Assessment of Results Achieved under SIGMA's Implementation of IR 6.4: Increased Use of Less Contaminating Technologies

The fourth Intermediate Result (IR 4) of USAID/G-CAP's 6th Strategic Objective (SO 6: Improved Environmental Management in the Mesoamerican Biological Corridor) is **"Increased Use of Less Contaminating Technologies."**

IR 6.4 has two separate IRs, each with three lower-level IRs:

6.4.1 "Municipalities adopt improved solid waste and wastewater management systems" has the following three sub-IRs:

- Financing options for municipal solid waste and wastewater management realized,
- Institutional arrangements for imprived solid waste and wastewater management in place, and
- Viable technological solutions for improved solid waste and wastewater management **??? can't read this on p. 11 of Semi-Annual Report.**

6.4.2: "Private Sector institutions implement environmental management systems" has the following three sub-IRs:

- Increased access to financing for improved environmental management practices and processes,
- Management embrace imprived environmental management, and
- Increased access to technologies, and procedures for improved environmental management.

Structural and Functional Organization of SIGMA

ARD, Incorporated (ARD) was selected by USAID/G-CAP to be its implementation partner for IR 2.4 following a competitive procurement action under the Water Indefinite Quantity Contract (IQC). ARD's 3 ½ year, $5.2 million contract to achieve the expected results under IR 2.4 began on October 29, 2001 and will end on March 31, 2005, unless a request to extend the contract is authorized by USAID. ARD implements this project under the name of SIGMA, which stands for its initials in Spanish (that is, *Sistemas de Gestión para el Medio Ambiente)* or Environmental Management Systems in English.

Functionally, SIGMA is divided into two "sides" or programs: 1) a private sector program to assist companies apply and adapt cleaner production (CP) practices and technologies to their productive processes, and 2) a municipal waste management program aimed at building the capacities of municipalities to deliver better quality and sustainable (both economically and environmentally) public services of solid waste management (SWM) and wastewater treatment to their communities. These two sides of the project are directed by a Project Director, and supported by a Communications Unit that addresses the information dissemination and publication needs of both sides of the project.

Organizationally, SIGMA is composed of seven technical professional positions:

- Project Director -- Don Peterson
- Municipal Sector Coordinator -- Doreen Salazar
- Private Sector Coordinator -- Ricardo Aguilar
- Environmental Development Specialist -- Nadia Gamboa
- Communications Unit Coordinator -- Antonio Arreaga
- Communications Unit – Web Specialist – Samuel Saito
- Program Assistant -- Andrea Monterroso

In addition, on the administrative side, there is an Administrative Coordinator, -- Anaíta Betancourt and an administrative assistant – Letica Soberanis.

This outstanding staff rely heavily upon and is supported by a broad, regional network of governmental institutions, NGOs and CBOs as well as financial institutions and technical consulting firms who have acted as local "extension agents," making it possible for SIGMA to significantly leverage its own human resources to reach a much larger target population of project beneficiaries.

A. Private Sector Activities and Results

1. Strengthening Regional Partnerships and Coordination – SIGMA has relied extensively on the existing network of five national Clean Production Centers (CPC) in the region, assisting them in their institutional capacity-building by providing technical information on various subjects, supporting the development of more than two dozen case studies, technical reports, and sectoral guides in six priority sectors (discussed below) by the CPCs, and organizing opportunities to exchange technical knowledge and experiences through a series of regional and sub-regional training workshops. Within the 1st year of their contract (July 2002), SIGMA had conducted an analysis of the comparative strengths and capabilities of each of the CPCs, identifying "technical areas of exclusive specialization" in ten productive sectors.[1] One small criticism of this work by SIGMA is that they either did not know about or chose not to take advantage of an excellent analysis prioritizing the main productive sectors throughout the Central American region (including Panamá) that was prepared by the United Nations Industrial Development Organization (ONUDI in Spanish) with the full participation of all five CPCs in the region.[2]

SIGMA has intelligently utilized the institutions, capabilities, and networks that already exist in the region instead of trying to reach their target sectors directly. In this manner, SIGMA has created learning opportunities and greater capabilities among the CPCs by facilitating the sharing of information and experiences within a given productive sector or a given area of interest (e.g., financial evaluations of CP projects or Life Cycle Analysis) without creating redundant capabilities between the Centers. For example, SIGMA has facilitated the cross-pollination of experiences by bringing an expert in CP practices and technologies in slaughterhouses or coffee *beneficios,* for instance, from one national CPC to work in another country with that CPC and productive sector.

[1] Reporte de los Centros de Producción más Limpia en Centroamérica, pp. 17-18, SIGMA, July 15, 2002.
[2] Sectores Prioritarios de Producción Más Limpia en Centroamérica: Resumen Final, date unknown.

These mutually beneficial partnerships with the regional network of national CPCs acting as "extension mechanisms" and "change agents" have been both efficient in terms of optimizing Project resources by "leveraging" SIGMA's limited human and financial resources while simultaneously building the institutional capacity of the CPCs, which will continue working with the private sector to promote the adoption of cleaner production long after the current project ends.

