RICE UNIVERSITY

Recasting the Convivial Tool

by

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ABSTRACT

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The state of Zacatecas sees more outmigration than any other state in Mexico, due to a reliance on U.S. labor demand. The towns of Zacatecas are underpopulated and not maintained as they were in the era before free trade with the U.S. Traditional agricultural and building skills are all but extinct, becoming impractical to continue in the face of a flood of cheap U.S. imports. The rural farm is quickly losing its social and economic significance.

This project, sited within the state of Zacatecas, Mexico, will involve the design of an organization and the implements it produces. Revising Ivan Illich’s “convivial tool,” these products would take advantage of efficiencies in methods of production and product delivery, enabling Zacatecans to live more autonomously, anticipating a resuscitation of vast areas of arable and domestic environments. Building upon programs that the Zacatecan government has already put in place to restore local public works, this project will propose alternatives to the existing system of interchange with the U.S.

Architecture is examined as a process that employs resources – human, environmental, and material. I will attempt to design the management of certain resources that could plug into and interrupt existing systems.
ACKNOWLEDGMENTS

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Operative Terms

Manipulative Tools  
- Car
  - restrict users to certain classes, professions, genders
  - can become "radical monopolies" - one product consumes an economy
  - increase efficiency and wealth at the cost of accumulatedills

Bike
- Convivial Tools
  - tend to deprofessionalize society
  - can be used by anyone and reused for multiple purposes
  - minimally impose on the natural environment
  - allow the user to maintain his or her unique social and cultural heritage
  - efficiently use human and mechanical power

Illich's dichotomy.

"An individual relates himself in action to his society through the use of tools that he actively masters, or by which he is passively acted upon."
Ivan Illich, *Tools for Conviviality*
In *Tools for Conviviality*, Ivan Illich argues that industrialization has undone many positive achievements society made throughout history. He condemns the education, transportation, health care, communication, and energy systems of industrial nations and urges the “third world” to avoid the alluring traps of industrialization. His claim is that once a nation passed its “second watershed,” there would be no turning back from industrialization - at which point the negative effects of industrial tools on society and the environment would multiply and quickly outweigh their positive effects. Illich compares the tools of industrial and preindustrial nations. He sets up the distinction between what he calls industrial, single-purpose, “manipulative” tools and preindustrial, enabling, “convivial” tools. To avoid the traps of nostalgia and to approach complex contemporary conditions, Illich’s scope can be expanded to include the appropriation of industrial materials and processes. Efficiencies offered by taking on industrial processes allow for the reallocation of resources towards satisfying other human needs.

Project concept: using manipulative processes towards convivial ends.

The Convivial Tool Today

To avoid the traps of nostalgia and to revisit the convivial tool as a viable approach to contemporary building practice, Illich’s scope can be expanded - efficiencies offered by industrial technologies and strategies can be appropriated as convivial tools. A heterogeneous approach would allow building production to enter into contemporary complex social and economic conditions.

Illich’s dichotomy.

The state of Zacatecas sees more immigration to the U.S. than any other state in Mexico. Rural towns are missing more than half of their population to outmigration. NAFTA, the internet, and cheap air travel now connects locations that were once isolated. Due to a reliance on the U.S. labor demand and cheap imports, public works are under-used and not maintained. Roads, irrigation systems, schools, and churches are literally falling apart. A vicious cycle of economic forces and demographic movement has taken its toll on the landscape.

Mexico’s Top Income Components:
1. Oil exports
3. Tourism
Central Zacatecas: Effects of Outmigration

In a state with high levels of outmigration, the Central Zacatecas plateau reveals its dramatic economic and demographic effects. Subsistence farming accounts for 90% of this area's acreage but numbers reveal that there is almost no workforce to support the farms.

