

environmental itinerary along the Port of Huelva.

- Collaboration with the environmental administration, NGOs such as Seo BirdLife, research groups and other actors linked to the conservation of biodiversity.
- Scientific and technical dissemination of the results.

5. Project Ownership *

The Port Authority of Huelva is the only one responsible for the project. The project has no partners.

Are you project owner?	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no
If you are NOT project owner, are you authorized by the project owner to present the project?	<input type="checkbox"/> Yes <input type="checkbox"/> no

6. Contact Details *

Contact Person *	Rocio López Picón
Contact E-mail *	rlp@puertohuelva.com silvia.gomez@puertohuelva.com
Contact Phone	+34 678 34 42 41 / +34 699 12 94 27
Position *	Head of Environment Division
Organization *	Port Authority of Huelva
Full Postal Address *	Avda. Real Sociedad Colombina Onubense, s/n 21001 Huelva

B Specific Project data

7. Characteristics of environment (more than one may apply) *

- | | | |
|---|---|--------------------------------|
| <input checked="" type="checkbox"/> Coastal Marine | <input checked="" type="checkbox"/> Inland waterway | <input type="checkbox"/> Lake |
| <input type="checkbox"/> Urban | <input type="checkbox"/> Rural | |
| <input type="checkbox"/> Tropical | <input type="checkbox"/> Temperate | <input type="checkbox"/> Artic |
| <input checked="" type="checkbox"/> Protected areas | <input type="checkbox"/> No protected areas | |

8. Key project dates *

- | | | |
|--|---------------------------|-------|
| <input type="checkbox"/> Project is in the planning phase | Date planning started | _____ |
| <input type="checkbox"/> Project is in the design phase | Date design started | _____ |
| <input type="checkbox"/> Project construction started/is ongoing | Date construction started | _____ |

- Project is complete
- Project monitoring is ongoing

Date project was completed 2018
 years monitoring planned Anually

9. Type of project (more than one may apply) *

- | | |
|---|---|
| <input type="checkbox"/> New construction or development | <input type="checkbox"/> Maintenance program or initiative |
| <input type="checkbox"/> Maritime | <input type="checkbox"/> Inland |
| <input checked="" type="checkbox"/> Port | <input checked="" type="checkbox"/> access channel |
| <input checked="" type="checkbox"/> Dredging activities or measures | <input type="checkbox"/> river |
| <input type="checkbox"/> Other _____ | <input type="checkbox"/> channel |
| | <input type="checkbox"/> Marina or other recreational facility |
| | <input checked="" type="checkbox"/> Project is a research or scientific pilot |

10. Clear depiction of the navigational infrastructure component of the project *

The Port of Huelva is located in the southwest of the Iberian Peninsula, occupying an area of 1,700 ha, making it the largest port in Spain.

It is a Core port of the Basic European Transport Network (Core Network) integrated in the trans-European transport networks (TEN-T) both by rail (freight transport) and road through the Atlantic Corridor, constituting the maritime-terrestrial node that links the land part of the Atlantic Corridor with the Canary Islands. It is also connected to the Mediterranean Corridor through its Majarabique railway platform located in the municipality of Seville.

Over the last few years, it has handled significant volumes of goods, exceeding 33 million tonnes, a new annual record after sustained growth in recent years which has placed it in the top 30 European ports and the second fastest growing port in Europe in the last decade. It is the fifth largest Spanish port and the 25th largest in Europe.





Image 1: The Port of Huelva.

In this sense, the link between the project and the infrastructures for shipping is clear:

1. On the one hand, it is closely linked to the need to maintain draughts in the Port of Huelva, and consequently, to dredging.
2. On the other hand, it is linked to occasional deepening dredging based on traffic demand.
3. On the other hand, it is linked to the infrastructures for the confinement of contaminated dredged materials within the internal waters of the Port of Huelva.
4. And finally, it is linked to the Port-City integration infrastructures based on ecological solutions.

11. [Brief description of WwN component of the project *](#)

The Port of Huelva is an estuary port and therefore requires constant maintenance dredging, as well as occasional deepening dredging to meet the demand for new traffic. This generates a minimum of 500,000 m³/year, of which approximately 300,000 m³ are contaminated materials according to the Spanish Guidelines in compliance with the OSPAR Convention.

