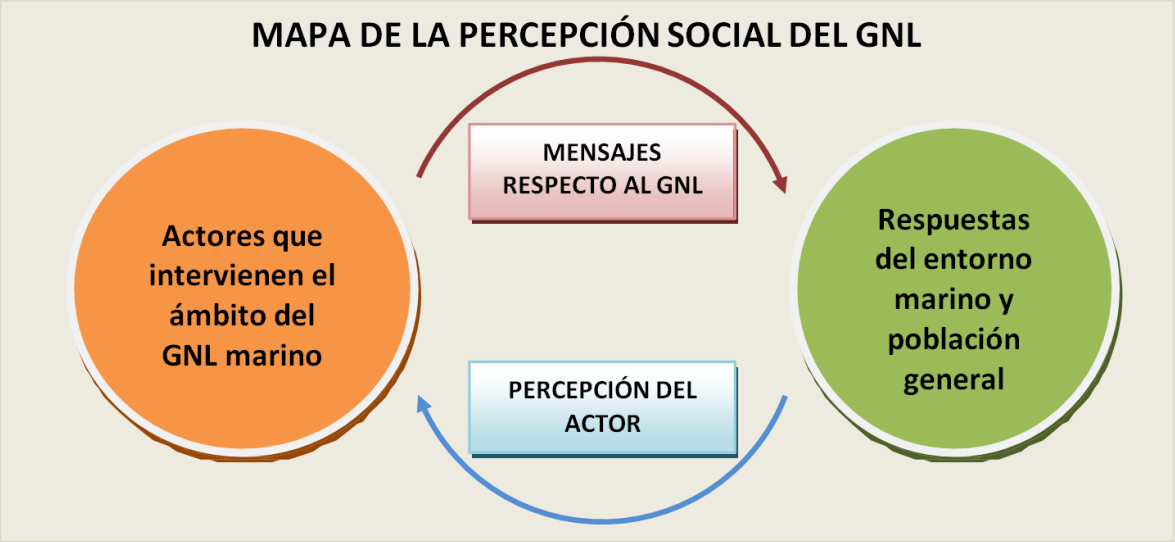
- The acronym LNG means absolutely nothing to the general public and, upon discovering that it means Liquefied Natural Gas, their curiosity is piqued even before receiving a detailed explanation, probably because of the association with natural gas, which many are familiar with in a domestic context. Despite receiving a visual and conceptual explanation of LNG's liquid state, it was repeatedly associated with gas.
- Whenever the question arose, they had difficulty distinguishing between LNG, LPG and CNG, an

indecipherable mix of letters.

- On the whole, participants took a cautious approach to the risks associated with LNG; most did not regard it as an unsafe fuel, but neither did they see it as safe, and were uncertain and primarily concerned about the risk of explosion (repeated comparison of LNG with gas).
- The role of LNG in contributing to an improvement in air quality was welcomed, but its GHG effect and environmentally-unfriendly extraction technology, such as fracking, diminished the power of this message.
- Strong public mobilisation against pollution levels means that there is strong support for the electrification of transport (including cruise ships in port), which is an immediate and clearly seen clean solution compared to more long-term and less-clean solutions such as LNG.
- After completing the exercise, most participants took an interest in LNG and regarded it as a valid alternative fuel, but agreed that stringent safety measures needed to be taken and GHG emissions assessed.
- There were reservations on account of its connection with large corporations and the fact that it could act as a barrier to renewable energies.
- Its use by countries in northern Europe was seen as an endorsement of the fuel.

5. ANALYSIS OF PUBLIC PERCEPTION

Two complementary techniques were used to prepare this analysis. Firstly, the information was analysed, taking into account the messages being conveyed by each actor we identified as involved in the field of marine LNG. We sketched out the perception of each one based on the studies carried out in each area, which included the general public and the maritime sphere. Finally, we recorded the responses we collected for the two spheres in response to each message. This analysis provides us with a complete map of public perception and the dominant views on LNG in the maritime sphere and among the general public.



In addition, we analysed all views expressed on LNG, irrespective of who generated or expressed the opinion, thus obtaining a diagram of the key aspects of public perception of LNG. To do this, an analysis of positive and negative perceptions in a present/future framework was used to determine weaknesses, threats, strengths and opportunities. The analysis was based on the SWOT technique used for the strategic analysis of entities and organisations, but internal/external factors were not assessed as they do not apply to perception analyses. Therefore, it does not give us a future strategy, but offers guidelines on how to position a message in order to achieve the greatest possible positive impact in the contexts we analysed.

KEY ASPECTS OF PUBLIC PERCEPTION OF LNG

	NEGATIVE	POSITIVE	
PRESENT	WEAKNESSES	STRENGTHS	PRESENT
FUTURE	THREATS	OPPORTUNITIES	FUTURE

5.1. MAP OF PUBLIC PERCEPTION BY MARITIME ENVIRONMENT AND

GENERAL PUBLIC

The following actors were identified:

- Environmental organisations, grouped according to sphere of action: national/international and local groups.
- Shipbuilding companies.
- Shipping companies, grouped according to area of operation, in Spain and abroad (Northern Europe).
- Port services companies, grouped into stowage/internal transport companies, and other services:
- Training / Materials / Personnel.
- Port authorities, grouped into Ports with regasification plant and Ports without regasification plant.
- Experts (university, technicians, other).
- Local Government.
- Gas Sector. Gas companies on any continent that post information and messages about LNG on the Internet.
- Other actors (Internet), other actors that post messages about LNG on the Internet.

To classify the general public and maritime sphere's responses to the messages, a colour code was used to indicate whether the perception was positive (green), neutral (yellow) or negative (red).

MAP OF SOCIAL PERCEPTION IN THE MARITIME SPHERE

Actores		Mensajes respecto al GNL	Percepción del Actor por el Entorno marítimo	Respuesta a los mensajes desde el Entorno marítimo
Environmental Organisations	National/International	Gas with strong GHG effect Inappropriate production methods Back renewable energy, not GHG Investment in LNG could act as a barrier to investment in renewables	High credibility Lack of spurious interests Focused on real problems for the common good Environmentalists as a problem	Currently the only viable and operative fuel capable of reducing NOx, SOx and PM emissions
	Local	Improves air quality and prevents polluting discharges Does not solve the current problem, only in the medium/long term: back electrification in ports		A priori, the electrification of ports would be a very costly solution for the port
Shipbuilding Companies		New viable and safe designs Create employment Tangible reality	Provide solutions Tangible and real designs that offer security	An economic opportunity in the medium term
Shipping Companies	Operating in Spain	Credibility as an option for the future An operational LNG tanker: the best guarantee of safety	The cornerstone of the business Business interests A customer	A solution for the future for some key sectors: Ro-Ro, RoPax, cruise and container ships
	Operating abroad (Northern Europe)	Endorsement of confidence in the product		A valid benchmark, to be imitated
Port Service Companies	Present: Stowage / internal transport	Possible use of LNG in the medium term Daily use inspires trust	An independent service with its own interests Workers need training	An option for the future that does not generate strong opposition
	Future: Training / Materials / Personnel	Emploment	New specialised and necessary services	An option for the future

Port Authorities	Ports with regasification plants	Champion LNG as a fuel for the future in the maritime sector Positive and demonstrative actions Improves air quality	Body that develops future strategy and manages day-to-day port operations	Preferential position as ports with LNG that could serve the new market Attentive to each port's strategy in order to adapt and optimise their own
	Ports without regasification plants	Looking forward to the advent of LNG as a new energy vector No knowledge and misgivings about working with LNG Do not reject LNG, but acceptance is tied to profitability	Body that develops future strategy and manages day-to-day port operations	Cost/opportunity dilemma
				Eager to see how the LNG market will develop
Experts (university, technicians, other).		The fuel of the future for the transport sector Improves air quality Good strategic position GHG Emissions	High credibility Not very pragmatic Holistic view	Pay attention to the conversation without taking a decisive view
Local Government		No stance on LNG and detached Opposed to gas in some specific cases Strategy focused on cars and their electrification Port pollution is not a priority issue as it is the remit of another authority Some have very powerful Air Quality Plans	Relations at two levels: political/strategic and technical Political level absent or occasionally in opposition Technical level responsible for managing air quality Air quality is not always an issue that is on the table	Need to work together
				Air Quality Plans of both Non-complementary authorities
Gas Sector		In favour of LNG Propaganda messages Messages to react to pessimism	LNG as a new actor, but with a promising future A strategic external service Need for clear and strict rules and procedures	An indispensable market player that participates in numerous stages of the LNG chain: production, transport, storage, supply, regulation, etc.
Other actors (Internet)		Generally pessimistic messages	They have low credibility	Can generate both internal and external opposition

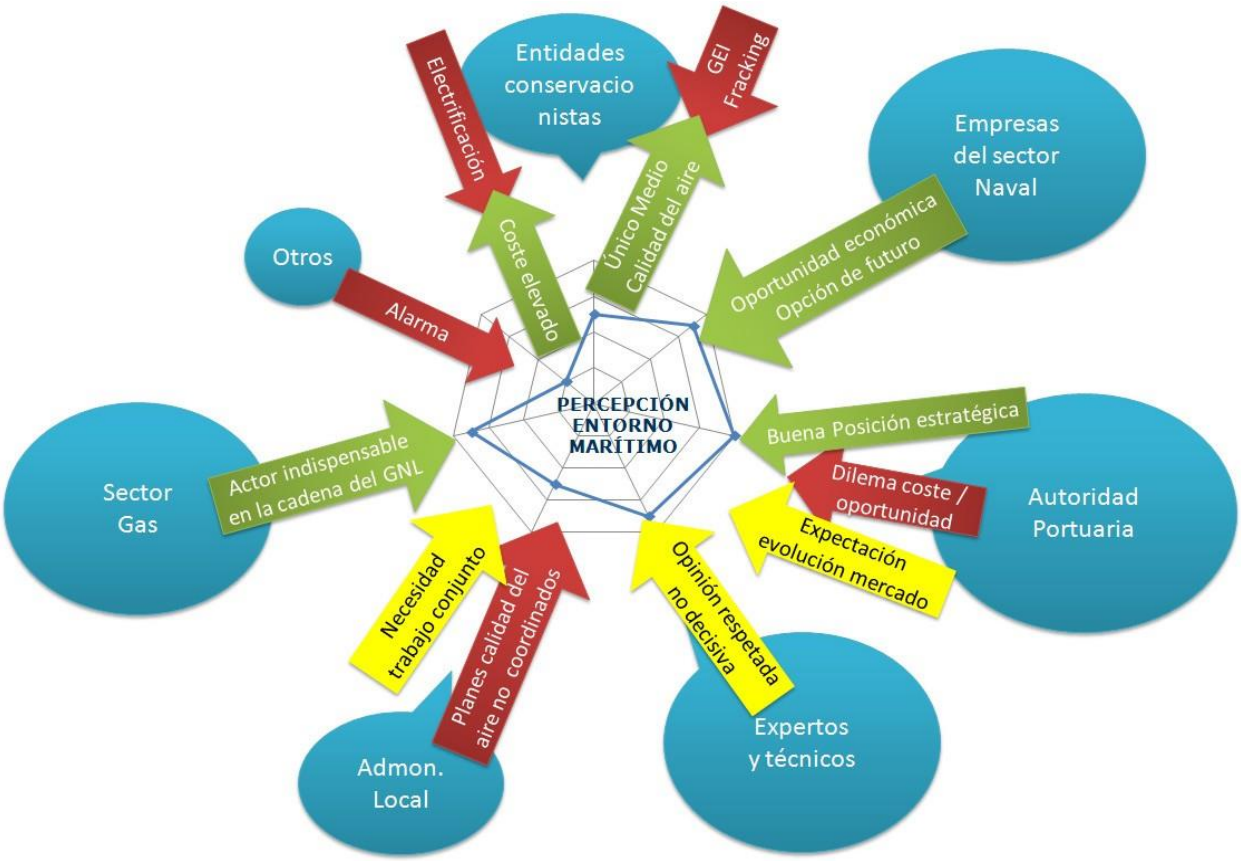
MAP OF SOCIAL PERCEPTION BY THE GENERAL PUBLIC

Actors		Messages about LNG	How the actor is perceived in the Maritime Sphere	Actors
Environmental Organisations	National/International	Gas with strong GHG effect Inappropriate production methods Back renewable energy, not GHG Investment in LNG could act as a barrier to investment in renewables	High credibility Lack of spurious interests Focused on real problems for the common good	Misgivings about a new non-renewable fuel with a strong GHG effect See fracking as an undesirable technique
				Reduction in discharges of oil to the sea
	Local	Improves air quality and prevents polluting discharges Does not solve the current problem, only in the medium/long term: back electrification in ports		Preference for the electrification of ports over LNG
				Improves air quality
Shipbuilding Companies		New viable and safe designs Create employment Tangible reality	Provide solutions Tangible and real designs that offer security	Support the activity Pragmatism, realities
Shipping Companies	Operating in Spain	Credibility as an option for the future An operational LNG tanker: the best guarantee of safety	Despite the limited number of LNG vessels, there is the feeling that this is a feasible reality	Corporate responsibility, supporting the reduction of emissions Operating with LNG is a reality
	Operating abroad (Northern Europe)	Endorsement of confidence in the product	Confidence in a growing reality	A valid benchmark, to be imitated
Port Service Companies	Present: Stowage / internal transport	Possible use of LNG in the medium term Daily use inspires trust	Limited to the port area, not transferable to everyday use	Corporate responsibility, supporting the reduction of emissions Feeling of security
	Future: Training / Materials / Personnel	Employment	Limited to the port area, not transferable to everyday use	Positive reaction to job creation