2. Demonstration Projects, Case Studies, Technical Guides & Training Workshops in Priority Sectors – One of the strategies of SIGMA in promoting the application or CP practices and technologies in the private sector has been to financially and technically support the CPCs in the development of a series of technical reports of CP plant audits and case studies of CP applications in target industries or sectors that can then serve as key inputs to technical guides and training seminars that SIGMA prepares jointly with the CPCs for broader dissemination regionally. Thus far, demonstration projects have been conducted in five of the priority productive sectors:

- Six ***dairy farms*** in the Olancho watershed of Honduras adopted 80% of the CP recommendations made by the Honduran CPC (CNP+LH), with the assistance of SIGMA, the National Agrarian University (UNAH), and the Canadian International Development Agency (CIDA), resulting in 10% savings in operating costs to the dairy farms and significant reductions in organic matter contamination (BOD and COD) caused by the disposal of whey lost in process.[3] Based on this experience and others in Nicaragua, a Best Management Practices (BMP) Manual for the Dairy Farm sector was prepared by SIGMA, which will be disseminated regionally with funding from PRODOMA.

- Six ***coffee fincas*** in the Rio Polochic watershed of Guatemala and the Lago Yojoa and La Trinidad de Santa Barbara region of Honduras are currently involved in a demo project with SIGMA and their respective national coffee associations; ANACAFE in Guatemala and IHCAFE in Honduras. This work is being coordinated with PROARCA / APM, which is assisting with coffee certification. Technical reports for these six coffee *fincas* and four training courses were developed, which served as key inputs to preparing a BMP Manual and a Cost Manual for processing coffee by SIGMA. On the financial side, SIGMA is assisting these coffee *fincas* in the submission of a grant proposal to PRODOMA to increase the application rate of recommended CP investments.

- Three case studies of ***slaughterhouses*** in Nicaragua, Guatemala, and Honduras as well as a BMP Manual and a validation workshop are being prepared by the Nicaraguan CPC (CNPML) with technical assistance from SIGMA and U.S.EPA under the PROARCA PASA agreement. In one interview in San Pedro Sula with the general manager of the city's slaughterhouse (it is publicly owned), he indicated that 50 – 60% of the CP recommendations (all low cost process changes) have already been implemented, and that they have analyzed the cost / benefit relationship of several of the more important but costly investments.

  Mr. Nuñez indicated that only the lack of affordable, accessible capital is holding them back from making a $40,000 investment in a blood collection tank

[3] Notes from interview with Juan Amilcar Colindres of the UNAH, Jan. 21, 2004, San Pedro Sula, HN.

that he is convinced would pay for itself within a very short time. He also saw the possibility to regionalize the operation and shut down other small, inefficient and unclean operations in the area. While it is still too early to realize the full potential of CP benefits for the region in this sector, personal site visits and interviews on three separate occasions made it quite clear that tremendous potential exists to improve sanitary conditions, worker safety, economic efficiency, and environmental protection by modernizing and regionalizing such operations with a CP orientation toward reducing waste streams while increasing the efficiency and competitiveness of this sector.

- In collaboration with the national aquaculture associations for both Honduras and Nicaragua (ANDAH and ANDA respectively), SIGMA is developing a CP strategy for four ***shrimp packing*** companies in the Gulf of Foncesa. In interviews with two of these companies, the owners indicated that they have realized water savings of 400,000 m^3 / day (representing a drop of 43% and 30% in total water use) as well as a concomitant drop in energy costs to cool water and the cost to treat waste water.[4] These benefits as well as others, such as compliance with HACCP quality & sanitation certification standards and increased competitiveness in lucrative export markets) have yet to be published and disseminated by SIGMA.

- SIGMA has initiated demo projects with hotels and restaurants working in the ***tourism industry*** located in protected areas in Talamancha, Costa Rica and Bocas del Toro, Panamá to develop a CP strategy to reduce water and electricity consumption and improve wastewater and solid waste management in six hotels. This demo project is being coordinated with the Costa Rican CPC with additional support coming from PROARCA / APM (TNC, WWF & Rainforest Alliance), the Dutch Cooperation Agency and the UNDP.

  Four training workshops on Clean Production BMPs for hotels and restaurants located in protected areas or buffer zones, as well as for regional sustainable ecotourism (CST in Spanish) certification requirements have been conducted in coordination with APM in the Gulf of Honduras and Bocas del Toro area. The demo project is being expanded to include eco-hotels in the Polochic watershed in and around protected areas near Cobán, Guatemala in close collaboration with PROARCA / APM. PRODOMA is financing an ecotourism initiative in the Gulf of Honduras, coordinated between Belice, Guatemala, and Honduras.

The ultimate objective of this technical and financial assistance to the CPCs and other organizations such as CARE or PCI working on demonstration projects is to facilitate a "multiplier effect" where other plants in a given sector will more likely be convinced of the benefits of CP by the "real-life" experiences of other firms in their sector operating in the region. To date, SIGMA has supported the preparation of seven case studies by the CPCs and is in the process of preparing 23 more case studies in various priority sectors.[5]

[4] Notes from interviews with Armando Piñeda, Gerente General de SeaJoy Inc. on Jan. 22, 2004 in Choluteca, HN., and with Larry Drazba, General Manager and Owner of Camanica, S.A. on Jan. 24, 2004 in Managua, Nicaragua.

[5] Email transmisión from Ricardo Aguilar to Richard C. Worden, Feb. 16, 2004.

3. Financial Assistance Model – SIGMA is working on several fronts simultaneously in the area of facilitating access to capital for CP investments by companies in the private sector as well as within the financial sector itself to train bank loan analysts in methods to better evaluate all the economic and market security benefits of investments in CP process changes and technologies.

a. Database of Sources of Financing for CP Investments – SIGMA has developed an electronic database of various sources of financing for clean production investments that is available to companies on the PROARCA website.

b. Training courses for Bank Loan Analysts – Using curriculum developed by the UNEP as part of a project in Latin America called "Strategies and Mechanisms for promoting CP." SIGMA organized and conducted a course for bank loan analysts to more critically and accurately evaluate loan applications seeking financing for CP investments in process changes and technologies.

c. Developing a Portfolio of Loan Proposals for CP Investments by Companies – SIGMA has been working with the CPCs and other "implementation partners" to assist companies prepare application papers for loans from banks and other funding sources in the region, such as the Development Credit Authority (DCA), other donors, and PRODOMA, as a means by which to generate more demand for CP and environmental management system (EMS) investments.

d. Creation of a Loan Guarantee Program utilizing the DCA Mechanism -- SIGMA in coordination with USAID/W has been working to create Guaranteer Agreements with 3 – 5 regional banks in Central America to administer loan guarantee funds backing up loans to companies implementing CP measures.