The estuary of the Port of Huelva is formed by the mouth of two rivers: the Tinto and Odiel river. These rivers run north-south through the province of Huelva, crossing the Iberian Pyritic Belt, which is characterised by the largest number of massive sulphide deposits in the world. This makes it an area rich in minerals whose deposits have been exploited since the earliest civilisations. This has historically led to the existence of two acid drainages. On the one hand a natural acid drainage called acid rock drainage, and on the other hand, an acid mine drainage caused by runoff from unrestored mining deposits that have existed since the earliest civilisations. These acidic drainages mean that the Tinto River has been classified as the most acidic river in the world, with pH 1, capable of harbouring colonies of unique bacteria that live in these extreme environments, a characteristic that has been studied in recent years by NASA as exceptional and unique conditions that could even represent the conditions for life on Mars.

For this reason, both rivers transport thousands of tons of heavy metals per year (Oliás, 2010) to the Puerto Huelva estuary. Once acidic water and seawater come into contact, the pH of the river water increases, causing a significant precipitation of metals into the port estuary. Therefore, the pollution is transferred to the sediments that are dredged and it is necessary to carry out a correct

environmental management.

In addition to the above, the Port of Huelva has had an industrial tradition since the 1960s. At that time, the lack of environmental regulations generated a strong impact on the port area, leaving environmental liabilities that have had to be restored.

Why is it important to conceive the WwN methodology in an integrated way?

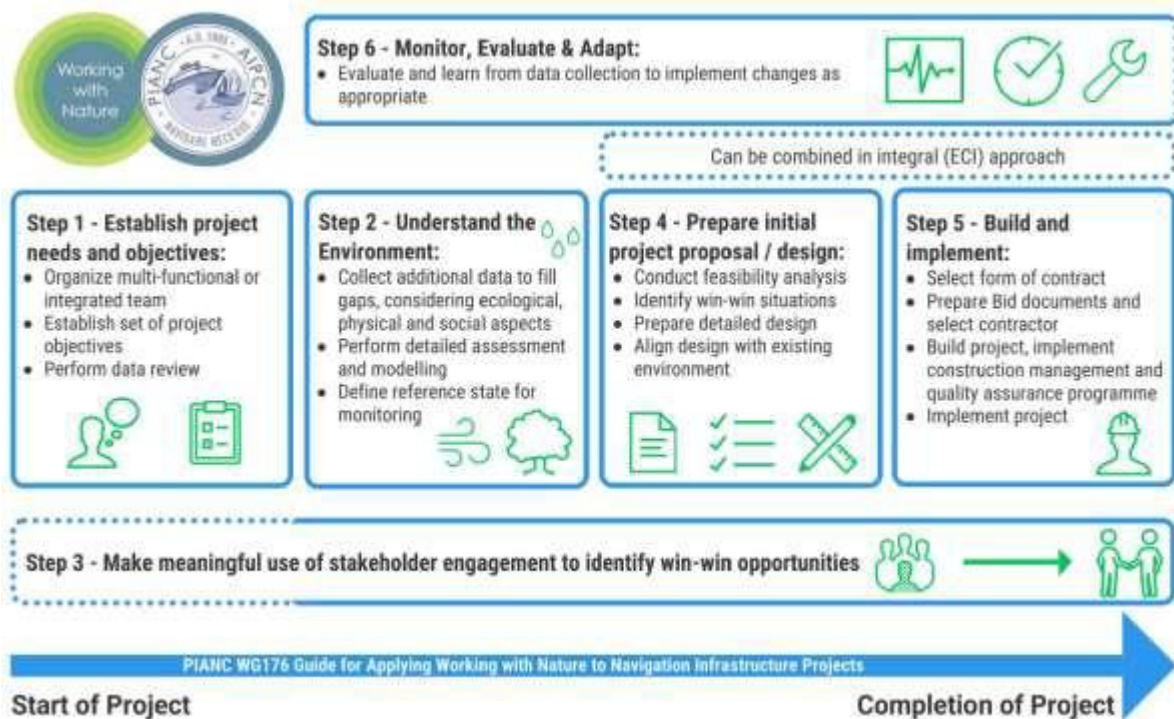
In contrast to the above, from an ecological point of view, the estuary of the Port of Huelva is subject to a highly dynamic tidal influence that favours a continuous renewal and exchange of nutrients, giving this space a high biodiversity and biological productivity. The predominant habitat is the estuary, with tidal marsh ecosystems of great ecological richness. In addition, due to its proximity to the main migratory routes, the Port of Huelva and its marshes play an important role in the North-South migratory flows, as transit, wintering or nesting sites for birds.

