

Why Do We Need SEA?

By Maria Teresa Serra

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I would like to start by introducing myself. I am Teresa Serra, and I am trained in urban and regional economics and regional planning, and I have been with the Bank for 11 years. I am currently Director for Environment and Social Development in the East Asia and Pacific Region.

I am Brazilian, and before coming to the Bank, I worked for 12 years in the power sector in Brazil, during which time, I set up and headed the Environment and Social Department at Electrobras, the holding company for the power sector in Brazil.

I have been asked to speak about the reasons why one might use Strategic EA as opposed to Environmental Impact Assessment of the standard sort.

I wish to distinguish between the two types of approaches, and I hope the case study that we are going to go through will bring out these differences.

Clearly, Strategic EA is not Environmental Impact Assessment, as currently and usually applied to site-specific projects. It is best suited to analyze policies, sectoral or regional strategic plans, and sub-regional investment programs.

The focus is on the big picture, on identifying priority concerns which can help to screen, pre-screen, a set of projects and sort out the good from the bad projects.

It is not really the sum of detailed or site-specific assessments and does not substitute for site-specific EIA.

The case study that I am going to talk about is one on power sector planning in Brazil that took place in the period 1991 to 1992, looking at the long-term expansion plan. It is an old case, but I think it highlights a number of the features of Strategic EA.

I have to highlight also that we did not undertake Strategic EA in this case by adopting ex ante this methodology. We essentially worked through a set of procedures that seemed to respond to the questions that the power sector was struggling with, and at the end of the day, one might very well call this a Strategic EA that was carried out.

The presentation will be structured as follows. I will give you a little bit of background on the Brazilian power sector and why an SEA type approach was adopted for this long-term expansion planning exercise. I will specifically mention how the environmental and social issues were dealt with in the planning exercise, although I cannot go into the methodological details. And then, I will wrap up with some conclusions.

Some basic data on Brazil. In 1990, we were looking at a country where the population was about 150 million, with an annual growth rate already winding down, thus the expansion of electricity consumption presumably tapering off a little bit. The country's GDP was about \$400 million, and what is notable here is that in the previous decade from the '80s to the '90s, the growth rate had experienced a severe drop. Thus, there was a lot of uncertainty with respect to what lay ahead in the future. The country obviously wanted to grow, but did it have the conditions to grow or not—power and the essential power infrastructure or key ingredients for that growth to take place. It also required significant investment; thus, these were very tricky questions, and the expansion plan was a very critical exercise at the time.

As I mentioned, growth had tapered off over the last decade, thus electricity consumption had fallen. Installed capacity over the period had also dropped considerably more so than demand, especially by comparison with the previous 30-year period from '5s to '80.

Thus, many, many big questions as to whether one was facing a situation of overcapacity or of possible shortages of electricity in the future.

I should note also that Brazil is a heavily hydro-based country. Ninety percent of the installed capacity is derived from hydro power. Thus, heavy up-front investments are entailed in expansion of the system.

A bit more background on the structure of the power sector. Brazil had at the time a holding company called Eletrobras. It also had four regional companies which were controlled by Eletrobras and were heavily engaged in generation and transmission. The 25 or 26 states that comprise Brazil also had, each one of them, state utilities. Four of these were heavily involved in generation activities.

The 2015 planning exercise had a number of innovations. Typically, the power sector planning cycle entails a long-term horizon and a medium-term horizon. The long-term horizon typically would be 20, 25 years and would be revisited every five years. The medium-term horizon deals with programs for 10 years and is reviewed every year.

What we are focusing on here is the first one, the long-term, 20 to 25-year horizon. Remember we were in the beginning of the nineties looking at 2015.

There were innovations in this planning exercise of two sorts, one in content, the other in process. In terms of content, I would highlight the fact that it was highly strategic in focus; it was indicative and a non-deterministic plan. By that, I mean it did not intend to come out with a list of prioritized projects that would be coming into line over the course of the 20, 25-year period. This was the case in previous plans. This plan did not intend to do that. Rather, it was looking at groups of projects over something like 5-year periods.

Another extremely important aspect in terms of content was the fact that for the first time, the long-term expansion plan looked explicitly at environmental and social costs.