In interviews with three of the participating banks in Panamá, El Salvador and Nicaragua (i.e., Panabank, Banco Cuscatlan and Bancentro, respectively), they showed a high level of interest in the DCA mechanism was evident along with confidence that the amount of the loan guarantee credit line available to the banks would be quickly (that is, within one year) exhausted as they see a fertile environment and much pent-up demand for this type of investment.

All of the banks interviewed had made the decision to participate in the DCA program as a high-level, explicit strategy to attract new clients in several currently underserved "niche" productive sectors with "high potential" in the face of continued regional integration and globalized markets (e.g., CAFTA). All of the banks saw the relationship with the CPCs as mutually beneficial in terms of using the Centers to technically assist the applicants with their loan documents while attracting new clients. However, two of the three banks also saw the competitive advantages of forming strategic alliances with the CPCs and SIGMA by offering CP audits as a "service" to their clients wishing to modernize, stay competitive and remain profitable. In other words, they see the relationship as being a "two-way" street in creating greater demand for their financial services at the same time that they provide a technical quality-control checkpoint for the banks in technically evaluating loan applications for CP investments.

4. *Creating "Waste Markets:" National Materials Inventories –* This is a relatively new undertaking by SIGMA, and represents a joint activity between its municipal services and private sector programs to better manage solid waste by-products by creating a "market" of buyers and sellers of recyclable or reusable by-products, such as organic wastes to make soil enriching compost, plastic and glass bottles, tin and

aluminium cans, and packing carton for boxes in secondary markets. SIGMA started like most CP programs by addressing the technical challenges it faced in convincing private sector companies of the financial and competitive advantages of adapting CP practices, measures and technologies in their plants and factories. Once that process of *convencimiento* was well underway, they began finding themselves faced with businesses convinced of the technical wisdom of the CP approach, but without the capital necessary to implement the recommended process and/or infrastructure changes. That second obstacle to CP implementation was the motivation behind the development of financial mechanisms like the DCA and PRODOMA. Now, that initiative is well underway, although the results may not yet be apparent. That leads to the next hurdle in this process, assuming that the first two have been addressed successfully, which is to maximize the extent to which the wastes that are inevitably generated are recycled or reused back into another productive process.

As a first step in that direction, SIGMA has supported the preparation of a National Report on the Management of Materials by the Costa Rican CPC (CNP+L) in which they characterized the composition and size of the national solid "waste stream" by sector, with the overall objective of defining, explaining the importance of, and justifying the application of new environmental policies to encourage a more efficient management of materials. The more specific objectives of the report were to accurately describe the present waste management system in Costa Rica today, to establish a list of buyers of recyclable goods in the country and/or region, to create a Strategy and a Plan of Action with concrete, measurable goals, and finally, to identify the priority actions that should be undertaken in the short and medium term in support of that strategy.

SIGMA is nearly done with a similar materials management study in El Salvador with the CPC (CNPML) there and the Universidad de Don Bosco, and is close to concluding negotiations with the CPC in Guatemala to do another study in Guatemala. SIGMA believes that these three studies will give them enough of a baseline to start work on a regional materials management model. It is a critically important task for SIGMA to strive to create such market mechanisms in the next year and a half, as there is no incentive to separate the recyclable portion of the solid waste stream if there are no markets where buyers can be cost effectively found to purchase them. The question is: Who can best serve in this role of interlocutor or facilitator finding markets for the waste products of SIGMA's municipal partners? In the absence of a clear or obvious candidate, the Assessment Team would suggest waiting until the three national materials inventories are completed to decide, when the picture may become clearer and a more obvious candidate surfaces.

But the fact remains that "waste markets" have been the most important new emerging trend in EMS and CP over the past 2 – 3 years because in essence they allow us to do cleaner production on the waste side of the productive process by taking greater advantage of the value to be found in "garbage." This allows us to "close the materials loop" by optimizing resource use and recycling in a process more similar to sustainable natural nitrogen or water cycles. It is the final hurdle that must be overcome in order to implement cleaner production as part of a fully integrated environmental management system, by minimizing the "wastes" that are inevitably generated in any productive process, no matter how efficient it may be. In tackling this daunting task without knowing where it will necessarily lead them, SIGMA should be commended for taking

that risk of following an emerging trend rather than punished for not having all the answers before it starts "working the problem."

B. MUNICIPAL PROGRAM ACTIVITIES AND RESULTS

1. Technical Guides on Solid Waste Management & Waste Water Treatment Options

SIGMA has developed two very important technical guides for local decision-makers, municipal technical managers, and communities wishing to tackle basic issues regarding the design, construction, operation & maintenance, and financial sustainability of a solid waste mgm't (SWM) system or waste water treatment plants (WWTP). The guides do an excellent job of explaining in simple terms enough of the technical information needed to become an intelligent "consumer" of that information while providing an overview of the more transversal issues. The guides are clear, concise and accurate in presenting all aspects of the project

For example, in the Manual for Managing Municipal Waste Water there is a sufficiently thorough explication of the technical aspects of building a WWTP for the target audience, balanced with a concise discussion of integrated watershed management, and the need for urgency in planning and implementing management plans for treating domestic effluents. However, the 4th section addressing legal & institutional aspectos was "deficient" in the opinion of the Assessment Team's legal counsellor, as was the 5th Chapter on Community Education and Public Participation in the view of the Team's Cleaner Production expert. In both technical guides, it might be recommendable to insert those chapters in the next edition of each guide *before* the section on technical aspects of either a SWM system or a WWTP is presented. However, the overall impression of the "brown" Assessment Team toward the guides was very positive.