Among the most numerous birds with very important populations are the little tern (*Sterna albifrons*), the spoonbill (*Platalea leucorodia*), the pink flamingo (*Phoenicopterus ruber*), the osprey (*Pandion haliaetus*), etc., which makes the marshes an internationally important feeding and breeding site. Other waders include sandpipers (*Calidris* spp.), grey plovers and plovers (*Pluvialis squatarola*, *Charadrius* spp.), sandpipers (*Tringa* spp.) and curlews (*Numenius* spp.). Ardeidae are also characteristic of this area, with significant populations of purple heron (*Ardea purpurea*), great egret (*Ardea alba*), little egret (*Ardeola ralloides*) and grey heron (*Ardea cinerea*). As a result of this ecological activity, numerous protected areas have been created within the port area and in the surrounding area, which are protected at regional, European and international level.

These ecological values coexist with the development of the port area with dredging, with the creation of port infrastructures, with traffic and the activity of the logistics-industrial sector. That makes absolutely necessary and essential to have an integral and strategic management project that conceives the component of nature applied to infrastructures and dredging. Furthermore, this project must last over time from a methodological (WwN) and technical point of view, because this is the only way to turn elements that could pose a threat to the Port of Huelva, into an opportunity.

C Applying Working with Nature philosophy

----- Steps of WwN within a Project Life Cycle -----



12. Step 1 - establish project needs and objectives

Taken from your basic navigational target, did you providently organize for an integrated team able to clearly and skillfully address projects objectives also covering identified objectives of related sectors?

- no
- if no, please briefly explain the reasons

- partly
- if partly, please briefly explain what was done

- X yes
- if yes, please explain who was involved and how this was achieved:

As far as the Huelva Port Authority team is concerned, the project has required a multidisciplinary team, mainly made up of engineers and environmentalists. However, the collaboration of external agents specialised in dredging operations, research biologists, ornithologists, etc. has been necessary.

Likewise, collaboration with the environmental administration, organisations such as Seo BirdLife, has been necessary.

13. Step 2 - Understand the Environment

From the earliest stages of the project, did you take steps to understand the environment of your project region, before work was started on the development of the project design?

- no
 if no, please briefly explain the reasons

 partly
 if partly, please briefly explain what was done

 yes
 if yes, please briefly explain what was done

The reason that makes more important and special the application of the Working with Nature methodology, is that the Port of Huelva is located in an estuary of great environmental and biological wealth, with more than 245,000 ha of protected areas both, within and adjacent to the Port area. All the inner waters, navigation channel and part of the land area of the port are protected areas, with a total of 16 protected areas, from regional to international level, including the Marismas del Odiel Biosphere Reserve (partially included in the Port of Huelva) and the areas of the European Nature 2000 Network, such as:

Nombre	Figuras de protección	Superficie (ha)
Marismas del Odiel	MAB RAMSAR Nature 2000 ZEP/LIC (ES0000025) Nature Park	6,618.09
Estero Domingo Rubio	Nature 2000 ZEP/LIC (ES6150003) Nature Park	343.66
Laguna de Palos y las Madres	RAMSAR Nature 2000 LIC (ES6150004) Nature Park	648.95
Isla de Enmedio	Nature Reserve	480
Marismas del Burro	Nature Reserve	597
Estuario del Tinto	Nature 2000 ZEC (ES6150029)	1.1,67
Espacio Marino del Tinto y del Odiel	Nature 2000 ZEP marina (ES0000502)	4,934.91
Marismas de Riberas del Tinto	Nature 2000 ZEC (ES6150014)	3,016.66
Golfo de Cádiz	Nature 2000 marine ZEP (ES0000500)	23,420.41
Dunas del Odiel	Nature 2000 ZEC (ES6150013)	64.44
Marismas y Ribera del Tinto	Nature 2000 ZEC (ES6150014)	3,016.66
	Total	251,140.78

MAB: Biosphere Reserve. UNESCO

RAMSAR: Wetland of International Importance.

