

Net Zero Energy Buildings? Yes, But Integrally, We Must Develop Net Zero Communities, as Context for NZE Buildings

ABSTRACT: This paper reports on a state-wide community development study that seeks to establish a community-based model of Net Zero Waste Planning and Design, describing multiple templates or a menu, of goals, programs, and strategies for any community to be able to select, in part or in whole for implementation of a comprehensive, community-wide waste management plan. The ultimate goal for this research is to aid any community to establish a path toward long-term multiple waste-reduction strategies and overall sustainability, with conservation of resources and materials, and waste reduction of the resources as the central focus for sustainability planning.

For purposes of this case study of planning and public policies three communities of different scale, socio-cultural composition, history and geography, and one state-wide environmental organization have collaborated with a NGO organization to organize the recommended templates, and to test initial implementation strategies in the three communities. Net Zero Building Energy standards and recommendations for buildings to become net generators of energy are among twenty distinct, but interrelated community programs that are essential to Net Zero Waste performance.

The assessments, modeling, metrics, and recommendations will be guided by a unique system of sustainability indicators, public engagement, and communications strategies for sustainable community planning and design.

1.0 Program Plan or Design Goal

- Other: 3.4%

What is "Net Zero Waste"?

Waste causes great loss of value and resources. Humans are the only species that create waste. We can learn to identify all types of waste and through their elimination, save money and achieve a more sustainable world.

Zero Waste Alliance

In 2010 the U.S produced more than 250 million tons of Municipal Solid Waste (MSW), or trash. This is equal to approximately 4.43 pounds of waste per person per day. The sources of waste generation break down, in general, as follows:

- Paper: 28.5%
- Yard Trimmings: 13.4%
- Food Scraps: 13.9%
- Plastics: 12.4%
- Metals: 9.0%
- Rubber, Leather, and Textiles: 8.4%
- Glass: 4.6%
- Wood 6.4%

If all forms of the materials flow required to produce what Americans use are counted, including all of the water, gasses and mine tailings, it amounts to 20 times your body weight for every American every day. Yet of all of this stuff, less than 1% is ever embodied in a product and is still there six months after sales. All the rest is waste. Hawken, Lovins and Lovins, Natural Capitalism, P52, Little Brown, 1999.

BESS-SB13 CALIFORNIA will provide a forum for sharing state-of-the-art knowledge in the design and advancement toward net zero buildings. The conference will focus on six major topics: innovative design, improving existing building stock, validation, affordability, user control, and education. New solutions are sought that will enhance the ways we live, work, and play in built environments (communities) at different scales and locations. The community research being undertaken on

Net Zero Waste Planning and Design touches on all six of these headings.

Net zero buildings will have a large influence on the energy efficiency of communities. However, success for these goals for efficient “net zero buildings” will depend, heavily, upon contexts, supportive infrastructure, appropriate sites, and knowledgeable leadership for “net zero waste” to be in support of new construction of net zero buildings.

1.1 DEFINITIONS

“Zero” waste suggests that the entire concept of waste should be eliminated, including consumption of net and embodied energy. Instead, waste should be thought of as a “residual product” or simply a “potential resource” to counter our basic acceptance of waste as a normal course of events. Opportunities such as reduced costs, increased profits, and reduced environmental impacts are found when returning these “residual products” or “resources” as food, or supplies, to either natural and/or industrial systems. This may involve redesigning both products and processes in order to eliminate hazardous properties and materials that make them unusable and unmanageable in quantities that overburden both industry and the environment.

Zero Waste strategies consider the entire life-cycle of our products, processes and systems in the context of a comprehensive system of understanding of our interactions with nature and search for inefficiencies at all stages. With this understanding, wastes can be prevented through designs based on full life-cycle thinking. Indeed, we should work to “design” our wastes, if any, so that they have future applications.

Our use of the term “Net Zero Waste (NZW)” includes “Zero Solid Waste”, “Zero Hazardous Waste”, “Zero Toxics”, “Zero Energy Consumption”, and “Zero Emissions”.

A Zero Waste strategy leads us to look for inefficiencies in the use of natural resources, manufactured materials, energy, and human resources. To achieve a sustainable future,

extreme efficiency in the use of all resources will be required in order to meet the needs of all of the earth’s inhabitants. A Zero Waste strategy directly supports this requirement. Individual communities form the most important context for the reduction of human wastes.

