INTERNATIONAL CO_2 ABATEMENT PROJECTS: EXPERIENCE FROM THE SWISS AIJ PILOT PROGRAM

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ABSTRACT
This paper analyses the two most advanced Swiss AIJ (Activities Implemented Jointly) projects. Key success and failure factors are derived from practical experience in developing and implementing these projects. The assessment of uncertainties shows that the counterfactual nature of baselines forms the most relevant factor for uncertainty with regard to climate benefits. Different strategies to minimise this uncertainty are described. For the investor, the performance of the project during its lifetime is the main source of uncertainty, since this will usually have a direct influence on the amount of emission reduction credits produced. Consequently, adequate legal structure and incentives for project hosts are crucial to ensure.

Key words: AIJ, climate change mitigation, energy efficiency, district heating, gas turbine, success factors, failure factors, uncertainty.

1. INTRODUCTION AND OBJECTIVE

In the frame of the Swiss AIJ Pilot Program (SWAPP), the Swiss Government intends to implement a total of four AIJ projects until the end of the AIJ Pilot Phase. Two of these projects are well underway, while others are in the prefeasibility or feasibility stages. This paper summarises some key experience and lessons learnt from the first two Swiss AIJ projects. Two main questions are discussed:

- What are the success and failure factors of these two pilot projects?
- Where are the major uncertainties in measurement and baseline definition?

The views expressed in this paper are those of external consultants involved in the feasibility assessment and implementation of several SWAPP projects, and not those of the Swiss Government.

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For STEP as well as for the project in Bucina agreements at governmental level have been signed. Implementation of both projects is in progress but they are not yet operating.	**Swiss-Romanian Thermal Energy Project (STEP)**	**Bucina Energy Optimisation Project, Slovakia**
Category	Energy efficiency	energy efficiency
Project description	reconstruction of 2 district heating systems: • new high-efficiency boilers, burners & distribution networks • introduction of combined heat & power generation	energetical optimisation of wood processing plant by installation of a gas turbine for wood drying and power generation
Crediting life (timeline)	15 years	8 years
Reference scenario (baseline)	• heat production and distribution first with existing, low-efficiency equipment (years 1-8), then with new medium-efficiency equipment (years 9-15) • central fossil-thermal power generation with a high share of coal (years 1-15)	• wood dried with exhausts from existing gas-fired burners • central coal-based power generation
Project host	Municipal utilities	wood processing enterprise (privately owned)
Investments (rounded) • Swiss Government • Host funding • Total	million US dollars 3.9 2.5 6.4	million US dollars 2.3 0.3 2.3
Emission reduction over project life (cumulative, rounded)	140,000 t CO_2	100,000 t CO_2
Cost of CO_2 abatement[1)]	8 USD/t CO_2	-9 USD/t CO_2
Stage of implementation as of September 2000	• Swiss components ready for delivery • monitoring / reporting / verification protocol existing • project design and baseline verified by independent party	in process of development: • supply contracts • monitoring / reporting / verification protocol • project validation
In-service date	2001	2001

Figure 1. Outline of the first Swiss AIJ pilot projects and stage of implementation.

[1)]abatement costs include investments, fuel and O&M costs with discount rates of 8% (STEP) and 12% (Bucina).

2. OUTLINE OF SWISS AIJ PROJECTS

The two most advanced SWAPP projects are the “Swiss-Romanian Thermal Energy Project” (STEP) and the “Bucina Energy Optimisation Project” in Slovakia. They are outlined in Figure 1. Under a discount rate of 12%, the Bucina project shows negative CO_2 abatement cost. Nevertheless, the project is considered to yield additional climate benefits for 8 years, because current obligations with the European Bank for Reconstruction and Development (EBRD) prevent the host company from accepting commercial loans during this period, which makes the project highly unlikely under non-AIJ conditions.

3. SUCCESS AND FAILURE FACTORS

Both described projects are not yet in service. Nevertheless, several main success and failure factors can be identified by analysing the project development, the contract negotiations, the validation process and the project implementation which have been carried out so far.