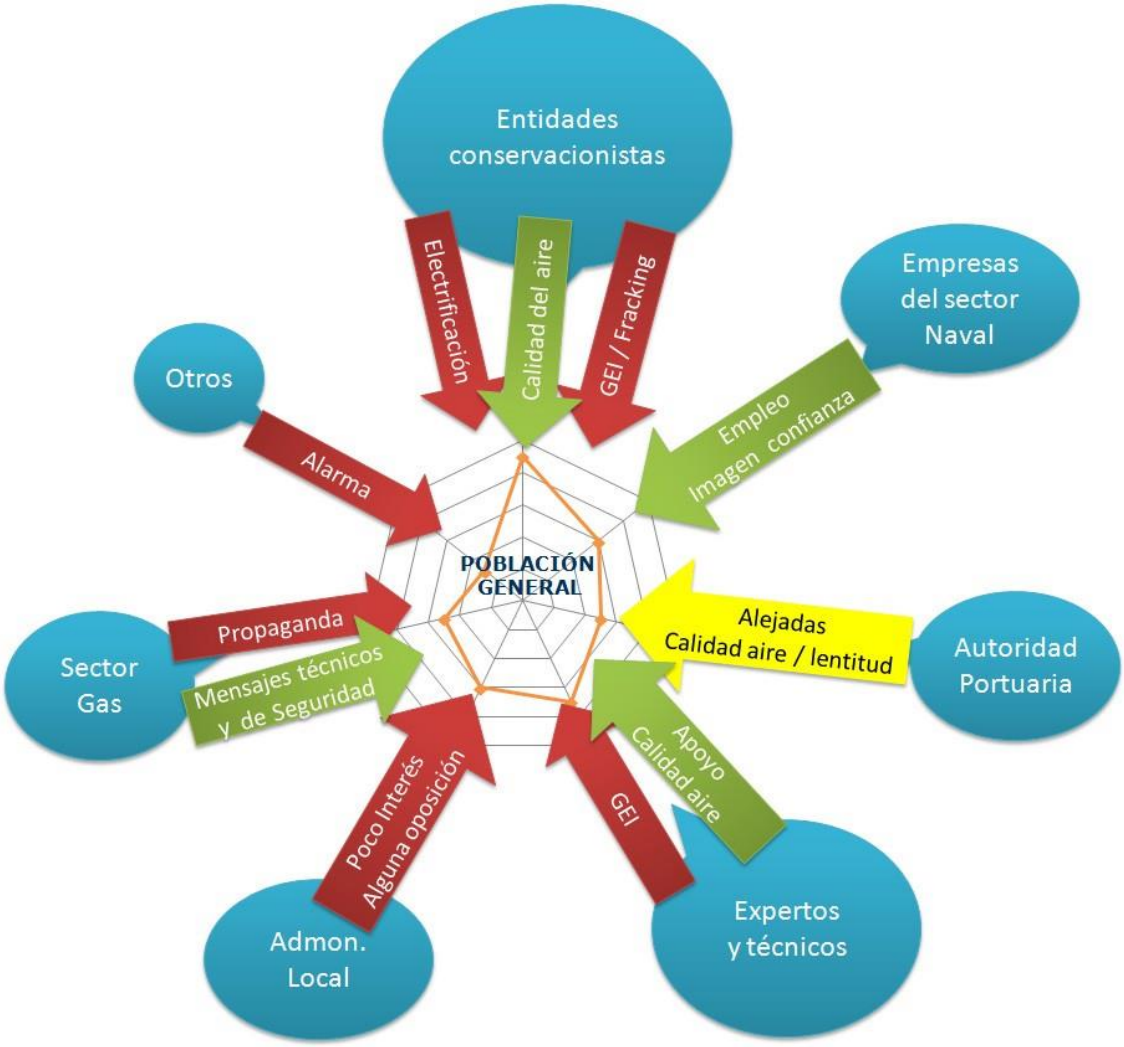
Port Authorities	Ports with regasification plants	Champion LNG as a fuel for the future in the maritime sector Positive and demonstrative actions Improves air quality	Limited to the port area, not transferable to everyday use	Unfamiliar with complex port dynamics and the maritime sector Indecisive position between supporting an improvement in air quality and the non-immediacy of the solution
	Ports without regasification plants	Looking forward to the advent of LNG as a new energy vector No knowledge and misgivings about working with LNG Do not reject LNG, but acceptance is tied to profitability	Limited to the port area, not transferable to everyday use	Indifferent / expectant
Experts (university, technicians, other).		The fuel of the future for the transport sector Improves air quality Good strategic position GHG Emissions	High credibility Not very pragmatic Holistic view	Support the use of marine LNG Improves air quality
				Misgivings about a new fuel with strong GHG effect
Local Government		No stance on LNG and detached Opposed to gas in some specific cases Strategy focused on cars and their electrification Port pollution is not a priority issue as it is the remit of another authority Some have very powerful Air Quality Plans	Govern the daily life of the city Sources of information for air quality Not optimistic that it will resolve the problems	Disinterest in LNG as a solution In some cases, opposition to gas fuelled by public officials
Gas Sector		In favour of LNG Propaganda messages Messages to react to pessimism	Advertising message has low credibility Technical and safety message is more credible Wary as it comes from the energy sector	Messages are perceived as interesting
Other actors (Internet)		Generally pessimistic messages	They have low credibility	Cause some alarm

The maps have been summarised in the following diagrams, where the information from the previous tables has been summarised and the main flow of messages represented. The colour code is the same as the one used in the tables and the size of the different actors is proportional to their influence within each sphere (maritime sphere and general public). Similarly, the vertices of the web in the centre point to the most important actors.

MAP OF SOCIAL PERCEPTION IN THE MARITIME SPHERE



MAP OF SOCIAL PERCEPTION BY THE GENERAL PUBLIC



5.1.1. CONCLUSIONS: SOCIAL PERCEPTION MAP

The improvement in air quality is the most widely received positive message from all actors and therefore emerges as the key to acceptance of LNG by the general public.

Environmental organisations constitute a critical nucleus with respect to LNG, recognising its contribution to improving air quality and its contributions to reducing discharges into the marine environment (oil slicks). Their opinion carries a lot of weight with the general public. It should be pointed out in the message that both the improvement in air quality and the elimination of discharges into the sea is acknowledged by the environmental conservation sector, but a 'yes, but' attitude (gas as a fossil fuel, GHG emissions, fracking, etc.) diminishes the power of the message. The maritime sector uses a forceful and well-targeted discourse, as it regards LNG as the only current and medium-term fuel capable of reducing emissions. It sees the electrification of ports as difficult from a cost perspective, although the latter argument is weaker.

Companies in the maritime sector (shipbuilding, shipping and port service companies) make up the face of the sector, and while they have little ability to reach the general public, they can define the 'playing field', creating the image of a maritime sector that is supporting, albeit slowly, the use of LNG, thus enhancing the message's credibility as a good solution for the sector. It is important to point out that the model is already working in the Nordic countries and these are held in high esteem by Spanish public opinion. Let the maritime sector know that, little by little, new initiatives are being introduced in this field to encourage companies to stop seeing it as a distant future possibility and to begin to incorporate it into their strategies.

The port authorities are a key actor for the implementation of LNG, and conveying the idea that they support it would be well received by the public. Apart from public statements, using the port with the permission of the port authority for LNG presentations and communications would be an important step. That space should also be open to the maritime community.

While experts are held in high esteem by the general public, they are sometimes seen as detached from reality. Nevertheless, their endorsement of the message that the fuel improves air quality would be a great advantage.

Although it does not have fully defined action plans, local government is in favour of improving air quality. The message that LNG is the marine and port environment's best ally for achieving the targets set for improving air quality includes local government, even if it does not comment on the matter. A large share of the messages found on the Internet (gas companies and other actors) focus on safety. Balanced messages highlighting the extensive experience in safety that the natural gas sector has gained through years operating in the market, and clear and comprehensive rules, procedures and standards appear to be the messages most favourably received by the sectors analysed.

5.2. KEY ASPECTS OF PUBLIC PERCEPTION OF LNG

The following is an analysis of positive and negative perceptions, structured, as explained previously, into a present/future framework to determine weaknesses, strengths, threats and opportunities. They have been arranged in such a way that the positive and negative elements are combined and shown for the present/future, with a summary table at the end.

5.2.1. WEAKNESSES

- There is an acute lack of knowledge of LNG in all sectors of society, not just among the general public, but also in the port areas themselves and among the energy experts we consulted. As a result, there is a lack of understanding of the day-to-day risks associated with LNG.
- Due to its nature, the scope to improve on the CO2 emissions produced by conventional fuels is limited.
- In some sectors, the idea that methane acts like a potent GHG has taken root.
- The environmental conservation sector does not regard LNG as a clean fuel because of its non-renewable fossil nature, unwanted leaks and venting of the greenhouse gas methane and the unconventional methods used to extract it (fracking).

- Although poor air quality is generally perceived as a common problem, because it is not on the political agenda of issues requiring immediate resolution, it is not considered a pressing issue.
- There is no uniform approach to LNG across port authorities, nor indeed within each port authority. Each one is at a different stage and influenced by local circumstances, which is why some are proactive and others are reactive.
- Stowage and cargo handling companies see the implementation of LNG as a distant possibility and, although they are not opposed to the idea of it, they have no immediate plans to switch to it.
- The name is seen as technical, vague, confusing and disturbing. LNG is difficult to pick out from a hodgepodge of acronyms (LNG, LPG, CNG, NGV, etc.). The name Liquefied Natural Gas (ambiguous for many people) means that it is confused with gas despite being a liquid, causing subconscious concern (gas tanks, gas transport, etc.).

5.2.2. THREATS

- LNG is not seen as the only marine fuel currently capable of providing a general solution for the improvement of air quality and, if it is, because air quality is not considered a pressing problem, greater importance is attached to the cost of switching, hindering its implementation.
- LNG carries risks which, once listed, let alone described in catastrophic terms, easily create the perception of danger and rejection, which could be difficult to counter (as happened in the U.S.).
- Local authorities' (City Councils, Island Government) lack of support for LNG could rob initiatives to promote LNG of momentum.
- The tightening of air quality policy and regulations in cities (ports) and sailing might be out of pace with immissions policy (cities and ports), possibly moving faster than emissions policy (at sea), thus causing a demand for more immediate alternative systems.
- The slow implementation predicted for LNG could give rise to the need for more immediate alternatives, even though these might be partial and less effective and efficient.
- The existence of partial solutions, such as 'plugging' ships into the power grid while at port to drastically reduce the pollution they cause in port cities, is considered a clean and immediate solution by the public and could, therefore, diminish interest in the LNG proposal.
- Renewable energies are considered a panacea. There is the widespread belief that they are not yet available because this is not in the economic interests of the large energy companies. Therefore, messages about the benefits of LNG might be regarded with suspicion if they come from a large energy company; moreover, LNG is seen as a barrier to renewables.

5.2.3. STRENGTHS

- LNG's greatest strength, according to all actors, is its impact on air quality because of its role in reducing NOx, SOx and PM emissions, especially in port cities and regions with heavy maritime traffic.
- The elimination of marine pollution caused by spillage and discharge (oil slicks).
- Nowadays, we have extensive knowledge of LNG and know how to control the risks appropriately, allowing the development of messages based on: no to risk (measures to minimise risk) and yes to prevention (measures for our safety).
- There is no deep-seated fear of LNG among the maritime and port community.
- Port authorities see the extension of LNG from ships to port machinery as a natural and desirable development.
- Increased implementation of LNG in Northern Europe, in countries that have a reputation for reliability and trend-setting.
- Spain's good position in terms of LNG infrastructure and a well-developed supply network.

5.2.4. OPPORTUNITIES

- LNG is seen as an alternative fuel with the potential for widespread use in the transport and maritime sectors, where it could well become an option for the future.
- LNG is not yet part of the social imagination; it is a complete stranger, which allows space to create a positive image for the product.

- It would be possible to position LNG as currently the best solution to improve air quality in port and marine areas.
- The creation of new and specialised (quality) jobs in the services sector and the consolidation of employment in shipbuilding due to fleet renewal.
- Environmental organisations are not fiercely opposed to the implementation of marine LNG.
- The likely tightening of air quality policy and regulations may create the right climate for its implementation.
- The presence of LNG in ports and sufficient information and incentives (possibly via regulations) could cause stowage and internal transport companies to choose LNG of their own accord.

		PRESENT		FUTURE
NEGATIVE PERCEPTIONS	WEAKNESSES	▪ Acute lack of knowledge of LNG. ▪ Limited scope to improve CO2 emissions. Methane is a potent GHG. ▪ Air quality is not a top priority on the public agenda. ▪ Port authorities do not take a uniform approach to LNG. ▪ Stowage and cargo handling companies see the implementation of LNG as a distant possibility. ▪ The name is seen as technical, vague, confusing and disturbing.	THREATS	▪ LNG is not seen as the only marine fuel currently capable of providing a solution for the improvement of air quality. ▪ LNG carries risks, which easily create the perception of danger and rejection. ▪ Local authorities' lack of support for LNG. ▪ The time frame for implementation of LNG could give rise to the need for more immediate alternatives (electricity). ▪ Messages about the benefits of LNG might be regarded with suspicion if they come from a large energy company, and LNG could be seen as a barrier to renewables.
POSITIVE PERCEPTIONS	STRENGHTS	▪ LNG benefits air quality because of its role in reducing NOx, SOx and PM emissions, and the elimination of concentrated marine pollution caused by spillage and discharge. ▪ We know how to control the risks appropriately. ▪ There is no deep-seated fear of LNG among the maritime and port community. ▪ Implementation of LNG in Northern Europe as an example to follow. ▪ Port authorities see the extension of LNG from ships to port machinery as a natural and desirable development. ▪ Spain's good position in terms of LNG infrastructure.	OPPORTUNITIES	▪ LNG is seen as an alternative fuel with the potential for widespread use in the transport and maritime sectors. ▪ LNG is not yet in the social imagination, which allows space to create a positive image for the product. ▪ The creation of new and specialised jobs in the services sector and the consolidation of employment in shipbuilding. ▪ Environmental organisations are not fiercely opposed to the implementation of marine LNG. ▪ The likely tightening of air quality policy and regulations may create the right climate for its implementation. ▪ The implementation of LNG in stowage and internal

5.3. DISCUSSION OF THE STRATEGIC POSITION OF LNG IN PUBLIC PERCEPTION

An acute lack of knowledge of LNG by the public affords the opportunity to create a new positive image for the product, given its current lack of visibility. However, it should be borne in mind that the name LNG is perceived as too technical, confusing and vague.

The limited scope to improve CO2 emissions with LNG and its strong GHG effect are inherent weaknesses of natural gas. Nevertheless, the focus groups demonstrated that this message is balanced by its contribution to improving air quality and reducing discharges to the sea.

Even though air quality is not currently high on the public agenda, it is likely to become an increasingly salient issue in our daily lives, aided by a likely tightening of regulations in this area, all of which will create an opportunity, given that the message that LNG contributes to improving air quality will become increasingly important.

The weaknesses identified in relation to the different approaches of the port authorities, both internal and external,
and stowage and cargo handling companies' perception that implementation is still a distant reality mean that work needs to be undertaken to communicate the safety of LNG operations and demonstrate that LNG is going to be a medium-term solution for which we have clear references in the Nordic countries. Therefore, specific lines of action will be needed in the Action Plan to turn these perceived weaknesses into new opportunities for the future.

The perception of the risk inherent in a new fuel is inevitable. The best response would be to convey a proactive message of anticipation, serenity and confidence based on credible and demonstrable experience. To achieve this, use should be made, among other arguments, of the strengths identified relating to daily use in the maritime sector, years of accumulated know-how and the safety technologies in place.

In addition, it is important to seek the support of local authorities which, together with the backing of the maritime sector and messages about improved air quality endorsed by experts and environmental organisations, will lend credibility to the message sent out by gas companies.

The 'pace' of implementation of LNG in the maritime sector is inevitably slow. In a world where everything seems outdated before it is even introduced, slow development could give rise to disinterest and the search for more immediate alternative solutions, especially for improving air quality, which is a key strength that must not be lost. It will be necessary to incorporate strategies that allow co-implementation with quick solutions while the LNG solution for maritime transport is being put in place.

LNG's most important strengths, which are far-reaching and multifaceted, are LNG's beneficial environmental impact on air quality and the elimination of concentrated marine pollution. These, together with economic factors that have not been addressed in this study, are the key to successful implementation of LNG. They will have an enabling effect on many of the opportunities identified, such as the consolidation of LNG as an alternative fuel in the maritime sector and less strong opposition to its implementation from environmental organisations.