1.2 BENEFITS

The benefits of a Net Zero Waste strategy can be achieved in nearly any kind of organization. Some examples are:

- Community and municipal programs can be designed to consider all uses of materials and energy both in operations and services. Focus on zero solid waste to landfills and zero wasted energy can result in new jobs not only in the recovery process, but also in the use of recovered waste products as raw materials to produce new products. New efficiencies in energy production, distribution and consumption, transportation efficiencies, purchasing policies, and water supplies and distribution systems are some of the early targets for a Net Zero Policy.
- Business programs can be designed for uses of energy and materials in products, process and services. Focus will be on increasing efficiency by eliminating solid and hazardous waste, process wastes, wastes in production operations (motion, time, over-production, misprinted invoices & documents, etc.) and striving for energy reduction.
- School programs when applied to all school activities and classroom teaching can save money while providing important education to help the younger generation be prepared to contend with coming changes. Zero waste can be applied not only to energy and material use, but also in the facilities plant, offices, classrooms and cafeteria.
- Home programs can be developed that include energy efficiencies and savings, changes of purchasing habits, reduction in the toxicity of cleaning agents, focused recycling/reuse of materials, and use of

more appropriate fertilizers and pesticides. Advertisement and promotion of such programs can be a key to education for the general public.

Zero Waste promotes not only reuse and recycling, but also, and more importantly, promotes prevention and reductions at the source - designs and administrative policies that consider the entire product life cycle. These new designs and policies will strive for reduced materials use, use of recycled materials, use of more benign materials, longer product lives, repairability, and ease of disassembly and reuse at end of the original life cycle.

A Zero Waste strategy is a sound business tool that, when integrated into business processes, provides an easy to understand long-term goal that can lead to innovative ways to identify, prevent and reduce wastes of all kinds. It strongly supports sustainability by protecting the environment, reducing costs and producing additional jobs in the management and handling of wastes back into the industrial and consumer cycles.

Many communities have already initiated "integrated planning strategies" for their waste cycles. However, these plans are only "first steps" to net zero contexts. Net Zero Waste policies and strategies will extend comprehensive plans in the following ways:

- **Technical & financial assistance to political subdivisions for creation of recycling systems and for modification of present recycling systems;** better planning, greater community responsibility, and specific program identification and management will result in decreased costs of public assistance.
- **Recycling and waste reduction projects, including public education, planning and technical assistance;** community awareness of comprehensive "net zero waste planning" will lead to more reduction strategies and more profitable public/private partnerships.
- **Programs which develop and implement composting of yard waste and composting with sewage sludge;** a viable "net zero waste management program" will always include strategies for bio-degradable

wastes and the recapture of the net embodied energy.

- **Programs to assist communities and counties to develop and implement household hazardous management programs;** the design and management of a municipal "net zero waste management program" will include the management of household hazardous wastes, and the comprehensive program will result in higher levels of public safety and lower disposal costs.

2.0 PROPOSED PLAN OF WORK

This Net Zero Waste (NZW) study is a two-year project, beginning in 2013.

Year I

The NZW partnership will organize and conduct a baseline survey of existing waste management programs in each of the partner communities. Typical survey questions, for each of the three communities, will be:

- Who is responsible for waste disposal, recycling, and waste prevention in your area?
- Which political subdivision (e.g., the city, town, county, etc.) is responsible for solid waste prevention, recycling, and disposal policies and programs?
- Which specific agency or office is responsible for overseeing solid waste prevention, recycling, and disposal?
- Who is the community (and state) waste prevention program manager?
- What is the size of the waste challenge? What is the annual tonnage of land-fill, recyclables, repurposed, and bio-degradable materials?
- What goals have been set for waste generation, disposal, recycling, and waste prevention?
- How does the community handle its waste, by category?
- What waste prevention strategies are being used?
- Does the community operate or fund any reuse programs?
- Has the community or state banned curbside collection or

disposal of certain items?

- Does the community operate or fund on-site composting, "leave-it-on-the-lawn," or other waste prevention programs for grass, leaves, food scraps, and other types of organic materials?
- Does the local government have a program to send surplus items to other public offices or institutions for reuse?
- Do local schools and other public institutions with food service facilities use reusable dishes and/or cutlery?
- Are leftover paint, carpet, fixtures and other items from construction project diverted to other community projects?
- How does the community educate the public about waste prevention and recycling?
 - What is the waste economic picture (i.e., tipping fees, income from recycling, trash hauling and collection fees, salvage income from certain materials, etc)?
- Does the community provide residents, businesses, and/or public institutions with economic incentives to reduce their generation of waste?
 - What laws and public policies promote waste prevention?
 - Has the community or state passed any legislation promoting waste prevention?
 - Has the locality enacted any executive orders or laws directing government agencies to practice waste prevention and/or environmentally preferable purchasing?
 - Does the local government encourage vendors and businesses to practice waste management?
 - Does the local government or state provide incentives for businesses to practice waste prevention?
 - Where is the nearest example of a "Eco-Industrial Park" that reuses a variety of wastes for new products?

A selection of survey questions from the above questions will comprise a baseline survey of each of the three partner communities to establish the individual

community's point of departure for consideration of a more comprehensive, goals based, and long-term net-zero waste management plan.

Representatives of each of the three partner communities and their local statewide affiliate will form a NZW Project Advisory Team for guidance, counsel, data supply, and outcomes evaluation.