SPA: Special Area of Conservation for Birds. European Natura 2002 Network.

SCI: Site of Community Interest. European Natura 2000 Network.

SAC: Special Area of Conservation. European Natura 2000 Network.

All these areas are located totally or partially in the Port of Huelva Service Area, or border with it, as shows the next image:

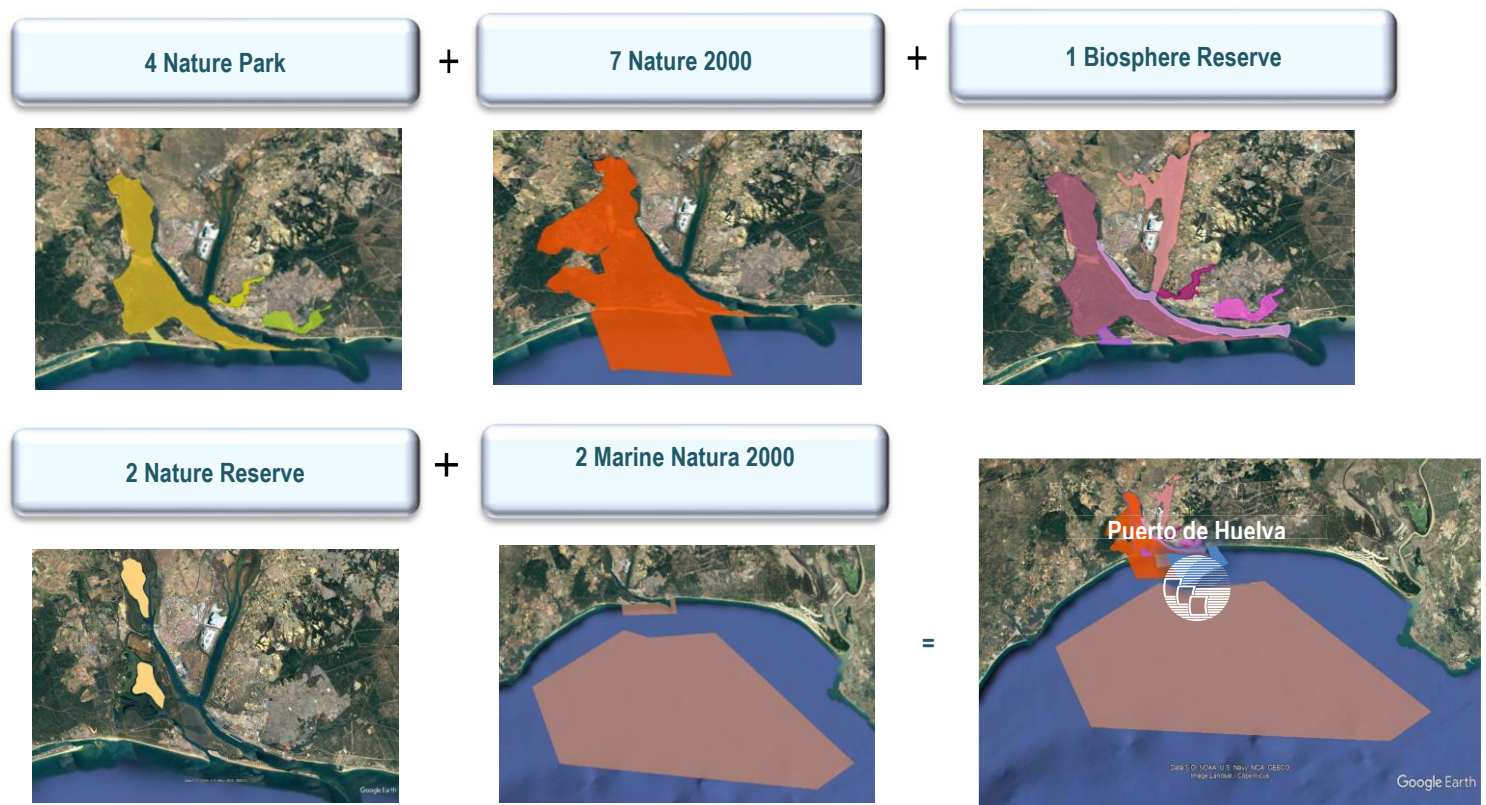


Image 2: Protected areas in the Port of Huelva. Google Earth and own elaboration.