Strengths were identified in relation to port areas, such as the marine and port community's perception of LNG handling as safe and the logical extension of the use of LNG in ships to port machinery by port authorities, which will give rise to opportunities such as the implementation of LNG by stowage and internal transport companies.

Finally, the effect on employment, particularly indirect jobs in shipbuilding and new service companies created to cater for the new fuel and its needs, while not seen as an opportunity to strongly influence public perception, is nevertheless important enough to create a favourable climate for the implementation of LNG.

6. ACTION PLAN TO IMPROVE PUBLIC PERCEPTION

To complete the study on public perception of LNG as a marine fuel, an Action Plan is recommended to improve public perception of LNG on the basis of the map and keys to public perception. By drawing on the strengths and building on the opportunities, the Action plan aims to limit the effects of the weaknesses and avert the threats, taking into account the different opinion sources.

However, we believe there are two issues that should be addressed first.

The first has to do with the idea that had the strongest impact on public perception: improved air quality. The second, which is also important, is the reduction of discharges into the sea. In other words, the perception that LNG is a clean fuel, improved air quality is going to become increasingly important as time goes by. Positioning natural gas as a fuel that improves air quality and LNG as a means of contributing to this in the maritime and heavy road transport sectors is a present-day message that will gain momentum on its own as time passes. In addition, images of discharges into the sea are a recurring sight which has left a lasting imprint on public memory; therefore, any improvement in this regard will be well received. The message of improving air quality and reducing discharges into the sea should cross-cut all activities carried out. Therefore, before undertaking any activity, we should stop and ask ourselves the following question: Have we take account of how LNG contributes to improving air quality and reduces discharges into the sea?

Although the second aspect only emerged incidentally in the analysis because it did not focus on LNG, we believe it is nevertheless important and, in the event that it is positively received, it could form an important part of the strategy to be pursued without invalidating the existing Plan.

One of the problems that emerged during the focus groups was identifying LNG. When the name behind the acronym (Liquefied Natural Gas) was revealed, there was a change of attitude from indifferent to positive when natural gas appeared. Participants have positive views of natural gas because it is familiar, and suggests trustworthiness and safety. However, a large part of the effect was lost when trying to define LNG as something new, with attendant risks, and in the short space of time that the focus group lasted, participants failed to assimilate this new concept. It was difficult to drive home the idea of a cold liquid when we repeatedly had to refer to gas. Later reflection led us to conclude that it is necessary to simplify the matter, and we should not try to conceptualise LNG as a new product, but rather cast it as a way to make the use of natural gas viable, primarily for transport. Because the fuel vehicles use is natural gas, not LNG, the risks arise in its natural gas form, not as LNG (except for its cryogenic element, which may be important from a technical perspective but is superfluous for the general public). Moreover, the risks associated with natural gas have been assimilated by the public; let us not forget that many of the participants use it in their homes, or would like to use it and, therefore, they see it as nice, manageable and safe. Furthermore, there is a common perception that it is a cleaner fuel. Presenting LNG as a format that enables natural gas to be used in a manageable and safe way in the maritime and heavy road transport sectors, and which is therefore cleaner, is a message that is easy to grasp, easy to explain and easy to assimilate.

The Action Plan is divided into six broad areas of action that include the most important actors as well as the two sectors of public perception analysed.

6.1. A. GENERAL REMIT OF ENAGÁS

A.1. To promote the improvement and optimisation of natural gas prospecting, production and transportation methods that minimise methane leaks and venting as far as possible, and demonstrate this to the public with official accreditation.

A.2. Use tools such as the carbon footprint and the environmental footprint as a means of controlling the reduction of GHG emissions.

A.3. To promote agreements and collaboration with renewable or low-carbon technologies so that the solution to maritime transport is global and combined. E.g: Electrical connection to ports, energy efficiency in ships and ports,

hybrid vessels and machinery, etc.

6.2. B. PORT AUTHORITIES

B.1. Encourage, in a Working Group with the Port Authorities, the exchange of information on the progress of LNG implementation at each port and take advantages of synergies between them.

B.2. Develop a basic procedure for the implementation of LNG in ports so that each port authority can see an implementation timeline for the elements to be developed that can be adapted to their situation and circumstances.

B.3. In coordination with action A.3, explore in-depth solutions to the problem stemming from local environmental groups and the general public's demand for quick solutions to port pollution, which for them is 'plugging' ships into the power grid. In other ports, such as Rotterdam, solutions are being implemented in this regard via LNG.

B.4. Use the port environment to carry out plan D and get the port authority involved.

6.3. C. PORT ENVIRONMENT

C.1. Prepare information and outreach material of a technical nature about the different uses of LNG in the port environment.

C.2. Give talks about LNG to stowage, cargo handling and container companies, etc.

C.3. Establish commercial contact with manufacturers of cranes and other port machinery to encourage the early inclusion of LNG models in their catalogues.

C.4. To draft action and safety procedures for LNG operations at ports, in addition to standards and the provision of training.

C.5. Include an introduction to LNG and its use in induction training for port workers. Stress the impact it will have on air quality.

C.6. Use the port environment to carry out plan D and enlist the collaboration of a number of companies for the carrying out of activities to raise public awareness of life at the port.

6.4. D. GENERAL PUBLIC

D.1. Considering public perception and the possible uses of natural gas vehicles, look for a new name and corporate image for LNG; this should be less connected with technical concepts like 'compressed' and 'liquefied' and focused more on the concept of gas as 'natural' from its origin, which can be played with. For example: '**natural energy**', '**natural fuel**' or even a variant on the trade name used by the competition: '**natural autogas**' (*autogás natural*).

D.2. Exhibition space inside an LNG truck adapted to showcase the CORE project and the fuel's properties (ease of handling because it takes up less space, transportability, stability, safety, clean fuel), referencing experts' comments. Prepare basic information flyers and merchandising.

D.3. Space devoted to 'what we breathe when we breathe', the effects of pollutants on people's health and how natural gas improves air quality.

D.4. Space devoted to marine pollution caused by discharges and how natural gas and LNG prevent pollution.

D.5. Space devoted to contextualising LNG in the marine environment: where we find it (ships, port services), how it creates employment (shipbuilding, specialised services), examples of vessels that use LNG, shipping companies

that are already using LNG and others that intend to do so, examples of common uses in the Nordic countries and Spain's outstanding distribution network. The opportunity will be taken to convey the non-explicit message that LNG is already happening, that it progresses day by day, so that by the end of the visit, visitors will have reached the inevitable conclusion, without being specifically given the message: We are on the way.

D.6. Cross-cutting message: about LNG Vessels – clean and environmentally-friendly boats – Blue Boats (using blue as a symbol of cleanliness and quality in the marine environment based on the idea that blue flag beaches are clean beaches).

D.7. Cross-cutting message: about LNG Ports – clean and environmentally-friendly ports– Blue Ports.

D.8. Carry out awareness-raising programmes tailored to the different target audiences from the LNG truck:

- Schools campaign. Focused on **gas as a useful and clean energy** for people's lives.
- University context. Focused on **improving air quality** by reducing polluting emissions **and eliminating discharges**.
- Rest of general public. Focused on: **improving air quality**, **eliminating discharges and LNG as a safe fuel**.

6.5. E. LOCAL AUTHORITIES

E.1. To establish high-level contacts with mayors to iron out any resistance and secure their support for the project.

E.2. Engage City Councils and Island Government in port districts through areas they may have an interest in: Environment, Tourism, Employment and economic activity, Energy, etc.

E.3. To organise events and seminars on LNG, improving air quality and eliminating discharges to the sea with the participation, collaboration and support of the City Council.

E.4. In line with A.3 and B.3, get local authorities involved in the process of finding solutions so that they can help build bridges and develop common strategies, thus securing institutional involvement in LNG projects.

6.6. F. CONSERVATION ORGANISATIONS

F.1. Secure the participation of environmental organisations in LNG events, not in an attempt to persuade them, but to foster relations based on recognition and mutual respect for differing stances.

F.2. Underscore the message that LNG is a clean alternative fuel that improves city air quality, reduces emissions in the marine environment and prevents polluting discharges, a message that is shared with conservation groups.

F.3. Communicate, in a transparent way, the progress being made in improving the CO2 emissions of vessels with LNG engines over conventional ones, as well as in reducing the organisation's carbon and environmental footprints.

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ACTUALIZACIÓN DEL INFORME: ACEPTACIÓN SOCIAL DEL PROYECTO *CORE LNGAS HIVE* Y SU PLAN DE ACCIÓN.

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Junio 2019

Inscrito en el R.M. de Madrid, tomo 11068, libro 0, folio 57, secc. 8ª, hoja M-174442, inscripc. 1ª. C.I.F. B-81486854

ÍNDICE

1. INTRODUCCIÓN

En el primer trimestre de 2017, el marco de la subactividad ET5 Aceptación social del Proyecto ***CORE LNGas hive***, Folia Consultores S.L. elaboró un estudio de percepción social del GNL como combustible marino, identificando las barreras y fortalezas existentes para la inclusión del gas natural licuado como combustible alternativo.

El estudio de percepción social se realizó partiendo de los datos recogidos de:

- Análisis de fuentes secundarias sobre la percepción social del GNL como combustible marino.
- Recogida de información de los diferentes actores implicados: personas expertas, Administración, ámbito portuario y población general.

A partir de los datos se abordó el análisis y procesado de la información, y la elaboración del informe final de resultados.

Transcurridos dos años de la presentación del estudio, y tras la realización de actividades de difusión y sensibilización, así como la implementación de las actividades desarrolladas en el marco del Proyecto ***CORE LNGas hive***, cabe preguntarse si el proyecto ha impactado positivamente en la percepción social del GNL, y si han variado las conclusiones del estudio en relación a las dificultades, amenazas, fortalezas, y oportunidades establecidas a raíz del trabajo realizado en torno a la percepción social del GNL marino.

Para ello se ha realizado un trabajo de análisis de fuentes secundarias que pudieran aportar claves para interpretar cómo ha evolucionado la percepción social, y cuál puede ser su evolución en un futuro cercano.

2. DESARROLLO DE LOS TRABAJOS

2.1. IDENTIFICACIÓN, RECOPILACIÓN Y ANÁLISIS DE FUENTES DOCUMENTALES RESPECTO DEL MOMENTO PRESENTE

Se ha realizado un trabajo de **identificación de fuentes documentales de relevancia respecto del GNL** publicadas en internet a lo largo de los últimos dos años.

En primer lugar, cabe destacar que, en la realización de este informe se ha vuelto a comprobar que **la información sobre el GNL se encuentra muy dispersa y es de difícil acceso para el público en general**. Se echa en falta un portal que unifique la información y sea accesible para cualquier persona que se interese por el tema. Por ejemplo, la Fundación Naturgy está presentando en España (hasta ahora Barcelona, Guadalajara y Madrid) una exposición sobre "La calidad del aire. Un reto actual", sin embargo, en su web no existe ninguna información al respecto. Una persona que no haya podido acudir a la exposición no puede conocer a través de la página web de esta Fundación cuales son los retos actuales de la calidad de aire y cuales los beneficios que aporta el GN al respecto.

Tal y como ya se puso de manifiesto en el estudio de referencia, la mayor parte de la información relativa al GNL y a sus aplicaciones en el transporte marítimo proviene de los actores implicados en su promoción y desarrollo: Administración, empresas gasistas, operador del sistema, patronal gasista, empresas de ingeniería naval, revistas técnicas del sector, consultores especializados en el sector marítimo, el propio Proyecto ***CORE LNGas hive***, etc. En general, las informaciones que se han podido obtener representan puntos de vista a favor de la implantación de su uso y haciendo hincapié en sus bondades y potencialidades de desarrollo.

Así, los datos (**GASNAM**) apuntan a que, **en la actualidad, hay 136 buques propulsados por GNL en el mundo, una cifra que crecerá un 87% hasta los 254 en 2020**. En España está actualmente en proyecto la construcción y/o transformación de nueve buques con motor de GNL y tres gabarras para suministro al transporte marítimo, mientras que **la infraestructura gasística portuaria ha evolucionado notablemente en el último año**, comenzando con la adaptación de las terminales de GNL para ofrecer servicios a media escala. La misma fuente pone de manifiesto que el **GNL también es una alternativa al diésel en el transporte ferroviario en España**, especialmente en las líneas en las que no se puede justificar su electrificación. En España se está trabajando en diferentes proyectos para fomentar su uso, entre los que destacan el *RaiLNG DMU*, la primera prueba piloto de tracción ferroviaria con gas natural licuado (GNL) de la UE, que se está realizando entre Mieres y Figaredo (Asturias); y el *RaiLNG Heavy Haul*, que consiste en la transformación a GNL de una locomotora diésel. Por otro lado, el **parque total de vehículos que utilizan gas natural como combustible ha crecido un 38% en el último año, hasta alcanzar las 8.471 unidades, un 112% más que en 2016**.

Hay que destacar que la profusión de páginas "catastrofistas" tanto de América del Norte como del Sur, que se detectaron en el trabajo anterior, prácticamente ha desaparecido, lo que evidencia una mayor confianza hacia la metodología empleada en el transporte y almacenamiento del GNL, así como en la seguridad de su uso, que influye positivamente en la percepción social.

Una de las novedades respecto del informe anterior la constituye la **aparición de noticias en los medios de comunicación, generalmente de carácter local, que se hacen eco de las diferentes actividades del Proyecto *CORE LNGas hive***, incluyendo, en la mayor parte de los casos, junto a la noticia de la actuación desarrollada, una valoración muy positiva del empleo del gas natural como combustible y sus consecuencias ambientales beneficiosas, concretando que supone una reducción de entre el 20 y el 30% (según las informaciones) de emisiones de CO_2, y la práctica desaparición de la emisión de contaminantes atmosféricos como el SOx, NOx y PM.

El Puerto de Huelva recibe su primera línea regular de pasajeros con Gas Natural Licuado en el buque Nápoles

Publicado 22/03/2019 15:37:18 CET

PUERTO DE HUELVA

HUELVA, 22 Mar. (EUROPA PRESS) -

El Puerto de Huelva ha recibido este viernes al buque 'Nápoles' que operará en la línea regular de pasajeros y tráfico rodado Huelva-Canarias, propulsado por motores duales de Gas Natural Licuado (GNL). Se trata de la segunda línea de estas características a nivel nacional, que está operada por Baleària y Fred Olsen Express gracias a la alianza que asumieron el pasado año.

Extracto de noticia de Europa Press.

Paralelamente se ha comprobado cómo se han producido ciertos hechos muy relevantes respecto a la percepción social del GNL. Ya se vio en el trabajo anterior como el público en general hacía una simplificación de siglas: GN, GNL, GNC, incluso GLP, haciendo una abstracción al concepto gas como fuente de energía, de forma que se extrapolaban experiencias propias que en general resultaban muy positivas, sobre todo el uso del gas natural a nivel doméstico, hacia el uso de otras formas del gas natural. Pues bien, estas experiencias positivas se ven reforzadas con la ampliación de las redes de suministro de gas natural doméstico a un mayor número de municipios. Actualmente más de 1.800 municipios españoles cuentan con suministro de gas, lo que supone el acceso del 80% de la población. En estos momentos existen varios proyectos en marcha para implementar depósitos de GLN para estos suministros. Del mismo modo, tal y como se ha visto arriba, se han multiplicado el número de vehículos que incorporan tecnología a gas (ya sea GNC o GLP, o híbridas) para su propulsión, estando identificados con etiquetas ECO respecto a sus emisiones. Todos estos hechos hacen que **la idea del gas natural como una fuente de energía limpia se vaya implantando poco a poco entre la ciudadanía**.