Now, in terms of process, there were a number of very relevant innovations also. Consultations were undertaken with a very broad set of stakeholders from the onset of the process, and this process went on for about 18 months. A number of background studies were prepared which again were broadly discussed throughout Brazil. They were technically prepared, engaging with all the utilities through a number of fora, technical fora, that the power sector had at the time—working groups on generation, transmission, distribution, fuel options, environmental and social aspects, financial aspects, a number of committees and working groups. Lastly, this plan was meant to be and was approved by Congress. This was a first in the case of Brazil.

Now, what factors affected the choice of approach and why did we go with something that ended up looking very much like a Strategic Environmental Assessment?

Well, environmental and social issues in the power sector in Brazil had been undergoing quite a significant change over the past 10 years for a number of reasons. One was the fact that the power sector was under tremendous scrutiny from outside NGO groups external to Brazil and also people who were potentially affected by the power sector projects. These were organized, extremely structured groups and were absolutely looking at the power sector with very close eyes.

This had brought on an increasing awareness on the part of power sector decision-makers and technical staff that these issues, environmental and social, were indeed extremely important and that future expansion of the sector needed to very carefully look at these issues.

In addition, the environmental sector, if you want to call it that, in Brazil had been increasing its capacity, its legal and institutional framework, and had put in place a series of guidelines, regulations, framework laws during this period which all would guide the preparation of individual projects as they came on line. Accordingly, the power sector had gone ahead and through Eletrobras had led a process of agreeing on technical guidelines and policies that would guide all the power sector projects.

Now, at the point when we were doing the long-term expansion plan, we were looking at projects that had been in many cases prepared before all this capacity-building effort had come on line. Therefore, there were projects that were very irregular in terms of how they dealt with environmental and social aspects.

We needed a very simple methodology that would allow us to compare projects along similar criteria. That was the essential point. We did not want a heterogeneous assessment. We needed to look also at qualitative and quantitative aspects of projects.

Importantly, this was therefore not about fine-tuning but about the broad categorization of projects in line with the indicative strategic nature of the expansion plan.

Some additional objectives that were very dear to the environmental and social constituency in the sector were that we were very interested in pointing out the importance of being transparent in testing some key decision-making criteria, in pointing out the limitations of the existing methodologies and where we needed to work on them, as well as on the state of knowledge.

Finally, we needed to point out the limitations of the current project budgets.

Now, I need to talk a little bit about some of the conceptual underpinnings of this exercise. As I mentioned, the power sector had gone through a period of strengthening the way it thought about environmental and social costs. It had put in place guidelines, a conceptual framework, and in this process, we found two concepts extremely important, and I will talk briefly about these.

One was the notion of what sectoral costs were. These essentially were defined as costs that were internalized to power sector projects. They would have an impact on project budgets, and therefore on the cost of system expansion and therefore on the tariffs that consumers paid. These costs originated in both measurable and, importantly, in non-measurable impacts. Very often, one thinks of non-measurable impacts as being externalities. That truly is not the case. There are non-measurable impacts that one can address explicitly in a project, and we can generate preventive, mitigatory or compensatory measures both for measurable and non-measurable impacts, and they derive from either technical considerations, legal requirement, or from negotiations with stakeholders—people affected by projects or people concerned about the projects.

The sectoral costs are quite distinct from what one might call collective costs. These are costs that for one reason or another are recognized as originating from the project, but they cannot be internalized for whatever reason, and I cannot discuss this during this session. But by definition, they would have no explicit impact on the project budget.

However, they do represent what in economic terms, one might say are social or collective costs that are incurred, and thus they are relevant to the decision-making process and should be factored in when considering whether to move ahead with a project or not.

What are the implications of these concepts for a planning exercise for the long term? Well, all those who are familiar with power sector planning will obviously recognize that minimization of the cost-benefit ratio, which is often referred to as the "merit indicator" or the "dollar-per-megawatt hour" that is produced, is a key element in prioritizing projects. Thus we do need to look at the merit indicator.

It is also very important to recognize that in designing a strategy for the long term power sector expansion, we should acknowledge that the full sector cost is reflected in budgets. For this

particular exercise, this meant that we needed to update and complement the existing budgets with respect to environmental and social costs.

We also recognized that we needed to take into account the factors that might not be quantifiable in economic terms and would not be fully dealt with by the project but did represent what one might express as, for lack of a better word, the complexity of the project. This concept essentially captured the notion of the total environmental and social impact, even if that impact was not fully addressed in the project budget.

