

# Paris Session 2022



## Inserting Crucial Environmental Issues into Energy Planning: Paths for Carbon Reduction

### C3 - Power System Environmental Performance

PS1 - Can the authors elaborate on the methods followed to combine such different types of indices into a single comprehensive indicator? Can the authors shed light on the ranking of importance of the criteria adopted (i.e., the relative importance of social impacts vs. economic impacts)? How can one weigh and compare the different dimensions? In the approach presented, each generation technology ends up being characterized by a SIGS score: how is the difference among several possible plants using a similar technology taken into consideration (e.g., old generation plant vs new generation plant using similar technological principle)? How far can the results obtained be representative for other countries? How spread are the values for different plants located in different parts of the country?

Ricardo C. Furtado, Brazil

- *Question 1.1 - Can the authors elaborate on the methods followed to combine such different types of indices into a single comprehensive indicator?*

For the study of complex relationships involving clear disparities, **the use of indicators is recommended**

The SIGS involves quantitative and qualitative indicators. To combine them, methods of normalization and parameterization have been used, translating them into scores between 0 and 1

In the case of qualitative indicators, to produce the score, a set of binary variables is associated to each one and a scale is used to evaluate the results

For example: one indicator may be evaluated by the presence of three characteristics. If none of the characteristics is present, the score of the indicator is 0. If two are present, the score is 0.5. And if the three characteristics are present, the score is 1.

- *Question 1.1 - Can the authors shed light on the ranking of importance of the criteria adopted (i.e., the relative importance of social impacts vs. economic impacts)?*

For this work, the null method was used, i.e., the same importance was attributed to all dimensions, themes, aspects and indicators

In general, the assignment of weights has caused more problems than the use of the null method

When specialists are used, relevant biases may be introduced to the results due to subjectivity aspects

It is not advisable to use weight assignment through public opinion research

There is no bibliographic reference to be used, since SIGS is a pioneering index in Brazil

The software allows the weighting of all socio-environmental aspects, themes and dimensions

- *Question 1.1 - How can one weigh and compare the different dimensions? In the approach presented, each generation technology ends up being characterized by a SIGS score: how is the difference among several possible plants using a similar technology taken into consideration (e.g., old generation plant vs new generation plant using similar technological principle)?*



Power plants with different types of generations but using similar technological principles may be considered as different technologies, since their impacts may significantly differ



For example: coal thermal plants and coal thermal plants using combined cycle technology (different generations) have different impacts on nature



The results presented must be permanently updated, so as to incorporate the technological innovations of the generation sources and thereby allow more realistic comparisons

• *Question 1.1 - How far can the results obtained be representative for other countries?*