Figure 2 gives an overview of the success and failure factors briefly described below.

	Swiss-Romanian Thermal Energy Project (STEP)	Bucina Energy Optimisation Project, Slovakia
Success factors	hosting utility experienced in implementing similar projects	excellent local management capacity (private company)
	intensive personal contacts with project host through our local staff	export-oriented production; output with high market value →local financial means available
	host truly convinced of technical design of the project	
Failure factors	delay of local co-financing	

Figure 2. Success and failure factors of the first Swiss AIJ pilot projects.

Swiss-Romanian Thermal Energy Project (STEP)

Experience of host

The local hosts in STEP are municipal utilities of the two Romanian Cities of Buzau and Pascani. Prior to STEP, they had already started reconstructing other district heating systems together with EBRD. The experiences gained through this former co-operation were very helpful for the development of the STEP project.

Intensive contacts with project host

We hired a local engineer in order to optimise the co-operation with the host. According to our experiences, permanent local staff – highly motivated and correctly paid – is essential to enable a smooth and successful project development and implementation. This ensures intensive, personal contacts to the project host and it simplifies the co-ordination of various local processes.

Truly convinced host

An intensive contact with the local project partner is particularly important when conflicting views about the optimal project design occur. It then is essential that project hosts are not forced to accept project developer (or investor) decisions, but that the project developer can truly convince the involved individuals of his proposal. This happened in STEP concerning the question of how to design the distribution networks of the district heating systems. A so-called 4-track network is utilised in most Romanian district heating networks. Accordingly, local engineers are used to implement 4-track systems. However, 2-track systems are much more energy-efficient and therefore preferable for AIJ projects (Ernst Basler & Partner, 1998a). It took some time to achieve a consensus on the superiority of the 2-track systems. This consensus, however, turned out to be an important success factor in the implementation phase of STEP.

Delay of local co-financing
A critical factor of STEP, and a potential failure factor, was the dependence on local co-financing. 40% of the overall project costs (local labour and materials, mainly the reconstruction of the distribution network) are to be financed by the Romanian government, whereas Switzerland pays for the other 60% (imported goods: mainly boilers, combined heat and power units and substations). The fact that the promised local finances were not available in time delayed the whole process of implementation. We have identified two major reasons for this:

- Not all the relevant parties were initially involved in the negotiation process. The memorandum of understanding between the two governments was not communicated to the Ministry of Finance who is in charge of the financing. Therefore the Ministry of Finance wasn't willing and able to deliver the needed money at the beginning of the project. As a result the implementation process has been delayed until today. Implementation will only continue after the local money has been granted.
- National elections will soon be held (autumn 2000). Therefore daily business lose its priority and activities of governmental institutions slow down.

Bucina Energy Optimisation Project, Slovakia
Local management capacity
The excellent management capacity of the Slovakian company where the project is to be implemented, appears to be one of the essential success factors in the Bucina Project. An experienced local management team allows for efficient project development and implementation.

Export-oriented production, output with high market value
The Bucina project is highly cost-effective. At a discount rate of 12%, abatement costs have been estimated at -9 USD/ t CO_2 (see Fig.1). In addition, the host company, which produces chipboards, also exports products to Western Europe. There is therefore a substantial and reliable stream of financial revenues. This enables the company to pay back the costs of the initial investment of the AIJ project together with a moderate interest. This fact is not given in numerous other projects within the energy sector. A private buyer of heat from the district heating systems in the STEP project described above, for example, does not pay a market price. The production of heat is still subsidised and it's difficult to change such policies immediately. As result, repayment of AIJ investments is often not possible.

4. UNCERTAINTY IN MEASUREMENT AND BASELINE DEFINITION

Based on our experiences from AIJ projects we distinguish three major sources of uncertainty: characteristics of the existing situation, counterfactual nature (below called "counterfactuality") of baselines and project performance. Evaluation of the existing situation and assessment of baseline counterfactualites are needed to define the project baseline. The definition of the baseline directly affects the amount of issued certified emission reductions (CERs). There is therefore a trade-off between the interest of investors and the interest of the environment. After the baseline has been established there is no longer any uncertainty for the investor, unless the baseline is subject to revision during the crediting life.