The environmental and social portion of the expansion planning exercise was undertaken covering a total of 400 projects that were in the pipeline. However, we needed to differentiate between these projects. There was a group for which feasibility and basic engineering studies were available. These were around 30~35. And then there was what one might for simplification call here "the rest," for which information was available largely from river basin inventory studies, thus at pre-feasibility level with varying degree of detail, some very sketchy, others much more fully developed.

The exercise was unfolded in three stages. First, we did an evaluation of the total environmental and social impacts of the projects using a common set of variables, indicators, and objectives.

Secondly, we estimated environmental and social costs by revisiting the existing budgets.

And thirdly, we classified the projects into a typology as a subsidy, as an input to the definition of different expansion alternatives.

If you wonder about resource requirements, I would just briefly comment that this exercise was undertaken by a multidisciplinary team of evaluators consisting basically of six professionals and one consultant from Electrobras, plus professionals, one each from the eight key utilities that I mentioned. We also counted on the input from two professionals from the Power Sector Research Center which were experts in modeling hydraulic and expansion plan.

The exercise took about four full months of the Electrobras team plus one month of the other team members over a period of something like six to eight months.

Now, moving to how we did Stage One, the complexity ranking. As mentioned, this covers total sectoral and collective costs. It involved an iterative adjustment between analytical requirements and available information. We started off with something like 52 variables covering economic, engineering, direct environmental and social impacts, and regional aspects and ended up grouping this, simplifying a bit these indicators—some of these, not too many but some of these, we did not have appropriate data for, and we clustered the set of 52 variables into 13 indicators and assessed them taking into account two overriding objectives—socioeconomic, generally called, and physical biotic.

Now, to evaluate the set of projects, we used a method that is known as Saaty method. This method basically compares options, two by two, and explicitly and very systematically incorporates the opinions of a set of informed evaluators or experts in situations where there is partial or predominantly qualitative information.

The evaluators have to compare each set of two projects as well as the objectives and indicate their preference with respect to the pair, whether they are indifferent, whether there is a small preference of one over the other, or whether there is a high or even an absolute preference of one over the other. This generates a ranking in four categories of complexity.

I will move now to stage two, which dealt with the merit indicators and with the issue of the cost-benefit ratio. As I mentioned, despite the improvements in analysis of environmental and social impacts over the previous period, there were still very significant discrepancies in the way that different utilities dealt with project budgets. And we clearly perceived that there were situations in which the actual costs of the measures that were being proposed and were being undertaken by the sector at the end of the day were significantly above the originally budgeted costs.

So we needed to revise in a very expeditious manner the project budgets so as to reflect the full sectoral environmental and social costs. Again, we differentiated between the 30 more developed projects and the rest of the projects for which feasibility studies were not yet available.

I unfortunately cannot get into the detail of the methodologies that we applied to these two sets, but essentially, we used a sample of projects that were at a more advanced stage in order to establish the deviation, the extent of divergence between initially projected costs and final costs that were likely to be incurred. We also took into account regional differences and the cost variations which are quite significant in Brazil. I cannot go into more detail regarding this. But what we ultimately did was to then apply to projects either a partial or a full surcharge reflecting the deviation in environmental and social costs that we considered that the project merited.

Now, the preliminary analysis of the existing project budgets actually produced some very interesting results, and some instructive ones. The first result that I would highlight is the following—that the most significant components of project budgets were resettlement and regional infrastructure.

On resettlement—and by that, I mean land acquisition, relocation of towns, villages, rural resettlements—very frequently represented up to 90 percent of the total environmental and social budget of the project. In many cases, this meant 30 percent of total project cost. These were—I should not say "many," but in some cases, it represented 30 percent of the total project cost.

Relocation or recomposition of regional infrastructure could also be quite significant but was more accurately reflected in project budgets that existed at the time. This is easy to understand—engineers are more familiar with costing out the roads and bridges and the like.

The second lesson—where resettlement was not significant, by definition, the physical and biotic components of the projects' total environmental and social costs grew. But even so, they never reached more than 10 percent of the total project budget, which is quite interesting because, especially in the case of Brazil, there was a lot of concerns about projects in the Amazon. They are very visible to the international community. But indeed, the impacts and the set of mitigative measures does not represent an extremely high cost for the project itself.

What it does say is that the complexity index is very important when making decisions, because not all aspects of complexity, as we pointed out, can be mitigated or compensated. Thus it needs to be considered on the side whether indeed there are impacts which would need to be considered which are not reflected in project costs.

