SUSTAINABLE HUMAN DEVELOPMENT

Pasajquim, Guatemala

CALTECH E/ME 105
Luz Marina Delgado
October 2009
In this class we will discuss:

• Sustainable Human Development: Definition & applications
• Statistical Data: Guatemala in the World
• Students perceptions from 2009 Research Trip to Guatemala August 19-27: Ideas captured
• Maya Culture and Current Events: Preliminary ideas
• Class Goals for Product Design in the Developing World
• Indicators of Success: Impact indicators applicable to your projects
• Cutting edge design concepts = Participatory design
• Examples
• Sources for secondary research
SUSTAINABLE HUMAN DEVELOPMENT

“To strengthen and/or open opportunities for people to develop capabilities to reach their potential without limiting or neglecting future generations’ right and ability to do the same” (UN, 1990)

ME105 goal = teamwork with the poor to open opportunities to walk out of poverty through sharing knowledge, ideas and marketing channels to make money
The 3 Elements of Product Design for Developing Nations

- Culture
- Engineering & Design
- Business
Statistical Data

Guatemala 13,300 million
- Maya population  41%
- Ladinos/mestizo, European and other  59%
Population growth  2.06%
Urban population  49 %
Rate of urbanization  3.4%

Population below the poverty line 56.2%
• GDP $68.58 billion country comparison in our world <81/266>
• Bolivia $43.27 billion <85> 9.7 Million people
• Cuba $108.2 billion <64> 11.4 Million people
• Ecuador $107 billion <65> 14.5 Million people

• Growth rate 4% <105>
• Government budget 15 % of GDP
• Education expenditure 2.6% of GDP <154>
• Investment (gross fixed) 18.6% <126>
• Total export: $ 7.86 billion
  - Agriculture 13.1 %
  - Industry 25%
  - Services 35%
• **Area**: 108,900 km\(^2\) (slightly smaller than Tennessee)

• **Inflation rate** 11.5% <163>

• **Distribution of family income**: *Gini index* 55.1 (2007); 55.8 (1998) <13>

• **Household income or consumption by % share**:
  • Lowest 10% 1.3%
  • Highest 10% 42.4%
Guatemala is the top remittance recipient in Central America. Remittances are the primary source of foreign income equivalent to nearly 2/3 of exports.

**Exports** $13.38 billion <87>
**Imports** $7.86 billion <96>

**Export Partners:** US 41.7%; Central America 22.6%; Mexico 6.4%
**Import Partners:** US 35.7%, Mexico 10%, Central America 8.8%, China 7.3%

**Public Debt:** 23.6% of GDP (2008); 32% of GDP (2004) <85>

**Natural resources:** Petroleum, nickel, rare woods, fish, rubber, hydropower
These “empty” numbers create social conditions that were perceived by students on the Research Trip as follows:

“I was amazed by the rich culture of Guatemalans, who were resourceful and tried to work with what they had, not necessarily going out to buy finished products. This was part of the strong independent spirit I saw in the people we met. I noticed few beggars, and those who had homes worked hard for sustenance as well as fulfillment. The traditional markets were filled with individuals who tried to sell their craft, who fought to eke out a living using their skills, without giving up or succumbing to beggary”.
A history of exploitation (root cause of conflict) and 36 years of war were supposed to have ended with international support that brought about the **Peace Accords in December 1996**

Incendiary bombs, burn and slash tactics “Tierra arrazada”* in more than 300 Maya villages, over a quarter of a million people killed, hundreds kidnapped and over a million refugees...yes, this tragedy ended in 1996.
Peace Accords resulted from hundreds of national and international experts and community leaders, meeting at all levels of society, working with a huge budget for 8 years discussing root causes of socioeconomic and racial inequities, then negotiating solutions.

