

Thinking and acting strategically: promoting integrated solid waste management and corporate responsibility through a public private partnership; the case of Altamira, Tamaulipas, Mexico

Alejandro von Bertrab, Juan David Hernández, Axel Macht and Bernhard Bösl

**Electronic version**URL: <http://journals.openedition.org/factsreports/264>

ISSN: 1867-8521

Publisher

Institut Veolia

Electronic reference

Alejandro von Bertrab, Juan David Hernández, Axel Macht and Bernhard Bösl, « Thinking and acting strategically: promoting integrated solid waste management and corporate responsibility through a public private partnership; the case of Altamira, Tamaulipas, Mexico », *Field Actions Science Reports* [Online], Vol. 3 | 2009, Online since 24 September 2010, connection on 19 April 2019. URL : <http://journals.openedition.org/factsreports/264>

Thinking and acting strategically: promoting integrated solid waste management and corporate responsibility through a public private partnership. The case of Altamira, Tamaulipas, Mexico.

A. von Bertrab^{1,2}, J.D. Hernández¹, A. Macht¹, and B. Bösl¹

¹Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), GmbH

²Mexico Office of the GTZ. Av. Insurgentes Sur No. 826, Piso 11 – Colonia del Valle – México – Distrito Federal – 03100 – México – Tel.: +52(55)5536-2344 – Fax: +52(55)5536-2344.

Abstract. This article provides an assessment of a public private partnerships (PPP) between the German Technical Cooperation (GTZ), the Municipality of Altamira, Tamaulipas, Mexico, and private counterparts: BASF Mexicana and Terminal de LNG de Altamira (TLA). The municipality of Altamira, located in the urban-industrial hub of southern Tamaulipas, Mexico, faces important challenges in the field of urban public service delivery, particularly waste management, due to a high demographic growth rate and chronic budgetary constraints. The partnership was formed as a means to develop and implement the Municipal Program for the Prevention and Integrated Management of Solid and Special Wastes. The paper discusses the efficacy of the PPP as a policy instrument for the implementation of integrated solid waste management. As an assessment method, the authors draw on GTZ's success criteria for the cooperation with the private sector. Criteria include the degree of complementarity, subsidiarity, neutrality and quality of private sector contributions. We argue that this PPP displays a pioneering alliance structure, since the private sector becomes a direct ally in creating strategies for the promotion of sustainable development and not simply an exclusive contractor for urban public services delivery or a recipient of incentives from international development cooperation. The PPP provides a means to reach corporate social and environmental responsibility goals while at the same time promoting development-related policy goals enshrined in the bilateral cooperation agreement between Germany and Mexico. However, the alliance faces important challenges related to different organizational cultures, electoral times and citizen participation.

Keywords. Waste management, environment, public policy, water resources, international cooperation

1 Introduction

Public private partnerships (PPPs) have been identified as efficient instruments to promote solid waste management at the municipal level (Nyachhyon, 2006; Rathi, 2005). Usually, in the area of urban public services, such as waste management, water or electricity, PPPs are promoted as a means to deliver services or generate infrastructure via a contractual relationship with a private sector firm. This mechanism may provide a direct market advantage for the firm, such as exclusive temporal operation of landfills or waste collection (Dohrman and Aiello, 1999). However, PPPs can also be a means to promote sustainable development in areas not directly linked to the companies' core business but that address their social and environmental

responsibility goals by contributing, as "good citizens", to the well-being of local communities (Global Compact, 2005). For public sector entities, alliances of this nature can facilitate access to a larger resource pool to undertake actions related to integrated solid waste management (ISWM), such as current waste generation and management diagnostics, citizen participation, awareness-raising campaigns, infrastructure and equipment, and institutional development. Basic operational principles for PPPs under this category are resource complementarity to spread project costs and reach greater degrees of efficiency, and subsidiarity. The latter term means that none of the alliance partners would undertake the project without the others' participation (GTZ, 2004). The sum of efforts and resources acquires a greater importance in developing countries, such as Mexico, where municipal governments suffer from chronic budgetary constraints in the provision of urban public services.