Incomes in Zacatecas have increased since the beginning of NAFTA. The gap between the rural poor and the urban middle class is gone as a burgeoning middle class takes hold. Numbers show that with more migration, families spend more on large consumer goods like cars and home improvements. With more migration, there is a tendency to invest more.
Remittances and the Three for One Program
Remittanced generate $9.3 billion a year for Mexico. This is almost half of the $23 billion in remittances to all of Latin America and the Caribbean. Mexico, with a population of 100 million, receives almost as much money from remittances as India, a nation of one billion. Remittances are Mexico's third-largest source of income, after oil exports and tourism. In Zacatecas, the value of remittances exceeds local and state public work budgets (Bada). In 1997, Zacatecas began a fund-matching program designed to multiply remittance funds set aside by hometown associations for public projects in Zacatecan hometowns. Funds set aside for infrastructure are matched by local, state, and federal branches. The ultimate aim of this program is to change the conditions forcing so many citizens to migrate.
Emergence of Commercial Produce

Immigrants returning from the Napa Valley have utilized knowledge gained from working large orchards there. By installing sophisticated irrigation systems, Zacatecans have found ways to irrigate their arid landscape, making it amenable to growing peaches, grapes, and guavas. These start-ups revive rural economies by subcontracting out vacant farmland, employing local labor, increasing local tax revenue, and introducing money into the economy.
Mexico topography

Mexico climate types
Percentage housing units without toilet by state, 1990
Data Source: INEGI, 1990 Mexican Census

Outmigration rates by state, 1990
Data Source: INEGI, 1990 Mexican Census
Regional processes.
Vernacular

Zacatecan construction typologies were researched over the course of the semester and became a catalog documenting the efficient use of local materials. Traditionally, natural resources like adobe brick, stone, and thatch have been ingeniously combined with newer technologies such as reinforced concrete, concrete block, and wood framing to provide places for living and working. These examples are used to illustrate J.B. Jackson's conception of the vernacular as a robust, evolving language that can easily absorb new processes introduced to it. Research suggests that the skilled builders of Zacatecas have by and large left the state, leaving room for a new, simpler type of building technology to interface with these existing typologies.

Masonry grain silos in Zacatecas.
Rotation molded products.

Structural logic.

Water pressure.
Component

The component introduced in the project is a lightweight, hollow form that optimizes its material performance in anticipation of its economic and social function. The hyperbolic paraboloid shell allows the component to form a cantilevered shelf. This top surface is perforated, forming a large roof grate used to collect rainwater, the most precious of resources in the arid climate of Zacatecas. The water is stored in the vessels in the piers, allowing the component to resist dead and lateral loads. Additionally, this water is stored above the ground level within the component, giving it water pressure and making it available for domestic and agricultural purposes without the use of an electric pump.
Weight of Components
HDPE = 44 lbs. per cubic foot

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Housing Assembly

As a housing system, the light plastic section components are connected horizontally by means of a simple clip detail, designed to be assembled with a minimum of construction skill and heavy machinery. Concrete floors can be cast into recesses in the forms.

Agricultural Assembly

As a agricultural system, components are connected similarly. Vessels are ganged together to provide a water source for a gravity-fed irrigation system.
Prosthetic use of component.
Scenario: Laguna Seca

A scenario is developed to illustrate the conditions in which the Vaso components could operate within and the the effects that their use could play a part in. Traditionally a region isolated from outside conditions, the Fresnillo municipio is currently one of the poorest in the state of Zacatecas. Many of the positive economic effects of outmigration are not apparent here as hometown families tend to move away from their towns instead of reinvesting in them. Like much of the rest of the state, its farmlands are quickly becoming pasture.
The scenario builds on the concept that these farms could participate in the commercial agriculture industry that has benefited nearby regions. Crops from this farmland could be grown by land owners and sold to commercial distributors in nearby towns.

A privately owned twenty acre farm, typical of this region is shown deploying the components both as a housing and agricultural technology in its transition from a vacant to a working condition.
Scenario: Laguna Seca

Plumbing riser diagram.

Site plan.
Housing Scenario
Rainwater Harvesting Data

Water Required:
- single family needs 40 gallons of water per day, living conservatively
  - 14,600 gallons per year
  - 45 day supply recommended
  - 1,800 gallons

Water Harvesting:
- 1630 sf roof of PET components
- 20" rainfall/year yields 15,573 gallons each year on this roof area
  - 264 gallon capacity of 48" long pier
- approximately 1 week supply in each 48" long pier when full

North elevation.