The Peace Accords were truly designed as a development plan to give place to fundamental change: a change in the structure of Guatemalan society.
However – Guatemalan’ social arrangement **did not change**. We just saw the statistics: Over half of the population is living **below the poverty line**. Gini Index 55.1

Gini index measures the degree of inequality in the distribution of family income in a country using the Lorenz curve.
The index is calculated from the Lorenz curve, in which cumulative family income is plotted against the number of families arranged from the poorest to the richest. The index is the ratio of (a) the area between a country's Lorenz curve and the 45 degree helping line to (b) the entire triangular area under the 45 degree line. The more nearly equal a country's income distribution, the closer its Lorenz curve to the 45 degree line and the lower its Gini index, e.g., a Scandinavian country with an index of 25. The more unequal a country's income distribution, the farther its Lorenz curve from the 45 degree line and the higher its Gini index, e.g., a Sub-Saharan country with an index of 50. If income were distributed with perfect equality, the Lorenz curve would coincide with the 45 degree line and the index would be zero; if income were distributed with perfect inequality, the Lorenz curve would coincide with the horizontal axis and the right vertical axis and the index would be 100.
### Gini Index: some comparisons

<table>
<thead>
<tr>
<th>Country</th>
<th>Gini Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guatemala</td>
<td>55.1</td>
</tr>
<tr>
<td>Mexico</td>
<td>47.9</td>
</tr>
<tr>
<td>US</td>
<td>45</td>
</tr>
<tr>
<td>Canada</td>
<td>32</td>
</tr>
<tr>
<td>England</td>
<td>34</td>
</tr>
<tr>
<td>EU</td>
<td>31</td>
</tr>
<tr>
<td>Argentina</td>
<td>49</td>
</tr>
<tr>
<td>El Salvador</td>
<td>52.4</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>43.1</td>
</tr>
<tr>
<td>Honduras</td>
<td>53.8</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>48</td>
</tr>
<tr>
<td>Colombia</td>
<td>53</td>
</tr>
<tr>
<td>Ecuador</td>
<td>46</td>
</tr>
<tr>
<td>Brazil</td>
<td>56.7</td>
</tr>
<tr>
<td>Chile</td>
<td>54.9</td>
</tr>
<tr>
<td>India</td>
<td>36.8</td>
</tr>
<tr>
<td>China</td>
<td>47</td>
</tr>
</tbody>
</table>
To some extent, after 1996 social conditions in Guatemala opened **windows of opportunity for the poor** - 80% of whom are Maya- enabling them to organize, study, travel, expand and interact with the rest of the world. The Maya began to have a voice, recognition.

**Encouraging Examples:**

- IMI-Transitions partnership: an example of collective design

- Francisco Guarchaj-COCODE and his dream for a Sustainable Living Model Project: his ambition to come to the US

- San Pablo Tacana’s organic and landscaping solutions for corn and livestock production

- Maya languages being thought at some public schools

- 79% of the largest bank in Guatemala, BanRural, is own by organized peasants, producers associations, cooperatives and women’s groups
Can the poor help themselves rise out of poverty?

YES, they can! It’s been proven:

• Muhammad Yunus, creator of the Grameen Bank, in Bangladesh, author “A banker to the poor” and others
• Julia Tzic, founder of Microcredit for women in Guatemala, now with Q 3.8 million credit line
• Benjamin Son Turnil, founder of Maya NGO CDRO, now partnering with Ban Rural and local corporation Paiz/Walmart
• Paul Polak, creator of cheap solutions for the poor, author “A way out of poverty”
• David Bornstain, activist for Social Entrepreneurship, author “How to change the world, Social Entrepreneurs and the power of new ideas”
Institutions and social arrangements - in each society - create social conditions.

Social conditions profoundly affect people and the way they interact with each other and with others.