Una de las fuentes de información utilizadas en el trabajo anterior fue la de Puertos del Estado, realizándose entrevistas en los puertos de Ferrol, Bilbao, Barcelona, Algeciras y Gran Canaria. La situación actual es mucho más favorable que la evaluada hace dos años. **En todos estos puertos se evidencian mejoras respecto del GNL**, o bien han pasado de una decisión estratégica favorable al GNL, como en los casos de **Ferrol, Bilbao y Barcelona**, a realizar actuaciones concretas que mejoran su posicionamiento (la vocación **ferrolana** de convertirse en el *hub* de gas del noroeste peninsular se ve favorecida por la ya probada posibilidad de recibir grandes buques de GNL en sus instalaciones; en **Bilbao** ya se han realizado con éxito las primeras pruebas de *bunkering* de un barco a otro barco gracias al ya adaptado Monte Aducas; mientras que **Barcelona** en su apuesta decidida por el GNL, junto a la carga de camiones cisterna y otros servicios tradicionales, se ha adaptado técnicamente para ofrecer otros servicios logísticos innovadores, como operaciones de recarga, a pequeña escala, distribución de GNL por tren y abastecimiento de GNL como combustible. Esto ha permitido pasar de una planta tradicional de GNL a una terminal multimodal, además es el único puerto con actuaciones con maquinaria de tierra mediante la adaptación de una *straddle carrier* (equipo móvil especial para el transporte de contenedores ISO) a gas natural, o la ha puesta en funcionamiento de la primera conexión eléctrica a un buque desde el muelle mediante un motor auxiliar de gas natural, que sustituirá el funcionamiento de los motores auxiliares durante la estancia en la instalación portuaria).

Terminal de GNL de Barcelona - Enagás

En el caso de **Algeciras** dónde veían como lejana la incorporación del GNL, donde Endesa está trabajando en los planes para la instalación de una nueva terminal de almacenamiento y distribución de GNL para barcos (Los Barrios) para competir con Tánger (Marruecos). Otros puertos que no se entrevistaron también muestran su dinamismo como el Port de Tarragona, que en su papel de socio del proyecto ***CORE LNGas hive***, ha desarrollado el estudio de ingeniería de la adaptación de una locomotora del puerto alimentada por diésel a GNL. Esta iniciativa prepara el camino hacia la introducción del GNL como una alternativa más sostenible a la tecnología diésel actual en el Port de **Tarragona**. O el puerto de **Huelva**, que ofrece un nuevo servicio de suministro de GNL

mediante *bunkering* a través de la primera gabarra multiproducto del Sur de Europa, con capacidad para abastecer a buques impulsados tanto por combustible tradicional (fuel-oil o gas-oil), como por Gas Natural Licuado, o bien la realización con éxito de la primera prueba piloto en Europa de transporte de Gas Natural Licuado por carretera, tren y barco, en el marco del proyecto ***CORE LNGas hive*** , que ha consistido en transportar GNL en un isocontenedor desde Huelva a Melilla, por carretera, ferrocarril y barco.

En **Gran Canaria** la situación es diferente, el sector marítimo mantiene una actitud a priori muy positiva hacia el GNL, dónde destacan las iniciativas en torno a la utilización de GNL para buques, tanto para el repostaje de grandes cruceros mediante gabarras procedentes de Huelva, como para la transformación (naviera Fred Olsen) o construcción de buques (la naviera Armas ha encargado un nuevo ferry en los astilleros Barreras de Vigo) propulsados a GNL. Sin embargo, y pese a que su situación estratégica parece indicar que Canarias lo tiene todo a favor para constituirse en el *hub* para la costa africana, la instalación de las plantas de regasificación de Granadilla y Arinaga está estancada, mientras que la del puerto de La Luz está iniciando los trámites.

En el informe anterior se hacía referencia al punto fuerte que suponía la experiencia noruega, muy avanzada en la instalación de una red de GNL (21 puertos noruegos disponen de GNL) con el fin de facilitar que los barcos que recorren sus costas pudieran hacer uso del mismo. Recientemente la *Norwegian Maritime Authority*, ha presentado un informe en el que ponen de manifiesto los logros alcanzados en los últimos años.

Portada del informe sobre LNG en Noruega de la *Norwegian Maritime Authority*

Destacan la elaboración por parte de la IMO en 2017 y a la propuesta noruega realizada en 2004 del "*International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels*"; una reducción de las emisiones de forma que tanto las de partículas como las de SOx se han reducido hasta cero, las de NOx se han reducido entre un 90 y un 98%, y las de CO_2 se han reducido en un 26%, todo ello comparado con las emisiones de MDO – 1% de S; y que, tras 17 años de experiencia y con 80.000 operarios trabajando en el ámbito del GNL,

los accidentes se han reducido a: un accidente personal en una desconexión tras el *bunkering*, con afecciones leves en mano y pierna que se recuperaron en un semana, siete accidentes técnicos menores en las embarcaciones, tres fallos en operaciones de amarre (movimientos del buque en el muelle), quedando la manguera de suministro de GNL en tensión pero no sin que se produjera rotura, y tres problemas de sobrellenado que produjeron venteos menores de metano. Todos los fallos fueron debidamente analizados y diseñados los procedimientos adecuados para evitarlos. Por último, considera al GNL como uno de los combustibles bajos en carbono del futuro, por tratarse de: un combustible limpio ya que puede cumplir con los estándares de nivel III de la OMI sobre NOx y los requisitos de SOx en las ECA (incluso nuevas regulaciones sobre las partículas de carbono negro); un combustible de bajo carbono y GEI (más bajo que el gas natural del gasoducto) ya que reduce los GEI en comparación con HFO / MGO (se eliminó el H_2S + CO2, mayor H2, sin partículas de carbono negro) (~ 46%); por su disponibilidad y cantidad: la cantidad prevista de gas natural es enorme (puede durar varios cientos de años), y por estar probado, ser económico, y estar disponible y regulado (55 años a gran escala, y 17 años a pequeña escala), el GNL tiene el potencial de ser económicamente competitivo en comparación con el fuel - oil pesado (HFO), y existen gran cantidad de plantas de licuefacción, almacenamiento y regasificación de terminales *ww*.

Todo lo anterior dibuja una situación del presente, en foto fija, de la que se puede concluir que la percepción social del GNL ha mejorado, tanto en lo relativo al público en general como en lo relativo al sector marítimo en particular.

2.2. IDENTIFICACIÓN, RECOPILACIÓN Y ANÁLISIS DE FUENTES DOCUMENTALES SOBRE EL FUTURO

Uno de los elementos que más llama la atención al analizar la documentación respecto del GNL, es la relevancia que, como no puede ser de otra manera, está alcanzando **la problemática generada por el cambio climático a consecuencia de las emisiones GEI, que se constituyen como un elemento muy relevante en tanto en cuanto al sector energético**. El acuerdo de París de 2015 se ha ido trasladando en los últimos años a estrategias y políticas de lucha contra el cambio climático en todo el mundo y, especialmente, en **la UE, actor principal en la consecución de los acuerdos de París**. De esta forma, en su marco de acción por el clima, para 2020 la UE se ha impuesto objetivos vinculantes en materia de energía y cambio climático con el fin de: reducir las emisiones de efecto invernadero de la UE un 20%, como mínimo, con respecto a las de 1990; aumentar al 20% la parte de las energías renovables en el consumo total de la UE; y mejorar la eficiencia energética para reducir el consumo de energía primaria un 20% con respecto al previsto. En el horizonte 2030 la UE establece como objetivos: una reducción del 40% (como mínimo), con respecto a los niveles de 1990, de las emisiones de gases de efecto invernadero; una cuota mínima del 27% de energía procedente de fuentes renovables; y una mejora mínima del 27% en eficiencia energética. A largo plazo, será necesario reducir aún más las emisiones para evitar que el cambio climático alcance niveles peligrosos. La UE se ha comprometido a reducir sus emisiones, antes de 2050, entre un 80% y un 95% con respecto a los niveles de 1990 como parte del esfuerzo colectivo de los países desarrollados por hacer lo mismo.

En esta misma línea **la IMO establece como objetivos en su estrategia inicial sobre la reducción de las emisiones de GEI de los buques:** La intensidad de carbono de los buques disminuirá mediante la implementación de fases adicionales del índice de diseño de eficiencia energética (EEDI), para que las nuevas embarcaciones revisen sus diseños con el objetivo de fortalecer los requisitos de eficiencia energética, y se

determinará la mejora del porcentaje para cada fase y cada tipo de barco, según corresponda; disminuir la intensidad de las emisiones de carbono del transporte marítimo internacional, de forma que se reduzcan las emisiones de CO_2 en el transporte marítimo, como promedio en el envío internacional, en al menos un 40% para 2030, persiguiendo los esfuerzos hacia el 70% para 2050, en comparación con 2008; y, finalmente, alcanzar el máximo las emisiones de GEI del envío internacional lo antes posible y **reducir rápidamente el total anual de emisiones de GEI en al menos un 50% para 2050 en comparación con 2008** mientras continúa los esfuerzos para eliminarlos totalmente tal como lo exige un camino de reducción de emisiones de CO_2 consistente con los objetivos de temperatura del Acuerdo de París.

Todo ello configura un nuevo paradigma estructural en el que va a desarrollarse el futuro del GNL, y a la vez establece un nuevo marco para evaluar la evolución de la percepción social respecto del GNL en un futuro inmediato, en el cual las ventajas del GNL respecto a la calidad del aire van a ser contrastadas con su carácter fósil y las emisiones de metano y CO_2 de su ciclo de vida (del pozo a la rueda).

En esta línea es en la que incide el último informe de *Transport & Environment* (organización que tiene como misión promover en el ámbito de la Unión Europea y a nivel global políticas de transporte basadas en los principios del desarrollo sostenible[1]), que ha encargado el estudio "*LNG as a marine fuel in the EU; Market, bunkering infrastructure investments and risks in the context of GHG reduction*", presentado a mediados de 2018 y que ha sido elaborado por la UMAS (*University Maritime Advisory Services -University College London bunquering consulty-*).

En sus conclusiones pone en tela de juicio la necesidad europea de seguir invirtiendo en GNL cuando los resultados del estudio establecen que afirma que la reducción de GEI derivada del uso del GNL supondrían *"un máximo de entre el 6% (probablemente un límite inferior) al 10% de reducción de GEI en comparación con el combustible diésel reemplazado (MFO) y todo esto en un escenario optimista de fuga de metano. Si las tasas de fugas de metano fueran más altas, un cambio a GNL en realidad podría aumentar las emisiones de GEI en comparación con el combustible diésel al que reemplaza, incluso antes de considerar el crecimiento del comercio marítimo."*

Por otra parte, mientras que desde las empresas gasistas y otros actores del mundo del GNL se propaga la idea de que el GNL reduce en un 80-90% los óxidos de nitrógeno (NOx), un 20-30% las de dióxido de carbono (CO_2) y prácticamente en un 100% las de óxido de azufre (SOx) y partículas, en comparación con los combustibles tradicionales, en un estudio propio de *Transport & Environment* publicado en octubre de 2018, la organización expresa lo siguiente en su resumen ejecutivo:

"El rendimiento global en términos de GEI (del pozo a la rueda/WTW) identificado en este estudio (con emisiones desde la fuente en el escenario central) oscila entre -12% y +9%, dependiendo del modo de transporte. En los turismos, la reducción de GEI es inferior, con un rango desde -7% a +6% en comparación con el gasóleo. En cuanto a los vehículos pesados, el rango está entre -2% y +5% en comparación con los mejores camiones a gasóleo y dependiendo de la tecnología del motor y del combustible. En el caso del transporte marítimo, las

[1] Para ello, desde 1990 T&E aúna a más de 50 organizaciones de 26 países europeos, fundamentalmente organizaciones ambientalistas. Son miembros de la *Clean Shipping Coalition* y generan gran número de estudios e investigaciones relacionadas con el transporte sostenible, disfrutando de un alto grado de credibilidad e influencia en el seno de la UE

cifras se encuentran entre -12% y +9% en comparación con el gasóleo marino (MGO), pero estas cifras dependen en gran medida de las pérdidas de metano…"

"Para los camiones, el GNC y el GNL no ofrecen beneficios significativos (NOx, PM) en comparación con los vehículos que cumplen con la norma EURO VI. La tecnología HPDI (Inyección directa de alta presión) tiene emisiones de NOx ligeramente superiores. Las emisiones en número de partículas suspendidas también son mayores en el transporte propulsado por metano, en comparación con el gasóleo. En el caso de los buques, el GNL resulta claramente beneficioso en comparación con el fuelóleo pesado, aunque también puede lograrse un rendimiento de emisiones similar equipando a los buques con sistemas de postratamiento tales como SCR y DPF y utilizando gasóleo marino con bajo contenido de azufre".

Este informe constituye un argumento clave en la constitución de la ***Red Gas no es solución***, opuesta radicalmente al uso del Gas Natural, por ser combustible fósil y no reducir las emisiones de CO_2. La *Red Gas no es solución* está integrada por las siguientes organizaciones: 350Bcn, Aliança contra la pobresa energètica, Amigos de la Tierra, Asociación de Cultura Popular Alborada (Gallur), Berriztu!, Comité Cidadán de Emerxencia da Ría de Ferrol, Ecologistas en Acción, Equo Huelva, Ferrol-Cape, Fracking Ez, Fundación Renovables, Fundación Ecología y Desarrollo, Greenpeace España, IIDMA, No Més Gas, Observatorio Crítico de la Energía, Observatori del Deute en la Globalització, Plataforma Ciudadana Zaragoza sin Fractura, Plataforma por un Nuevo Modelo Energético, Plataforma Resposta al Midcat, Plataforma Salvemos Doñana, Podemos, Sí se puede, Seo/BirdLife, Transport and Environment, WWF España, Xarxa per la Sobirania Energètica.

Esta Red pretende convertirse en un "lobby medioambiental" de presión en contra del Gas Natural. En este sentido ya han mantenido reuniones con el MITECO y con la Comisión Nacional de Mercado y la Competencia, en este caso en relación con las regasificadoras de Canarias. Y prevén acciones en torno a la próxima reunión de la que será objeto el proyecto MidCat.

Todo ello puede dar lugar a un cambio importante en la percepción social a futuro respecto del GNL, ya que los grupos ecologistas centran su mensaje en la firme oposición al mismo. Tanto es así que en la reciente III Conferencia Internacional "Reducir la contaminación del aire de los barcos en el mar Mediterráneo", celebrada en Madrid en marzo de este año, la postura ecologista expresada en el programa de radio "Españoles en la mar" de RTVE, se mostraba a favor de la propuesta francesa de establecer una ECA en el mar Mediterráneo, propugnando la evolución hacia un cambio de combustible no fósil, y la inmediata adaptación portuaria para el "enchufe" de los buques atracados. En el programa no se hizo referencia alguna al GNL, pero sí una referencia indirecta oponiéndose a los combustibles fósiles.