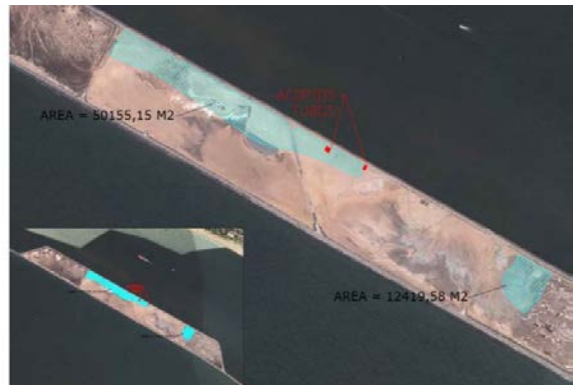
In addition to these areas, there are other protected areas within a 20 km radius, including Doñana, internationally known due to its relevant importance.

The main ecological value of these areas lies in the fact that they are ecosystems of estuarine, tidal and continentalised marshes, as well as highly productive coastal sandy ecosystems, which constitute a strategic point for nesting and breeding migratory birds and are home to a wide variety of habitats and landscapes.

The Huelva Port Authority has carried out different monitoring and census studies in these areas to consider their conservation objectives in port management.

In this way, with the integral project developed, the following goals has been achieved:

1. An increase in the plant diversity of the restored port marshes through the introduction (in seeds and seedlings) of new endangered native halophyte species of high interest from nearby marshes (e.g. *Inula chritmoides* L., *Aster tripolium* L., *Limonium* sp., *Frankenia* sp., etc.).
2. The elimination of invasive species such as *Spartina densiflora*.
3. The introduction of native species such as *maritime spartina*, *Zostera noltii*, *chritmoides inula*, *tripolium aster*, *Limonium* sp., among others.
4. The creation of new nesting and breeding areas for protected seabirds in port facilities: a total of 57 bird species have been censused in the restored port marshes.
5. Atmospheric carbon sequestration, through the creation of maritime *Spartina* meadows.
6. Erosion control in marsh areas particularly affected by waves and flooding.



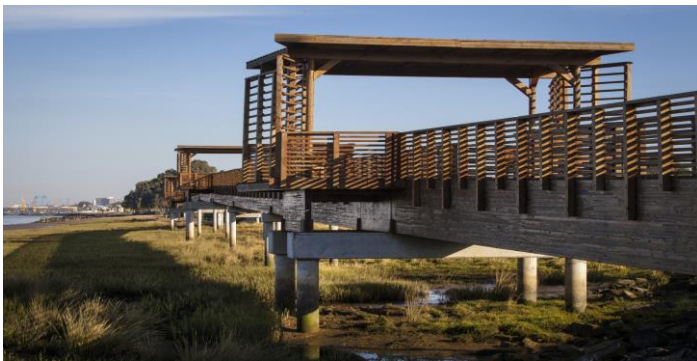


Image 3: Projects images.

14. Step 3 - Stakeholder Engagement

Were stakeholders or potential partners involved in the project life cycle, identifying and agreeing on preferred options and solutions which provided clear 'win-win' opportunities?

- no
- if no, please briefly explain the reasons

- partly
- if partly, please briefly explain what was done

- yes
- if yes, please explain who was involved and when and how this was achieved

As indicated, the project has required the participation of the environmental administration, organisations such as Seo BirdLife and research groups.

On the other hand, the aim has been to involve society, both to find out its opinion through surveys and to raise awareness through different cycles of information days for different sectors of the population, interest groups and environmental volunteer days.