Correspondence to: Alejandro von Bertrab
(alejandro.bertrab@gtz.de)



Figure 1. Geographic location of the municipality of Altamira, Tamaulipas, Mexico. Source: Atlas Barsa (1980), Encyclopaedia Britanica and Rand McNally Company

The German Technical Cooperation, the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ) of the German Government, promotes PPPs on a global basis as a part of its instruments to foster sustainable development. In Mexico, the GTZ office has been involved in an alliance with BASF Mexicana, Terminal of Liquefied Natural Gas of Altamira (TLA) – a joint venture of enterprises Shell, Total and Mitsui – and the municipality of Altamira, Tamaulipas, for the design and implementation of the municipality’s ISWM program. Both private enterprises have operational presence in Altamira and are thus, interested in investing in the local community.

This article offers a discussion related to the efficacy of this PPP as an instrument to promote ISWM.¹ The assessment focuses on the success criteria defined in the GTZ’s guide for cooperation with the private sector (GTZ, 2004), which include the degree of complementarity, subsidiarity, market neutrality and quality of contributions of the private sector (GTZ, 2004). We argue that this PPP case offers a pioneering example, since the private sector becomes a direct ally in the promotion of sustainable development and not only an exclusive contractor or a recipient of international cooperation stimuli. However, there are important challenges related to organizational culture differences between public and private sector entities, political administrative terms and citizen participation.

2 Project description

The PPP among GTZ, BASF, TLA and Altamira began in January 2006 with the objective of developing and implementing the municipality’s ISWM program – the Municipal

¹This article expands and deepens a previous discussion presented at the XXXI Inter-American Congress on Sanitary and Environmental Engineering in Santiago, Chile (von Bertrab et al, 2008).

Program for the Prevention and Integrated Management of Solid and Special Wastes (PMPGIRSUME, acronym in Spanish). The PMPGIRSUME is a public policy instrument set forth in the General Law for the Prevention and Integral Solid Waste Management of Mexico (LGPGIR, 2003). Municipalities are required to develop and implement their own PMPGIRSUMES. These programs should include a basic diagnosis of current waste management practices at municipal level, installed capacity, definition of objectives and goals to achieve ISWM, financing and technical advice needs. ISWM is based on the “3R strategy”: reduce, reuse, and recycle solid waste through incremental capacity development to offer a high-quality public service, institutional strengthening, infrastructure development and citizen participation (Tchobanoglous et al, 1993).

The municipality of Altamira, with approximately 175,000 inhabitants, is part of the urban-industrial region that also includes Ciudad Madero and Tampico in the southern part of the state of Tamaulipas, in Mexico’s northeast (see figure 1). Altamira has one of the main multi-modal port facilities in the country and is an important direct investment destination for the petrochemical sector. The municipality has registered a high rate of demographic growth, approximately 4.5% annually in the last ten years, and thus, faces important challenges in the provision of public services. The municipality generates 136 ton/day of urban domestic solid waste (R. Ayuntamiento de Altamira et al, 2006).

The PPP discussed here was formed initially through an initiative of the company BASF. This enterprise was weighing social investment options in the municipality of Altamira. It contacted the municipal administration at the time and the GTZ to gauge different options. Together, a decision was made to launch a PPP in the field of ISWM. The PPP scheme promoted by the GTZ was adopted due to the agency’s proven worldwide experience. The alliance has just initiated its third phase. The phases are briefly described below.

- Phase I: Elaboration of the municipality’s PMPGIRSUME (Jan-Dec 2006) which included a diagnostic of current waste management practices, objectives and goals for the short, medium and long terms.
- Phase II: Implementation of a waste collection pilot project in two fractions (organic and inorganic) within a collecting truck route (Sep 2007-Apr 2008).
- Phase III: Completion of the PMPGIRSUME’s activities for the medium term – expansion of waste collection separated in two fractions, establishment of an organic waste composting site, design of a reusable materials and recyclables concentration and collection facility and institutional strengthening (Dec 2008-May 2009).