Se han revisado opiniones de varios expertos en relación con el GNL. Las opiniones contrastadas se pueden resumir en:

- **El GNL tiene potencial de reducir emisiones GEI (con una mejora de la tecnología actual), sin embargo, las emisiones de la cadena de suministro y la relativa menor eficiencia de los motores reducen sensiblemente o incluso anulan la posible reducción de GEI**.
- **El futuro del GNL en el transporte depende de maximizar los beneficios GEI y la reducción de la contaminación atmosférica que produce (emisiones NOx de algunas tecnologías GNL)**.
- En cualquier caso, **no se considera al GNL y al GN como la solución a las emisiones GEI dado su limitado rango de reducción en el mejor de los casos.** Por tanto, es necesario establecer hasta qué punto el GNL

puede contribuir a reducir las emisiones a la par que se establece en qué punto del futuro deben empezar a implementarse los combustibles y vectores de energía Cero emisiones. Hay que destacar la evidente mejora de las tecnologías basadas en electricidad y de las basadas en hidrógeno (en pruebas con éxito en California) y pilas de combustible de hidrógeno.

Todo ello nos lleva a que las opiniones de los expertos sean cada vez menos favorables al GNL.

Por último, merece la pena consignar que el informe de la *Norwegian Maritime Authority*, al que nos hemos referido anteriormente, incluye una segunda parte sobre la estrategia noruega para avanzar hacia un escenario de cero emisiones en los próximos años, **con una apuesta firme por nuevas tecnologías de control y seguridad, y la utilización de combustibles no fósiles, principalmente hidrógeno y electricidad.**

3. ANÁLISIS DE LA EVOLUCIÓN DE LA PERCEPCIÓN SOCIAL RESPECTO DEL GNL

Con el fin de ilustrar de mejor manera la evolución de la percepción social que se detecta a partir del trabajo realizado, se ha decidido reformular las conclusiones al Mapa de percepción social y actualizar, en la medida de los posible, el análisis DAFO realizados en el anterior informe, siendo muy conscientes de que el resultado es indicativo, y que sería necesario un trabajo de mayor profundidad para poder ir más allá en las afirmaciones realizadas que responden únicamente a una prospectiva.

DAFO DE LAS CLAVES DE LA PERCEPCIÓN SOCIAL DEL GNL

	NEGATIVAS	POSITIVAS	
PRESENTE	DEBILIDADES	FORTALEZAS	PRESENTE
FUTURO	AMENAZAS	OPORTUNIDADES	FUTURO

3.1.1. CONCLUSIONES DE LA REVISIÓN EFECTUADA RESPECTO A LA PERCEPCIÓN SOCIAL

La mejora de la calidad del aire es el mensaje positivo más recibido desde todos los actores, y por tanto aparece como la clave de la aceptación del GNL por parte de la población en general. Sin embargo, **este mensaje pierde fuerza al enfrentarlo al de las emisiones GEI**. El argumento de los grupos conservacionistas de que, cómo solución transitoria, es mejor optar por el MGO y los filtros de emisión, e invertir decididamente en el desarrollo definitivo de tecnología limpia (eléctrica, hidrógeno, etc.) parece muy potente.

Las entidades conservacionistas, que constituyen una fuente de opinión bien valorada por parte de la sociedad, **forman un núcleo de fuerte oposición al GNL**, y si bien admiten su contribución a la mejora de la calidad del aire y la mejora frente a los vertidos al medio marino (manchas de petróleo), aducen que sus emisiones GEI no son sostenibles y por tanto rechazan el GN de plano. Conviene destacar la evolución de su opinión en los dos últimos años que ha pasado de admitir como positiva la aportación del GNL tanto a la mejora de la calidad del aire como la eliminación de vertidos al mar, al no rotundo al GN por tratarse de un combustible fósil que no contribuye a disminuir las emisiones GEI, pudiendo, incluso, aumentarlas. Obviamente la clave radica en la importancia estratégica que ha atesorado la acción contra el cambio climático y, consecuentemente, las emisiones GEI. Este factor cabe esperar que vaya cobrando más importancia con el paso del tiempo.

El sector marítimo tiene un discurso fuerte basado en informes anteriores solventes, que transmite la consideración del GNL como único combustible, actual y a medio plazo, capaz de mejorar la calidad del aire y, a la vez de reducir emisiones de CO_2 (entre un 20 y un 30%), mientras que ven la electrificación de los puertos compleja tanto en la operativa como en los costes. Estas consideraciones se ven apoyadas por la evolución

positiva de la implantación del GN en poblaciones y en el transporte privado con las etiquetas ECO. Ahora bien, en el caso de que el mensaje conservacionista que revisa negativamente los informes anteriores, empiece a hacerse oír, dejando en entredicho el argumentario actual a favor del GN, puede calar la idea de que los apoyos al GN, y consecuentemente también al GNL, son interesados y poco creíbles, generando rechazo.

Las empresas del sector marítimo (construcción naval, navieras, servicios portuarios) transmiten una imagen del sector que, si bien no tiene mucha capacidad de penetración en la población en general, sí deja traslucir la idea de que, aunque lentamente, se va decantando por la adaptación de parte de la flota al GNL, una realidad, por otro lado, cada vez más visible. Ahora bien, **si bien las perspectivas del GNL en el sector son, hoy en día, positivas, una reconsideración siquiera parcial del apoyo al GN por parte de la UE y la Administración, debido a las recientes tesis del sector conservacionista, y amparándose en la descarbonización de la economía, podría dar al traste con ellas, y sufrir un parón importante**.

Las Autoridades Portuarias son un elemento clave para la implantación del GNL, y transmitir la idea de su apoyo sería bien recibido por la población. Los problemas surgidos en Canarias podrían ser fácilmente interpretados como una oposición al GN por parte de la propia Administración, por lo que sería conveniente separar la idea de la introducción del GN en las Islas, y la utilización del GNL en los puertos como combustible limpio solicitado por los buques y navieras. De todas maneras, cabe esperar alguna reticencia al GNL por parte de la Administración central debido a la presión que puedan ejercer los grupos conservacionistas.

Parece que el impulso de **la ECA del Mediterráneo y su evolución, caso de que sea finalmente aprobada por la IMO, va a suponer una importante piedra de toque para el GNL**. Si consigue implantarse como la mejor opción, hoy en día, para cumplir con los requerimientos de esta, así como suponer una reducción suficiente de las emisiones de CO_2, supondría un espaldarazo importante para las perspectivas del GNL en el sector, sin embargo, si se imponen las tesis conservacionistas de no apostar por el GNL, sino por los filtros para el MGO y el apoyo decidido a las tecnologías basadas en pilas de hidrógeno y las soluciones eléctricas, supondría todo lo contrario.

Los expertos son bien valorados por la población en general, aunque en ocasiones se les percibe alejados de la realidad. **Su aval en el mensaje del GNL como combustible que mejora la calidad del aire parece, hoy por hoy, difícil de desligar del de las emisiones GEI.**

Las administraciones locales, sobre todo las de las grandes ciudades, están cada vez más comprometidas con la mejora de la calidad del aire de sus núcleos urbanos, si bien sus estrategias parecen cada vez más dirigidas a apoyar los vehículos de cero emisiones. **El mensaje de que el GNL es el mejor aliado en el medio marino y portuario para lograr los objetivos establecidos de mejora de la calidad del aire podría aún ser apoyado por éstas**, pero la presión que a nivel local puedan ejercer los grupos conservacionistas puede dificultar estos apoyos.

La seguridad del Gas Natural Licuado parece que ha dejado de ser una percepción negativa, en buena medida esto queda avalado por los datos en sus años de experiencia y una normativa y protocolos de procedimientos claros y exhaustivos parecen no ser los mensajes mejor recibidos por los sectores analizados.

3.2. CLAVES DE LA PERCEPCIÓN SOCIAL EN TORNO AL GNL

A continuación, se desarrolla el análisis de percepciones negativas y positivas, tal y como ya se ha explicado anteriormente dentro de un marco presente futuro, el cual determina debilidades, fortalezas, amenazas y oportunidades. Se ha ordenado de forma que se aúnan por un lado elementos negativos y por otro positivos, y en cada uno de ellos la clave presente / futuro.

3.2.1. DEBILIDADES PRESENTES

- Debido a su naturaleza fósil, **el margen de mejora en emisiones de CO_2 es pequeño frente a los combustibles tradicionales**.
- **El metano se comporta como un potente GEI, 28 veces más que el CO_2 durante los primeros cien años**. Según estudios recientes, los escapes de metano en todo el proceso del GNL se consideran infravalorados en un 60% (Ramón A. Álvarez et al. *Science*. 2018).
- **El GNL es rechazado en el entorno conservacionista**, por su carácter fósil y no renovable, por los escapes y venteos no deseados dado el carácter GEI del metano, y por los métodos no convencionales empleados para su extracción (*fracking*).
- No se ha podido contrastar suficientemente la afirmación realizada en el estudio anterior de que: "no existe un planteamiento homogéneo sobre el GNL entre las autoridades portuarias, ni tan siquiera internamente dentro de cada entidad". Aun así, sí **parece que cada Autoridad sigue en un momento diferente influido por la casuística local**, con lo que unas parecen más proactivas y otras más reactivas.
- Dentro del sector marino, permanece la idea de que **las empresas de estiba y consigna ven todavía la implantación del GNL muy lejana**. Si bien se han realizado las primeras pruebas en Barcelona, no se ha constatado un interés por parte del sector en este sentido.
- No se ha podido contrastar un avance en la mejora de la comprensión y conocimiento de la denominación (GNL o Gas Natural Licuado), que se percibía como técnica, difusa, confusa e inquietante. Con todo, a la par que el uso del gas natural en el entorno próximo (el hogar, los vehículos…) va aumentando y normalizándose, **parece que las siglas se van relativizando, de tal forma que se le presta menos atención a la comprensión de un término concreto, que a la idea de que es una forma más de gas natural**.
- El endurecimiento de las políticas y normativas de calidad del aire en las ciudades (puertos) y en navegación siguen desacompasadas. **La calidad del aire en las ciudades se ha convertido en un problema urgente cuya solución, mayoritariamente, empieza a ser de carácter eléctrico**. Ello facilita que el mensaje de soluciones eléctricas para los puertos tenga el campo abonado para instalarse, y la incomprensión generalizada de porqué los buques no incorporan soluciones eléctricas.

3.2.2. AMENAZAS FUTURAS

- **El fuerte rechazo desde las organizaciones conservacionistas**, con una fuerte oposición al GN y una evaluación de la infraestructura gasista en España como sobredimensionada, puede, en un futuro próximo, convertirse en la base de un movimiento más amplio en contra del GN, que alcance a Administraciones y la UE. La pérdida de apoyo administrativo calaría rápidamente en el sector marítimo, ya que sin un apoyo

económico el paso a GNL resulta menos atractivo; mientras que favorecería la investigación y los avances en otro tipo de combustibles y tecnologías cero emisiones.

- **Nuevos informes técnicos ponen en entredicho la capacidad del GNL en la reducción de emisiones de CO_2**, indican una infravaloración de las emisiones GEI (fundamentalmente metano, con efecto GEI 28 veces superior al CO_2 en los cien primeros años) en todo el proceso del GNL, **y apuntan a unas emisiones de NOx superiores a las de los modernos motores diésel según la tecnología utilizada en los motores GNL**. Todo ello resta credibilidad al mensaje de que el GNL es una fuente de energía adecuada para la transición hacia las cero emisiones.
- Está cobrando mucha fuerza en la opinión pública el control de las emisiones GEI a fin de controlar las consecuencias del cambio climático. Baste como ejemplo las últimas manifestaciones de jóvenes a nivel mundial (Viernes por el Clima), también en España, en pro de una acción decidida contra el cambio climático. **La idea de que la utilización de GNL supone mejorar la calidad del aire a costa de mantener o no reducir suficientemente las emisiones GEI es un mensaje muy potente y de rápido calado**. Podría arraigar la idea de que el GNL no es una solución comprometida con el clima.
- **La falta de apoyo desde las administraciones locales** (Ayuntamientos, Cabildos), incluso la firme oposición en algunos casos (Canarias) resta peso a las iniciativas en pro del GNL.
- **Cabe esperar mayor presión en pro de** la existencia de soluciones parciales, como **el "enchufe" para los barcos en puerto**, que a la población le parece una solución limpia e inmediata para disminuir drásticamente la contaminación de los barcos en las ciudades portuarias, y puede restar interés por la propuesta GNL.
- Las organizaciones conservacionistas propagan la idea de que las energías renovables no están ya implantadas por intereses espurios de las grandes corporaciones. Por ello **podría darse que** los mensajes de los beneficios del GNL puedan identificarse como dudosos por venir de una gran empresa energética; y **se perciba al GNL como un freno a las renovables**.
- Si bien desde las autoridades portuarias se ve la introducción del GNL en las maquinarias de puerto como algo natural y deseable, **el riesgo de aumento de emisiones GEI pueden derivar en que las tecnologías de cero emisiones se introduzcan en este ámbito antes de lo esperado.**

3.2.3. FORTALEZAS PRESENTES

- **En el sector marítimo el GNL es ya comúnmente conocido e identificado**. Además, hoy por hoy, la mayor fortaleza del GNL es ser identificado en el entorno marítimo como una tecnología disponible y limpia, beneficiosa en la mejora de la calidad del aire y que reduce las emisiones de CO_2, lo que la convierte en una de las fuentes energéticas del futuro inmediato en el sector.
- La calidad del aire se percibe como un problema acuciante que es necesario solucionar, sobre todo en las grandes ciudades. **La reducción de NOx, SOx y partículas en suspensión, sobre todo *black carbon*, es su mayor fortaleza frente a la opinión pública**.
- **La eliminación de focos de contaminación marina por derrames y vertidos (manchas de petróleo)**. Sin embargo, este valor pierde fuerza ya que las tecnologías cero emisiones también los eliminan.
- **El GNL es una tecnología disponible, probada y que cuenta con buenos protocolos de seguridad para su implementación.** No existe una percepción de peligro arraigada en la comunidad marítima y portuaria.

- **Buenas experiencias**, con datos al respecto en Noruega.
- La **buena posición de España en cuanto a infraestructuras de GNL y desarrollo de la red de suministro**. La tendencia en los últimos dos años ha sido positiva respecto de la implantación del GNL en el entorno portuario.
- **La tecnología basada en el uso del GNL parece que se está consolidando como opción de futuro en la construcción naval**.

3.2.4. OPORTUNIDADES A FUTURO

- Aprovechar la **buena acogida del gas natural hasta ahora en España** (hogares, vehículos, …), para posicionar al GN como la solución más limpia para transitar hacia las cero emisiones.
- Explotar los datos de **una solución técnica que genera empleo especializado** (de calidad) en el sector servicios y la consolidación de empleo en astilleros vinculado a la renovación de la flota.
- **El previsible endurecimiento de las políticas y normativas de calidad del aire en el Mediterráneo** puede generar un clima adecuado para su implantación.
- La **infraestructura GNL en los puertos y la buena imagen creada** es un buen pilar para el desarrollo de esta alternativa.
- **Incluir la reducción de *black carbon* como mejora muy importante para la salud pública y el cambio climático dado su fuerte componente GEI**.

