

OFFSHORE

Sustainable, Inclusive and Competitive Cuenca Argentina Norte Potential Impacts

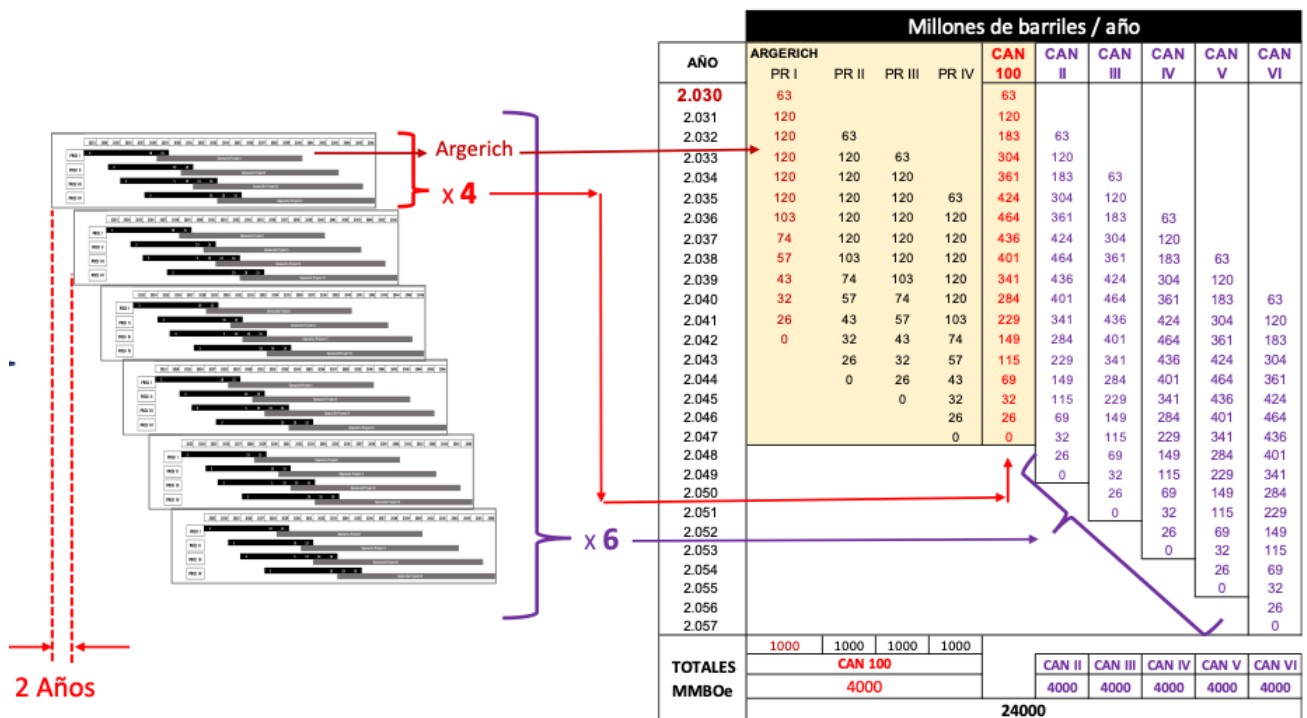
EXECUTIVE SUMMARY

This is the summary of the study, commissioned by YPF to FIUBA in December 2022, on the industrial, technological, and energy transition potential impacts of the offshore development in the *Cuenca Argentina Norte* (CAN, by its initials in Spanish) in the face of an eventual discovery of hydrocarbon accumulation that end up being technically and economically viable for production.

In this study, two oil production scenarios have been worked on, and four issues (port, technology, industry and sustainability) have been addressed in an analytical way, comparing them with other international cases and also seeking to quantify their potential impacts.

Scenarios

Two production scenarios were defined by YPF. The BASE Scenario considers the Argerich development plus three other similar projects in the CAN 100, reaching a total cumulative hydrocarbon production of 4.000 MMBOe in 18 years. The MAXIMUM Scenario would reach 24.000 MMBOe in 28 years. Among the six projects, a time lag of 2 years is assumed, considering that production starts in the year 2030, as shown in the following table.