The company TLA joined the alliance during the second phase. This enterprise had already identified the waste problematic of the municipality as a possible area of involvement within its corporate social and environmental responsibility initiatives. The alliance proved to be a direct channel to offer resources and expertise for the benefit of the locality. The other alliance partners benefited from a greater resource pool to cover more activities set forth in the PMPGIRSUME. To

Table 1. GTZ's Success criteria for the implementation of public-private partnerships

Success Criteria	Description
Complementarity	The public and private contributions must complement each other such that both partners achieve their objectives at a lower cost, more effectively and more quickly as a result of their cooperation.
Subsidiarity	Participation is only possible if the private partner would not undertake the measure without the public partner. The contribution of the private partner to the PPP includes only those inputs that go beyond the company's normal business activities.
Market neutrality	The GTZ must be open to cooperation with all firms, without any restrictions. The possibility of PPPs must be made public and brought to the attention of as many firms as possible. The process of selecting the private partners must be transparent, and the decisions must be objectively clear. Companies have no automatic entitlement to PPP cooperation.
Contribution of the private sector	The firm must make a substantial financial, human-resource and/or in-kind contribution to the PPP measure. The resources and contributions that the private sector brings to a development partnership may take many different forms, including consultancy and training services, know-how and technology transfer, infrastructure and the procurement of equipment for the partner-country institutions receiving support. The important factor is that the impacts generated by the contributions go beyond the original business interests of the firm and serve general interests. The aim is to have a 50-50 split between public and private contributions.

Source: GTZ (2004)

date, neither of the private sector partners maintains market interests in waste management. Both have joined the alliance as a way to contribute to the municipality as part of their corporate responsibility strategies.

3 Assessment methodology

The evaluation methodology for the case presented here is based on GTZ's success criteria for the implementation of integrated PPPs. These criteria, described in table 1, refer to the institutional arrangements and means that can contribute or limit the possibilities of attaining project goals. The ultimate aim of a PPP is to add efforts and resources to reach developmental objectives in the most effective, efficient and fair way possible.

Information sources for the current project assessment are the opinions and positions of project partners as well as of project beneficiaries living in the municipality of Altamira (neighbors living along the pilot project collection route).

4 Results

Phases I and II – the elaboration of the municipality's PMPGIRSUME and the implementation of a waste collection pilot project respectively – have been completed successfully. Phase III only became operational in December 2008, so it is yet too early to present any concrete results. The pilot project consisted of waste separation and collection in two fractions (organic and inorganic) within a single waste collection truck route in a total of 10 neighborhoods of Altamira, amounting to approximately 10% of the municipality's population and covering a wide socioeconomic spectrum, from middle-class households to poor urban dwellers. Waste collection in two fractions along the pilot route was preceded by an active awareness-raising campaign, through which visits were made

to most houses, schools and commercial establishments along the route. The campaign included marketing materials designed specifically for the project – posters (figure 2), flyers (figure 3), baseball caps, stickers – and a comprehensive house-by-house visit program undertaken by high-school student volunteers who received the appropriate training on how to approach neighbors, answer questions and conduct surveys. On the side of Altamira's government public services division, two waste trucks were adapted with a metal structure along the wheel axis to be able to collect waste separately in one trip. According to a survey conducted by the student volunteers, by the time the municipality began with the actual waste collection, over 80% of the neighbors along the route knew about the program, 68% could distinguish between organic and inorganic waste and approximately 55% of households were delivering their waste in two fractions. This last proportion is higher than the 25-30% that project planners had as a benchmark from similar projects in other parts of Mexico. Along the pilot route, 600 kg of organic waste are collected each day (9 ton/mo), ready for further treatment options (more on this below) (R. Ayuntamiento de Altamira et al, 2008).

Before the pilot program, waste collection was deficient along the pilot route, with only one to two trips per week in the more affluent neighborhoods.² The more marginalized neighborhoods saw the truck drive by only once a month or less. With the pilot project, collection frequency along the pilot route improved substantially, covering the entire route two to three times per week. The burning of waste, which was a common practice in the poorer areas, ceased almost entirely as the garbage truck began to appear more frequently.

²This posed basic health and urban landscape problems, as the warm, sub-humid weather characteristics of the region (with rains averaging 1,289 mm/yr and average temperatures of 23.88° C) prompt a relatively fast organic waste decomposition.



Figure 2. The project's poster



Figure 3. The project's flyer

Additionally, all 74 waste collection workers of the municipality were trained on separate waste collection and about half received new uniforms sponsored by the project.