The brown team also agreed with the recommendations of the U.S.EPA regarding the essential components of any community SWM Action Plan in Central America,[6] but would caution to place more emphasize on the cost-effectiveness and willingness-to-pay aspects of recommending specific technologies and standards to a region of developing countries.

By way of making recommendations, we would suggest the following:

- Disseminate the SWM and WWTP guides as useful tools standardizing concepts, terminology, and technical criteria to the broadest audience possible in various user groups, such as technical staff in municipalities, consultants and consulting firms working in the private sector, regional (FEMICA) and national municipal associations (such as INFOM and ANAM in Guatemala), other non-governmental and community-based organizations (NGOs and CBOs) in civil society, and other bi-lateral and multi-lateral development partners working in the same thematic area.

- The guides are an excellent first step in the process of informing users about the general scope of issues that they must address in designing and implementing integrated and successful infrastructure projects, but should be refined into smaller, more specific guides for "niche" users, varying in content and orientation by the intended user (more narrowly focused), the technology described, the type of

[6] Recommendations for a Central American SWM Action Plan, Final Version, ExSum. p. 3, U.S.EPA, Sept. 9, 2003.

location (geographically or climatically), and other salient factors such as financial methods for costing out projects, staff training programs, or improving administrative systems to accurately identify beneficiaries and efficiently recover costs of providing services. In effect, these could be a series of shorter, more focused "mini-guides" covering individual aspects of the whole system to complement the more general SWM and WWTP guides, as they stand now.

- It might be recommendable to contract a local NGO which has worked with communities to develop Action Plans for SWM systems and/or wastewater treatment plants to more fully develop the sections in the two guides on community involvement, public participation and awareness-building processes and techniques to improve those sections of the guides. Similarly, an individual consultant or local NGO could provide the same type of technical assistance on the legal aspects of undertaking such projects and the local *"ordenanzas"* that have been widely used to create a legal obligation on the part of local citizens to take steps to protect the infrastructure project, or at least not to damage it. It might also be helpful to include several real communities examples to concretely show how it can be done.

2. Municipal Financial Management Training Packet – SIGMA has developed a broad spectrum, three-part packet of financial management training tools. The purpose of the first guide is to provide municipal managers with an overview of the financial management system and show them a logical sequence of actions and decisions that should be taken to achieve successfully operating public service programs. It succeeds in providing a crisp discussion of the path or *"ruta crítica"* to follow from the identification, planning & preparation of a project to its construction, evaluation & feedback phases. One observation by the brown team was some discomfort felt by the section on transparency in government (Chapter 2), which might be interpreted as being somewhat patronizing by its target audience (that is, by local leaders).

The second guide in the set is the Public Services Cost Analysis Guide, prepared by the Salvadoran Municipal Development Institute (ISDEM). It is a very simple and clear document with good examples (case studies) for costing out common municipal services, such as street cleaning, and solid waste collection & disposal activities. However, it may be too general and non-specific to be of maximum utility, but the Brown Assessment Team will give the benefit of the doubt to the authors and assume that the guide was ground-truthed in focus groups before its dissemination.

Finally, the Directory of Financing Sources for Cleaner Production Projects is very comprehensive and an excellent 1st step in the process to connecting proponents of CP investment projects with different sources of financing to overcome the current problem of lack of available capital for such projects. However, there are many more steps than this that are needed to truly facilitate the creation of an efficiently functioning "stock market" of buyers and sellers, and the Team is confident that SIGMA is fully cognizant of this issue and is already taking the next steps in tailoring the message to more specific audiences, but there is concern about the lack of a clearly demonstrated interlocutor to facilitate the access to capital on the public sector side. Unlike the CPCs on the private sector side, there is no organization that is generally recognized as capable to assume this critical role for the public sector, although the national level INFOMs would be a logical choice, but that requires a country-by-country assessment of their capabilities and suitability to assume that role.

Thus, the recommendations and observations of the Brown Assessment Team include the following points:

- It might be fruitful for SIGMA to review the Public Services Cost Analysis Guide for completeness, and decide whether it should be supplemented with a more rigorous treatment of this critically important topic, using case studies and experiences that they have gained over the past two plus years, to the extent practical and desirable.

- As stated above, the Directory of Financing Sources for Cleaner Production Projects is an excellent 1st step in the process to creating efficient capital markets, and SIGMA should continue to follow this up with more client-oriented assistance through its network of local NGOs, such as CARE and PCI, to connect interested lenders, such as those banks participating in the DCA program or the small grants PRODOMA program. SIGMA should continue working with those interested communities in the targeted geographic areas of SIGMA's current activities in Estelí, Nicaragua, Choluteca, Honduras and the La Union area of El Salvador, all located within the Gulf of Fonseca watershed.

3. Targeted Municipal Training & Capacity Building **–** SIGMA has expended considerable time and effort to strengthen the technical, organizational, financial and managerial capabilities of municipalities in several community "clusters." These include the seven communities surrounding Estelí, Nicaragua; three communities in the La Union area of El Salvador, and the nine communities that comprise the "mancommunidad (that is, small associations of municipalities) of MAMBOCUARE around the city of Choluteca, Honduras.

