

## **To water that is of water, to soil that is of soil**

Center for Innovation in Alternative Technology, CITA

Water maladies throughout the world, particularly in arid regions, is exacerbated through the transportation of excreta in water. The contamination of water with excreta adds further to its scantiness. In using water to transport excreta, the typical household consumes over 45% of the potable water that enters it. This means that the water consumed by a family for moving its excreta in one year alone is equivalent to its water usage for drinking over forty years.

In Mexico, where the majority of families have less than 28L/person daily, the conventional use of water for waste transport and treatment is particularly ecologically unsustainable and economically impossible for the majority of Mexican citizens. Where waste treatment facilities do exist in Mexico, one recent study revealed that fewer than ten percent of these facilities function properly. Problems most often cited include: frequency of pipe ruptures and leaks resulting in groundwater contamination, construction flaws requiring costly repairs and economically untenable overhauls, and maintenance irregularities leading to the improper treatment of wastes in addition to long-term damage to the local ecology. In the absence of wastewater treatment facilities, septic tanks also tax water supplies by contributing to groundwater contamination. Pit latrines and open-air defecation, unsightly and odorous, threaten public health.

The three-fold problem: 1) the large-scale waste of water in transporting excreta, rendering water unavailable for basic human necessities, 2) the inefficiency, insufficiency, and cost-prohibitive ness of conventional treatment facilities, and 3) the ineffectiveness and risk associated with common alternatives to conventional treatment call for a workable, economically-viable, socially and ecologically sustainable solution.

One solution enacted in southern Mexico by the Center for Alternative Technologies (CITA) and its founder, César Añorve, consist in building sustainable water security, community autonomy, and environmental health throughout the region. For over twenty years, Añorve and his collaborators have been central to the design and dissemination of ecological dry toilets throughout Mexico and Latin America.

The ecological dry toilet designed, constructed, and promoted by CITA consists of a unique seat basin which funnels the urine and excrement into separate containers. The urine is channeled, collected, and diluted with water (10:1 ratio) for daily and immediate use as liquid fertilizer. The excrement is deposited in one of two vaults situated beneath the seat basin. After a minimum of six months of storage, the dry excrement is rendered an excellent soil fertilizer.

Recognizing early that successful implementation of autonomous and appropriate technologies must occur through grassroots adoption and dissemination, Añorve set out to establish a method whereby community members would conduct every aspect of the toilet's establishment—from promotion to construction. Having initially piloted the ecological dry latrine in communities surrounding Cuernavaca, his home city, as well as in his home, Añorve prepared the way for community representatives, once educated about the ecological dry toilet's advantages, to learn the methods for community dissemination. In workshops, conducted within a community following its invitation or at CITA outside of Cuernavaca, Mexico, participants learn every aspect of toilet design, construction, and maintenance, catchment water collection, and gray-water treatment using small-scale constructed wetlands, even as they learn about democratic alternatives that promote community and environmental well-being.

Following involvement in a dry-toilet workshop, participants return to their communities where the knowledge is shared with others. Community members or organizations interested in adopting the ecological dry toilet are identified and plans for construction are established. In San Luis Beltrán, Oaxaca, a former workshop participant constructed a small-scale shop for the fabrication of the urine-diverting seat basins. Later, a UNDP grant financed the construction of 125 toilets throughout the state. The seat basin fabricator currently makes his livelihood through the sale of seat basins. In Ciudad Juarez, Chihuahua, the "implementation through contagion" model established by CITA is well demonstrated. In early 2000, a Catholic nun, Petra Peña, visited Cuernavaca. A chance notice of the ecological dry toilet prompted the nun to learn more about its functioning. Convinced of its merits, the nun purchased one seat basin to take back to her community. Once there, the nun convinced one family to install the dry toilet in their home. Witness to its overwhelming advantages, thirty families had committed themselves to installing a dry toilet over the following six months. With funding from a state environmental agency, the community purchased the needed urine-diverting seat basins. With interest and materials secured, the community now required training in the construction and maintenance of their dry toilets. In October 2000, a group of four community women organized the first workshop. Today, these organizers produce the seat basins to meet the rising demand for them in neighboring communities. Two years later, Ciudad Juarez has 200 functioning dry toilets in addition to a community and visitors center that introduces people at the border between the United States and Mexico to the ecological dry toilet. Examples such as these are abundant within every state of Mexico.

From the perspective of grassroots implementation, CITA and Añorve have experienced remarkable success in overcoming resistance and other obstacles during the last twenty years. As interest from government officials grows, the most significant difficulty in implementing these actions are their imposition on communities prior to

the communities' own thoughtful embrace of new relationships to excreta, soil, and water embodied in the ecological dry toilet. Consequences of such impositions include poor functioning of the dry toilet given their insufficient desire to maintain the dry toilets. As the need for the ecological dry toilet is recognized throughout Mexico and Latin America, insufficient funding for bringing community leaders interested in implementation to CITA for workshop training continues to limit extensive implementation.