Port Issue

Regarding the choice of the base port for the CAN offshore operation, it is concluded that, under certain circumstances, once the works ready to be tendered are completed (storage area, highway, etc.), the port of Mar del Plata would offer, in a limited timeframe and with a restricted budget, the best conditions to be used for the Base Scenario.

Then, for a more demanding situation, a decision will need to be made regarding which path to follow: whether to continue in Mar del Plata or to move most of the activities to the port of Bahía Blanca, while keeping emergency services in Mar del Plata. Another alternative is to explore the possibilities offered by Mar Chiquita or an equivalent location near Mar de Cobos with a greenfield development. In the future, with a more precise knowledge of the expected operations, it will be advisable to expand the reference database, in terms of operation types and their volume, in order to adjust the results of this study.

Technological Issue

In contrast to the relatively low Science and Technology (S&T) budget for research on marine resources, Argentina has ambitious plans that would include oceanic topics, covering offshore hydrocarbon production.

By applying a system similar to Brazil's, the necessary resources could be generated, not only to support the national technological development of offshore Oil & Gas (O&G) but, above all, to prepare "ocean scientists" to meet the magnificent challenge represented by the exploration and production of other riches in the Argentine Sea.

The experience of developed countries in shipbuilding and O&G industries has shown that, in order to have a competitive offshore industry, it is important to create intelligence and reduce excessive dependence on foreign technology packages.

The scientific and technological problem has strategic characteristics and requires a long-term vision. Only by persevering on this path it is possible to reach, in several years, a higher level of development based on knowledge, through intellectual work rather than solely through industrial labour. It is indisputable that the wealth of countries increasingly depends on developed knowledge rather than inherited natural resources (e.g., hydrocarbons). And in this case, there is a clear opportunity to leverage a virtuous future development through the sustainable exploitation of natural hydrocarbon resources. A great example of the effective realisation of this vision is the case of Norway's offshore.

Industrial Issue

In the construction of offshore ships and equipment, and particularly in the participation in the FPSOs projects, lies the greatest potential impact for the development of the CAN. However, it will not be possible to seize this opportunity with the current regulatory framework or the existing shipyards. Therefore, similar to the case of Brazil, there is a need to adapt the regulations and the national shipbuilding industrial structure.

To achieve this, it is proposed to promote partnerships between competitive national shipyards and medium to large international offshore shipbuilding industrial groups. This move would provide locals the specific expertise and financial strength necessary to be considered as potential suppliers of the offshore vessels for CAN. In this way, a new group of Second-Generation Shipyards would arise, capable of competitively targeting the construction of Crew Boats, Offshore Supply Vessels, and perhaps other vessels of similar complexity.

