Note: This document is a summary and background for the Sustainable Orphanage Project. Full copies of the Monte Cristi Case Study and Layperson's Guide are available for order from the Sustainable Facilities & Infrastructure Program Office at 404-894-8055.

The Sustainable Orphanage Project

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The search for sustainable solutions affects all types of facilities around the world. The Sustainable Orphanage Project, undertaken by a group of Civil Engineering students at Georgia Tech with support from the GE Foundation, targeted a specific group of people whose facilities are particularly in need of repair and would benefit greatly from the utilization of sustainable technologies. Orphanages in Latin America face some difficult challenges. These orphanages typically have very little funding and must operate with decaying and insufficient facilities for the numbers and needs of their children. In many Latin American countries the infrastructure for water supply, sewage treatment and electricity is inadequate and unreliable.

These facilities can benefit from assistance in the form of sustainable technologies. A sustainable technology is one that uses little natural resources, depends on renewable as opposed to non-renewable resources, is economically efficient and affordable, and fits within the social and cultural context of the surrounding community while bringing a satisfactory quality of life. In seeking sustainable solutions to the problems of Latin American orphanages, this student-driven project focused on developing and pilot-testing a process for evaluating orphanage facilities in terms of engineering and sustainability properties, to facilitate the selection and design of sustainable technologies for these facilities.

The problems faced by third world orphanages were initially brought to the attention of Georgia Tech's Civil and Environmental Engineering Department by members of Orphanage Outreach, a non-profit Atlanta-based organization that provides financial and social support to four orphanages on the Caribbean island, the Dominican Republic. While the primary driver of Orphanage Outreach had been to support these orphanages with contributions of time, expertise, materials, and money from donors in the United States, the organization gradually began to realize that it could serve far more children if it were able to make sponsored orphanages self-sustaining, without need for additional support over time. Representatives from Orphanage Outreach contacted Dr. Jorge Vanegas, Associate Professor of Civil and Environmental Engineering, to see how Georgia Tech might be able to help them create sustainable orphanages in Latin America.

Dr. Vanegas pulled together a volunteer team of civil engineering students interested in sustainable facilities and infrastructure to address the problem. Over a period of six months, the students developed a prototype list of the kinds of data that would need to be collected in order to assess the sustainability of an orphanage and design sustainable technologies to meet its needs (see Appendix below). In March 1997, a core group of students assembled equipment and supplies and traveled to one of the sponsored orphanages in Monte Cristi, Dominican Republic to pilot test the information collection framework. After an intensive week of data collection, interviews with orphanage occupants and local officials, and video and photographic documentation of the Monte Cristi orphanage, the team returned to Atlanta to compile a data collection handbook and case study of the Monte Cristi orphanage. The 161 page handbook, entitled *A Layperson's Guide to Data Collection for Sustainable Orphanages*, was internally published and distributed to Orphanage Outreach, as well as archived in Georgia Tech's library. The 100 page case study was also distributed to Orphanage Outreach and Georgia Tech archives. The team also delivered a group presentation in May 1997, open to the Georgia Tech and Atlanta communities, to describe the outcome of the project.

In addition to the two publications and presentation directly resulting from the project, the data collected at the Monte Cristi orphanage were used in the M.S. thesis and Ph.D. research of two members of the Georgia Tech team. The project was reported in Georgia Tech's student newspaper, the *Technique*. An ongoing relationship with Orphanage Outreach has been maintained, and future projects are expected to result from this initial collaboration.

Appendix:

Information Requirements for Sustainability Assessment of Orphanage Facilities

Objective: to determine values for specific contextual variables to enable the design of a sustainable facility for the Monte Cristi Orphanage.

Guidelines: How should this facility be different from other facilities?
How are its requirements different than those for a typical residence?
How are its requirements different than those for a typical school?
How would it be different if it were located in the United States?
Who are the stakeholders in the facility's construction and operation?
What are the concerns of each stakeholder?
How will the facility be integrated into the surrounding community?
How will the facility be integrated into the surrounding ecological context?

