APPENDIX 1 –WASTE RESOURCE CENTERS, EXTENSION SERVICES, CO-OPS, AND REGULATORY AGENCIES

If the implementation of the technologies outlined in this paper is to take place in an effective manner, several types of support institutions will be required. Let us begin with the concept of a waste resource center.

A waste resource center, as its name suggests, is a center that helps manage resources derived from waste. Such centers could be set up in each province in Vietnam, along with branches or outreach stations within each district. The waste resource center would be staffed by experts highly skilled in mesophilic and thermophilic composting, BSF and red worm bioconversion, duckweed cultivation, gasification and lactic acid fermentation. Additionally, the agricultural departments of all of the major universities in Vietnam would be called upon from time to time to provide graduate or post-graduate students to serve as temporary teachers and trainers in the waste resource center.

After several days or even weeks of training, those graduating a waste resource center would be recognized as certified waste managers. Scavengers would be invited to participate in all of the activities of the center, and they too would be granted formal recognition, certification and status. Various apprenticeship programs might also be set up. From time to time the center would invite experts to hold workshops explaining the latest advances and improvements in sustainable waste management.

In addition to training and certification, the waste resource center would offer counseling and advice. It might attempt to match the skills of a trainee to the type of work involved in processing a particular type of waste. It might assist in identifying waste processing opportunities in a particular area within a city, district or province. It might explain the economics and logistics of processing waste in a particular area. It might identify existing markets and help create new markets for the products derived from waste. It might assist in apportioning small tracts of land set aside by local authorities for the decentralized processing of waste. It might offer health and safety counseling to all those exposed to toxic substances or disease-related materials in the handling and processing of waste. It might offer micro-credit for the purchase of waste processing equipment: equipment such as biopods, gasifiers, shredders, compost fleece, fermentation vessels, push-carts or small motorized carts. It might offer micro-credit for the purchase of safety equipment, such as gloves and masks. It might identify the best suppliers of process and safety equipment, and allow them to display, demonstrate and sell their equipment at or in proximity to the center. It might keep records of types and tonnages of waste not buried, burned or dumped, so as to meet the requirements of carbon credit certification.

But perhaps the most important function of waste resource center would be to organize and manage cooperatives on behalf of scavengers. Note that the center is not itself of a co-operative, but it would play a vital role in organizing scavengers into cooperatives. It might actually staff and run cooperatives, enabling scavengers to focus fully on collecting and processing waste.

The one waste resource center might manage many different cooperatives. There might be, for example, a co-op for those involved in composting, another for those involved in vermi-composting, another for those collecting food waste for pig farmers, another for those cultivating and trading in BSF larvae, another for those collecting and trading in recyclables, and so forth. Each cooperative

would need collection and processing equipment specific to that co-operative. Some equipment would be jointly owned by the co-op. Some would be owned by individual members of the co-op.

A cooperative would exercise formidable power in helping scavengers to obtain the highest prices for their recyclables and waste-derived products. A cooperative would seek out companies manufacturing goods from its products and invite them to set up shop in the area. It would set standards for the quality of its products, and it would certify that all of its members adhere to those standards. A cooperative would make sure that all of its members undergo regular medical checkups and would have adequate and affordable health insurance. A cooperative might assure that the children of its members attend school and are not exploited for their labor. Cooperatives would put an end to the exploitation of scavengers currently exercised by mafia middlemen in Vietnam. Cooperatives would attract a lot more people to the profession of waste management, and they would elevate their members to a high level of social acceptability. The stigma often associated with the word "scavenger" would eventually disappear.

The waste resource center would serve primarily women. Women are readily disposed to dealing with waste on the level that this concept so often demands. For example, women are not afraid to clean out mesophilic bins; to grow red worms and sort them from their castings; to put food waste into biopods and harvest larvae; to chop and blend vegetable waste for input into fermentation vessels; or to collect recyclables, biochar and urine from households. These are all jobs that women are socially inclined to do. The co-op relieves her of having to spend a lot of time on the managerial aspects of running a business, and it allows her to focus all of her attention on the task at hand.

So co-ops would be comprised mostly of women. Instead of working under a boss, a member of a co-op would remain at all times her own boss. Instead of selling at low prices to a middleman, she would receive for her goods approximately the same prices that the middleman currently receives. As a member of a co-op, waste becomes in her hands a resource as never before. This will attract more people to the waste management profession, and with more people, comes more competition and more waste recycled at higher levels of efficiency and sustainability. Every type of waste will be exploited for all it's worth.