The final and third stage of this exercise was creating a typology of projects. This is summarized by means of a two-by-two matrix. On the vertical axis, we classified projects according to whether they incurred constitutional restrictions or not.

What do I mean by "constitutional restrictions"? Well, in Brazil, the Constitution specifies that for certain types of projects, Congress needs to review. For the power sector, this would be the case when projects flooded or affected the areas occupied by indigenous peoples or areas that were classified under certain conservation categories. This obviously means that the political process, the whole negotiation around the project, would tend to be more laborious.

On the horizontal axis—and you cannot see this completely in this slide because I have created two slides for this—we are classifying projects according to the merit indicator, the cost-benefit indicator, and how it compares to the marginal cost of expansion which was adopted by the sector at the time. And we will go to the next slide so that you can fully understand that.

Under the Type 1 project, we were looking at projects where there were no legal restrictions, where the socioeconomic impacts were deemed to be either inexpressive or of medium complexity according to the Saaty method class. Thus, we did not expect that there would be significant critical additional costs to these projects.

The implication is, well, just to proceed normally. Do the site-specific EIAs go ahead with the consultation process, with the licensing process? No. Major concerns or risks were envisaged. Just good project preparation should be able to deal with these projects. There is no dam project which is simple, but this cluster of Type 1 projects were situations where we thought that environmental and social impacts were fully manageable.

The Type 3 project which is featured on this slide refers to projects that were indeed subject to legal restrictions and whose studies indeed indicated that they were fairly complex projects. However, the notion was that it was very possible to mitigate or compensate for these social and environmental impacts.

They would incur costs that could be managed by the power sector and would place them, the full project cost, below the marginal expansion cost, which of course is a cut-off point of whether you do or do not move ahead with a project.

What was the message here? Well—proceed with care. Indeed, one would need to ensure that the environmental and social programs were undertaken, were prepared in a timely manner, were very carefully consulted. The licensing process would probably need a bit more time but was fully manageable according to this assessment. These are clearly projects that would be under very high scrutiny. You might say that they were high-risk/high-reward projects but projects that we should invest in.

Moving to the other group of projects, projects where the assessment of the full cost, including the adjusted environmental and social component, placed them beyond the marginal expansion cost that was considered at the time. Some of these had legal restrictions, some not.

Those without legal restrictions were cases where usually there were social and economic impacts which were nonetheless fairly complicated, so our assessment is that they would incur some very complicated negotiations and probably very high compensatory measures that would throw them beyond the referenced marginal expansion cost. The recommendation there was either redesign the project or possibly move to an alternative project altogether.

Type 4, I will not spend time on. They were really no-no projects. They incurred legal restrictions; they were expensive projects—so why do them? The recommendation was to seriously consider an alternative.

Some patterns emerged from this exercise, and I will mention four. The first pattern was that in all cases, Class 4, in other words, the highly complex projects, required resettling populations above 8,000 people and/or flooding an area above 500 square kilometers. In most cases, these were also projects that were subject to legal restriction.

A second conclusion was that there was a very strong correlation between reservoir area as a key indicator and the project's complexity—in other words, the project's total environmental and social costs. In the case of Brazil, this clearly pointed to the fact that we should look very carefully at projects that had flooded areas beyond half a square kilometer per megawatt hour.

A third conclusion was that there was a very strong correlation between displaced population per megawatt and sectoral, environmental and social costs, i.e., project budgets. This results in a very key indicator for inventory studies. It is a quite effective screening indicator and in Brazil suggests that we should look very carefully at projects where population per installed capacity is beyond 10 people affected and/or situations where total displaced population is beyond 5,000. If we are beyond those limits, we should really look carefully at the project to make sure that we have the numbers right, make sure that there are not alternative design solutions, or even that we should not move with other projects.

Finally, and extremely important for hydropower based countries, it resulted that the optimal expansion plan from an environmental and social viewpoint was not necessarily the sum of smaller projects. By that, I mean the following. If we were looking at a given target program capacity to be added to the system, say, 30,000 megawatts over a given period of time, a small number of large projects might result in smaller total inundated area and displaced population.

That is a result which is not entirely intuitive and is often refuted in the international debate, but it very clearly stood out in the analysis of the Brazilian power sector.

I want to point out some limitations of the approach. This approach presupposes an integrated power system. It is indifferent where a project is hooked into the system. If we were looking at isolated systems which are not connected to the national grid, the comparisons would have to be between different fuel options which might include hydro power but would be relative to a given location.