3.3. DISCUSIÓN DE LA POSICIÓN ESTRATÉGICA DEL GNL EN LA PERCEPCIÓN SOCIAL

El GNL parece que sigue siendo un gran desconocido para el gran público, pero no en el entorno marítimo, donde cada vez está más presente. Paralelamente el uso del GN, independientemente del formato, se ha ido extendiendo los últimos años en domicilios, empresas y vehículos, lo que acerca este tipo de combustible a la ciudadanía creando una imagen de confianza. Con todo, debería facilitarse el acercamiento al GNL por parte de del público en general y del sector marítimo a través de un portal web.

En un momento en el cual el cambio climático y la descarbonización de la economía marcan en buena medida la percepción social respecto de los combustibles, el bajo margen de mejora en emisiones CO_2 y su elevado efecto GEI, son debilidades intrínsecas del gas natural. Las prospecciones realizadas han mostrado que en el sector conservacionista esta circunstancia es más valorada que su aportación a la mejora de la calidad del aire y la reducción de los vertidos al mar (caso del GNL), generando una fuerte oposición al GN. Este mensaje está siendo lanzado a partir del tercer trimestre del año 2018 y no se conoce aún el impacto de esta campaña y sus consecuencias sobre la opinión pública y la posición de las Administraciones.

Siguiendo las directrices de la UE, la calidad del aire está, hoy por hoy, en la agenda pública de las grandes ciudades como algo prioritario y se han iniciado acciones decididas ante la IMO para la declaración de una ECA en el Mediterráneo. Todo ello representa una oportunidad única para dar un empuje definitivo al GNL en el

sector marítimo. Sin embargo, es necesario trabajar un argumentario fuerte en el que se abunde en la reducción de emisiones GEI por parte del GNL.

Las fortalezas más importantes del GNL, que son el beneficio ambiental sobre la calidad del aire y la eliminación de focos de contaminación marina, están en cuestión desde el sector conservacionista, desde dónde se ejerce una fuerte oposición al GN en base a su poca versatilidad para disminuir las emisiones GEI. En ellas recae, junto a factores económicos que no se tratan en este trabajo, la clave del éxito de la implantación del GNL. Se debe de tener muy en cuenta que las posiciones conservacionistas pueden socavar los pretendidos beneficios económicos, lo que tendría un efecto negativo sobre la consolidación del GNL como combustible alternativo en el sector marítimo.

Por todo ello, es imprescindible contar con **un argumentario sólido basado en mediciones efectuadas con garantías**, que muestre: cuales son las emisiones de metano y el margen de mejora; cuales las emisiones de CO_2 y el margen de mejora; y cuales las emisiones de NOx, SOx y PM, de las diferentes tecnologías y su margen de mejora. Dicho argumentario debería estar disponible y accesible para el conjunto de la población.

Con algunas excepciones (Canarias) **el GNL va encontrando buena acogida en los puertos españoles**, tal y como se puede deducir de la actividad demostrada en estos últimos años y que ha sido, en general, recogida y muy bien valorada desde los medios de comunicación locales. Se evidencian fortalezas vinculadas a las zonas portuarias, como la no percepción de peligro asociado al manejo de GNL por parte de la comunidad marítima y portuaria y a el incipiente apoyo a la extensión del uso del GNL desde los buques a la maquinaria de puerto por parte de las Autoridades Portuarias.

La percepción de riesgo e inseguridad inherente que aparecía en el informe anterior ha ido diluyéndose y, actualmente, no se percibe como un elemento preocupante, sin embargo, merece la pena seguir insistiendo en ello.

Es importante **seguir recabando el apoyo de las administraciones locales** junto con el **apoyo del sector naval** a fin de asentar los logros alcanzados.

El "tempo" del GNL en el sector marítimo es inevitablemente lento. En un mundo donde todo parece quedarse antiguo antes de estrenarlo, la lentitud puede producir desinterés y búsqueda de soluciones alternativas más inmediatas, tanto en la mejora de la calidad del aire como en la mejora de las emisiones GEI. Es necesario incorporar estrategias que permitan aliarse con las soluciones rápidas a la vez que se asienta la solución GNL para el transporte marítimo. No se puede perder de vista que las soluciones basadas en la utilización de motores eléctricos, pilas de hidrógeno, u otras, están avanzando a gran velocidad comparado con años anteriores.

Por último, **el efecto sobre el empleo**, sobre todo de carácter indirecto tanto en astilleros como en empresas nuevas de servicios creadas en torno al nuevo combustible y sus necesidades, si bien no se observa como una oportunidad que pueda ser una razón de peso para decantar la percepción social sí **es un apoyo importante para lograr un clima favorable a la implantación del GNL**.

4. PLAN DE ACCIÓN PARA LA MEJORA DE LA PERCEPCIÓN SOCIAL

Como producto final del estudio de percepción social del GNL para uso marítimo se propuso un Plan de Acción con fuerte carácter estratégico con el fin de mejorar la percepción social del GNL en base al mapa y las claves de la percepción social. En el presente documento se propone un nuevo Plan con un carácter menos estratégico y más operativo.

Como en el caso anterior, el Plan de Acción que ahora se propone busca, basándose en las fortalezas y potenciando las oportunidades, limitar los efectos de las debilidades y desvirtuar las amenazas, atendiendo a los diferentes actores de opinión, y dirigiéndose para ello al conjunto de la sociedad y, prioritariamente, al sector marítimo.

Lógicamente el **Plan de Acción a proponer debe ser coherente con la Estrategia de Sostenibilidad de Enagás**, y su Plan de Gestión Sostenible recogidos en el informe Anual 2018, que recoge como principales líneas para 2018:

- *"Definición del sistema de gestión de la energía ISO 50001 por tipo de instalación.*
- *Fijación de objetivos de reducción de emisiones a corto (reducción media del 5% de las emisiones del periodo 2019-2021 respecto a 2018) y a largo plazo (reducción del 57% de las emisiones de CO_2 desde 2014 -en proceso de validación por Science Based Targets a fecha de publicación del informe anual 2018-).*
- *Evaluación de los proveedores más relevantes en materia de cambio climático.*
- *Revisión de las cuantificaciones económicas de los riesgos y oportunidades derivadas del cambio climático (elaboración de escenarios en función de los incrementos de temperatura-TCFD).*
- *Revisión de contratos de suministro eléctrico con el objetivo de incrementar el porcentaje de electricidad suministrada con Garantías de Origen al 40% en las instalaciones de mayor consumo.*
- *Ampliación de la campaña LDAR para la detección, cuantificación y reparación de fugas abarcando cada vez un mayor número de estaciones de regulación y medida y posiciones de la red de gasoductos".*

Y marca como líneas de acción para 2019:

- *"Implantación del Sistema de gestión de la energía según la norma ISO 50001.*
- *Plan de sustitución de turbocompresores por motocompresores eléctricos en Estaciones de Compresión críticas.*
- *Colaborar activamente en la elaboración de informes, estudios e investigaciones con impacto para el gas natural (GIEMarcogaz, transporte marítimo, methane guiding principles, etc.).*
- *Realización de campañas anuales LDAR para la detección, cuantificación y reparación de fugas de gas en plantas de regasificación y almacenamientos".*

Respecto de la **Gestión de riesgos y oportunidades derivadas del cambio climático, en el Plan de Gestión Sostenible** se establece que:

"Los riesgos derivados del cambio climático se evalúan de forma integrada en el modelo de control y gestión de riesgos de la compañía. De este modo, se identifican y cuantifican riesgos derivados de factores como las políticas y cambios regulatorios para incentivar el uso de energías renovables, el efecto de la temperatura, el incremento del volumen de emisiones y de precios de CO_2 y/o carga fiscal de las emisiones de CO_2.

Todo ello se ha evaluado en tres escenarios climáticos alineados con el incremento de la temperatura global: un business as usual en el que la temperatura se incrementaría 4°C, un escenario alineado con el incremento de 2°C que se acordó en la Cumbre Climática de París y un escenario estresado en el que la temperatura global se incrementaría en 6°C acentuando así los riesgos físicos (desastres naturales)".

De este análisis se derivan una serie de riesgos y oportunidades:

*"**Riesgos**:*

- *Sobrecostes de operación por emisiones CO_2.*
- *Disminución de la demanda de gas natural.* Este riesgo es evaluado como el más alto teniendo en cuenta el impacto y la probabilidad de ocurrencia, proponiéndose las siguientes medidas de control:
    - *Promoción de nuevos servicios y usos del gas natural en los sectores del transporte (marítimo, ferroviario y carretera), industrial y residencial.*
    - *Promoción del desarrollo del gas de origen renovable e hidrógeno y su integración en las infraestructuras gasistas.*
    - *Fomento del desarrollo de nuevas tecnologías e infraestructuras de captura, transporte y almacenamiento o utilización de CO_2 y licuefacción a pequeña escala.*
- *Incidentes en operación por catástrofes naturales. Adaptación de infraestructuras.*

***Oportunidades**:*

- *Gases renovables, con líneas de acción en los focos de biometano e hidrógeno.*
- *Nuevos servicios"*.

Cabe destacar que en ambos casos se prevé un bajo impacto, si bien la probabilidad de ocurrencia es media y alta respectivamente.

Los esfuerzos de la compañía en materia de cambio climático se centran en el control y reducción de la huella de carbono de la propia entidad, existiendo un Plan de Eficiencia energética y reducción de emisiones.

Desde el punto de vista de la percepción social que nos ocupa, una vez analizado el Plan de Gestión Sostenible de la empresa y, en concreto, su apartado de cambio climático y eficiencia energética, parece indicado que el

mismo incluyera un pronunciamiento expreso alineándose con los objetivos derivados de la Cumbre Climática de París, lo cual le conferiría mucha más fuerza a cualquier acción para mejorar la percepción social.

El Plan de Acción para la mejora de la percepción social del GNL se articula en dos sentidos. Por un lado, las **estrategias de trabajo** y, por otro, los **programas que las desarrollan**. Los programas se concretan en actividades que pueden contemplarse a la vez en ambos ejes (por ejemplo, realizar para los colegios unidades didácticas), o bien en únicamente en uno de ellos.

		EJES DE TRABAJO	
		EJE 1	EJE 2
PROGRAMAS	PROGRAMA 1	Actividad 1.1 - E1	Actividad 1.1 – E2
		Actividad 1.2 - E1	
		Actividad 1.3 - E1	Actividad 1.3 – E2
		…	…
	PROGRAMA 2	Actividades 2 - E1	Actividades 2 – E2
		…	…
	PROGRAMA 3	Actividades 3 - E1	Actividades 3 – E2
		…	…

Una de las claves para que el Plan de Acción sea efectivo es que llegue con un mensaje claro y enriquecedor, a los públicos objetivo y, dentro de cada categoría, al mayor número de personas y entidades posible. Para ello **es necesario**:

- **lanzar mensajes concretos con mensajes claros y sencillos que, en segundo término, estimulen el interés de los públicos objetivo por el tema y**
- **facilitar y canalizar dicho interés hacia contenidos más detallados y adecuándolos a cada uno de ellos.**

Las acciones están diseñadas para trabajar en este doble sentido, con acciones directas que catalicen toda una oferta posterior. **Dicha oferta puede darse a conocer a través de un portal web, que parece el alojamiento idóneo para ello, tanto por su accesibilidad como por su economía**, ya que hacer llegar todas las iniciativas y recursos directamente a los usuarios finales sería tremendamente costoso, mientras que proveer de las herramientas para desarrollarlas desde la web, reduce mucho el esfuerzo y multiplica el impacto.

El portal web adquiere así una función esencial en el Plan de Acción diseñado: **es el lugar de encuentro entre la sociedad y el GNL** y, por ende, debe ser un enlace de referencia, es decir, al escribir en un buscador "gas natural licuado" o "GNL", debe ser una de las primeras páginas que surja.

Estimamos que el alojamiento del portal puede estar vinculado tanto a la página del proyecto ***CORE LNGas hive*** (tiene el hándicap de temporalidad de la página unida a un proyecto con fecha de finalización), a la página de la empresa (apartado nuevo o apartado dentro de la responsabilidad social corporativa), a la de una entidad sin ánimo de lucro existente, a una página nueva creada exprofeso para ello, o bien una combinación de ellas. Todas las opciones tienen ventajas e inconvenientes que se deben valorar desde Enagás, si bien entendemos

que la cuarta opción, una fundación de la empresa cuya actividad, y por tanto su página, se centrara en desarrollar programas dirigidos a la mejora de la calidad de aire y la transición ecológica, resulta la más idónea.

Partiendo de este portal, se debe diseñar una campaña de presencia en redes sociales, buscando una comunicación más directa con diferentes sectores sociales.

4.1. EJES DE TRABAJO

El Plan de Acción busca, a través de diversas acciones, que llegue a la población en general un mensaje claro y articulado en función de dos ideas clave que son los **dos ejes de trabajo**:

- **El GNL es la mejor solución actual para mejorar la calidad del aire en el sector marítimo.**
- **El GNL es el mejor medio para garantizar una transición ecológica hacia una economía baja en carbono en el sector marítimo (el GNL es el medio para alcanzar la solución).**

Como primer paso para articular los ejes de trabajo **es necesario reforzar la imagen positiva del GNL con un argumentario bien fundamentado capaz de responder con solvencia a ambas ideas**. Para ello es preciso dotarse de datos, resultados de mediciones solventes, artículos y estudios de prestigio que sustenten las dos ideas. **Este argumentario debe ser común para todas las acciones relativas al GNL que se realicen**, ya sea con administraciones, organismos, empresariado, presentaciones en foros, publicaciones en prensa, o comunicaciones directas con la sociedad (exposiciones, campañas, actividades, …).

El **argumentario relativo a la calidad del aire** debe consolidar la **reducción de emisiones de NOx, SOx y partículas en suspensión, sobre todo *black carbon*, dado que es la mayor fortaleza del GNL frente a la opinión pública**. Pero también debe avanzar y contemplar, en todo caso, las ventajas y desventajas de las diferentes tecnologías en el uso del GNL, y aspectos como la comparación con las últimas tecnologías de los motores diésel y gasolina que reducen sensiblemente las emisiones.

Por su parte, el **argumentario relativo a la transición ecológica** debe, partiendo de la idea de ser una tecnología disponible y probada, profundizar en dos aspectos: **las emisiones de metano y su control y minimización** en el proceso de vida del GNL WTP (del pozo a la hélice) y **la reducción de las emisiones de CO_2** en comparación con otras tecnologías (descarbonización). Además, se deben aportar diferentes líneas de trabajo que pongan de manifiesto cómo el GNL es la mejor vía para conectar las exigencias actuales con las soluciones futuras, por ejemplo, las tecnologías híbridas, producción eléctrica más limpia gracias al GNL, la transición hacia la utilización de gases renovables (biometano e hidrógeno), apoyando también la idea de que las infraestructuras actuales para el almacenamiento y distribución del GNL no queden como elementos obsoletos a corto, sino como infraestructuras de futuro en la utilización de otras soluciones renovables.