Specific Information Requirements

Site Plan, including:

- Approximate topography
- Existing vegetation (types and locations)
- Existing natural features, e.g., bodies of water, notable geological features, etc.

- Existing manmade features, e.g., buildings, roads, gardens, etc.
- Path of the sun
- Prevailing wind directions and velocities
- Note: the use of overlays is recommended

Photographs of Site and Facilities, including:

- Interior and exterior shots of existing facilities
- Site features of interest
- Shots from boundaries of site
- Aerial photos, if possible
- Shots of notable problems with existing facilities

Basic Climate and Weather Data, including:

- Annual and monthly average rainfall
- Average monthly temperatures
- Average high and low temperatures by month

Existing Utility Infrastructure (gas, water, sanitary, electricity, etc.):

- Type
- Service capacity
- Availability
- Reliability
- Average consumption (per month)
- Sources/sinks for each resource flow

Social and Governmental Context:

- Tax requirements
- Applicable ordinances and/or building codes
- Permit requirements
- Other applicable government requirements or constraints
- Community requirements, e.g., will this facility be used by the community, and if so, how?
- Attributes of surrounding community:
  - Population and demographic information
  - Available construction resources (labor, materials, equipment)
  - Available social resources (e.g., are there other facilities which might be able to share the responsibility for meeting some user needs, such as libraries, recreational facilities, etc.?)

Economic Context and Constraints:

- Initial capital funding sources and quantities
- Funding sources and quantities for ongoing operations and maintenance
- Current operating budget
- Current operating and maintenance resources (labor, materials, equipment)

Demands for Infrastructure, including:

- Estimated water requirements for drinking, bathing, laundry, cooking, etc.:
    - Quantities (and justification)
    - Use patterns (times of greatest demand, etc.)
    - Attributes of existing fixtures (quantity, types, flow rates, etc.)
- Estimated power requirements for existing appliances and electrical equipment
    - Types and quantities
    - Wattage
    - Age (for efficiency estimation)
    - Use patterns (times of greatest demand, etc.)
- Estimated power requirements for desired appliances and electrical equipment
    - Desired types and quantities
    - Desired wattage
    - Justification/rationale for inclusion in facility
    - Anticipated use patterns (times of greatest demand, etc.)
- Estimated sanitary facility requirements, including:
    - Existing and desired types/quantities of toilets and baths/showers
    - Existing and desired types/quantities of dishwashing and laundry equipt.
    - Existing and desired types/quantities of cooking and kitchen equipt.
- Estimated solid waste disposal requirements, including:
    - Types and quantities of typical waste stream from facility
    - Current disposal practices
    - Availability of disposal options, e.g., composting, recycling, etc.
- Estimated food generation requirements, including:
    - Existing gardens, including types and quantities of food generated (also show on site plan)
    - Existing livestock, including types of quantities of food generated and input requirements to sustain livestock

Attributes of Existing Structures:

- Floor plans
    - Draw to rough scale
    - Show fixture and furnishing locations
    - Show window, door, and other opening locations
- Elevations
    - Exterior from four sides
    - Interior as appropriate
- Identify materials, state of repair, adequacy, and dimensions of:
    - Foundations
    - Wall systems
    - Structural systems
    - Roof systems
    - Interior finishes and furnishings
    - Mechanical and electrical systems

Attributes of Users:

- Current and projected population of occupants and their features:

- Age
- Gender
- Special requirements, e.g., handicaps, etc.

• Identify basic needs to be met by facility, including:
- Eating
- Sleeping
- Hygiene
- Education
- Recreation

• Identify cultural requirements to be considered for facility, including:
- Separation of genders
- Religious issues

• Identify potential roles users may play in constructing, operating, and maintaining the facility

Strategy for Developing a Program of Requirements:

• Identify basic needs to be met by facility
• Generate objectives for facility based on needs it must meet
• Brainstorm a "dream list" of fixes and added features, including the actual users of the facility in the process
• Prioritize the list of fixes based on objectives