This preference or bias in favor of women operating at the level where scavengers currently operate defines generally what "small-scale" should mean in the context of waste management in Vietnam. *It says that the poor people who go in and do all the dirty work should be the primary recipients of the income associated with such labor.* The co-operative provides the necessary condition for this small-scale waste management effort to thrive.

Households, businesses, markets, schools and other institutions must learn the basics of source-separation, and the waste resource center would provide formal instruction as well as on-site training in this regard. The center would hold seminars and workshops in both rural and urban settings to explain all aspects of source-separation. It would publish and distribute pamphlets and brochures. It would write articles in newspapers. It would produce television programs and short films. It would target in particular primary and secondary schools, and it would provide teachers there with the resources they need to teach their students the importance of source separation.

But the waste resource center might go further and instruct those who generate waste on how to process some of the waste they generate. For households the primary waste processing unit, of course, is the mesophilic bin, and the center could organize neighborhood training sessions on how to manage a mesophilic bin. If a household should have a problem with a mesophilic bin, the waste

resource center would send out an expert to resolve this problem. The most common problem encountered with a mesophilic bin: it begins to stink due to the fact that it is not properly aerated.

This trouble-shooting role of the center must also go beyond technical issues into the social domain. Imagine two households that have a long history of not getting along with one another, and they are called upon to share a mesophilic bin. Imagine two scavengers in competition for the same type of waste. Imagine a household and a scavenger in dispute over the clean-out of a mesophilic bin. The center will inevitably be called upon to address social problems such as these.

Some households might want to learn how to capture and sell BSF larvae cultivated within mesophilic bins, and the waste resource center would provide the necessary technical and commercial support. Some households might want to learn how to operate a small vermi-composting facility composed of one or more mesophilic bins stocked with red worms. Packing houses and markets could be taught how to ferment and sell their fruit and vegetable waste. They could be taught how to shred on site certain types of waste so as to immediately reduce its volume. They could be taught how to shred, blend and prepare certain types of waste for thermophilic composting operations. Restaurants and institutions could be instructed on how to prepare (grinding and possibly sterilizing) food waste for consumption at pig farms. Many more examples could be given. To the extent that the center succeeds in getting people involved in preparing and processing waste, more waste will get recycled at higher levels of sustainability and profitability.

The waste resource center would handle all aspects of waste collection, preparation, processing and recycling (with the exception of anything relating to landfills). It would function under contract to government as a business organization that is both private and non-profit. It would be funded from two sources. 1) The center would sell all goods collected and processed by the cooperatives, and for this service, it would collect a small fee. 2) The center would handle the administration of carbon credit certification, and for this, it would also collect a small fee. With the exception of these two fees, all revenue from the sale of goods and from carbon credits should go entirely to the cooperatives.

As a non-profit organization, the waste resource center would pay no taxes. Cooperatives would also be exempt from any form of taxation. In exchange for this tax exempt status, neither the waste resource center nor the cooperatives would charge local government anything for the collection and processing of bio-waste.

The waste resource center would be staffed by social and environmental entrepreneurs totally focused on providing jobs for the poor and cleaning up the environment. Managing a waste resource center that works with scavengers means recruiting people who truly care about the poor and are willing to work with them in creative ways. Gaining the total trust of the scavenger community is of paramount importance. Those hired by the center should spend at least a year demonstrating their interest in serving the poor.[1] They should be equally passionate about sustainability in all aspects of how humans relate to the natural world.

On April 9, 2007, the Vietnamese government issued a decree (No. 59/2007/ND-CP) that stipulates unequivocally that solid waste must be *segregated at source*, and that source-separated materials have to be reused and recycled. No type of domestic solid waste is exempted or excluded from this

[1] This is the recruitment policy practiced by the Grameen Bank. See: http://opinionator.blogs.nytimes.com/2011/03/21/microfinance-under-fire/?nl=opinion&emc=tya1

requirement. Note that this decree is not simply the expression of wishful thinking on the part of government. This decree actually calls for monitoring and implementation.

If the only option available to waste management authorities at provincial and district levels would be to bury waste at an enormous loss, perhaps they would be justified in ignoring this decree. But in light of the substantial economic opportunity that the technologies outlined in this paper represent, every directive spelled out in Decree 59 should be seriously considered and fully implemented. In fact, with these technologies, all of the waste management goals and timelines set out in this decree can be easily met and surpassed.

While waste resource centers and cooperatives might train, enable and facilitate, they would not have the power to monitor and enforce. This is where local government can intervene in a powerful and positive way by setting up a waste management regulatory agency.