The brown team reviewed the "Action Plan for SWM" that the town of Condega, Nicaragua had developed with assistance provided directly by CARE and supported by SIGMA. We found it to be very forward-looking and progressive Plan in its understanding of the need to take the institutional, coordinative, managerial, financial management and cost recovery, educational-cultural, communication and public participation aspects of the proposed project into consideration in designing a SWM system. This was in addition to the focus on technical, legal and capitalization issues that is typically found in infrastructure proposals by local governments. This represents the kind of "breakthrough" in social attitudes and sense of responsibility and "buy-in" that are present in most successful community public service programs, such as trash collection and disposal, street lighting, public spaces cleaning & maintenance, and sewage collection systems. We did not have time to review other Action Plans that have been prepared to date, but we were very favourably impressed with this Action Plan for Condega, Nicaragua as well as with the commitment and support that CARE was providing to these communities on behalf of the PROARCA Project via a subcontract with SIGMA.

In one meeting with the mayor and several heads of municipal operations of another town in the Estelí area, we were told that the technical and organizational assistance provided by CARE had made significant changes in the community's attitudes toward first identifying their most pressing problems by themselves (the first time they said that this had ever happened in their collective memory), and then taking the decision to do

something about the problem by preparing a Community Action Plan. One of the department heads stood up at that meeting and told us that while other international assistance projects in the past had "talked," CARE had achieved real results by working hand-in-hand with the community to guide them through the entire process. Their application for a small grant from PRODOMA had been approved, as had their Action Plan, and they were now starting work on implementing their plan to build a new SWM landfill and shut down the existing open pit dump. It spoke volumes about the potential for achieving "results" in terms of empowering communities, supporting decentralization, creating open and transparent democratic processes with full community participation, fighting corruption at local government levels, and reducing the significant human health risks and environmental damages caused by inadequate collection and disposal of solid and liquid wastes, typically felt most acutely by those least able to protect themselves in society: the poor, the young, women, and the elderly.

For example, in the document describing the objectives and motivation behind the formation of the mancomunidad MAMBOCAURE, it says in the first paragraph that the mancomunidad was formed to "unite forces and enhance the technical capabilities of the communities as two critical factors in finding solutions to problems of common concern."[7] The document goes on to state that the principal objective in forming the mancomunidad under the Honduras Municipal Association (AMHON) was to "promote the integrated development of the associated communities by strengthening their institutional and socioeconomic capabilities in order to improve the living conditions of the people in those communities, … and to assure in this community consensus-building process a *high level* of participation by women in the community."[8]

The brown team believes that the approach taken by SIGMA to develop "enabling" capabilities in communities first as a precursor to building infrastructure projects is the correct approach with the greatest chance of achieving truly lasting and sustainable results. It is a daunting task to transform present attitudes, or the level of interest in such local services, or for that matter to change the policies, capabilities, and actions of communities in so short a time with a limited number of "demonstration projects," but it is an important task because all of these "enabling" capabilities need to be present at the municipal level if the infrastructure investments in SWM and WWTPs are to have a realistic chance of becoming self-sustaining over time.

In terms of "achieving results," it might have been quicker and easier for SIGMA to have shown more "results" by simply identifying a community willing to allow them to design the optimal trash collection route plan and build a SWM landfill without doing any of this community empowering and enabling "leg work" first. However, it most likely would have been abandoned within a short time, as has been the case in dozens of other failed attempts to build "hardware" without the necessary "software" of community capacity-building and public support first. It would be analogous to giving a computer to a person without any software or training, -- a fruitless expenditure.

Thus, unless the PROARCA designers are willing to make this commitment to capacity-building seriously, then they should probably not continue with this work because without that commitment to and investment in municipal & community capacity-

[7] Terms of Referente: Desarrollo de Planes de Acción en Aguas Residuales – Municipalidades de la Mancomunidad MAMBOCAURE …", p. 1, date unknown.
[8] Ibid. pp. 1-2.

building, there frankly isn't much hope of achieving the expected results for this activity, namely the widespread adoption of more adequate SWM facilities and WWTPs. However, the benefits of tackling this difficult problem are very significant, and in many ways more important than the more obvious "results" achieved in the private sector. These benefits include providing the technical and managerial training required to strengthen institutions and the decentralization process, by creating greater transparency and openness in local governance, we support democratic processes, by empowering public participation and community involvement, we support anti-corruption efforts, and by significantly reducing some of the most serious human health risks and environmental damages through demonstration projects that address the most important problems that many communities face, we build greater sustainability and replicability into those projects. These benefits are arguably much more important than any private financial benefits that accrue to individual plants and factories through the adoption of more efficient, and less contaminating CP practices and technologies.

- The Assessment Team is aware that the municipal side of the SIGMA project is under considerable scrutiny among some quarters in the PROARCA Project when compared to the impressive results that have been achieved to date on the private sector side of SIGMA. However, it is the strong opinion of the brown team that the municipal capacity-building efforts of SIGMA have been equally, if not even more impressive and important than those on the private side. These benefits include supporting several of the most important goals or pillars of development that USAID works toward in many ways, such as: greater decentralization by demonstrating competence at the municipal level, greater democratization caused by community involvement and public participation in decision-making processes, greater transparency and less corruption once municipal administrative and financial management systems have been opened up to the light, and enormous reductions in public health risks and environmental damage caused by untreated sewage and uncontrolled solid waste disposal practices that most impact the poorest and most vulnerable segments of society here. These "results" may be harder to demonstrate or quantify than lowered water use or energy savings by a shrimp-packing factory, or reduced chemical input costs for an owner of a metal-plating business, but it doesn't make them any less significant or important to USAID's mission.