On the other hand uncertainties related to the performance of the project do affect the investor because actual performance as determined by the project monitoring will directly impact the amount of CERs generated. The performance does not affect the environmental additionality, as long as CERs are issued based on monitored emissions of the new plant.

Figure 3 gives an overview of different types of uncertainties, interests affected and the level of uncertainty.

		Type of uncertainty		
		Existing situation	**Baseline counterfactuality**	**Performance of project**
Interests affected by uncertainty	**Investor's profit**		(medium-high uncertainty if baseline is subject to revisions)	medium-high uncertainty
	Environmental benefit	low – medium uncertainty	high uncertainty	

Figure 3. Different types of uncertainties. The table distinguishes between the kinds of issues affected and defines a level of uncertainty for each type. Reading example: Uncertainty caused by baseline counterfactualities is high and affects the environmental benefit.

Figure 4 provides an overview of tools which can be used to reduce different uncertainties. Below the uncertainties and tools are discussed with regard to the Swiss AIJ projects.

Existing situation

For retrofit or technical improvement projects such as STEP and Bucina, the starting point for the baseline definition is usually the existing situation before the project started. Thus, current energy consumption needs to be measured to determine baseline emissions. In theory, the uncertainty within this area can be easily minimised because no predictions about the future are involved and because fuel consumption is relatively simple to measure. But often these basic data are missing or there are only very vague assumptions available (e.g.: „we are using several piles of coal a year"). To gain more precise data, a pre-implementation monitoring of the energy consumption was suggested for STEP, but not implemented due to financial reasons. Nevertheless, in most cases the uncertainty caused by the inaccurate measurement of the existing situation will be negligible compared to the uncertainties related to baseline counterfactuality and AIJ project performance, i.e. related to the need to predict what would have happened in the future in the absence of the AIJ project.

		Type of uncertainty	
	Existing situation	**Baseline counterfactuality**	**Performance of project**
Dependent on	• available data	future development in: • technology • economy • politics	• local management capacity • input and output markets (stability of supply and demand, prices) • technical performance
Tools for uncertainty minimisation	• pre-project monitoring of energy consumption, emissions (not implemented in described projects)	• short crediting time • baseline revisions (not implemented in described projects)	• comprehensive training of local staff • financial incentives for the project operator to run the system optimally • contracts to ensure service and maintenance and updates • future investments to ensure long-time performance • online-monitoring of performance, and intervention scheme to react to underperformance

Figure 4. Factors influencing uncertainties and tools to minimise them

Baseline counterfactuality

The baseline definition involves assumptions about future technological, economic and political developments. This development has to be assessed ex ante for the entire crediting time of the project. The scenario that looks most probable serves as the baseline to determine the GHG emission reductions generated by the project. Naturally, forecasting of such a highly complex system over several years involves high uncertainties.

The Bucina project demonstrates the difficulties related to this topic. In the original design of the AIJ project, the installation of a gas turbine as well as the implementation of an energy control system was foreseen. Due to lack of local capital, both elements were considered environmentally additional. But meanwhile (before implementation of the AIJ project) the energy control system has already been installed using other means. Therefore the environmental additionality of this particular component was not given. This clearly shows the difficulties related to the definition of baselines.

The uncertainty related to baseline counterfactuality in both projects was reduced by relating the baseline directly to conditions stipulated by EBRD which, for example, do not allow the hosts of the STEP project to accept additional loans until 2007. Therefore a retrofit is very an unlikely baseline scenario in this period but could be expected to take place after loans are available again. This is the reason for the sharp decrease in baseline CO_2 emissions after year 8 (see Figure 5).