As one of his most important tasks, an officer in this agency would be called upon to monitor and enforce the source-separation of waste. The use of a mesophilic bin makes it quite easy for him to do his job at the household level, since he knows well who deposits waste into each bin under his jurisdiction. Most often there is but one bin per household, and he would examine each bin on a regular basis in search of misplaced material. He would fine any household depositing, for example, glass, metals, textiles or plastics into a mesophilic bin. Exceedingly high fines would be levied if toxic waste such as batteries or light bulbs is mindlessly thrown in. He would be assisted by certified waste managers who would report to him the presence of any bio-waste in the non-bio-waste fraction put out on the street, and the waste management officer could take appropriate action. The waste management officer would also patrol markets, canteens, restaurants and other businesses to monitor and enforce strict adherence to Government Decree 59 in its call for source-separation, reuse and recycling. Households and other waste generators that do things properly would receive each year substantial rewards.

So we see that waste resource centers, cooperatives and regulatory agencies all have an important role to play in the implementation of this waste management concept. The first teaches and advises, the second implements, and the third makes sure that all regulations and directives regarding waste are strictly followed.

Since the management of bio-waste is so intimately connected to agriculture, there must be close interaction and communication between waste resource centers and agricultural extension agencies. Since farm waste can be processed by many of the same technologies used for domestic bio-waste, many of the experts at a waste resource center could advise farmers on waste processing issues, and many extension agents could inform waste management trainees about many aspects of how waste-derived products are used on farms. Nonetheless, the waste resource center and the extension service are not the same and should remain distinct.

An enormous amount of agricultural waste in Vietnam is created by farmers who are not properly advised on what to plant at a particular time. If, for example, too many farmers plant onions, a lot of onions remain unsold and get discarded as waste. This waste ends up on farms, at packing houses and markets. Normally it is the job of extension agencies to advise farmers on what and when to plant. Vietnam, no doubt, should invest a lot more in agricultural extension services so that farmers would grow crops that are in demand and do not unnecessarily create waste.

Another possibility might be to promote the formation of agricultural cooperatives that oversee many critical farming issues on behalf of its members. A farmers' co-op could also advise farmers on what and when to plant. It would assist the farmer in the marketing of his products at fair market prices. It would also advise its members to avoid the use chemical pesticides and herbicides, and to adopt instead the use of bio-pesticides and bio-herbicides. Many bio-pesticides, such as compost and vermi-compost teas, are fabricated out of products derived from waste.

Just as there might be a close connection and interaction between waste resource centers and agricultural extension agencies, there might also be a close connection and interaction between waste co-ops and farmers' co-ops. For example, when a waste co-op sells its products to farmers, it does so in large quantities preferably through a farmers' co-op. The farmers' co-op in turn prefers to deal with the waste co-op because it knows that the latter goes to great lengths to assure the quality of its products.

Waste co-ops might exert pressure on farmers' co-ops to limit the use of chemical pesticides and herbicides, since the presence of these chemicals negatively affects the quality and marketability of many of the products derived from bio-waste. At the same time the use of products derived from bio-waste greatly reduces the need for chemical fertilizers, pesticides and herbicides. Just as good communication between waste resource centers and agricultural extension agencies is important, so is good communication between waste co-ops and farmers' co-ops.

Finally, just as there should be an agency regulating the source-separation, recycling and reuse of domestic solid waste, there should also be an agency regulating what happens on farms. This agency would strictly enforce sustainable manure management practices. It would fine any farmer involved in dumping, burning or discharging solid or liquid waste. It would do everything within its power to prevent the overuse of chemical pesticides and herbicides. It would totally ban the use of antibiotics on pig farms.[2] It would apprehend anyone engaged in the sale of agricultural chemicals banned internationally. It might even conduct soil testing at each farm in order to determine levels of soil depletion and chemical contamination. In conclusion, this agency would play an absolutely vital role in maintaining the safety and security of Vietnam's food supply.

So we see in conclusion that waste management in partnership with sustainable agriculture is not an activity that spontaneously self-organizes as if by magic. It requires waste resource centers, extension services, co-ops, and regulatory agencies – all operating in close collaboration with one another.

[2] The use of antibiotics on pig farms is a major contributor to the evolution of a staph bacteria called MRSA. These bacteria have become resistant to almost all of the antibiotics used each day in medicine. "MRSA (Methicillin Resistant Staphyloccus Aureus) kills more people every year than AIDS. In the US alone 19,000 die from it each year, and another 369,000 are hospitalized because of it. The World Health Organization calls MRSA the most important health issue of the 21st century."
http://www.boingboing.net/2011/03/14/interview-with-autho-5.html