The method can take into account transnational exchanges. Transnational exchanges, or purchase of power from a different country, simply means that there are no environmental and social costs other than those that are already embedded in the power purchase that would need to be considered in making a decision as to opt for a transnational transfer or a local project.

In this particular exercise, we did not take into account the associated transmission costs. Of course, these are relevant for ease of analysis; we could not do this at the time. Future methodological developments should take these into account.

In this case, we were also not looking at the cumulative impact of the cascade of projects on any given river basin. This, of course, is an area which lends itself extremely well to Strategic EA when one is considering river basin schemes. We could not manage this at the level of the overall sectoral expansion program.

Finally, there is no distinction here between public and private provision.

Some lessons learned. Well, for the long-term expansion planning or strategic planning approach, we clearly concluded and firmly believe that it is better to be roughly right than precisely wrong, and that is indeed why Strategic EA is a relevant tool here. Strategic EA is not a fine-tuned exercise.

Now, very importantly, we found, as environmental and social practitioners, that it is absolutely essential to talk with the engineers and economists in order to understand their rationales and better understand the logic of the expansion program. This is valid also for individual project work, and perhaps even more so.

A third conclusion—putting a price tag on environmental and social impacts goes a very, very long way in the right direction. I highlight this especially because this is not something that environmental and social practitioners usually like to do, precisely because price tags do not capture fully the environmental and social costs that any given project entails.

But, indeed, the costing out of the mitigative measures and the compensatory measures or the preventive measures is extremely important and generally points in the right direction.

I would highlight again that the focus of an exercise such as this is on priority issues. Thus, a lot of simplification has to be accepted. You want to be able to capture the costs either on the economic, environmental, social, or political front. It is not about fine-tuning. It is about screening. So focus on the priority aspects.

Finally, along the same lines, there are clearly a set of very powerful simple indicators that I pointed to in the previous slide that can be used to screen projects and flag potentially undesirable situations at an early stage, and we firmly believe that these should be more broadly used.

Looking at individual project development, what we learned from this exercise—or, rather, confirmed—was that river basin inventory studies is where you want to reflect the broad social and environmental perspective and the overall resource use of hydro resources. Thus one needs

to look beyond the strictly sectoral perspective when doing inventory studies. It is essentially about the best use that society can make of a river and its resources, its hydro potential, whether it is for power, whether it is for irrigation or for sanitation purposes. It is at that moment of the inventory study that one needs to optimize the use of the resource.

Moving on to feasibility studies, it is clear that these need to capture fully the environmental and social costs which can be internalized, because these are going to affect ultimately the marginal expansion costs for the sector and, very importantly, will need to be reflected in consumer tariffs.

Finally, the collective costs, I emphasize again, may not be internalized, but they need to be pointed out, because ultimately, they may affect a decision to carry out or not carry out a project.

Now, by way of conclusion, how is this relevant to some other cases?

Well, we can generalize. Strategic EA, as indicated before, is best suited to analyze policies, sectoral or regional strategies and plans, and sub-regional investment programs. That is the prime area in which the SEA is relevant. Because the focus is on the big picture, the priority concerns, the trends, the medium and long-term perspective, it is not about the site-specific issues and the fine-tuning of that analysis.

It is extremely relevant when we are looking at cumulative impacts, which is not what this exercise did, or when we are looking at aggregate aspects, which indeed was what was going on here, for a series of investments, and when you are interested in screening out the bad apples from the good ones, thus extremely important when we are doing national, regional, or sub-regional investment plans or programs in any sector.

It is important to point out that this type of exercise entails a considerable degree of uncertainty, much more so than site-specific assessments. Thus one needs to be very comfortable with just being roughly right, with using expert opinion rather than detailed technical assessment—again, not about decision, but about the rough big picture.

Finally, SEA allows attention to be placed on institutional gaps and cross-cutting management approaches and tools either at the sector or region-wide level. In the case of the power sector in Brazil, Eletrobras went on to improve its planning methodologies, its inventory studies, its feasibility studies; it went on to develop even stronger and to systematize its approach to Strategic EA; it worked extensively on budgeting criteria, and this entailed a very profound revision of the way that sector budgets are set up; and lastly, the conclusions of the exercise led to further work on participation mechanisms.

I want to thank you very much and hope that this is relevant to your work and that you derive some benefit from this presentation.