



## **Cleaner Production (CP) and Conflict Resolution: A way out of social exclusion. A case study on micro- tanneries in Colombia**

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### **Abstract**

#### **Introduction**

In Colombia, the annual cost of the water pollution is equivalent to more than 1% of Colombia's Gross Domestic Product (GDP) (Sánchez-Triana, 2007). As only until the year 2010, the Ministry of the Environment has formulated a policy on Integrated Water Management, efforts for comprehensive approaches in the water field are not common practice yet (MAVDT, 2010). Only 5% of the environmental authorities' budgets have traditionally dealt with pollution issues aside from investments in conventional wastewater treatment plants (Sánchez-Triana, 2007).

Measures have been undertaken in the last decade to build wastewater treatment plants for residential communities. The coverage, though, has not reached more than 35% in most cities (Rodriguez, 2009). Within this scenario, there are underprivileged communities that have been put aside from pro-poor policies and governmental support because they are seen as polluters belonging to the private sector. This group is constituted by the micro and small sized industries that represent 11% of the micro and small sized enterprises as a whole in Colombia (DNP, 2007).

Colombia has a vast majority of micro and small sized enterprises (MSEs)<sup>1</sup> - employing 81% of the nation's work force and representing 99.4% of the total number of businesses (DNP,

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<sup>1</sup> MSEs have micro enterprises (1-9 employees) and small enterprises (10-49) employees

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2007). The owners of these enterprises have limited opportunities to climb in the social ladder. The MSEs belonging to the industrial sector impact heavily the environment- some figures consider them responsible for 70% of the industrial pollution in developing countries (Le Van Khoa, 2006; Soni, 2006 ; Hillary, 1997).

Facing the environmental degradation caused by the smallest industries through innovative approaches is of the utmost importance.

### **MSEs as complex problems**

Since MSEs are seen as complex problems in the developing countries, there have been uncertainties on policy, scientific and methodological domains with regard to dealing with them. The use of regulatory, market and persuasive policies often bypasses the MSEs because of their specific characteristics. They belong to the informal sector of the economy, have limited access to financial, educational and monitoring resources- and usually the only possibility left to deal with them is through legal actions from the adjudicatory<sup>2</sup> system. Successful cleaner production (CP) projects are not being broadly implemented; end-of-pipe approaches still dominate and entail high investments that can be unreachable for MSEs (Cloquell-Ballester *et al.*, 2008; Montalvo and Kemp, 2008; Blackman *et al.*, 2007; Altham, 2007). As the viability of MSEs is threatened, social unrest results. Not surprising, MSEs are in frequent conflict with authorities.

### **Goal and Objectives**

The goal of this research is to contribute to the environmental, social and economic sustainability of micro tanneries in Colombia.

The research objectives are

1. to implement a system based on negotiation, conflict resolution and managed learning so as to bring the MSE community on speaking terms with environmental authorities,
2. to implement cleaner production in the MSEs so as to reduce the environmental impacts and improve the economic viability of these industries<sup>3</sup>.

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<sup>2</sup> Referring to the judicial system

<sup>3</sup> This objective has been developed in the other article: *Implementation of cleaner production in micro- tanneries from Villapinzon and Choconta, Colombia* from (Tobon *et. al.*, 2011)

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## Background

The History of the conflict (year 2004)

### Case study

At only 6 km from the source of the Bogotá river, which is used for the water supply of Bogotá and for crop irrigation, lies a community of 150 tanners with a native Indian background. The community has just primary education, lives on a subsistence economy and uses obsolete technology. The industries have existed for decades, spread over an area of 7 km along the river and south of the village of Villapinzón.

Natural tanning agents were used until 1984 when the Regional Authority CAR (not yet Environmental), taught the use of synthetic tanning agents and was absent for more than 10 years (CAR, 1994). Today, tanning entails two basic processes that impact upon the environment: the classical dehairing with sodium sulfate and the tanning process itself using chromium sulfate.