You need to understand the extent of this impact in human behavior in rural Guatemala.
Attributes and conditions to rise out of poverty:

- In general, they are willing to help each other = community life is strong - but greatly lost compared to 30 years ago.
- Endurance in the face of hardship: courageous people
- Ability to grow their own food and food systems: keep native seed bank alive: corn, beans, squash, amaranth, medicinal plants, etc
- Ability to keep ancestral knowledge (even with huge gaps in data): self-confidence
- Self sufficiency, e.g. clothing solutions: weaving/foot and back strap looms.
- More people are literate, some have gone to university studies
- Some modern food and modern agricultural methods have increases food production and consumption
- More people use modern technology
56.2% of Maya living their lives reduced to subsistence, come with consequences. In general people suffer from:

-No sense of self: weakened self worth
-Neglected personal values and native knowledge
-Insecurity in decision making, fearful: Treated as less than equal
-Lack of collective or individual voice
-Limiting or weaken social organization and networks: midwives, healers, priests, leaders, local authorities
-No emerging leaders
-Weakened or lack of opportunity to sell native products, creating an absence of family enterprises”. 30 years ago most of all products Maya families used were produced by themselves.
-Weakened traditions, some people believe that copying the lifestyle they see on TV is a sign of being modern. Traditions faced with technology are changing.
Students Perceptions
Quotes from 2009 Trip Report

“It was a huge, eye-opening step into a world that I'd only recently discovered and already become emotionally immersed in: the world of social entrepreneurship and engineering for society”.

“Local partners were helpful in that they were completely familiar with their surroundings and the resources available within their vicinity. Local partners were also knowledgeable about where to sell their products, how much was being sold, and the revenue they received from it”.

“These families live very simple, humble lives. Their resources are not limitless, and their productivity is gained through how resourceful they are with what they have”.
“I was amazed at their apparent satisfaction with the traditional methods that they use. In many ways I view this “satisfaction” as a blessing and a curse as I feel that it reduced their innovative capacity”.

“The people we met through our travels lived simply and harshly, in certain circumstances- but they were always inviting and welcoming to our interruptions”.

“I was glad to have witnessed the spirit of endurance in the rural Maya as well as the poor at large in Guatemala”.

“Guatemalans are hard-working and strong in their spirit of self-sufficiency and self-improvement, and will obtain what they need if they recognize it and can afford it”.
“The poor and sometimes appalling living conditions did not come as too great a surprise, but the truly amazing thing was the hardiness of Guatemalans in the face of hardship. It spoke measures to the amount of good capable there is if resources (material and intellectual) are carefully introduced and nurtured and if doors opened for the people. Learning these things and experiencing the lives of Guatemalans, especially those in rural and poor areas, was one of the most enriching experiences I've ever had.”

“Lack of opportunities, other than subsistence agriculture is evident among the poor in Pasajquim”

All these traits and social conditions define our poor partners in the global economy.
Partners have to know each other, they share responsibilities and benefits and work together for a common purpose, they contribute equally to results.

Through the intense research trip experience and Landívar’s teammates field work, you will be sharing your talents with the poor, so they can have new opportunities to gain money.
E/ME105’s primary goal is to create income generation opportunities through strengthening or designing new products and services.

Also for students to learn a new perspective to product design

   Design with rather than for = Participatory Design
   Design with the poor rather than design for the poor

• Be ready to nurture innovation, be ready to mentor
• Promote inclusive idea generation = participatory ideation
• Listen to partners with respect and openness = Co-design
• Decide solutions together = Co-create
• Define products and services together = Inclusive solutions
• Go for inclusive definition of business plans = sustainable solutions

This design perspective empowers people to walk out of poverty
How can your work nurture, mentor, promote participation, co-design, co-create, stimulate sustainability, empower poor people?
- Break down parts of design and include rationale for including the parts and assess how much it takes into account their opinion
- Talk to people
- Make it easy so that they can use products once you are gone
- Keep testing and do quick reiterations with their suggestions
- Make sure you have understood the problem they present to you
- Understand your assumptions and test them.
- The proof that a product works is if the product makes itself into society
- If no one wants to buy your product it’s a proof it is not viable
Participatory Research

“At the heart of participatory research lies a simple commitment: to combine research and action for social change. Relationships between researchers and the communities they partner with are cultivated over decades in many cases, with the goal of empowering communities and spreading new knowledge.”

http://www.communityagroecology.net/participatory_research

This quotes comes from the University of California at Santa Cruz, Agroecology Department.
Collective creativity: Participatory Research and co-design use new tools and methods - students become subjects of a new design process, a two-way learning process - accept to learn from poor partners as well as share their knowledge.