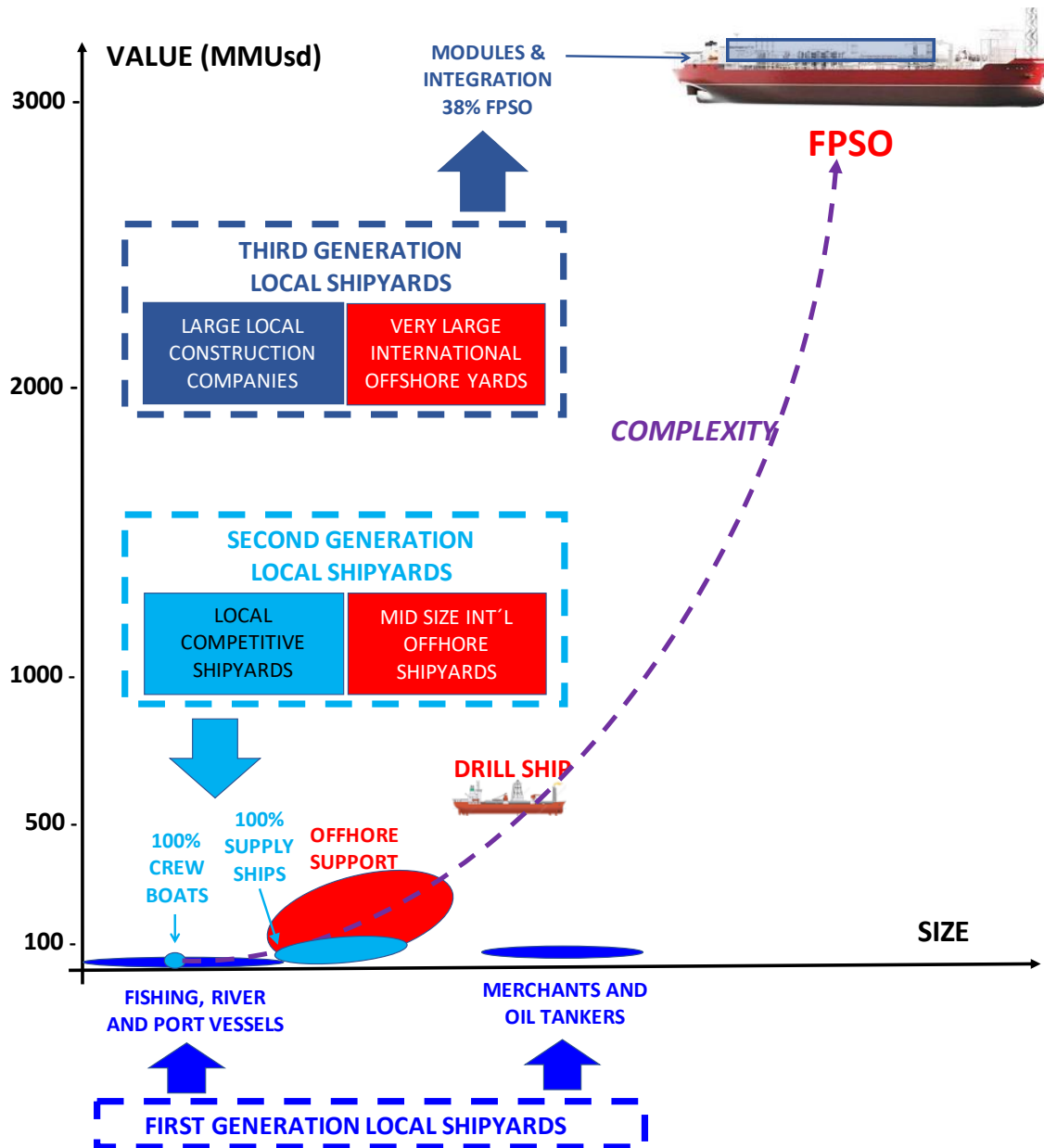
However, the greatest challenge with the capacity to truly transform the national industrial reality is to participate in the construction of the FPSOs. To do so, just as Brazil did, a partnership between some of the industry's heavyweights is required: the largest national construction companies with experience in major engineering projects (including Oil & Gas) and international mega shipyards that build the FPSOs.

This would create a new group of gigantic Third-Generation Shipyards that could build, assemble, and integrate the modules to be installed on board FPSOs, whose colossal hulls would necessarily need to

be imported. The third-generation mega shipyards would be more staffed by personnel from the O&G sector than from the shipbuilding sector.

An intermediate step in this development is that of “virtual” shipyards, which build equipment or modules for FPSOs and ship them for integration at the Asian mega shipyards where these gigantic vessels are built. Brazil is currently certifying 18% of net Brazilian FPSO content following this model of virtual shipyards.

The following national shipbuilding industrial map presents the relationship between value, size, and complexity, indicating the possible and necessary transformation to take advantage of this excellent opportunity.



The only way to ensure that these new generations of shipyards provide much more employment than the direct employment generated in their own terminals is through the development of the current hundred ship parts supplier companies (and many more in the future), and, above all, the nearly 10.000 supplier companies in the Oil & Gas industry throughout the country.