The effluents of these industries are discharged into the Bogotá River with disastrous consequences for river water quality. According to Regional Authority (CAR) Ruling 043 of 2006, these values exceed water quality parameter limits of the Bogotá River, for the year 2020, *i.e.* 7 mg/L for BOD and 10 mg/L for TSS.

For over 20 years, the Regional Environmental Authority has tried to solve the environmental problems of the community of Villapinzón. However, 67 potential solution proposals remain still today on the shelves (CAR, 1998). Since the agency has always had a focus on end-of-pipe solutions without a CP branch, only one of the presented proposals was directed towards the prevention of the polluting flow (Cleaner Production). None had been implemented and the tanners were the ones to be blamed for. The conflict had not benefited the economic livelihood of the tanneries, whose owners all have been sued by the authority, banned from credits and face fines that they are unable to pay. As a result, all tanners are literally joining the growing group of

## Theories

The theories of Negotiation, Conflict Resolution and Managed Learning (Action Research) seemed to be able to handle the complex situation of the MSEs. Together these theories imply working with big groups implementing a process that is planned, problem solving and systematic and that, at the same time, is highly participative while respecting the interests of the MSEs.

Social scientific practices like Managed Learning (action research) (Schein, 1996) or “postnormal science” (Ravetz, 1999) develop understanding parallel with the change process taking place.

In Managed Learning the researcher plays the role of a Change Agent who (a) engages in the process and differentiates when he needs to be a helper, a facilitator or a mediator, (b) recognizes the importance and uniqueness of the context in every case, (c) facilitates an open learning process based on the special characteristics and culture of a given community, on trial and error instead of preset models and on mutual learning, and (d) is mainly

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motivated towards empowering vulnerable communities to solve their own problems (Lewin, 1946; Schein, 1996).

## Methodology

This research developed a strategy based on the necessity to put an end to the social exclusion and to a mostly technology driven end-of-pipe focus. The strategy is based on internal strengthening of the target communities, and on building strategic alliances in order to face the different issues at stake. The approach is based on understanding the context and the specific needs of the MSEs. A systematic process aimed at boosting the negotiating power of MSEs, at focusing at multilevel and multidisciplinary interventions, and at leading the marginalized communities to learn to solve their own problems.

A process called SASI (Systematic Approach for Social Inclusion) is based on an integrated theoretical and methodological framework that was inspired by the above theories (Fig 1).

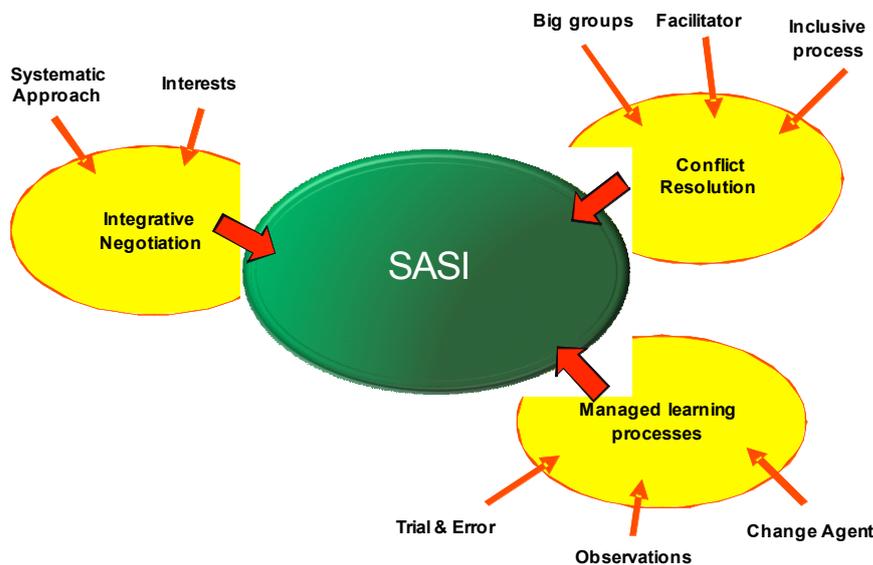


Figure 1. Theoretical and Methodological Framework:  
Key elements of the SASI Systematic Approach for Social Inclusion

The approach is based on five principles taken from the theories. The following principles stem from conflict resolution (1) and (2), negotiation (3), and managed learning (action research) (4) and (5).