Professor Steve Montgomery will be teaching on this topic. For Summer Prep Program he sent interesting material:

http://www.vimeo.com/1269848
http://www.ideo.com/work/item/human-centered-design-toolkit/
http://www.maketools.com/.../CoCreation_Sanders_Stappers_08_preprint.pdf
Participatory Research through Experiential education creates conditions for students to see the big picture and their specific project as a contribution to a better world. It provides with conceptual and hands-on elements to have perception of integration. Social problems are all interconnected and complex.

Be aware of your influence
“...However, to really gather ground truths- I found myself having to let go of the need to make explanations and just adapt to the situation and observe the surroundings”.

“Without having this first hand experience with the local people, our hypotheses and assumptions would be faulty, and completely mistaken”.
“The trip from Antigua to the Sololá Traditional Market felt worlds apart, and was a very eye-opening experience. Entering Sololá in the bus, and seeing the woman and men doing business and walking about was a great scene, and a fantastic introduction to the market place. The types of food, produce, and products being marketed and sold really told a lot about who they were”.

You need to learn a new set of tools and practices to accommodate to this new people-centered “landscape of design”*
Co-creation and the new landscapes of design*
Elizabeth B.-N. Sanders (*) & Pieter Jan Stappers (**)
(*) MakeTools, LLC, 183 Oakland Park Ave., Columbus, Ohio 43214 USA
(Liz@MakeTools.com) (**) ID-StudioLab, Faculty of Industrial Design Engineering, Delft University of Technology, Landbergstraat 15, 2628CE, Delft, The Netherlands (p.j.stappers@TUDelft.nl)

Abstract
Designers have been moving increasingly closer to the future users of what they design and the next new thing in the changing landscape of design research has become co-designing with your users. But co-designing is actually not new at all, having taken distinctly different paths in the US and in Europe.

The evolution in design research from a user-centered approach to co-designing is changing the roles of the designer, the researcher and the person formerly known as the “user”. The implications of this shift for the education of designers and researchers are enormous. The evolution in design research from a user-centered approach to co-designing is changing the landscape of design practice as well, creating new domains of collective creativity. It is hoped that this evolution will support a transformation toward more sustainable ways of living in the future.
**Indicators are** designed to test cultural and social sensibility, these are criteria to measurement activity in regards to pre set lists of expectations.

Examples:
How many stoves were built? How many training sessions were held? How many people attended? How many pounds of vegetables did Pasajquim men’s group produced off season with new irrigation system? How much money did Paulina’s family saved in wood? Etc.
Impact Indicators
Measure the impact of activities in people’s lives

EXAMPLES:
Off season people planted ten vegetable beds using new irrigation systems = produced 3 times more than before, where did they invest the extra income? How does Pasajquim people reacted to their success? Is there another group wanting to try drip irrigation? How can E/ME105 students make a cheaper system?

Why are they important?
Cutting edge Sustainability refers to lasting solutions = friendly to people, economics, environments, resources, cultures and social arrangements.
Always discuss impact, consequences, and effects of your teams’ actions.

- Students and local partners* discuss historical data and talk about bases for interactions: equality, trust, fairness or the absence of these elements.
- Teams** partners anticipate ways in which products may affect local culture, disrupt or promote autonomy and technological advancement; they discuss how new rituals and new behaviors may come when using new products.