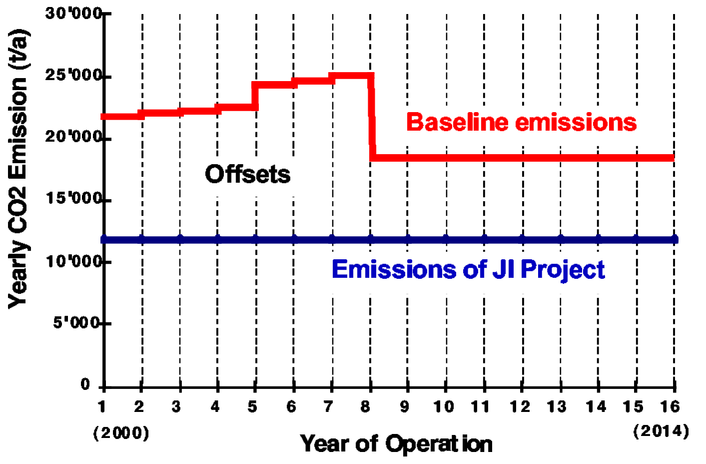

Figure 5. Baseline of STEP and predicted CO_2 emissions. The baseline is related to EBRD conditions that do not allow the project host accept new loans before 2007.

Another mechanism to minimise uncertainty caused by counterfactuality is to choose a short crediting time and limit the time for which a baseline needs to be forecasted. The timeline in the Bucina energy optimisation project was set at 8 years which is greatly below the expected technical lifetime of the installed system. Thereby the uncertainty was clearly reduced compared to a setting where the crediting time would be similar to the technical lifetime. A limited crediting life will reduce the amount of (CERs) generated by a JI/CDM project. The resulting change in a project's internal rate of return will, however, often be small. In other words, investors will usually discount the loss of CERs "at the far end of project life" when assessing a JI/CDM project ex ante, which mitigates the impact of limited crediting lives on project attractiveness.

A third way to minimise the uncertainty caused by counterfactuality would be to allow for baseline revisions during the course of the project. The baseline would then – according to triggers defined in advance – be revised during the project lifetime if needed. This was generally not foreseen for the two Swiss projects because the uncertainty for the investor would have been too high. However, the STEP baseline, which was defined in absolute terms (t CO_2 / year), includes a provision for revision if heat production changes significantly, for instance due to new consumers of heat (new buildings) being added to the distribution network.

Performance of Project

Uncertainties due to the performance are especially interesting from an investors point of view. In contrast to (non-revisable) baselines, the performance is not a well defined function when the investor decides to invest. He will only have a forecast of the expected performance. GHG credits will be issued after real emissions, and associated emission reductions, have been verified. Therefore it is in the investor's interest to minimise the associated uncertainties and ensure optimum project performance in advance.

5. KEY LESSONS LEARNT FROM THE SWISS PROJECTS

As a conclusion, we summarise three key insights gained from the SWAPP projects so far.

Personal contacts – a crucial success factor

Intensive personal contacts with project host's key persons are essential to enable smooth and successful project development and implementation. Permanent local staff – highly motivated and correctly paid – turned out to be very helpful in that context.

Dependence on co-financing – a potential failure factor

A co-financing of the project provides additional risks that shouldn't be neglected. The implementation of the whole project can be affected when the co-financing party doesn't act as previously agreed on – whatever the particular reasons may be.

Handling uncertainty

Special attention should be paid to the highest uncertainties that affect environmental benefits when setting guidelines for interpreting the Kyoto Protocol while keeping investors' interests in mind. Therefore one has to focus on how to handle counterfactuality affecting the baseline. A useful tool to minimise this uncertainty is to choose a rather short timeline for crediting. Thereby future uncertainty is reduced and at the same time there is no additional uncertainty for the investor. This will increase CER costs from the investors' perspective, but investors will usually discount the foregone emission reduction credits in their net present value calculation, which renders the impact of limited crediting lives on project attractiveness less severe. Investors are mostly affected by uncertainty resulting from project performance. For this reason they should make sure that sufficient incentives and legal structures ensure an optimal performance of the project throughout its whole crediting period.

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