1. People support initiatives that they help create (Holman, 2004) or said differently, participation increases commitment (Dick, 1999);
2. When focusing on big groups as the selected targets, conflict resolution should work at building common grounds within those groups as well as at respecting individual autonomy (Holman *et al.*, 2007; Holman, 2004; Holman and Devane, 1999);
3. Bringing negotiation based on interests and not on positions will open up possibilities towards creative outcomes that generate better results for all stakeholders involved (Thompson, 2009; Raiffa *et al.*, 2002; Fisher *et al.*, 1991).

4. There is no better way to know a system than trying to change it (Lewin, 1946).
5. The learning process has better results when it works through trial and error (Schein, 1996).

## Design

The process consists of six basic cyclic steps. Each cyclic step is critically reflective and has been designed as having five elements: observe, plan, act, observe, and reflect (Fig 2.). The reflection at the end of each cycle fits into the observations of the next cycle. Data collection and data analysis are developed in parallel through cyclic processes. The researcher observes and plans before acting and reflects on the findings and the methods after acting.

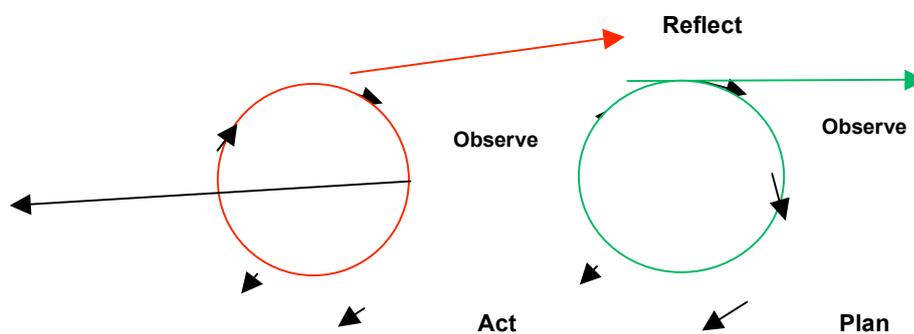


Figure 2. Cycles of action research

The six basic cyclic steps are: 1. Preparation, 2. Building relationship, 3. Redefinition of the problem, 4. Building common grounds, 5. Agreements, and 6. Implementation and follow-up (Fig 3.).