The results of these actions showed that a high proportion of citizens use the restored areas for walking, cycling or bird watching.

Likewise, the preparation of a doctoral thesis and different scientific and technical dissemination articles was facilitated, as mentioned above, training and awareness-raising campaigns and

conferences were held for the public and schoolchildren, in addition to the mandatory consultations with the competent environmental bodies.

X if yes, please briefly explain what was achieved in terms of generating 'win-win' opportunities:

Apart from the success of nature restoration through the beneficial use of dredging and bio-tools, leisure benefits have been provided for the population of Huelva: a degraded area has been restored, new nesting and breeding habitats for protected seabirds have been created, social use has been promoted through the creation of a pedestrian path and river walk, and environmental education and outreach has been promoted.





Image 4: Projects dissemination activities for society.

15. Step 4 - Project Design

When preparing the project design, were solutions incorporated that clearly minimize the impact on the environment or that work with nature or even make use of natural processes?

- no
 if no, this project may not be well suited for PIANC's WwN recognition award. Please briefly explain the reasons

- partly
 if partly, please briefly explain what was done

- yes
 if yes, please explain please briefly explain what was done or how this was achieved

The project is one of the clearest examples of:

1. Minimising the impact on the environment of dredging and port infrastructure.
2. Working with nature to provide the basis for the design of the project.
3. Incorporating natural processes as part of the solution.

The project has achieved the following results:

1. Valorise contaminated dredged material enclosures.
2. Create new habitats for birds and wildlife of European protected species.
3. Ecologically restore deteriorated marshes through the use of bio-tools such as *Spartina maritima*, *chritmoides inula*, *tripolium aster*, *Limonium sp.* This is a pioneering action at European level.
4. It has been possible to eliminate existing invasive species in the degraded marshes. Such species include *Spartina densiflora*, which had spread across the area, displacing native species.
5. Improving the environmental quality and the quality of life of the citizens of Huelva, perfectly integrating the social and recreational uses of the area with the conservation of environmental values and with the development of the City, making it possible to bring the city closer to its estuary and the estuary, thus becoming an international reference as an example of an innovative environmental project that has enabled Port-City integration, a fact that has led it to be considered by the World Network of Port Cities in its Guide of Good Practices "Making the City with the Port". Likewise, the European Sea Ports Organisation selected this project as a finalist for its ESPO awards in 2014.

The project budget has exceeded 27 million €, and as outlined above, relies on solutions that beneficially integrate engineering and natural systems.

With recent advances in the fields of engineering and ecology, there is an opportunity to combine these fields into a single collaborative approach with results that ultimately achieve greater social acceptance and are environmentally and economically sustainable.

X if yes, please explain how the project also met other objectives (e.g. nature conservation, flood risk management, fisheries, recreation, etc.)

As indicated above, the project has facilitated compliance with the conservation objectives of the protected areas, with ecological connectivity being fundamental. For this reason, the management of dredging and the creation of infrastructures has been conceived not only in a way that is integrated into nature but also based on its natural processes for the success of the compatibility between port activity and the conservation of the ecological values of the protected spaces existing in the Port of Huelva.

In addition, this project has a clear component of improving the integration of the port in the city of Huelva, the social use of the port areas, the improvement of the quality of life, as well as the dissemination and environmental awareness.

16. Step 5 - Build and Implement

Did you directly include working with nature matters in contracting and operational project realisation?

- no
- if no, please the reasons and problems with it

X partly
X if partly, please briefly explain the reasons for doing so

- yes
- if yes, please briefly explain what was done or how this was achieved

The project started in 2008 and has comprised different phases. Although the terms and conditions of the contract make the requirements explicit, there is a need for greater dissemination among contractors of what Working with Nature is about. This lack of information could lead to errors in the presentation of tenders, and as the Port Authority is a public body, it should not give rise to errors or misinterpretations in the specifications.

17. Step 6 - Monitor, Evaluate and Adapt

During multiple project phases, did you monitor (or are you in the process of monitoring) processes and effects of applied working with nature issues? And are you using monitoring results to adapt through corrective actions in project realization and performance?