Waste treatment is only planned to begin in the third project phase, with the design, construction and operation of a composting facility and the design of a waste collection center. The pilot project was launched without further waste treatment, as it was necessary to test the ability of the municipality and its workers to collect waste separately, as well as identify problems and areas of improvement. Given the positive results of the pilot project, all project parties decided to continue with the third phase of the project which will enable the municipality to expand waste collection on a two-fraction basis to the entire urban area and begin treating waste, especially the organic fraction. During the first quarter of 2009, project partners were identifying an appropriate site for the composting facility.

In order to understand the contribution of a PPP measure to a municipal ISWM program, it is necessary to assess the institutional arrangements and resource pooling that have made this project possible. What follows is a description of the most relevant findings of the PPP's assessment according to the GTZ's success criteria described in table 1.

4.1 Contribution of the private sector and complementarity

The PPP among private enterprises BASF, TLA and public entities Municipality of Altamira and GTZ has been an effective instrument to add financial resources destined to achieving ISWM at the municipal level. According to Altamira's PMPGIRSUME (R. Ayuntamiento de Altamira et al, 2006), yearly financial requirements to implement the program range from US\$80,000 to US\$200,000 within an eight-year time-span. After two full years of project activities, total partner contributions have reached approximately US\$160,000. Another US\$210,000 will be invested within the 18-month duration of the third phase (starting December 2008). The proportion of private contributions has increased from 40% to 52%. These amounts imply that the Municipality's Office for Sustainable Development and Environmental Protection – the division responsible for project implementation – now has access to funds destined to ISWM in the areas of awareness-raising campaigns, diagnostics, infrastructure design and development and institutional strengthening. Previously, this division did not have an independent budget for ISWM-related activities.

This alliance is based on shared responsibility and project partners have had the opportunity to share knowledge, resources and ideas to strengthen the PMPGIRSUME's implementation. All project partners have assigned an internal responsible party for the project. This has facilitated interaction and dialogue among participants. It is noteworthy to mention that the high efficiency of waste separation during the pilot project was largely due to an awareness-raising campaign designed collectively. The initiative to design such a campaign arose from various discussions among project partners, where the principles of citizen participation in sustainable development and local authorities' knowledge of regional conditions were backed by the marketing expertise of private sector counterparts.

4.2 Market neutrality

The positive outcomes of the alliance's first phase prompted the private enterprise TLA to join the project. TLA joined the PPP measure voluntarily and its contributions have played a key role in the achievement of project goals. TLA's contributions during the third phase will be of strategic importance to cover all project activities. Additionally, alliance partners have included as a project goal the joint search for additional private sector associates. Current private partners are generating a list of potential allies. During the coming months a specific strategy to involve other enterprises will be developed.

On the other hand, the project achievements have been advertised via different media, such as regional and national

newspapers as well as internal media channels of alliance partners. In July 2008 the project was submitted for consideration for the National Recycling Recognition sponsored by the Employer Confederation of the Federal Republic of Mexico (COPARMEX, acronym in Spanish) and the Federal Ministry of the Environment and Natural Resources (SEMARNAT, acronym in Spanish). The project received the third place in the category of potentially applicable initiatives. It is expected that such an active publicity exercise will aid in the replication of the cooperation model in other regions, while at the same time attract more private partners for future project stages.

4.3 Subsidiarity

This PPP is based on the subsidiarity principle. The private partners had identified ISWM as a field of action within their corporate social responsibility strategies but did not have the required technical expertise to develop a project in this area. The municipality faced a legal requirement to design and implement a PMPGIRSUME but did not have access to sufficient resources, know-how and institutional capacity. By means of this alliance, both the private firms and the municipality have benefitted from GTZ's technical expertise and project management capacity. The German Technical Cooperation, on its part, has been able to access more resources to broaden its cooperation mandate in Mexico and has been able to promote corporate social and environmental responsibility more effectively.

5 Challenges

One of the main challenges of an alliance of this nature is the inherent differences in organizational culture between the public and private sectors. Bureaucratic procedures in both sectors and within individual institutions have their own dynamics. For instance, private enterprises have different rhythms in their internal disbursement verification procedures. The municipality, on its part, is subject to a series of bureaucratic hurdles. These factors can slow down the implementation of project activities. The GTZ and its partners have had to take such differences into account in the planning of specific activities and have had to learn to work in a highly diverse context related to priorities, interests and bureaucratic procedures.