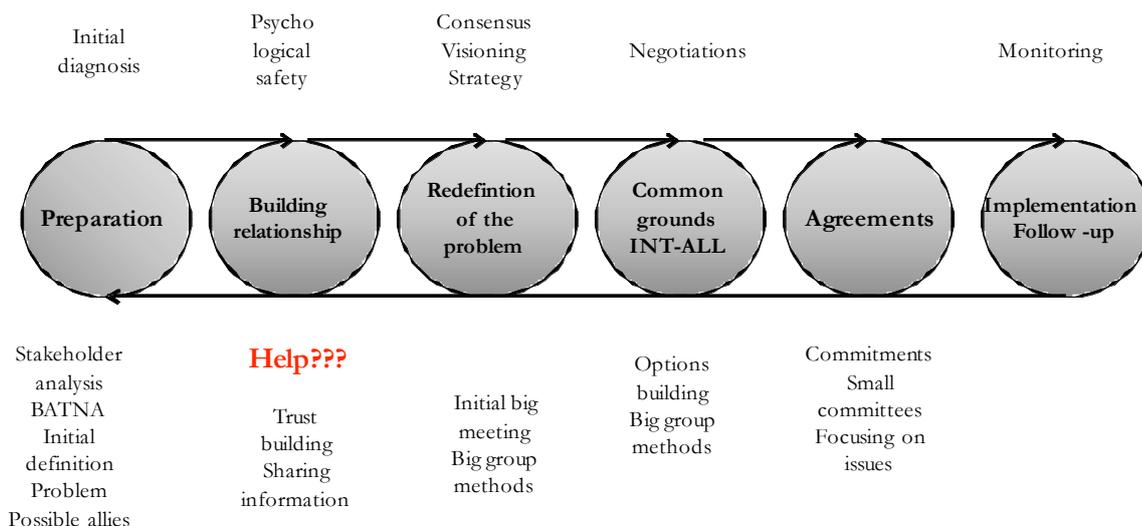


Figure 3. The six basic cyclic steps of SASI

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## Results

In the specific case of the tanneries in the region of Bogotá (Villapinzón) that had been impacting the Bogotá River and living through a conflict with the regional authority CAR for the past 20 years, a six year action research showed that:

1. through the systematic 6 steps approach, the owners of the MSEs became knowledgeable regarding their own problems and became willing to change. The MSEs fully supported the process aiming at their own social inclusion. They incorporated the prevention concepts and conflict resolution principles.
2. the tanners created a strong association of micro-tanners that now participates in the regional and national committees. A positive leadership resulted and proactive attitudes dominated.
3. the tanners chose CP as their best environmental solution. They presented the authority with 84 environmental plans based on CP that were accepted for the first time in twenty years, and grouped themselves into 7 water associations for water use that are meant to be controlled by the authority.
4. the tanners came up with innovations with respect to CP control processes (see Tobon *et al.*, 2011)
5. the judicial court order regarding the Bogota River ruled that the authority should support the process of CP implementation with the tanners.
6. a judicial court order has considered changing the environmental fines imposed on the tanners and which they are unable to pay, with environmental recovery work in the River's upper basin.
7. the CP policy is being considered to measure loads instead of concentrations .
8. it was possible to reduce the impacts from the discharge of wastewater into the Bogotá river. Based on measurements in two tanneries involved in the SWITCH-UNAL project in 2009 the following stands out: savings in water use between 24-68%, reductions between 32 to 68% in Chromium use and between 60 to 72% on BOD<sub>5</sub>, in all the processes resulting in liquid discharges onto the river compared with measurements in the year 2004.

## Conclusions

SASI may have implications for cities around the world that are tackling the issues of environmental pollution and the sustainability of marginalized communities.

- Technical solutions proved to be more successful once the impending social challenges were faced and consensus had been built with all the stakeholders involved.
- Recognizing the interdependency between authorities and communities and the need for long term-relationships between them were essential in terms of building consensus and establishing a commitment for change processes
- A social inclusion process is a shared responsibility by all the stakeholders involved, even if this process originates from a conflict.
- By establishing strategic alliances (like with politicians), the micro-tanners' negotiating power was boosted and their interests were respected.
- The Change Agent proved to be successful in leading the change process by being independent and by offering holistic approaches to problems.
- Conflict can be viewed as an opportunity for positive change, instead of being seen as an obstacle because people are prone to change when they are going through a crisis.