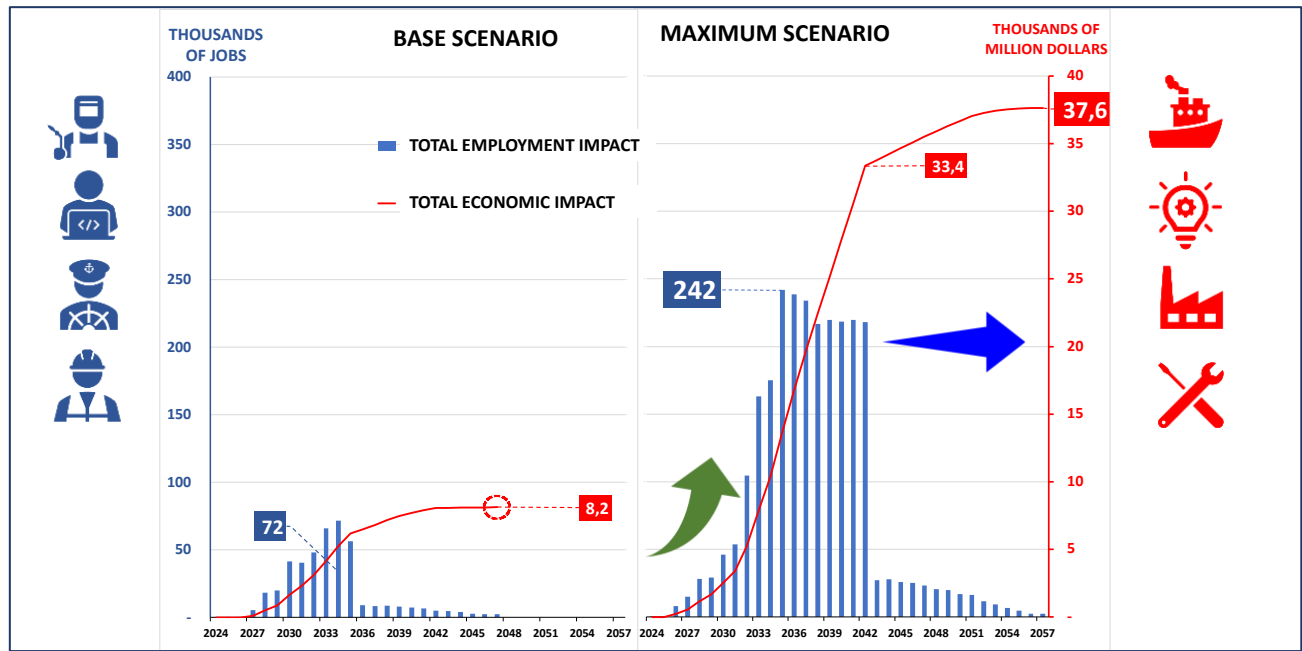
To achieve this development, as Brazil did, a progressive policy of increasing National Content in offshore constructions is required. Several guidelines for these regulations are presented in this study and others are recommended for future development.

Impact Quantification

Following a simple and comprehensive analytical model -fuelled by information provided by YPF, international references, and the consultants' own criteria-, the potential impacts of the following sectors were quantitatively projected: shipbuilding, O&G, crews, and S&T.

For the results to be consolidated and compared with other cases, two simple variables were used: Employment and Value (produced or invested), the totals of which are presented in the following graph comparing the impacts of both scenarios.

With a new Virtuous Model of development as the one proposed in this Study, shipbuilding and O&G equipment construction would represent between 63% and 73% of the total impact. In the Maximum Scenario, it is possible to create up to 242.000 jobs by 2035, and the total cumulative value generated in these productive activities would reach 37.600 MMUSD. The current model's regulatory system allows to generate only 10% of the indicated potential impact.



The green arrow in the graph indicates the challenge “prior” to development, which is to change the industrial policies of the last four decades and generate new ones, this time in favour. Without a green arrow of magnitude, the potential impact will not occur or will happen in a very insignificant way, giving continuity to the current model of underdevelopment.

The blue arrow, on the other hand, represents the challenge "subsequent" to development, which is to avoid wasting the generated capacities by harnessing them for what they are ideally suited to: the conquest of the formidable wealth in the national oceanic frontier.

This would translate, for example, into the design and development of projects for offshore wind farm, underwater mining, tidal and wave energy and biorefineries using marine algae biomass, among other activities associated with the use of the natural resources available in the ocean, deepening our role in the indispensable global energy transition.