The ecological dry toilet—a holistic water action and alternative to conventional waste-treatment—is achieving the following objectives: human waste treatment 1) without water, 2) without contamination or environmental destruction, 3) within the economic means of peasant farmers and villagers, 4) which can be constructed and maintained autonomously, providing income for local residents, 5) which is hygienic, 6) which uses locally available, low cost, and low-impact materials in its construction, and 7) which enriches soils by generating resources (solid and liquid fertilizers) rather than wastes.

### **The influence of Implemented Action**

The influence of Añorve's actions has spread across every state in Mexico, in urban and in rural areas, in places with water abundance as well as in those where water is scarce. In the Mexican state of Oaxaca, one hundred thousand dry toilets have been built. In the state of Morelos, the state budget presently includes a budget line devoted to dry toilet construction, while at the same time future budget requests for sewer system construction have decreased. In Cuernavaca, home to CITA and Añorve, over twenty new homes representing every income-level have been constructed with dry toilets.

On the national level, the Mexican Institute of Social Security through its Community Action Program, the Ministry of Health in its Healthy Municipalities project, and the National Water Commission all currently promote the ecological dry toilet for its capacity for generating local employment, its documented effectiveness in protecting public health, and the ease and effectiveness with which it is adopted and implemented within small communities.

On the international level, Añorve's ecological dry toilet prototype is currently being constructed in El Salvador, Peru, Ecuador, Ethiopia, South Africa, Uganda, Philippines, and Mozambique. Representatives working in these and other countries have each traveled to CITA in order to learn from the twenty-year experiences of Añorve. The international impact of Añorve's ecological dry toilet is further evidenced in the interest of researchers from Sweden, the United States, and Spain in studying the bacteriological (excrement) and soil nutritional aspects (urine) of the products of the dry toilet. Numerous international publications currently feature the work of CITA. In attempting to address interested parties within numerous countries, Añorve has in the last two years accepted invitations to present his work and lead workshops in China, Brazil, and Peru. The Peruvian story illustrates the successful mode of dissemination into other nations pioneered by CITA. In 1995, the architect Juan Carlos Calizaya, inspired by CITA, returned to Peru, initiated a seat basin fabrication enterprise and secured USAID funds to install dry toilets and contained wetlands for gray water treatment in 125 homes. The Ministry of Health, Sanitation, and Housing in Lima is interested in supporting these grassroots initiatives.

In every locale in which the ecological dry toilet and its workshops have spread, both short and long term beneficial impacts are observed. The environmental impact is observed immediately in multiple ways. The ecological dry toilet provides a low-cost, low-maintenance method for completely eliminating "black water." Water, more appropriately used for drinking, cooking, and washing, is saved from its conventional usage in transporting waste. Soils are saved from contamination by untreated or improperly treated wastes. Furthermore, soils are enriched with nutrients (phosphorus, potassium, nitrogen, organic matter, etc.) preserved as products of dry toilet functioning. With soils, biologically diverse habitats and their distinctive array of flora and fauna are also nourished and preserved. Long-term environmental impacts include the replenishment of aquifers and seasonal water bodies and the regeneration of once vibrant ecosystems. People too are becoming stewards of that which sustains them.

The social impact is likewise multi-dimensional. Peasants, villagers, and urban dwellers alike recognize their own potential for autonomous action for the improvement of their own lives and communities, thereby promoting democratic participation by all. Women are particularly strong advocates for the ecological dry toilet, leading workshops, assuming leadership roles within their communities and civil society, while enhancing subsistence living and regenerating the commons of water.

The economic impact is, perhaps, most significant. With the implementation of the ecological dry toilet, confidence and dignity are restored to communities now empowered to seek additional economic opportunities. In Oaxaca, following the establishment of dry toilets, a group of young people initiated several economic enterprises, including a quail hatchery and restaurant. Throughout Mexico, the construction of every dry toilet represents employment for bricklayers, laborers, and seat basin fabricators, providing income for tens of thousands of people.