* the poor
Success Indicator # 1

**Participatory Design Advancement.** Level of co-creation and co-design has risen with collaborations between different partners to generate empowerment

a) Teams* consider global context and information about key cultural, business, engineering and design criteria is shared with team* (students and local partners)

b) As a result of on going research on local techniques and local materials partners’ abilities are valued and understood. “In situ” capabilities are reflected in resulting designs

c) Teams* applied and transferred information to other producers

d) The way students relate to design challenges has been transformed, expanded onto inclusive methods
Success Indicator # 2: 

**Continuous Improvement in Design Environment.** There is a two-way learning process moving towards income generating activities with partners and their families’ participation.

a) Students and local partners form effective teams* for participatory product design. Students include local poor partners from the start: to discuss problems, ideation, solutions, prototyping, budget, business plans, etc.

b) Teams follow up with responsibility and passion to implement business plans with and for local people.

c) Interactions produce empowerment: Teams* discuss and measure improvements on empowerment, self-esteem, self-management, decision-making and leadership.
d) There is a growing level in which “positive actions” are considered practical ways to include partners, their ideas and input.

e) Student’s ideas are in harmony with user’s/partners’ vision.

f) E/ME105 stimulates “horizontal interactions”

g) Teams seek integrated and strengthen local leadership. Full participation is promoted: Project progress is presented in General Assembly meetings

f) Local leadership becomes aware of new opportunities. They take part in discussions about where change may take people

g) Teams* deeply discuss impact, consequences, and effects of human actions.
Success Indicator # 3

**Supports self-confidence through Cultural identity.** E/ME105 projects encourage locals and participants to understand the grounding importance of strong “self” connection to collective memory & cultural markers: ancestral values, Cosmo-vision, rituals and traditions

a) Teams* take cultural background into consideration and help local partners revalued local knowledge is valued and use it through all stages of design process.

b) Local empowerment grows: people express their ideas and participate actively

c) Local materials, tools and techniques are researched and then used: interaction

d) Individual students and teams* are keen and able to conduct research of local culture through documentation, visual media and “in situ” collective actions.
e) Teams* research the type of influence humans have on social arrangements, and see what can be done to promote or influence change. They discuss how and where do social arrangements leave “cracks” to find where change can happen.

f) Students talk to local partners about their own cultures; they share insights and communicate personal views

g) Teams* understand how culture, rituals and traditions impacts the environment in which people live.

h) Teams* observe how people interact with resources and tools. They promote applied science and technology

“I think it’s quite easy for someone like me, who lives in a fully westernized culture, to lose perspective of things that are important and vital to life. Having the chance to observe our local partners has really put things into a new perspective. The standard of living of the Guatemalans were on the other side of the spectrum from the life I live here in the states, however, I found them to be incredibly generous, giving, and completely open. It really was a beautiful experience”
In learning others’ ability to cope with challenges, hardship and poverty, human traits become evident.

“In general people **seemed very friendly, welcoming, and peaceful**. We were always welcomed into people’s houses, and they seemed eager to find out about us and help us in whatever way they could. Guatemalan people also appear to live very simply... People **were not in a rush to get things done**, and they did seem to have the horrible imbalance that Americans do between what they are capable of doing and what they desire or attempt to do. A **very noticeable difference** between Guatemalan and American people stood out to me. I anticipated that people would be poorer, yet **they seemed well-kept and content...people did not seem to complain or want to change their way of doing things**. People in the U.S. are never seem to be content with the latest gadgets or styles, and being poor implies entitlement to complain and bemoan your very existence. Guatemalan people seemed to **simply accept things, do their best with them, and not dwell on the “greener grass”** that was on the other side of their fence. Guatemalan people also **hold different value of things**. I sensed that **family life** was much more **significant and respected** than in the U.S. **Things like a milpa (small field) that may seem insignificant to me are actually sources of great pride for farmers**”
Success Indicator # 4

**Cultural Respect of students for Indigenous society.** Participants have sufficient level of sensibility to understand diversity, respect for the “other”, treasure “others” views and knowledge and are able to incorporate social and ethical issues into participatory design process.

a) Teams* partners discuss and measure improvements on empowerment, self-esteem, self-management, decision-making and leadership

b) Teams* partners seek local leadership participation: Project progress is presented in General Assembly meetings

c) Local leadership is integrated and strengthen: They become aware of new opportunities. They take part in discussions about where change may take people
“The most important lesson I learned was the sensibility to the Mayan Culture. The corn sheller serves as one good example. Only because it makes sense and it works for us, it doesn’t mean it will work for them”.