Sustainability

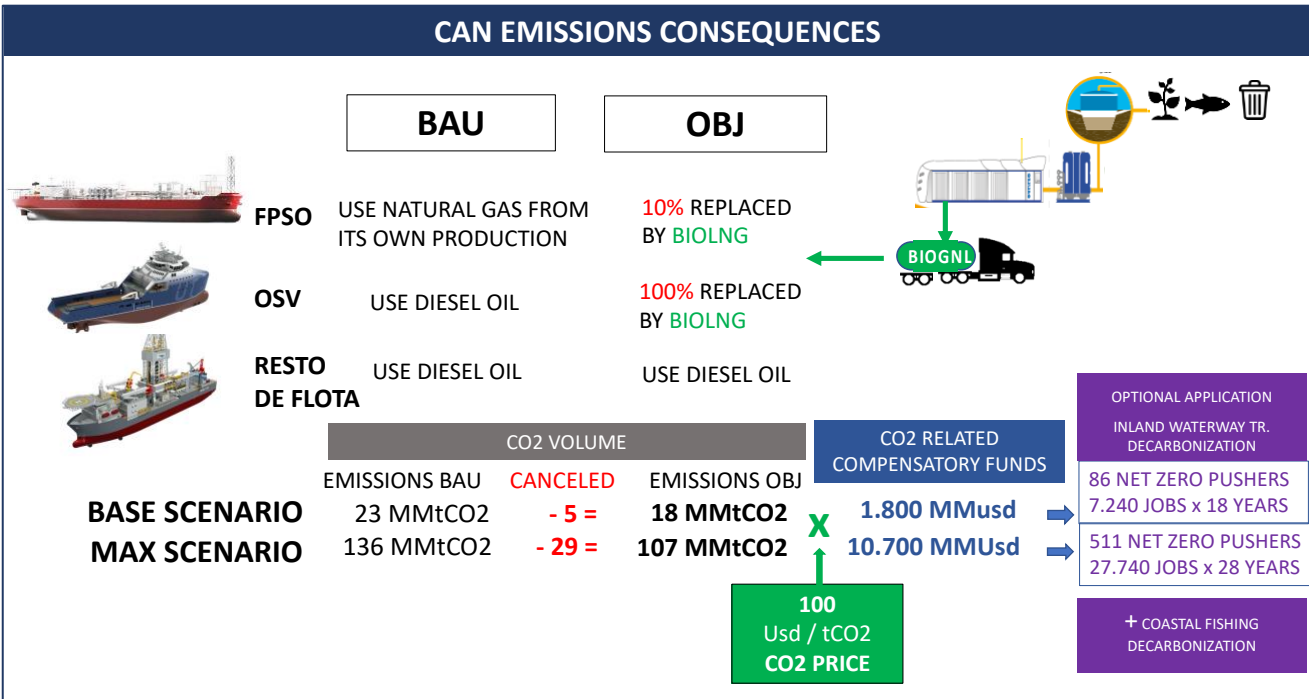
Like almost all industrial economic activities, offshore production also generates undesirable CO₂ emissions and, as it is a high-volume activity, these emissions are also substantial. They mainly come from the use of natural gas from the production wells that power the FPSOs, but also from the emissions generated by the other offshore vessels that use Diesel Oil (DO) for their operations.

Projecting the current situation (BAU: Business As Usual), between 22 and 136 MMtCO₂ would be emitted, depending on the scenario considered. This study quantifies the impact of replacing 100% of the DO used by the OSVs and 10% of the natural gas used by the FPSOs with locally produced bioLNG (zero emissions).