With a population of over 125 million and growing, Mexico exemplifies for other nations all the advantages inherent in the extensive adoption of the ecological dry toilet. As demands for water increase and as the availability of income for all things beyond the basic necessities of food, shelter, clothing, etc. continue to be stretched if not shrunk, the ecological dry toilet as opposed to expensive, inefficient, polluting, and wasteful waste treatment alternatives appears critically necessary. In Mexico City, the use of water in transporting waste is now having dire consequences for the entire basin and region. As water is drained from beneath the sprawling megalopolis to move excreta, the city sinks into the now empty basin. South of the city, in the cosmopolitan Cuernavaca, wastewater has progressively killed the once flourishing ravines for which the city was famous. Today, stench and contamination characterize the ravines. In the fields surrounding numerous cities throughout Mexico, farmers are forbidden to cultivate the soil due to its levels of contamination by municipal wastewater drained into the surrounding areas.

The short and long term impact of the ecological dry toilet and workshops is most concisely expressed by the following: the conversion of the *problem* of the disposal of excreta into a *solution*—a solution for the environment, for persistent social concerns such as economic development and employment, for the strengthening of communities, and for an ecologically sustainable relationship to the water and soil which maintains all living beings.

### Stakeholder Participation

Any account of stakeholder participation of the water actions described herein must begin with the users of the ecological dry toilet themselves. Having once expressed interest in implementing the dry toilet, preparations are then set in motion for the establishment of workshops and construction. Representatives of identified users participate in the CITA workshop. Next, these users establish their own workshops within their communities; both for fabricating seat basins and for learning dry toilet construction and maintenance. At this point, other stakeholders are incorporated into the implementation process. Community leaders identify local, state, and national government funding sources. In addition to these, funding is sought through national and international development organizations. Examples have included SIDA, UNDP, UNICEF, et al. Funds from these sources provide for the purchase of raw materials used in seat basin construction, for the purchase of construction materials, for the purchase of pre-fabricated seat basins, and for wages. Various national and international stakeholders have also funded the activities of CITA. Such funding has provided for wages paid to workshop providers, for the creation and dissemination of educational and promotional materials, and for travel.

Stakeholder participation at the grassroots accounts for close to ninety-five percent of the participation by people. As municipalities are increasingly designating funds for the ecological dry toilet as an alternative to costly sewer systems, treatment facilities, and their maintenance, local resources represent an ever-increasing proportion of the total financial resources utilized.

### Sustainability

Presently, the two water actions—**a) designing ecological dry toilets and b) disseminating workshops**—are sustained in the following ways. CITA receives periodic local, state, and national funding to continue functioning in its roles as consultant, advocate, as well as in education and promotion. These funds, however, are insufficient to meet the growing grassroots demand for workshops at present.

As interest and demand for the dry toilet and workshops continues to grow throughout the Mexico, Latin America, and the world, obstacles arise when funds are limited or unavailable for materials and for travel to those communities. Although the requisite funds for materials and travel are relatively small, such budgetary limitations often require that community leaders, agency representatives, and government officials from all over the world travel to Cuernavaca to receive training. Small and sporadic stipends by agency and government representatives who visit Añorve continue to supplement the activities of CITA.

Given the distinctive method of dissemination and implementation, the actions themselves are sustainable in that people learn from others who have successfully implemented both the dry toilet and workshops in their own communities. In this aspect, the sustainability of the actions is assured, and self-sufficiency is guaranteed. Because people and communities at the grassroots are the principal actors, the role of securing sufficient funds for materials and workshop training increasingly falls upon the communities as they meet the demand for solutions to their pressing environmental, social, and economic problems. In this CITA has a continuing role in helping to identify funding sources. As implementation continues to grow, Añorve and CITA never cease to provide education, training, and support to all those interested in the ecological dry toilet.

## Commitment

CITA has concentrated all its efforts during the last twenty years in implementing and disseminating the two water actions. As the originator of these actions, CITA and Añorve will not cease to maintain their commitment to continuing and expanding the actions. Recognizing that similar environmental, social, and economic problems exist in every nation of the world, the commitment to the solution represented by the ecological dry toilet and workshops will likewise persist.

The commitment of CITA to education, construction, and promotion is similarly evidenced in its continued efforts in lobbying government agencies. These efforts have and will continue to result in funds designated for dry toilet construction, for the education of people in rural and urban areas alike about water use, for the promotion of alternative technologies, and for various forms of grassroots social and economic development.

CITA is also committed to furthering its work through securing grants and awards. To this end, the support of the Third World Water Forum would be strategically important to its initiatives.

## Originality and Innovative Ideas

The water actions described are radically innovative and original in three important areas.

**First**, the design of the urine-diverting seat basin incorporates Vietnamese inspired ideas of urine and feces separation with Guatemalan and Mexican influenced raised seat basins. This integration of distinct traditions and technologies renders the urine-diverting ecological dry toilet design original and innovative.