“I was surprised to see the way they lived. I was expecting to see more of slum type of place. The families we visited live in one with nature. They work the land, eat fresh healthy food, breath clean air, and the parents spends time with their children. They might not have the material things we have, however they seem to live in peace with their surroundings”.

“A misconception I had before the trip was that the poorer Guatemalans lived in the same conditions and faced the same problems. However, it appears that the rural and the urban lower classes faced different challenges and have different ways of living. An important consideration in our product and business model design”.
Students use same methods as effective promoters or “early adaptors” do, lead by example:

• Empower by praising good traits, good attitudes
• Express admiration to support people working their way out of poverty
• Believe in the power people have to change
• Honestly and openly admire cultural positive traits, techniques, native knowledge
• Promote critical thinking: nurture creativity
• Share knowledge and experience with excellence
• Commit to spread change: be ready to mentor partners
Success Indicator # 5

**Income generating solutions.** E/ME105 class projects create viable products, which produce income and/or savings.

a) Prototypes have potential to become small businesses.
b) Partners as well as students learn the importance and fundamentals of a business plan.
c) Project’ activities are design to be developed by locals as “their own” business.
d) Plans are developed to include local banks or microcredit programs.
Homework

Each Team shows how these Impact Indicators apply to their projects. Include your customer/partners in the field, share with All team* members (US students, Landívar students and poor partners) come up with the criteria to be used for your own specific project. All indicators need to be created now and tested at project mid term and final.
Recommended readings:

Other books:

**Design for the Other 90%** by Cynthia E. Smith  
**A Fine Line: How Design Strategies Are Shapi...** by Hartmut Esslinger  
**Expanding Architecture: Design as Activism** by John Thackara  
**Making It: Manufacturing Techniques for Product...** by Chris Lefteri  
**Sketching 5th print: Drawing Techniques for Produc...** by Koos Eissen  
**In the Bubble: Designing in a Complex World**  
**1000 New Eco Designs and Where to Find Them** by Rebecca Proctor  
**The Evolution of Useful Things: How Everyday Ar...** by Henry Petroski  
**Designing Design** by Kenya Hara  
**Process: 50 Product Designs from Concept to Ma...** by Jennifer Hudson  
**The Power of Unreasonable People: How Social En...** by John Elkington  
The Economist Intelligence Unity. Guatemala Country Profile
Movies, videos, speakers, interesting sites:


The Story of Stuff by Ann Leonard (You Tube)
Understanding Peak Oil (You Tube)

http://www.ted.com/themes/rethinking_poverty.html
http://www.ted.com/speakers
http://www.usaid.gov/locations/latin_america_caribbean/country/guatemala/corruption.html
http://www.un.int/guatemala/english/english.html

http://www.desarrollohumano.org.gt/
We are not alone, there are courses like ME105 spreading all over. 
*You* are leading the way!

**University of Colorado at Boulder:**
- Professor Bernard Amadei. Program in Engineering for Developing Communities: Viewing the Developing World as the Classroom of the 21st Century.

**Stanford Graduate School of Business:**

**MIT D Lab Amy Smith**
http://www.popularmechanics.com/technology/upgrade/4273674.html
http://worldenergyjustice.org/?p=328
http://www.esustainableworld.org/displaycommon.cfm?an=1&subarticlenbr=9

**Cornell:** http://cresp.cornell.edu/ourwork.php?work=pp&pp=5
http://www.nextbillion.net/blog/creative-design-for-affordability-at-cornell

**Northwestern University, Illinois:**
http://google.mccormick.northwestern.edu/search?q=developing+world&spell=1&access=p&output=xml_no_dtd&ie=UTF-8&client=mccormick&site=default_collection&proxystylesheet=mcc

**University of California Santa Cruz:** [www.communityagroecology.net](http://www.communityagroecology.net)
Thank you

For the rest of the term I will be available via
-Email luz.mdelgado@gmail.com or
-Skype (luzmidelgadoblanco)

Enjoy! “Have fun while working”