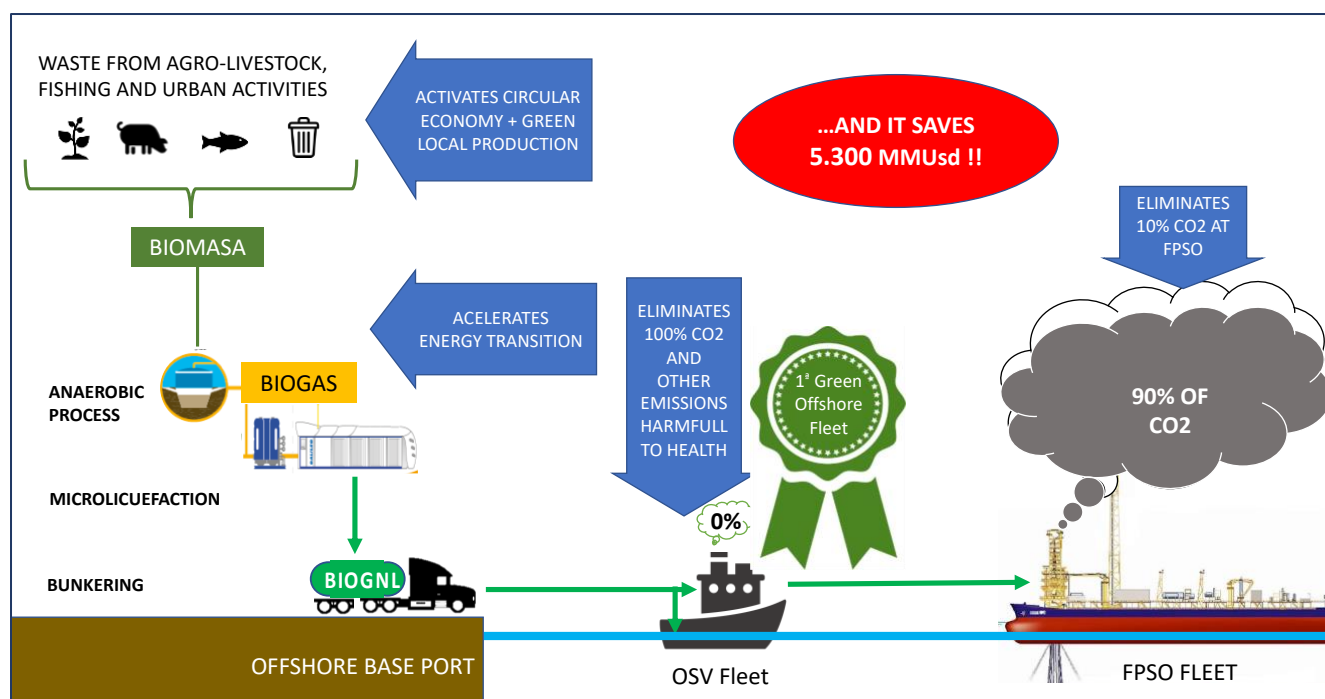
The results of these measures define the Target (OBJ) emissions projection, with a substantial reduction of 4 to 29 MMtCO₂, depending on the scenario. Still, a significant amount of emissions remains, ranging from 18 to 107 MMtCO₂, according to the scenario, whose negative impact must be compensated.

Aware of the negative impact of emissions, major companies around the world (including Equinor), assume (for 2030 offshore operations) a value of 100 USD/tCO₂ to cover compensatory actions for the negative impact of emissions they have not yet been able to avoid.

In this case, these compensatory investments would allow, for example, to decarbonise inland waterway transport and the coastal fishing activity, creating up to 27.740 jobs over 28 years.



This would be possible thanks to the national capacity to produce bioLNG (zero emissions) in the necessary quantities, with low investments and competitive costs, by developing bioRefineries close to the offshore ports of Buenos Aires province.



Final Conclusion

At the end of the Study, a global analysis shows the need for a change from the Current Model, considered unnecessarily costly, exclusive, high CO₂ emitter, centralised, and lacking the ambition to achieve a high level of impact on employment and on national added value. The existing system, in place for four decades, impedes much of the development: it does not promote the investment in S&T, does not request emissions reduction nor increased local industrial content and, what is worse, does not even generate the minimum incentive for this to happen.