- Secondly, SIGMA should continue to focus on mancomunidades due to the efficiencies in Project resources spent to reach a larger number of potential beneficiaries needed to have a critical mass of users that justify implementing more expensive, but ultimately more cost-effective solutions, such as regional SWM landfills, WWTPs, or publicly-operated slaughterhouses with proper sanitation safeguards in place.

- Finally, the PROARCA Project should resist the temptation to see results only in terms of "hardware," such as the number of infrastructure projects completed. There still is a tremendous amount of "software" training and awareness-raising that must occur before those technical fixes can be successful and sustainable.

4. Construction of Two Waste Water Treatment Plants (WWTPs) – SIGMA took over the final design and construction of two waste water treatment plants in Livingston, Guatemala and La Union, El Salvador that were begun under the LEPPI component of PROARCA I. SIGMA has encountered numerous problems with design

flaws, multiple reiterations of technical reviews by other partners involved in these projects, and delays in awarding construction contracts due to excessive cost proposals. All of these problems have resulted in the projects requiring much more time to complete than expected, and they have also siphoned off tremendous amounts of SIGMA staff time and attention. The fundamental problem with the implementation of these two WWPTs appears to be that the wrong tool was selected for the job: SIGMA is not an engineering firm like Bechtel or CH2MHill, it is an environmental consulting firm. Thus, there has been a poor match between what was required in this case and the comparative strengths of the organization hired to carry it out.

However, there is an even larger question of why the Mission was even in the business of building infrastructure demonstration projects in the first place as part of PROARCA II. Ostensibly, it was for the purpose of demonstrating the effectiveness of the technologies used in these WWTPs with the idea of replicating them in other communities throughout the region. However, this purpose has several critical flaws:

- First, while the plants are without question technically effective, achieving very high levels of organic matter and suspended solids removal, they were very expensive to build. For example, the wastewater treatment plant in La Union cost approximately $193,000 of SIGMA's subcontractor line-item budget and presently serves around 250 users, but will ultimately serve an additional 800 once the new central marketplace is constructed, which works out to an average of $185 (max number of users) to $800 per current user; the plant at Livingston cost SIGMA nearly $245,000 of its subcontractor funds to serve 435 users currently with the potential to serve up to 1,100 users eventually which works out to per user costs ranging from $225 to $575 currently. By way of comparison, the treatment plant at Suchitoto, El Salvador cost around $280,000 to build using a similar technology, but serves a user base of roughly 10,000 persons, resulting in a *per capita* average cost of $28/user. Thus, these technologies may not be a cost-effective solution for demonstration purposes in many other communities where waste stabilization lagoons and percolating filters are less expensive to build and operate. The costs cited above were taken directly from SIGMA[9], and do not include the costs of their staff time nor that of staff from USAID and USEPA (with their additional costs of transportation and lodging). All of these PTARs require technically qualified personnel to maintain and operate, placing greater burden on the technical and administrative capacities of communities.

- The plant in Livingston uses a "combined" system that relies on individual septic tanks at the household level to separate solids from the liquid portion of the waste stream before reaching the treatment plant, but there is little existing cultural awareness or experience to fully understand the need and importance of maintaining those tanks in working condition so as not to adversely affect the operation of the treatment plant. This will place additional pressure on the municipality to maintain the community informed and to take punitive action, when necessary.

- Both plants use re-circulating sand filters for biological secondary treatment, which requires the use of water pumps and electricity, both of which add to construction and operating (O & M) costs. In the case of La Union, the decision was made to demonstrate the re-use potential of residual treated waste water to irrigate a nearby

[9] Notes from meeting with D. Peterson, D. Salazar, N. Gamboa, A.Pocasangre, and R.C. Worden in ARD's offices in Guatemala City on Feb. 19, 2004.

soccer field via an impressive, but very expensive (i.e., $20,000) underground sprinkler system. This has been a public relations success, but it has come at a high cost.

- Neither plant chlorinates the treated waste water before releasing it. In Livingston, the residual waste water is discharged into a small creek that feeds directly into a highly populated bay and tourist area. However, the evaluation team noticed that this creek was chock full of garbage and debris thrown into it by neighbors living along it. This illustrated the importance of first raising the community's awareness of the problem and involving them in seeking solutions. As evidenced by the Sustainability Plan that SIGMA is preparing in Livingston, it is apparent that they are aware of this issue and have worked hard to involve the community, but it does demonstrate the difficulty of changing bad habits and old attitudes.

- Finally, both demonstration sites use effective, but expensive technologies, and are located in isolated, hot environments that are difficult to access. This limits their value as sites that other community leaders are likely to visit with the goal of replicating those experiences in their own communities.

  The Suchitoto PTAR has been a more successful replication model, for reasons of its lower *per capita* cost and ease of accessibility. In fact, of all the field sites we visited during this assessment, Suchitoto had the most impressive PTAR and SWM system that we saw. This is mostly attributable to an active local government with a history of working very closely with the community and with local NGOs to achieve results that are impressive by any standard in Central America, such as over 90% coverage of both solid and liquid waste collection & disposal with practically 100% cost recovery for unsubsidized public services provided, conservation of its most important natural resource nearby (the *Gran Cerrón* reservoir) with plans for a new tourist recreation center to be located there, and source separation of domestic organic (made into compost for the community) and inorganic solid wastes.