A more specific challenge related to organizational differences is the division of responsibilities within the municipal administrative structure related to solid waste management. The Public Service Division is the entity responsible for waste collection and disposal, while the Office for Sustainable Development and Environmental Protection has been charged with the coordination of the PMPGIRSUME. A sizeable amount of project time and efforts have been dedicated to facilitating dialogue between both divisions and generating mechanisms for internal collaboration.

Electoral times can be another institutional risk factor for the project, mainly in the medium to long-terms. The possibility of losing political support for the project from one electoral administration to the next is always latent, especially in the case of Mexico where municipal administrative terms only last three years and there is no reelection possibility. In Altamira, municipal elections took place in 2007 and the new administration took

office in January 2008. This change occurred during implementation of the second project phase. Luckily, the new mayor offered support for the project from the start. A key strategic event was the inaugural event for the pilot project, which took place in December 2007. Both the mayor in office and the mayor elect were invited to the event. This generated a direct sense of ownership from the elected municipal head. However, the change in administrations was followed by a brief adjustment period which slowed project activities somewhat. This prompted project partners to extend the phase's termination date by a few months to ensure proper goal achievement.

The differences in organizational cultures and electoral times, which can place projects like this PPP at risk, can be overcome by creating citizen participatory spaces that lend sustainability to the project. Participatory spaces where local decision-makers, such as politicians, businessmen, academics, and citizens-at-large take part can provide the means to ensure that local government continues with projects as these groups, if they are sufficiently autonomous and politically powerful, will demand continuity beyond single administrations. Altamira's PMPGIRSUME contemplates the creation of a follow-up committee that brings together important local personalities in the political, academic and private fields. Local government is obliged to inform this committee on a regular basis and incorporate the participatory body's advice. The committee began having bimonthly meetings in 2008. It is yet too soon to assess the committee's political leverage and the committee is subject to change from one administration to the next, as the local government can change the committee's membership structure. It is nevertheless hoped that, due to the relatively small size of the municipality, most of the important committee members will remain from one administration to the next and hence provide the necessary leverage to ensure project continuity.

Another key dimension of citizen participation is the one required by the ISWM itself. One critical aspect of integrated waste management is the participation of household and local business in the separation, reuse and reduction of solid waste. Ensuring participation at this level requires efforts via awareness-raising campaigns, such as the one implemented in this project. However, citizen involvement in those daily tasks can easily dwindle, if inhabitants fail to perceive the benefits from ISWM, such as organic waste actually ending up in a composting site. In the case of this project, potential delays in the construction of a composting site or the design of a recyclables collection center, contemplated as project activities within the third phase, can generate a degree of despondency among local population, which may cause a loss of interest in separating waste at the household level.

6 Discussion

The assessment of the Altamira PPP displays a proper design and project implementation structure according to GTZ's success criteria for cooperation with the private sector (GTZ, 2004). The appropriate degrees of complementarity, subsidiarity, and quality of private and public contributions give rise to not only an efficient instrument for the promotion of ISWM but to an innovative alliance which can bring together