**Second**, the construction workshops are particularly innovative in that users are at the nodes of dissemination and implementation activities. Users—representing every social group—are *the* means by which seat basin fabrication, dry toilet construction, education, maintenance, and promotion occurs. Thus, in providing this model of dissemination via user-led workshops, CITA has all but guaranteed the persistence of the dry toilet as a viable solution in the present and future.

Third, and perhaps most distinctively, CITA has from its inception pioneered the use of the ecological dry toilet within rural and urban areas alike. Although innumerable organizations exist throughout the world working to promote particular dry and composting toilet designs exclusively among the rural poor, CITA and Añorve represent the lone voice working to promote and construct dry toilets in cities, among all socio-economic classes equally. Añorve's artistic genius in creating satirical cartoons, posters, and political art, placing excreta and the relationship of humans to their own excreta at the center of political discussions about alternatives, further illustrates his innovativeness and originality. In not limiting their scope of actions to the poor and to rural areas, CITA and Añorve represent a vision for local innovation with ecological impact that is global.

## References

### Retooling the domestic domain

#### 1. A GRASSROOTS `ALTERNATIVE SANITARIAN` WHO GENERATES LOCAL EMPLOYMENT

Cesar Añorve, a Mexican architect, has read Ernest Schumacher, Ivan Illich and John Turner. The right scale (Schumacher) conviviality (Illich), people's empowerment and autonomy (Illich, Turner, Ortiz) are the qualities and values that according to him should characterize the tools of the domestic domain, including sanitation appliances. In houses connected to the industrial network of tap and wastewater, this is unfortunately not the case. The illusion that water is available at the faucet in unlimited amounts, Añorve insist, has buried traditional conservation habits. The daily gesture of `flushing and forgetting` blurs one of our most fundamental links to the soil – the soil to which we bequest our excrements, which are soil themselves (Groeneveld and friends, 1991). If one further reflects upon the fact that in industrial society the tap-tuning hand ignores what the flushing hand does – e.g.: drinking water and waste water are controlled by separate institutions, working without a common concept (Coing and Henry, 1989; Stasser, 1982; Tarr, 1984; Warning, 1911) -, he will understand how inappropriate conventional sanitation technology can be in poor as well as in rich countries.

Starting from the realization that in the long run a poor country like Mexico cannot afford the price of such a careless technology, Añorve has begun to think of alternatives to conventional – industrial - sanitation tools. He has modestly started by designing and proposing an ecological dry toilet that is technically flawless and socio-culturally accepted. In his workshop are also found plans and models of an aerobic slow sand filter (Hopping Stoner, 1977) for grey waters whose domestic installation could cut a home's water consumption by half by recycling grey waters to the garden and/or the flush toilet (Hopping Stoner, 1977; World Bank, 1991).

Añorve calls this filter a producer of negaliters – a device that makes the tapping of ever more distant sources unnecessary because it curbs the need for more liters of water. He is also exploring the possibility of letting the soil `treat` waste waters and is working on the first pilot project of a root zone plant (Kickuth, 1984) in Mexico. But Añorve insist that we only report on the aspect of his activities that he considers `ripe` enough to withstand the test of public acceptance. Among these, the ecological dry toilet has been co-opted by the public to a point that exceeds Añorve's and his group's logistic capacity.

Far from fighting `competitors` Añorve has actively encouraged imitations, even organizing courses for would-be ecological dry toilet builders (letrineros). After 10 years of an effort that has more the features of a social animation in some kind of community artistic pursuit than a commercial enterprise, it can be said that Añorve's ecological dry toilet has acquired the substance of a cultural, social, and – small scale – political reality. It has certainly enriched the technological options of the communities with which he has worked as well as the neighbors who have copied his projects.

The economic implications of this form of commitment would deserve more than a brief commentary: An average of 120-150 new ecological dry toilets a month are built in the state of Morelos by Añorve's team and imitators. Since the building of every dry toilet requires 5-7 full working days, Añorve's action generates about 700 days of employment a month, which quantitatively correspond to the creation of 35 constant full time masonry jobs (mid-1993 numbers). This number does not include the building of the hygienic seats in Añorve's workshops nor the activities of `grassroots consultants` and `teachers`.

In the long run, Añorve hopes to be able to propose a concept of water management better fit to the realities of his native town, Cuernavaca, than imported practices from England or elsewhere such as conventional sanitation techniques. Having been born in a shantytown located in one of the seven – presently several polluted – barrancas or canyons among which Cuernavaca is built, Añorve particularly interested in the regeneration of those canyons.

In short: Añorve's projects start at the domestic level, but their implications reach beyond the scale of the household and even that of the quarter or district, up to the `hydric horizon` of his community (for more information, see Añorve 1994).

(Jean Robert, 1994. Water is a commons, Habitat International Coalition.)

transcription by Cesar Añorve.