The fundamental question that the brown team poses to the Mission is the following: Was this the best use of Project resources? Given the success of other more cost-effective and self-sustaining "capacity-building" activities undertaken by SIGMA on the municipal sector side, and considering some of the limitations of replicating the technologies used in La Union and Livingston in other communities, it is far from certain that the answer to that question would be an unqualified "yes." At the very least, the Brown Team would make the following suggestions and recommendations:

- Cost/benefit and/or cost/effectiveness studies should be conducted of the different treatment alternatives available and commonly used in the region before recommending the replication of the pilot project technologies in other locales.

- More effort should be placed on first strengthening the local awareness, full participation, and support for these projects before launching into infrastructure works. This is not a criticism of the current pilot projects, but rather an admonition about the difficulty of the task, which is admittedly much easier said than done. Purely educational materials and community awareness-raising meetings must be combined with more coercive means, such as enactment and enforcement of local ordinances governing unacceptable behaviours and uses of these public investments.

- It is imperative that O & M manuals as well as Sustainability Plans be an integral part of any SWM or PTAR project. A "lessons learned" summary of SIGMA's experience in La Union and Livingston would be useful for future project designs and to distribute to municipal leaders thinking of undertaking similar infrastructure projects. Without these guides, plans and manuals being integrated into the process and used in an on-going fashion, there is little chance of the resulting public works projects being successful and self-sustaining over time.

C. SIGMA Project Support

1. ***Project Management and Backstop*** **–** From the perspective of the "Brown" Assessment Team, SIGMA is a very well managed project, having provided us with very concise, clear and timely descriptions of their activities and results achieved to date. They have provided us with honest and accurate assessments of their project successes as well as their failures, and have been most responsive to our numerous informational requests and have made available all relevant documents and other materials to us. They have assisted the Brown Team with setting up interviews, scheduling site visits, and making other logistical arrangements that have greatly facilitated our ability to assess their performance in the very limited time we have had to conduct this assessment. They have also been very open-minded in discussions with the Assessment Team about our initial impressions and observations about various aspects of the assessment, and these conversations have been very enriching to the Assessment Team.

Due to the fact that this consultancy is an "assessment" rather than an "evaluation" of the PROARCA Project, we have focused our attention in a more forward-looking direction as opposed to a rigorous and systematic analysis of process and results indicators met and Intermediate Results achieved as a result of activities implemented. However, based on a quick reading of annual work plans and semi-annual progress updates, it is our impression that SIGMA has met most of its contractual requirements as well as its deadlines for reaching indicators and expected results for the most part, although we have not read SIGMA's contract with USAID. Judging by the semi-annual reports to the Mission, it also appears that the project is on track financially and technically in terms of meeting its contractual obligations by the end of project (EOP).

2. ***Combined Training & Dissemination Materials (Private Sector & Municipalities)*** SIGMA had organized 25 training seminars/workshops[10] and disseminated training materials to nearly 800 participants by the end of the last Federal fiscal year (Sept. 30, 2003) activities. They also participated in 17 other training events sponsored or organized by other organizations, such as the APM component of the PROARCA Project, the Peace Corps, regional & national municipal associations, USAID/DCA and PRODOMA financing initiatives, involving over 1,200 participants.[11]

The following non-exhaustive list of SIGMA training courses/workshop topics include:

- Solid Waste Management and Treatment of Domestic Wastewater Effluents,

[10] PROARCA/SIGMA Work Plan 2003—2004, p. 56, ARD, Oct. 24, 2003.
[11] Estatus de Actividades Municipales – PROARCA/SIGMA, date unknown, email sent by D. Salazar to R.Worden on Feb. 10, 2004.

- CP training in selected sectors, such as coffee, shrimp packing, dairy & tourism,
- Cleaner Production (CP) Methods and Environmental Mgm't Systems (EMS),
- Life-cycle Analysis and Energy Efficiency practices for industries,
- Action Plan preparation, including community participatory processes, and
- Preparation of project profiles or proposals to lending institutions as well as financial evaluation methods for CP project profiles with bank loan analysts.

In terms of the quality and results or impact of the various training seminars/workshops, we analyzed the evaluations for more than a half-dozen courses realized immediately after the courses were given. Based upon this analysis of course evaluations collected by SIGMA, we found that 84% of the participants described the courses as "excellent" and slightly less than 12% described them as "good/acceptable." We also analyzed the results of a phone evaluation conducted by SIGMA six months following the training activities, in which they found that 94% of those interviewed indicated that they were utilizing the skills and knowledge they had developed in the courses, and that nearly the same percentage (93%) of municipal officials who had received training in one of the SIGMA courses was putting those concepts or skills acquired to use six months later.

Finally, it should be noted that SIGMA is currently developing new technical guides for sustainable eco-tourism in protected areas with APM and for publicly- and privately-owned slaughterhouses in the region, both of which demonstrate the relatively recent emphasis being placed on "integrated" approaches to improved environmental management. In addition, SIGMA is developing materials focusing on SWM and national materials inventories to encourage municipal cooperation with the private sector in developing secondary "waste" markets, an initiative that the Brown Team highly commends and urges SIGMA to continue pursuing actively.

3. *Communications Unit* – The Communications Unit of SIGMA is an important resource for both SIGMA and PROARCA more generally, publishing quarterly bulletins for PROARCA and having taken over all modifications, updates and maintenance of the PROARCA website.

The bulletins are particularly well-written and informative, and in the view of the brown Assessment Team, documents, guides, and training materials that the Communications Unit has produced are almost always superior in terms of both presentation and clarity of content to others' materials that we have reviewed. The PROARCA website now counts with an Active Server Pages (ASP) system that allows SIGMA or others to monitor the number of "hits" the website receives, and the number of times articles or documents are downloaded from the website, among other attributes that an ASP system allows web-designers to refine or adjust to better address its target audience.