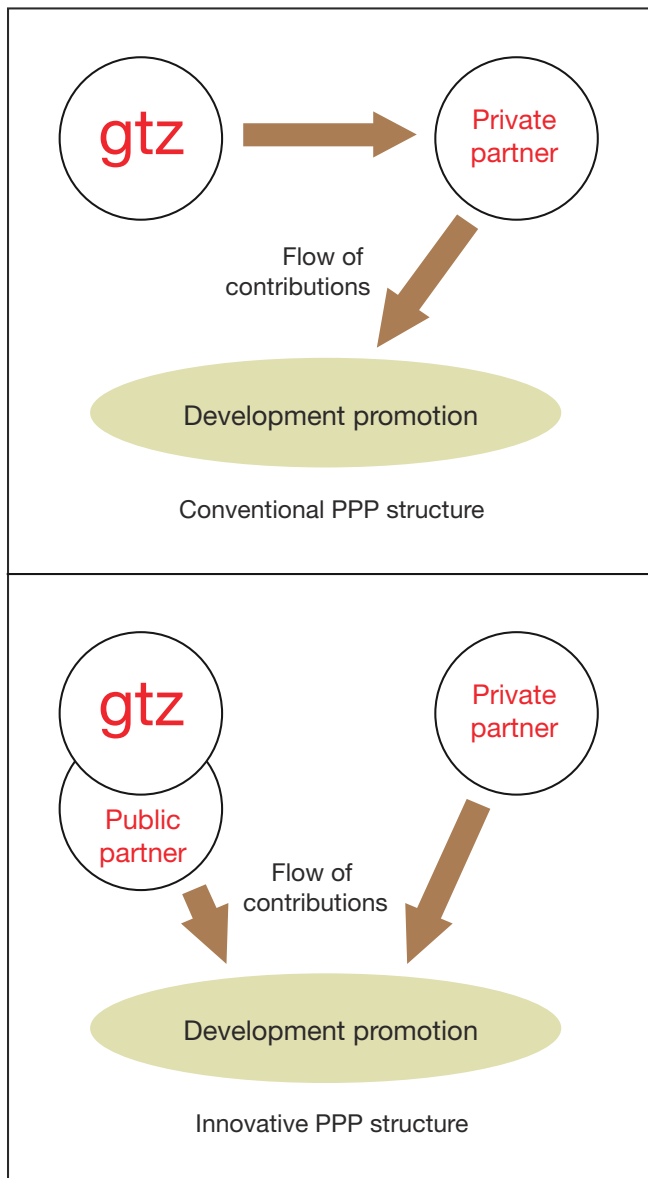


Figure 4. Two basic structures of PPP measures as promoted by the German Technical Cooperation.

a variety of players with an interest in promoting corporate social and environmental responsibility and high quality urban public services. The challenges discussed above – cultural differences, citizen participation, and electoral times – are inherent to the daily tasks of promoting sustainable development. Any project of this nature should take those contextual variables into account.

In general terms, there are two basic forms of PPPs promoted by the GTZ. Firstly, there are those alliances which focus on offering support to initiatives of private sector counterparts. In these alliances, if a private firm has a project idea geared towards the promotion of sustainable development, it can seek support from the GTZ. The agency, in turn, offers direct resource contributions or technical expertise. The PPP measure analyzed here is of a different order, as private sector counterparts become direct allies in fostering sustainable development policy. Private firms take on responsibilities traditionally assumed by the Technical Cooperation, such as financing of awareness raising campaigns, feasibility studies

and expert travel costs (Eckermann et al, 2008), in addition to providing their own expertise for specific project components. Figure 4 displays the differences between the two types of PPPs.

This alliance generates a true win-win situation, since the implementation of Altamira's PMPGIRSUME is directly within the field of the bilateral cooperation mandate between Mexico and Germany, which includes the promotion of ISWM. On the one hand, the private sector can fulfill its corporate social and environmental responsibilities and contribute to the development of its immediate surroundings. On the other hand, the public sector can have access to a larger resource pool, experience and know-how in order to be better able to promote development within a scheme of complementarity and subsidiarity.

This case offers insights into an innovative PPP that can serve as a precursor for similar projects in other countries and localities, with or without access to international development cooperation. Generally, practical implications of such alliances involve adopting a more collaborative and strategic stance towards the private sector. While PPPs geared exclusively towards filling gaps in public service delivery are oftentimes necessary, alliances such as the one discussed in this article aim at broader objectives, beyond a company's direct market interests. As such, PPPs like this can act as umbrella policy instruments by providing necessary resources and know-how to design project activities. Aid agencies or government concerned with promoting corporate involvement in sustainable development may make a more effective use of private sector resources by building alliances that are more strategic in nature and serve as the basis to assess, identify, plan and implement activities to provide high-quality public services. In other words, the aim would be to create cooperative management structures where actors within diverse social spheres, with varying interests and priorities, identify a problem and jointly seek ways to solve it (Forsyth, 2005). One of the challenges in this respect is to identify private sector partners which have within their corporate and environmental responsibility mandates the investment in sustainable structures at the local level. It is necessary to note that access to international development cooperation is not necessary to build PPPs of this nature. The main ingredient for such alliances is that public and private sector interests can be congealed so as to promote sustainable development and corporate social and environmental responsibility. It is a matter of initiative, trust and the development of institutional structures that can sustain project activities.