- no
- if no, please explain the reasons and problems with it

- partly
- if partly, please briefly explain the reasons for doing so

- X yes
- X if yes, please briefly explain what was done or how this was achieved

Work has been carried out to monitor plant, fish and bird communities, the ecological functions of the restored area were evaluated and the impact on the public was assessed, with very satisfactory results, as they began to develop important socio-economic and ecological functions, such as the purification of the estuary waters, the stabilisation of sediments, the increase of plant and animal biodiversity, acting as breeding grounds for fish species and as carbon dioxide sinks, as well as contributing to the improvement of the landscape and the conservation of several endangered species.

Thus, the following results stand out:

1. Monitoring of plant diversity (in seeds and seedlings) and introduction of new endangered native halophyte species of high interest from nearby marshes (e.g. *Inula chritmoides* L., *Aster tripolium* L., *Limonium* sp., *Frankenia* sp., etc.).





Image 5: Projects monitoring works 1.

2. Monitoring of plant communities in low, medium and high marshes with special attention to the presence of threatened species (*Zostera noltii* and *Spartina maritima*) and invasive exotic species (*Spartina densiflora*). Results are being obtained on the evolution in terms of cover, ecological diversity or total biodiversity of the species established in the marshes studied, and abiotic characteristics for comparison with previous results.



Image 6: Projects monitoring works 2.

3. Study of the zonation of the bird community in relation to the vegetation and the characteristics of the abiotic environment along the tidal gradient in the restored harbour marshes throughout their maturation.



Image 7: Projects monitoring works 3.

4. Study of the fish community and invertebrates, obtaining a proliferation of these that have given greater environmental value to the spaces.



Image 8: Projects monitoring works 4.

18. Were steps needed to convince internal and external stakeholders to go beyond conventional practices by incorporating the WwN philosophy and approach into your project?

- no
- If yes, please briefly explain what was done

19. Was there feedback within your organization, in other administrations, in media, in the public or even in national or even international scale on applying WwN approach?

- no
- if yes, please briefly describe which feedback was given

Yes, in fact, various actions were carried out to publicise the project and raise environmental awareness of the action undertaken.

1. The project was finalist on the 2020 IAPH World Ports Sustainability Awards:



Image 9: WPSWP Awards 2020.

2. The project was shortlisted on the 214 ESPO Awards:

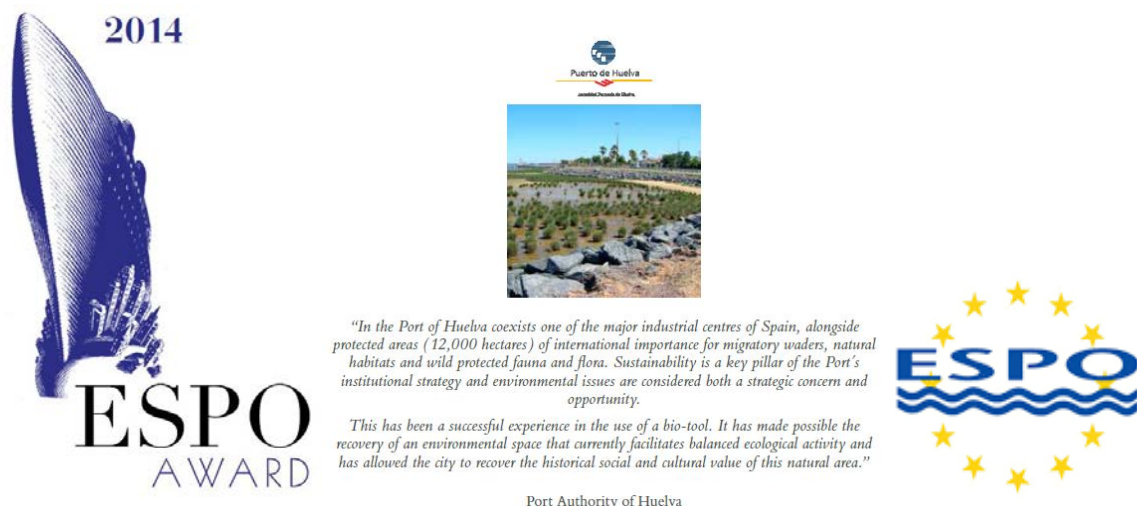


Image 10: ESPO Awards 2014.