The idea of the proposed tool in question reflects the Brazilian reality

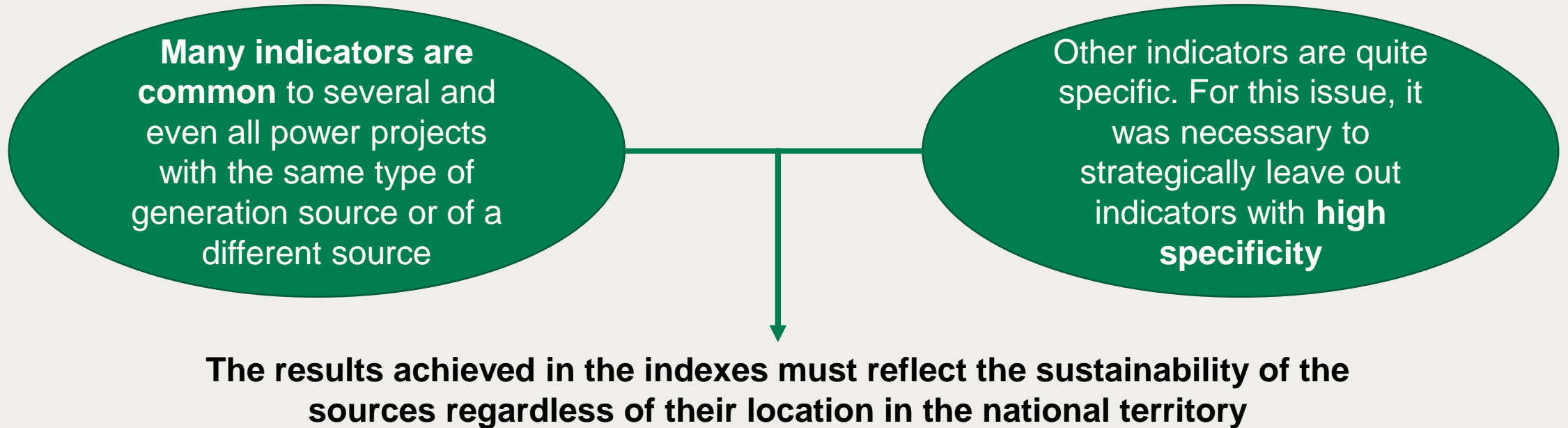


The tool may be applied in other countries by adapting the indicators to their different realities



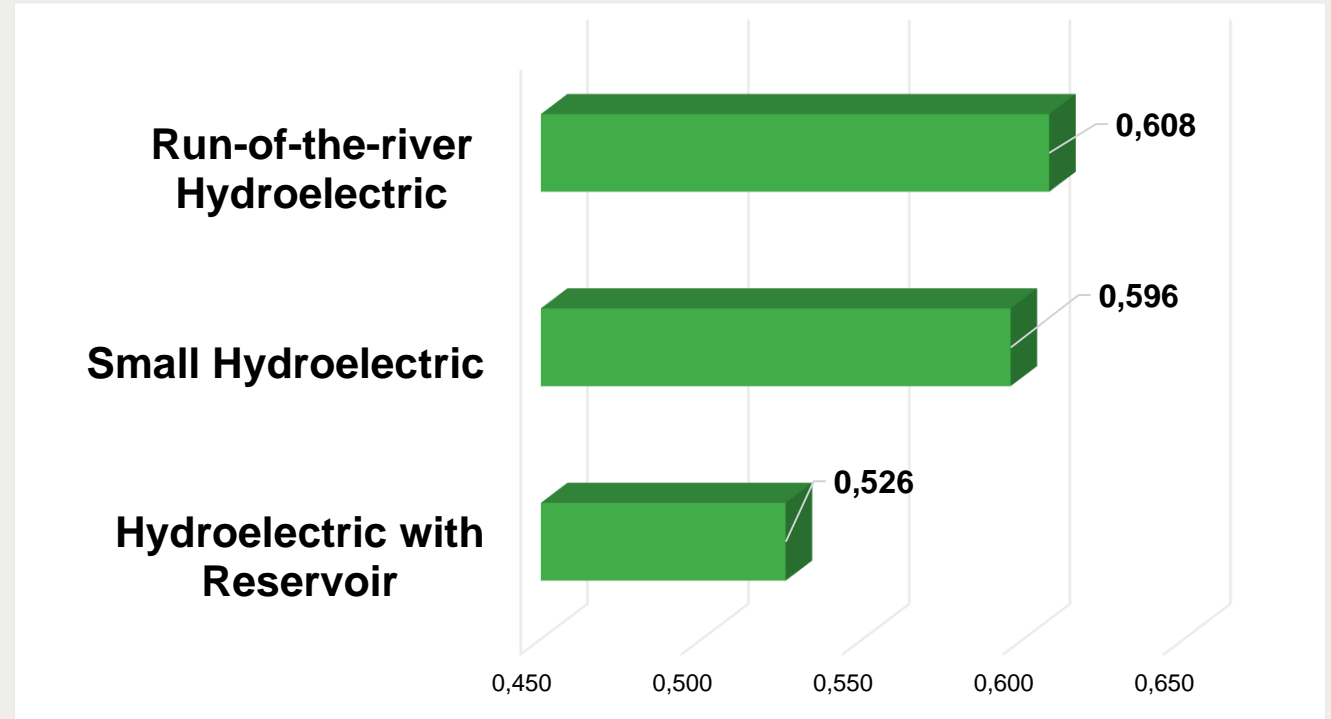
Evaluating the environmental impacts produced by the implementation of energy sector enterprises demands a broad knowledge of both the actions of the impactor and the characteristics of the environment that will receive it, which varies between nations

- *Question 1.1 - How spread are the values for different plants located in different parts of the country?*



- *Scores of sustainability indexes - SIGSs*

The characteristics of the reservoirs account for the differences of the SIGS values of the hydroelectric power plants



- *Scores of sustainability indexes - SIGSs*

The technological evolution explains the different SIGS values of the thermal power plants