7 Conclusion

The public-private partnership among the GTZ, the municipality of Altamira and private partners BASF Mexicana and Terminal of LNG of Altamira (TLA) was formed as a means to implement the municipality's Program for the Prevention and Integrated Management of Solid and Special Wastes. The alliance, which started in 2006 and is now starting its third phase of implementation, has proven to be an effective instrument for the promotion of integrated solid waste management. The PPP measure profits from a high degree of

complementarity of public and private sector resources and know-how and has generated a multiplier effect by integrating other private partners. Challenges have included differences in administrative cultures between private and public sector counterparts, administrative changes and citizen participation at both the household level in the realm of waste separation and at the political level to ensure project continuity. The PPP is innovative in that it is based on the constellation of multiple interests to achieve sustainable development policy on the basis of a cooperative agreement, while at the same time promoting corporate social and environmental responsibility. Alliances of this sort can play a pivotal role in the strategic planning of public service delivery for cash-strapped municipalities.

Acknowledgements: The authors wish to thank BASF Mexicana, Terminal of LNG of Altamira and the municipality of Altamira, Tamaulipas, for their collaboration in the public private partnership discussed herein. The support of the German Government through the Federal Ministry for Economic Cooperation and Development (BMZ) is greatly appreciated.

References

- Cámara de Diputados del H. Congreso de la Unión (08-10-2003), *Ley General para la Prevención y Gestión Integral de los Residuos (LGPGIR)*, Diario Oficial de la Federación, México, 39 p.
- Dohrman, James and Aiello, James (1999), “Public-private partnerships for waste management: challenges for policies and procedures”, *Development Southern Africa*, 16, 4.
- Eckermann, André, Hack, Sebastian and von Bertrab, Alejandro (2008), “Wirksamkeit der Entwicklungszusammenarbeit steigern“, *GTZ Intern*, 3-4, 3.
- Forsyth, Tim (2005), “Building deliberative public-private partnerships for waste management in Asia”, *Geoforum*, 36, 4, 429-439 pp.
- Gesellschaft für Technische Zusammenarbeit (GTZ) (2004), *Guidelines for development partnerships with the private sector (Public-Private Partnerships – PPPs) within the framework of technical cooperation projects*, Eschborn, Germany: GTZ, 4 p.
- Global Compact Office (2005), *The United Nations Global Compact: Addressing Corporate Citizenship*, New York: United Nations, 10 p.
- Nyachyion, Badan Lal (2006) “Prospects and constraints of public private partnership for urban waste management”, *Policy Paper 15*, Kathmandu, Nepal: SCAEF, Economic Policy Network, Asian Development Bank, 59 p.
- R. Ayuntamiento de Altamira, GTZ and BASF Mexicana (2006), *Programa Municipal para la Prevención y Gestión Integral de los Residuos Sólidos Urbanos y de Manejo Especial (PMPGIRSUME) en Altamira, Tamaulipas, México*, 77 p.
- R. Ayuntamiento de Altamira, Terminal de LNG de Altamira, BASF Mexicana and GTZ (2006), *Informe final de la medida PPP, I Fase de implementación PMPGIRSUME*, Altamira, Tamaulipas, México, 11 p.
- Rathi, Sarika (2005), “Alternative approaches for better municipal solid waste management in Mumbai, India”, *Waste Management*, 26, 10, 1192-1200 pp.
- Tchobanoglous, George, Theisen, Hilary and Vigil, Samuel (1993). *Integrated Solid Waste Management: Engineering Principles and Management Issues*, McGraw-Hill: Boston, Massachusetts, USA, 978 p.
- von Bertrab, Alejandro, Hernández, Juan David and Macht, Axel (2008), “Public private partnerships and instruments for integrated urban solid waste management: the case of Altamira, Tamaulipas, Mexico,” oral presentation at the XXXI Inter-American Congress on Sanitary and Environmental Engineering, AIDIS: Santiago, Chile, 8 p.