3. The project was considered by AIVP on his Good Practice Guide "Plan the City with Port":

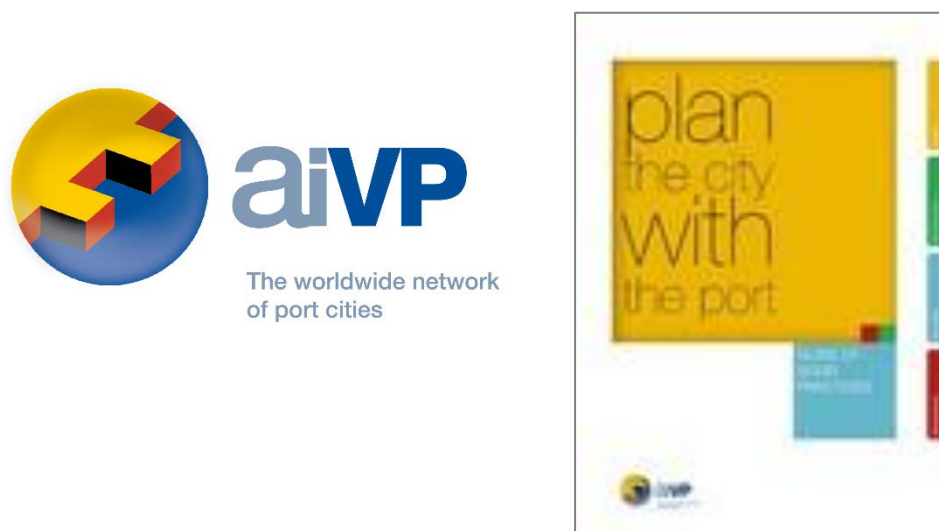


Image 11: AIVP Guide of Good Practice.

4. Part of the project was enough to elaborate a PhD Thesis



Image 12: PhD Thesis. Curado, G.

5. Numerous scientific and technical articles have been disseminated, conferences have been held for different groups and specific material has been published, such as the "Bird Guide" and "Bird Sheet" of the Port of Huelva.



Image 13: Scientifics and technical articles.

- As part of the project's actions, an educational programme was developed through the SEO BirdLife organisation with the aim of disseminating the environmental values associated with the restored area through the design and publication of specific material, using birdlife diversity as an educational resource. A programme of environmental education activities was also developed, aimed mainly at schools in the city of Huelva and municipalities linked to the Huelva estuary. Lastly, the project focused on disseminating the results of the project through the web, social networks and the media.



Image 14: Bird guide of the Port of Huelva.

20. What was the cost implication of adopting elements of WwN discussed above? Please highlight any of the options that apply and provide a brief explanation.

- Costs were lower than the conventional approach to this type of project
- Costs were marginally or significantly higher than a conventional approach
- No extra costs compared to conventional approach
- Additional funds were provided from third parties
- A long-term monetary benefit is being expected
- Other cost implications (please describe)

The Port Authority of Huelva has allocated significant resources to the development of projects incorporating the WwN criteria. This has meant greater investment in sustainability than would have been the case if the Port did not have all the environmental factors mentioned above.

In this case, the investment has been 27 million euros, and although these figures are not economically amortisable, we can affirm that this project and the investments in sustainability are "key" for the development of the necessary infrastructures, to be able to anticipate environmental requirements and achieve the validation of the environmental administration.

In social terms, it has succeeded in changing the perception of port activity, increasing the quality of life and the use of port spaces based on solutions that put nature and ecological processes at the centre.

Environmentally, it has been possible to recover the ecological functions of important ecosystems such as the marshes, with protected habitats and species.

Landscape-wise, the conversion of the Port of Huelva has been achieved as can be seen in the following images.

Before and after images:

BEFORE



Image 15: "Before" images.

AFTER





Image 16: "After" images.

AND finally in fairness

Would you apply WwN again?

- no
- maybe
- probably
- I don't know
- yes

Submission verification *

This form has been completed by *

: Rocio López

Phone *

: +34 678 34 42 41

E-Mail *

: rlp@puertohuelva.com