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## Reference

- Altham W., 2007. Benchmarking to trigger Cleaner Production in small businesses: Dry cleaning case study. *Journal of Cleaner Production* (15). p. 798-813
- Blackman A., Lahiri B., Pizer W., Rivera M. and Muñoz C. 2007. *Voluntary Environmental Regulation in Developing Countries: Mexico's clean industry program*. Resources for the future. 34p.
- CAR, 1994 Tannery courses, 1984-1994.
- CAR, 1998 Revisión documentos curtiembres 1982-1996 *Centro de documentación CAR*.
- Court Order, 2004. Sentencia sobre la recuperación del Rio Bogotá. Tribunal Contencioso Administrativo de Cundinamarca, Magistrada Nelly Yolanda de Villamizar.
- Cloquell-Ballester, VA., Monteverde-Díaz, R., Cloquell Ballester, VAn., Torres-Sibille, A ., 2008. *Environmental education for small and medium-sized enterprises. Methodology and e-learning experience in the valencian region*. *Journal of Environmental Management* 87. p. 507-520
- Dick, B., 1999. *Sources of Rigour in action research: Addressing the issues of trustworthiness and credibility*. Association for qualitative research conference. "Issues of rigour in qualitative Research". Duxton Hotel. Melbourne Victoria. 6-10 July 1999.
- DNP, 2007. Conpes 3484. Política Nacional para la transformación productiva y la promoción de las Micro, Pequeñas y Medianas Empresas: Un esfuerzo público-privado. 32p.
- EL TIEMPO, 2004a. Los grandes costos de la pobreza. August 8, 2004.
- EL TIEMPO, 2005a. Cierran 59 " fábricas" de cuero. January 28 2005
- Fisher R., William U. and Patton B., 1991. *Getting to Yes: Negotiation Agreement. Without giving in*. 2<sup>nd</sup> Ed .Penguin Books. New York.
- Hillary, R., ed 1997. *Environmental Management Systems and Cleaner Production*. Wiley, Chichester.
- Holman, P. and Devane, T. (eds), 1999. *The Change Handbook. Groups methods for shaping the future*. Berrett-Koehler Publishers, Inc. 390 p.
- Holman, P., 2004. Emerging in Appreciative Space. *AI Appreciative Inquiry Practitioner. The International Journal of Appreciative Inquiry AI best practice*. November. 48p.
- Holman, P., Devane, T. and Cady, S. (eds). 2007. *The Change Handbook: The definitive Resource on today's Best Methods for Engaging Whole Systems*. 732p.
- Le Van Khoa., 2006. Greening Small and Medium-sized enterprises: Evaluating Environmental policy in Vietnam. PhD thesis. Wageningen University. ISBN 90 8504-482-0. p.247

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Lewin K., 1946. *Action Research and minority problems*. Journal of Social Issues, 2, Pages 34-46.

MAVDT, 2010. Política Nacional de Manejo Integral de Agua

Montalvo C. and Kemp R., 2008. *Cleaner technologies diffusion: Case studies, modeling and policy*. Journal of Cleaner Production Vol 16 Supplement 1 S1-S6.

Raiffa, H., Richardson, J., and Metcalfe, D. 2002. *Negotiation Analysis. The Science and Art of Collaborative Decision Making*. Harvard University Press. 548p.

Ravetz, J., 1999. *What is postnormal science*. Futures. The journal of Policy, Planning and Future Studies, 31 (7), 647-653p.

Rodriguez, M., 2009. *Agua Riqueza de Colombia*. Villegas Ed. 221p.

Sánchez-Triana, E., Ahmed, K. and Awe, Y., 2007 (eds). *Environmental Priorities and Poverty Reduction. A country environmental analysis for Colombia*. Directions in Development. The World Bank. 483p.

Schein E., 1996. Kurt Lewin's Change Theory in the Field and in the Classroom: Notes Toward a Model of Managed Learning', *Systems Practice*, 34p. <http://dspace.mit.edu/bitstream/handle/1721.1/2576/SWP-3821-32871445.pdf;jsessionid=D07E0CEC9DC3410DE33D13015EE56077?sequence=1>

Soni P., 2006. Global solutions meeting local needs. Climate change policy instruments for diffusion of cleaner technologies in small scale industry in India. Ph.D. Thesis VrijeUniversiteit. Amsterdam. 253p.

Thompson, L., 2009. *The Mind and heart of the Negotiator*. Fourth edition. Kellogg School of Management, North Western University. Prentice Hall editors. 411p.