Key elements of a potential Community Plan for Net Zero Waste are:

- Construction/Demolition Waste Reuse and Repurposing
- Materials Exchange programs
- Deconstruction of hazardous, unusable buildings (model action plan for deconstruction)
- Building Codes and Ordinances for Net Zero Energy requirements for new construction
- Composting of food, yard, and bio-degradable wastes
- Recycling and reuse of household hazardous wastes (especially Latex paints)
- Community EcoProducts and Services Information (survey the local community for availability of green products and services; develop guidelines for exhibit for salvage materials store and products and services)
- Municipal Green Products/Packaging and Purchases Policies
- Community vehicle fleet and public transportation policy
- Coordinated collection, transport, repurpose, disposal system
- Curbside collection system for reuse, recycle materials
- Youth education/projects programs (regional spokes and hub system)
- Community Net Zero Waste Information and Exchange website
- Conservation based resolutions, recommended modification to Building Codes and Ordinances
- Model ordinance for Eco-Industrial Parks, and strategies for new markets for recyclables
- Recommended components of a Water, Waste, Energy

Conservation/reuse Master Plan (Triple Net Zero Strategy)

- Recommended components of a Alternative Energy Generation Plan (Bio-gas, CNG, wind and solar generation, distributed generation, district energy systems)
- Existing buildings' energy efficiencies retrofit program
- Transportation plan for energy efficiencies and alternative fuels.
- Local business and commerce commitment to conservation-based planning and operations.

The baseline Net Zero study will pay particular attention to all existing extant plans and public policies to establish profiles of existing waste conditions in each community.

Year II

The second year of the proposed study will establish the feasibility of the proposed NZW Templates and the project team will measure, assess, and evaluate the strategies for transfer and applications of the elements of the NZW Templates in other communities. The metrics process will be guided by the NGO's sustainability indicator tools. The final reports will be formatted to provide reproducible information and advisory materials available for distribution to communities, in a handbook format, that will assist the community in developing local Net Zero Waste Management Programs. The final report will also provide guidance for new, and/or revisions to state and local policies for the creation and maintenance of NZW programs.

Year I Tasks

- Establish an advisory/focus team from three case-study communities ; conduct one sustainability leadership workshop for each community with key waste reduction stakeholders; include, project team members, key community stakeholders, youth leaders, and city administrative personnel.
- Establish a "Best Practices Data Base" of existing US and international models of Net Zero Communities; set the data base up on a project website accessible to

all members of the project team, and representatives of the three model cities.

- Survey existing and planned waste management programs in each of the three partner communities; describe the history and impacts of each program in each community
- Identify the several implementable components of a comprehensive Communities Net Zero Program for Waste Reductions
- Develop a "Model Menu of Templates for a Community Net Zero Program" (Establish community actions for implementation, i.e., baselines, goals, administrative structures, imperative actions, choices of elements of the template, timeframes, budgeting, alternative strategies, communications plan/public engagement strategies, evaluations and program feedbacks, etc)
- Apply the sustainability indicators model for program planning, implementation, and program evaluation. Engage the NZW advisory team in close collaboration in the development of the templates.

Year II Tasks

- Organize a "Private Sector Users and Stakeholders Advisory Group"; solicit review and comments on the Proposed Templates from the group
- Organize a "Net Zero Implementation Group" (NZIG) in each of the three model communities; stage a sustainability leadership workshop in each community, with NZW Templates as the focal point; use the Indicators process as the guiding format for the workshops; recognize and complement all existing elements and components in each community of a community-wide waste management plan; recommend expansion and/or additions of elements to achieve comprehensive NZW goals.
- Transform the project website into a publicly accessible site.

- ° The project team to work with each of the three community NZIG's to establish a NZWR Plan; establish goals, timelines, budget estimates, benchmarks, public communications plans, and evaluation strategies for implementation of selected components of the NZW Templates.
- ° The project team to track program elements progress in each of the three communities.
- ° The project team to develop a draft NZWR Handbook, suitable for copy and electronic distribution to communities.

3.0 PROJECT/PROGRAM SIGNIFICANCE

At this time, no community in the state has a Net Zero Waste Reduction plan. Waste management has been seen as a variety/collection of independent programs, i.e., recycling, household hazardous waste, construction and demolition waste, etc. While some of these programs have proven effective, new experiences with comprehensive, interdependent waste management plans in other national and international communities has shown that the management of waste – in all its forms – in a holistic and comprehensive fashion can lead to reduced costs, increased economic development, new jobs, and broad programs of green improvement to the community. **A new view of waste management is that waste is a community utility, with several interrelated components.** The net impact of a coordinated system will depend upon leadership, holistic visions and guidelines, commitment, realistic goals, good planning and good management. The proposed presentation will discuss one state-wide case study of the strategies and actions necessary to achieve good management and administration of this community utility.