Es importante tener en cuenta que **el objeto de estos argumentarios es la propia esencia de la utilización del GNL como fuente de energía limpia y de transición**, apoyando el papel clave que debe jugar en el proceso hacia una economía descarbonizada.

No es necesario que el Plan de Acción progrese del mismo modo en los dos ejes. Uno de los ejes, el de la calidad del aire, ya está mucho más avanzado, e incluso existen campañas de otros actores que ya están insistiendo en este sentido (ej.: Naturgy). Por lo tanto, crear un argumentario para esta idea parece, a priori, más fácil y rápido

que en el caso de la transición ecológica y las emisiones GEI, dónde creemos que los trabajos de medición iniciales pueden demorar más la puesta en marcha de este. Además, iniciar las acciones en este eje permitiría asentar buena parte de las fortalezas y oportunidades detectadas. Ahora bien, se debe tener en cuenta que la mayor oposición y descrédito social del GNL es probable que provenga de su carácter fósil, y la articulación de la idea de que insistir en el GNL es contribuir al cambio climático, por lo que este argumentario debe ser desarrollado con celeridad.

Los argumentarios, en todo caso, deben ser accesibles en todo momento, manteniendo **dos niveles** de información: uno con carácter **básico** que soporte el argumento concreto y otro de carácter **más técnico** que dé respuesta a personas interesadas con más formación y grado de exigencia.

Paralelamente, dentro de cada eje de trabajo, y con el fin de visibilizar un vínculo inequívoco de la entidad con ambas ideas clave, proponemos que se articulen sendos compromisos propios de Enagás (estos compromisos podrían asumirse dentro del Plan de Sostenibilidad y eficiencia energética de la empresa). Entendemos que estos deben concretarse a partir del argumentario que se desarrolle, pero avanzamos dos ideas que parecen interesantes en el marco del momento actual.

- **Calidad del Aire**. En línea con el Plan de Gestión Sostenible de Enagás, y buscando que el compromiso esté ligado con el proyecto ***CORE LNGas hive***, debe articularse en torno a **la idea de mejora de calidad del aire en los entornos portuarios y el transporte marítimo, mediante la facilitación del uso del GNL**, calculando, en base a las operaciones realizadas empleando o suministrando GNL, la cantidad de emisiones no producidas, y establecer un compromiso por alcanzar una cantidad relevante y factible de no emisiones en un número de años determinado. Esto **reforzaría el papel del GNL como tecnología limpia en los puertos**.
- **Compromisos por el Clima**. Tal y como se pone de manifiesto en el Informe anual 2018 de Enagás, **dos son los elementos clave respecto al clima en la gestión de la compañía: las emisiones de CO_2 y las fugas de metano**. **Un compromiso por el clima** creíble desde la percepción social debe, apoyándose en la gestión de la propia empresa, ser **coherente con los acuerdos de Paris y los Objetivos de Desarrollo Sostenible** (ODS), que constituyen la Agenda de la humanidad para 2030.

  Enagás, partiendo de la ejecución de su Plan de Eficiencia energética y reducción de emisiones que contempla campañas LDAR en las plantas de regasificación y almacenamientos, o la incorporación de cuantificadores de emisiones como herramienta de trabajo habitual de mantenimiento de los activos de transporte, así como la participación en diversas asociaciones colaborando activamente en la elaboración de informes, estudios e investigaciones relativas a las emisiones de metano, puede formalizar **un claro compromiso frente al cambio climático respecto de las emisiones de metano que será necesario valorizar**, apoyándose en los datos de la reducción obtenida. Esta actuación debería ser extendida, en concreto, al sector marítimo, de manera que el sector confiara en una gestión adecuada del combustible en pro de la disminución de emisiones, y tuviera mayor capacidad de respuesta ante la presión del sector conservacionista al GNL.

  Por otro lado, y no menos importante, la compañía debería **concretar su compromiso con la reducción de emisiones de CO_2**, en el que debe ir más allá de la disminución de su huella de carbono, tal y como ya contempla su Plan, persiguiendo una reducción de las emisiones globales de CO_2 (algo que el informe anual 2018 deja implícito al identificar el alineamiento de su Plan de Sostenibilidad con los ODS) mostrando cómo y en qué medida el uso del GNL descarboniza la economía respecto de otros combustibles fósiles, y cómo la apuesta de la compañía por el uso de los gases renovables y el fomento del desarrollo de nuevas

tecnologías e infraestructuras de captura, transporte y almacenamiento o utilización de CO_2 y licuefacción a pequeña escala, van a contribuir a conseguir los objetivos fijados en París y los ODS.

4.2. PROGRAMAS

Las actividades que se incluyen en cada uno de los programas desarrollados deben apoyarse en los argumentarios a desarrollar. Se han establecido un total de cuatro programas de trabajo: población en general, comunidad educativa, administraciones locales, y comunidad portuaria que incluye una actividad dedicada a los *stakeholders* del entorno marino.

4.2.1. PROGRAMA POBLACIÓN EN GENERAL

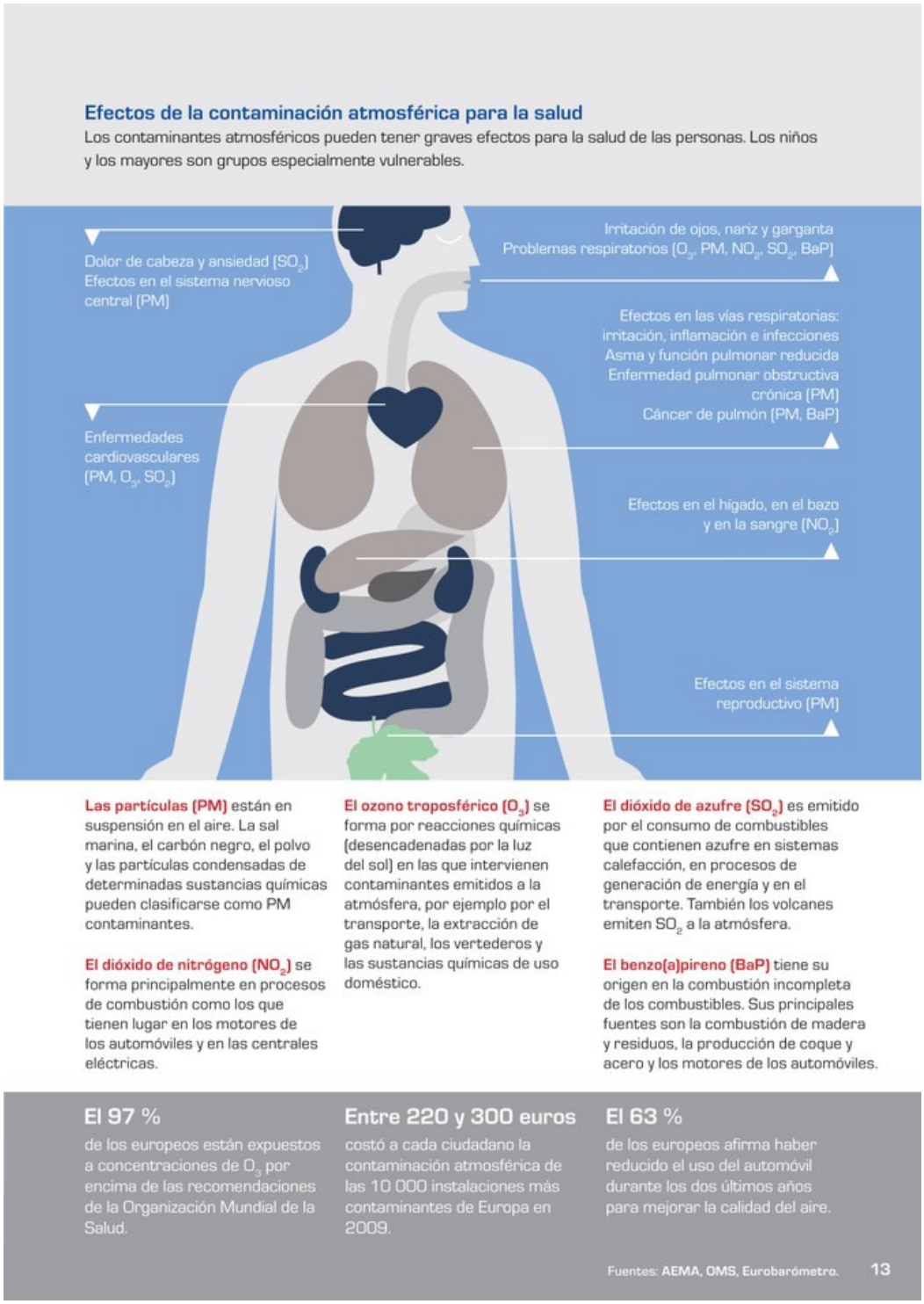
Campaña en los medios para reforzar el papel del GNL como energía limpia, disponible y presente en múltiples áreas de actividad. Ayudaría también a posicionar la página web.

Se trata de campañas de impacto y recurrentes presentadas como **publireportajes** y elaborados como vídeos de animación con técnicas de *storytelling* e infografías, y una duración de no más de cinco minutos. Si diseño se concebirá para su emisión en televisiones locales y autonómicas (con ello se busca el impacto en la percepción social de las comunidades portuarias y marítimas, sin embargo, caso de considerarse que van a ser medios con poca repercusión, se puede optar por medios nacionales), sirviendo también cómo recursos de la página web.

Cada vídeo estará dedicado a tratar una **temática concreta y todos ellos incluirán una parte final dedicada a enmarcar el GNL en el entorno marino**: dónde lo encontraremos (barcos, servicios portuarios, distribución a otros entornos…), y como generación de empleo (astilleros, servicios especializados). Se aprovechará para lanzar el mensaje implícito del **GNL como una realidad en marcha**, que avanza día a día, de forma que sea una conclusión evidente al final de los vídeos.

Proponemos las siguientes temáticas para las historias:

- **Qué respiramos cuando respiramos**, efectos de los contaminantes para las personas, poniendo el acento en cómo el GNL mejora la calidad del aire.



Fuente. Agencia Europea del Medio Ambiente.

- **Contaminación del aire derivada de las emisiones de los buques**. Consecuencias de estas y controles impuestos por las distintas Administraciones y Autoridades marítimas. Cómo el GNL supone una solución adecuada y facilita el cumplimiento de la normativa.

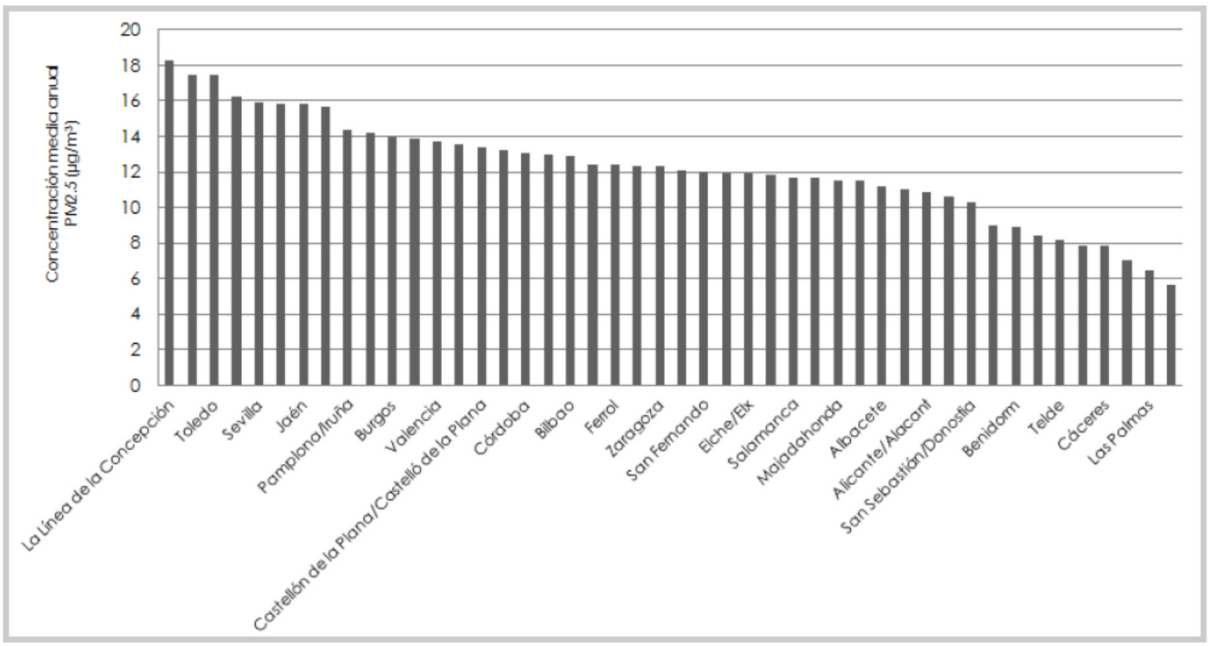
Ejemplo de contaminación de un buque. Fuente: Ingenieromarino.com

- **Contaminación marina por emisiones contaminantes y vertidos de petróleo**. Cómo el GNL evita esa contaminación y mejora el estado de los ecosistemas marinos ayudando a su conservación.

Tortuga afectada por vertido de petróleo. Fuente: eldiario.com

Si bien, tal y como ya se ha dicho, se debe esperar a disponer el argumentario respecto de la transición ecológica, proponemos dos líneas para campañas en este ámbito:

- **El GNL, la vía para la descarbonización**, en línea con la idea de que el GN no es la solución, pero es la vía para conseguirla.
- Instalar la idea de trabajo concienzudo y continuo para **evitar las emisiones de metano**, con mensajes como, por ejemplo: no podemos evitar que las fugas de metano de las vacas (ligada a las emisiones de metano de la ganadería), pero sí las nuestras.
- ***Black carbon*, una amenaza para la salud, una amenaza para el planeta**. GNL libre de *black carbon*.



Niveles de PM2.5 en ciudades españolas. Mediciones realizadas por la OMS durante 2011. Fuente: OMS y Factor CO_2.