The Communications Unit has also developed a multimedia CD with text, photographs, and video feed to promote PROARCA activities and achievements, and plans to distribute 700 copies.[12] The Unit also provides support for all SIGMA publications, case studies, technical guides, and training materials. And finally, even though it is not part of the Communication Unit *per se,* SIGMA has promoted the distribution of a CP "calendar" (*"La Empresa Eficiente")* originated by the UNEP and the Wupertal Institute to 42 different industrial sectors in the region. The calendars are meant to be "stand

[12] PROARCA/SIGMA Semi-Annual Report: April – September, 2003, ARD, p. 26.

alone" tools, meaning that they are not supposed to be accompanied by any training or follow-on activities. According to a follow-up survey done by SIGMA, 31 or 74% of the firms receiving the calendar had taken some action based on the information contained in the calendars. However, on the basis of interviews with CPC staff in several countries and a review by the Cleaner Production Expert of the Assessment Team, the calendar was found to be overly technical and complicated for the target audience. It was suggested to re-edit the calendar for next year, a task that would be ideally suited to the considerable skills and talent of the Communication Unit.

4. ***Performance Monitoring and Evaluation (PME)*** -- SIGMA has realized a number of companion activities using various different types of tools designed by Roberto Martín, a specialist in PME systems for projects, to track the performance of the progress of the PROARCA Project to date. The SIGMA team has applied the PME tools to monitor the effectiveness and impact of its training workshops & capacity-building activities in both the public (that is, municipal) and private sectors. In interpreting the results of data among the different impact surveys conducted thus far, it is important to note that the results of course evaluations realized right after each course was given were very positive. That is, 84% of respondents described the course they had just attended to be "excellent" while another 12% described the course as having been "good or acceptable." With respect to the evaluations realized six months later via a telephone survey, it was found the 94% of those interviewed in the private sector and 93% of those from the public (municipal) sector were still using concepts, tools and/or methods learned during the training workshop. However, it is important to note that 40% of the total number of municipal officials who had attended the workshops had since left their jobs in the public sector, demonstrating a high turnover rate with obvious implications for designing future training events for SIGMA and other projects as well.

In addition, the SIGMA Project has had to develop a PME instrument for the domonstration projects, given that they did not have set of baseline data against which to measure impact or results achieved, and had to rely solely on diagnostic reports elaborated by various consultants and entities at the beginning of the Project. Thus, one of the recommendations of the Assessment Team is for SIGMA to consider what PME measures or tools should accompany all future Project activities to serve as a decision-making tool throughout the rest of the current Project.

D. "BROWN TEAM" OBSERVATIONS, CONCLUSIONS, AND RECOMMENDATIONS

- Potential synergies of linking SO5 (Increased Trade and Competitiveness) with IR6 (Improved Mgm't in MBC) under the new CAM SO 2: creating more competitive firms & assisting them to access financing & green markets are complementary activities of the same process. CP dovetails perfectly with both CAM and CAFTA.
- Focus on developing smooth working relationships between key regional banks and CPCs in region to help finance private sector adoption & incorporation of CP practices & techs in production processes. On the municipal side, work hard to help develop efficient "waste" markets via information-sharing and brokering activities.
- In the face of dramatic reductions in funding and staffing levels in USAID/CAM region over the next couple of years, it is even more important and imperative than ever to "piggy-back" on existing regional CP institutional capacities (CPCs,

universities & gov`t institutions) working on the private sector side, and with international NGOs with proven track records working locally with munis. These are all much more cost-effective mechanisms than U.S. consulting companies.

- Questions about "cost-impact" of SIGMA contract raised by some USAID Mission staff in the region. Other models, such as TAP model in Peru with a single US hire working with local NGOs & gov't institutions with TA to bring in CP experts, may be more cost-effective. TAP-Peru worked on CP for six years & spent < $2 million.
- The key constraint to achieving results is limited local institutional capabilities, thus the need is for capacity-building efforts (e.g., Community Action Plans and greater dissemination of technical Guides) through NGOs working at local level with municipalities – with all the spin-off benefits that go far beyond those on the private sector side (i.e., decentralization, democratization, anti-corruption, community empowerment (particularly for women), greatly reduced contamination disproportionately affecting most vulnerable members of society (i.e., the poor, young & old).
- Do not drop municipal sector activities after EOP of current contract. However, do not build any more infrastructure projects – too costly and time-consuming for staff. Why the lack of a municipal "take-off" so far? – in sharp contrast to private sector reaction to demo projects, – is lack of public awareness about the problems, and then providing technical & organizational help to empower them to solve problems. USAID should provide the "software" and let other aid agencies build "hardware."
- In most cases (such as slaughterhouses and landfills), *"mancommunidades"* are the most appropriate solution to the problems.[13] Differentiate type of TA & training within critical watersheds from TA offered to priority sectors outside geographic scope of those watersheds (sectors don't always align with 4 critical watersheds).
- Consolidate gains won thus far by developing an effective strategy to disseminate technical materials, methodologies, and "lessons learned" to regional & national gov't agencies (INFOMs, CPCs, and Ministries of Envir. & of Health) as well among bi-lateral USAID Missions, other donors, and dev't banks (IBRD & IDB) as part of an "Exit Strategy" (including implement. partners for this phase of project.
- Improve PME activities/tools of SIGMA with the objective of providing real-time info to decision-making processes to optimize project impacts.

[13] Guía de Gestión de Recursos Financieros para Proyectos de Servicios Municipales, p. 18, Jan. 2004.