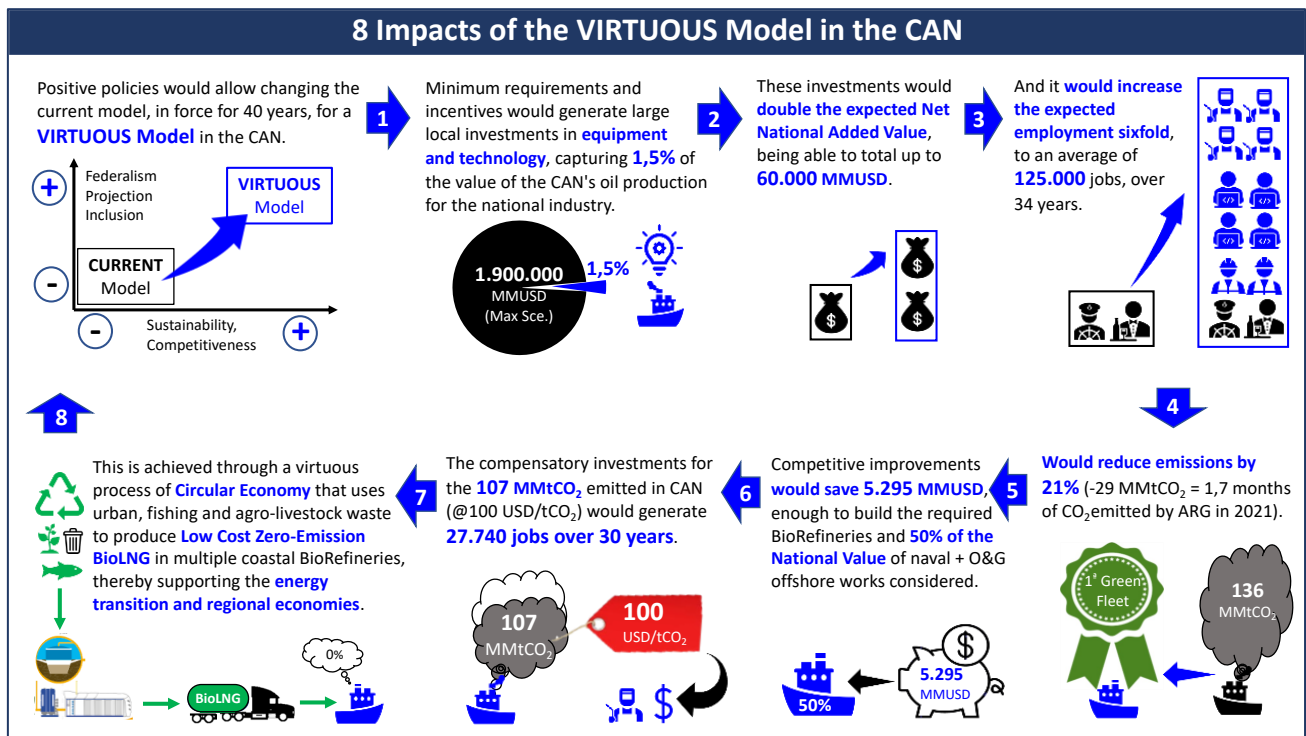
It is required a Virtuous Model of the type developed in this Study, which is much more sustainable, competitive, inclusive, federal, and whose strength is the healthy ambition for possible, necessary, and lasting national development.

The impact of capturing 1.5% of the value of the total estimated production (Maximum scenario) of the CAN was calculated for the national industry and for S&T. This "extra" value would be formed by investments in offshore technology and equipment made in the country instead of abroad. The result is astonishing: it would be possible to double the National Value generated by the CAN obvious basic provisions (seafarers, fuel, maintenance, provisions, etc.). Furthermore, employment could be multiplied sixfold, and it would be of high quality.

By implementing this Virtuous Model, emissions can be reduced by 21% (-29 MMtCO₂), resulting in the world's first zero-emission offshore support fleet. And this would be achieved while providing the offshore operators with savings of approximately 5.295 MMUSD, which could fully fund the necessary biorefineries and cover 50% of the national value of the planned national offshore constructions.

Opportunities for offsetting the impact of the emitted 107 MMtCO₂ are also proposed, which, at the projected (2030) value of 100 USD/tCO₂, would generate 27.740 industrial jobs for 30 years, decarbonising important regional marine activities.

Part of these environmental, economic, and social benefits are due to the development of low-investment biorefineries that economically produce zero-emission bioLNG using waste from agro-livestock, fishing and urban activities, creating a virtuous Circular Economy process that accelerates the energy transition and supports regional economies close to the ports of Buenos Aires province. The eight main impacts of the Virtuous Model proposed are summarised as follows:



But none of this will happen by continuing with the current model that has been in place for 40 years. Much better sectorial policies are needed to enable Argentina to aspire to the development level of Norway or Brazil, moving it away from our current destiny in this sense, which aligns with that of W. Africa.

It is essential to switch to a model like the one proposed in this study in order to be able to aspire that the wealth of the CAN, in addition to royalties and taxes, ensure a true development, that substantially improves the fate of argentinians.