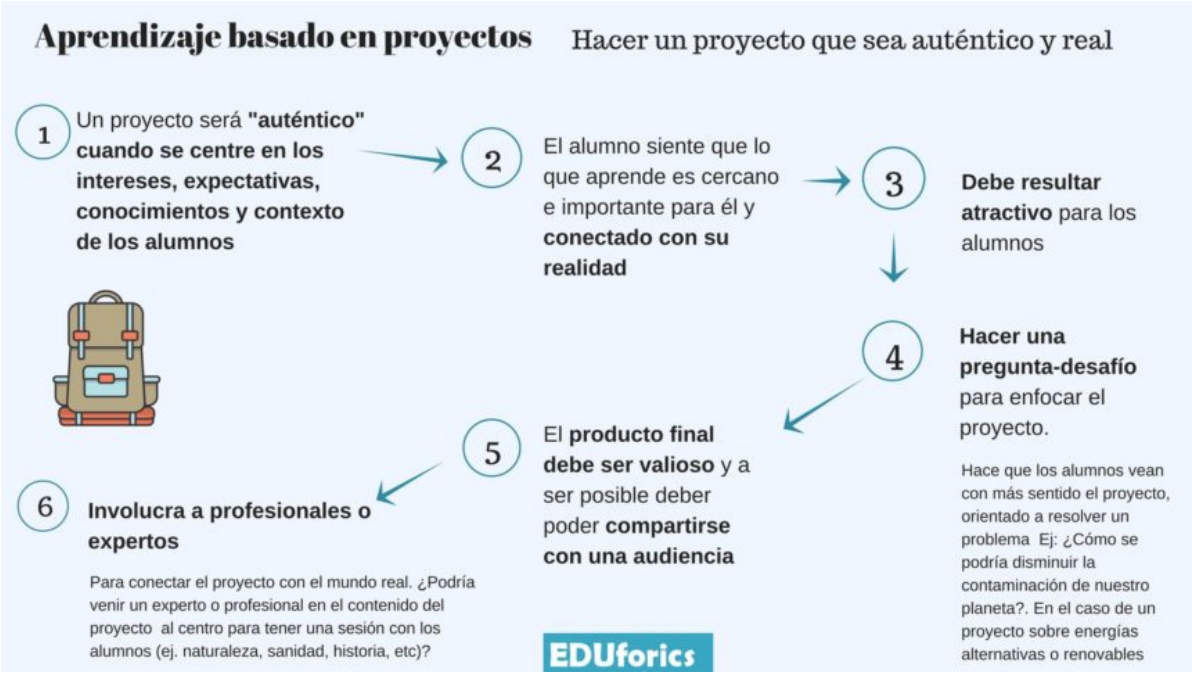
4.2.2. PROGRAMA COMUNIDAD EDUCATIVA

Este programa va dirigido a **proporcionar herramientas prácticas a los docentes para trabajar diferentes temas relacionados con la calidad del aire y en diferentes niveles educativos**: el aire que respiramos, las consecuencias de los contaminantes en nuestro organismo, la consecuencia de los contaminantes en la naturaleza, el ahorro económico en sanidad, todo ello relacionado con los beneficios del GNL para la calidad del aire.

En el ámbito de la transición ecológica, a la espera del argumentario, se pueden avanzar ideas en torno a la identificación de las emisiones de metano y su comportamiento como gases de efecto invernadero, y los controles que se efectúan desde el sector gasista para disminuir las emisiones. Para abordar las emisiones de CO_2, se puede enlazar desde la quema de metano generando CO_2 exenta de otros contaminantes, para luego comparar los diferentes combustibles fósiles destacando la reducción de emisiones por el uso de GNL. Otra

línea de trabajo sería la relación entre GNL y gases renovables, destacando los beneficios ambientales y climáticos.

Los recursos educativos propuestos se basan en la **metodología ABP** (Aprendizaje Basado en Proyectos o *PBL*, *Project-based learning*), un modelo de enseñanza fundamentado en la utilización de proyectos auténticos y realistas, basados en una cuestión, tarea o problema altamente motivador y envolvente, relacionados directamente al contexto de la profesión, mediante el cual los alumnos desarrollan competencias en un enfoque colaborativo en busca de soluciones.



Fuente: EDUforics

En esta metodología, el aprendizaje de conocimientos tiene la misma importancia que la adquisición de habilidades y actitudes. Es considerada, además, **una estrategia de aprendizaje**, en la cual los estudiantes se enfrentan a un proyecto que deben desarrollar. Da el protagonismo al alumnado evitando su papel pasivo del sistema de contenidos y trabajando desde su participación, activa y crítica, para que alcance los aspectos clave definidos en el proyecto. La educación confirma este proceso como algo fundamental para lograr ciudadanos democráticos y con pensamiento científico.

No se trata de ofrecer una guía de conocimientos para el alumnado, sino de facilitar a los docentes recursos mediante los cuales puedan organizar y tutelar una actividad en torno a los temas propuestos, de forma que el GNL sea una solución que aparezca en el trabajo del alumnado buscando soluciones al problema (calidad del aire, etc.), y el profesor disponga de recursos para facilitar al alumnado las vías para encontrar los conocimientos suficientes relativos al mismo.

El uso de estos recursos reporta la aplicación de metodologías activas, el uso de las TIC, el aprendizaje entre iguales y el trabajo cooperativo, y, cómo fondo, una concienciación sobre la problemática de los temas propuestos y lo que el uso del GNL puede aportar para su solución.

Estos recursos educativos estarán disponibles en la web. El desarrollo del programa parte de un envío postal a las direcciones de todos los colegios e institutos dirigido a la dirección y jefes de estudios, dónde se les informaría de la disponibilidad de los recursos y herramientas en la web, y se les invitaría a participar en un certamen mediante la presentación de una actividad escolar que haya realizado el centro sobre los temas abordados en las herramientas o relacionados con ellos, y que se premiaría (recursos, dataciones, participación en un evento, …).

Previamente es necesario desarrollar los recursos y herramientas didácticas, derivadas del argumentario de cada eje de trabajo, para cada uno de los temas, y colgarlos en la web. Entre los recursos facilitados se aportarían ideas base sobre actividades que pueden desarrollar en los centros. En caso de querer darle a la iniciativa mayor repercusión desde el punto de vista educativo cabe también la posibilidad de dirigirse a plataformas especializadas como el INTEF (Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado).

4.2.3. PROGRAMA ADMINISTRACIONES LOCALES

Las Autoridades locales representan un apoyo importante para la implantación del GNL debido a que son responsables de las políticas medioambientales y de salud pública directamente relacionadas con la calidad del aire de sus ciudades. Fomentar un movimiento entre ellas en pro del GNL como una de las soluciones para la problemática derivada de la contaminación por NOx, SOx y partículas en suspensión, es un reto importante para la percepción social del GNL.

Entendemos que la mejor manera de incentivar el interés de este estamento por el GNL es a través de la **comunicación entre iguales**, dado que es la mejor manera de abordar las problemáticas complejas y comunes que suponen este tipo de actuaciones.

La propuesta concreta de actividad para este programa consiste en un **Foro sobre la calidad del aire en las ciudades**, dirigido a todas las administraciones locales, organizado y apoyado desde la página web, con una convocatoria en los medios, y la participación de personas expertas y experiencias nacionales e internacionales. Este tipo de eventos identificaría **a Enagás como una entidad comprometida con el aire limpio**.

Con posterioridad al lanzamiento de la campaña de publireportajes / *storytelling* en los medios detallada en el programa de población en general, y aprovechando el impacto generado, sería el momento más adecuado para presentar la idea del Foro sobre la calidad del aire en las ciudades.

La intención es que, dependiendo de los resultados y la acogida de la iniciativa, este Foro de ciudades por un aire limpio se repita cíclicamente. Independientemente de ello, la página web mantendría un espacio dirigido al aire limpio en las ciudades, identificando buenas prácticas, con reportajes sobre problemáticas y cómo el GNL puede ayudar a resolverlas.

Para dar a esta idea una mayor repercusión en los medios y entre las Administraciones, cabe el lanzamiento de esta en colaboración con la Federación Española de Municipios y Provincias.

4.2.4. PROGRAMA COMUNIDAD PORTUARIA

Este programa reúne actividades dirigidas, a la **población en general**, usuaria y vecina del puerto, y al sector marítimo, en especial al portuario, centrándose en nuevos ***stakeholders*** del proyecto.

Para la **población en general está dirigida a valorizar las actuaciones portuarias que facilitan la incorporación del GNL**. Dentro de esta acción se prevé como actividad base la instalación, en todos los puertos cuyas autoridades portuarias participan en el proyecto ***CORE LNGas hive***, de unos paneles informativos ubicados en áreas de fácil acceso para el público y los trabajadores del puerto.

El contenido de los paneles irá destinado a informar de las ventajas del uso del GNL en el medio marítimo (reducción de emisiones y mejora del medio) y de las acciones concretas desarrolladas por ese puerto en particular para convertirlas en realidades. Los propios paneles informaran de que puede encontrarse más información en la web.

Modelo de paneles informativos: imagen con fuerza, explicaciones cortas en dos idiomas.

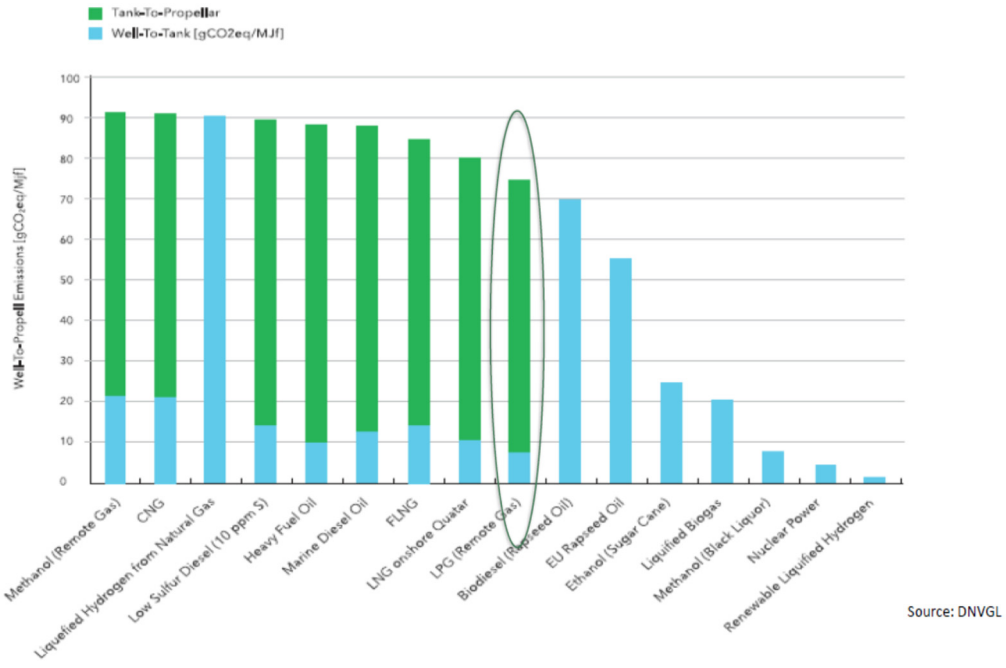
Además, cabrían actividades como la de denominación de "Puerto Limpio" a aquellos puertos que alcancen una determinada tasa de actividades con GNL (esto se puede articular complementariamente al compromiso de Enagás en este eje).

Los *stakeholders* del proyecto ***CORE LNGas hive*** son muchos y variados e incluyen a: asociaciones y empresas del sector gasista, autoridades portuarias, navieras, astilleros, tecnológicas, administraciones, centros universitarios y de formación, etc. No cabe, desde un Plan de Acción de percepción social, establecer actividades específicas dirigidas en concreto a cada una de estas categorías dada la especificidad de los intereses particulares. Sin embargo, sí se debe **abordar el diseño de actividades y mensajes claros hacia el sector marítimo que promuevan la reacción positiva del conjunto del sector hacia el GNL**.

La mejor manera de llegar al sector es a través de la comunicación directa. Esta comunicación puede establecerse en el entorno portuario, siendo este espacio un punto de encuentro de la comunidad marítima. Se propone la realización de una campaña de comunicación directa a realizar en los puertos de interés mediante el desarrollo de un encuentro en torno al tema: “GNL una realidad. Perspectivas de futuro”.

Los temas a tratar serían:

- **Combustibles verdes frente a HFO / MGO**.
- **Regulación**. ECAs, emisiones. Control de emisiones de metano en los motores LPSI / LPDF / HPDF. Perspectivas de evolución de la regulación tanto marítima como portuaria.
- **Emisiones**. Comparativa de emisiones totales grCO_2eq/MJ (WTP, y desagregadas en lo posible en WTT y TTP) de los diferentes combustibles verdes. Emisiones de NOx, SOx y PM.



Source: DNVGL

	HFO	LS-MGO		LNG (Qatar)		New HPDF engines LNG (Qatar)
• WTT	9.79	14.4		9.68		9.98
– Refinery part	5.79	10.4		-		-
• TTP	77.7	74.4		69.5		~56.1
• Total WTP	87.49*	88.8	>	79.18	>>	66.08
gCO2eq/Mjf				- 10%		~ 25%

Source: DNVGL

*Energy for scrubbing not included

- **Reducción de emisiones** del GNL basadas en los resultados experimentales y experiencias reales.
- **Disponibilidad** de GNL tras las pruebas realizadas en el proyecto ***CORE LNGas hive***.
- **Seguridad** en el manejo del GNL. Estadísticas de accidentes. *IGF Code*. Otros protocolos para las operaciones con GNL.
- Futuro del GNL. **Fuel marino para el futuro próximo 2020 – 2050**:
    - **Combustible limpio**. Puede cumplir con las exigencias IMO Tier III para NOx y SOx en ECAs y también con las regulaciones previsibles sobre *black carbon*.
    - **Combustible bajo en carbono y GEI**. Reducciones de GEI comparado con HFO / MFO.
    - **Abundante**. Gran cantidad de gas natural en yacimientos.
    - **Probado** (55 años a gran escala y 11 años a pequeña escala), **económico** (el GNL tiene el potencial para ser competitivo frente al HFO), **disponible** (capacidad probada de almacenamiento y distribución), y **regulado**.
    - **Probadas combinaciones de uso con baterías**, facilitando el control de picos de demanda, funciones *start and stop*, y como spinning reserve, con una evidente disminución del coste de mantenimiento.

Estos encuentros, dependiendo de la acogida pueden tener carácter periódico e itinerante, con el GNL como argumento central y abordando en profundidad temas de interés en el sector: legislación, regulaciones, seguridad, investigaciones, novedades en el sector, etc.

En cualquier caso, estas actividades deberían tener su soporte y seguimiento en la web, facilitando el acceso a documentación, … La web puede proveer de artículos especializados y enlaces a otras páginas. El objetivo es hacer de la página un referente en el mundo del GNL.

4.3. PORTAL WEB

El portal debe ser capaz de integrar a todas estas acciones descritas, dándoles un espacio concreto y abierto para su desarrollo, e integrando para cada una de ellas todos los elementos gráficos, de imagen y demostrativos necesarios. Además, debe contar con secciones dedicadas como, por ejemplo:

- **El GNL**. El Gas Natural y el GNL, otras formas de GN, su uso y aplicaciones (hogar, transporte, …), sus ventajas (argumentario), siempre contando con un nivel básico destinado a proporcionar una información completa y suficiente para un primer contacto con el tema, y un *"saber más"* para aquellos que necesiten profundizar;
- **Normativa y legislación aplicada**. No se trata tanto de listar normativa y/o legislación (se puede referenciar y proveer de enlaces), como de informar de cómo ayuda el GN a cumplir la actual (emisiones en las ciudades, IMO, …) o futura (ECA Mediterráneo).
- **Noticias**. Una actualización constante de las noticias más relevantes, nacionales e internacionales, en el entorno del GN y el GNL.

- **Documentación y bibliografía comentada**.
- **Ciudades Aire Limpio**.
- **Seguimiento de Blogs de técnicos y opiniones relevantes sobre el GNL**. Se trata de realizar un resumen de las aportaciones que van apareciendo en cada blog y un enlace a las mismas.

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