South elevation.

House floor plan.
Scenario: Laguna Seca

Crop row elevations.

Irrigation system.

Crop types.
Agriculture Scenario
Rainwater Harvesting Data

Peach season = April through September
Each tree needs 7 - 56 gallons per week, depending on age of tree

Water Required:
- 56 gwp scenario
  - avg. 9 trees per pair of PET components = 504 gpw
  - 12,096 gallons for 6-month season

- 10 gwp scenario
  - avg. 9 trees per pair of PET components = 90 gpw
  - 2,160 gallons for 6-month season

- maguey plant requires no irrigation - used for textiles, aguamiel, bags.

- alfalfa requires little irrigation - used for hay

Water Harvested:
- 512 sf per pair of PET components

- 20" rainfall/year yields 4,900 gallons each year on this roof area
  - harvest 6 months of this water

Farm row plan.

Farm perspective.
The Laguna Seca plot scenario is played out with drawings and images revealing the new environments created by organizing multiples of the plastic modules. There is an attempt to show the farm environments realistically, interfacing with a variety of other agricultural and domestic systems.
View in house looking towards crops.

View in house looking towards water-filled piers.

Exterior view.
The use of the components as a housing technology and as an irrigation technology simultaneously creates the need to "develop the section." A more general approach, applicable to a range of other projects, ensues. Preference is given to the working section, the methods of production, the detail, and models. The plan, on the other hand, becomes a matrix or schedule referencing specific sections and details. Inverting the traditional obsessions of architects, images from the project acknowledge and grow out of the workings of the real world.
Section showing building systems.

Section showing irrigation system.
Phase 1:
A Loaded Import

A U.S. roto-molder is hired by a private Zacatecan organization, backed by “three for one” funding to manufacture a line of self-build products. Manufacturer constructs a new line of molds in addition to other rotation mold products. The components are trucked to Zacatecan distributors who, in turn, truck the products to local markets. The products are used by Zacatecans both to create new housing and to revive a stagnant farming industry.

Phase 2:
Local Production and Distribution

Roto-mold facility is built in Zacatecas and takes over the production of components, employing local labor, increasing local tax revenue, and offering lower prices due to less trucking and avoiding transnational commerce fees.

Phase 3:
From Exporting People to Exporting Products

Components are exported transnationally for a variety of uses including permanent housing, disaster-relief housing, highway infrastructure, and commercial uses. The components could become a player in the attempt to retain and return population by giving Zacatecans viable alternatives to migrating.
Flow chart showing application and effects of product over time.
Assembly Instructions

Site preparation.

Creating shelter.

Tapping the vessel.

Pouring a concrete floor.
Installing plumbing fixtures.

Installing windows.
A project that the current U.S. administration is proposing is a guest-worker program, which would legalize approximately 10 million illegal migrants working in the country. The immediate effects of such a program might include establishing a minimum wage for these laborers, and providing health care and benefits for them and their families. It would also mean taxing their incomes for federal and social security programs. But what about the matter at hand, discussed in this thesis project? How would the guest-worker program affect remittance payments, outmigration, and the economic development of rural Mexico?

The guest-worker program would undoubtedly lead to a decline in the amount of remittance money sent home by Mexicans working in the U.S. Illegal workers, becoming legalized, would want to bring their families over, thus eliminating the need to send money home or invest in projects for rural Mexico. Further, we can speculate that the populations of the small Mexican town would dwindle to such small numbers, that no population could be sustained there. Towns populated with the wives and children of the workers in the States could easily disappear altogether, as these remaining family members would leave to join the fathers and brothers.

If the existing system has a benefit for rural Mexico, it is actually that it is so easy to loophole. An issue of quantity and quality arises: retain the millions of illegal, low-paying, and dangerous jobs or legalize and begin to provide better working conditions and better pay for these jobs. A simple economic formula expands on this: as wages increase, the price of goods and services will increase. And as prices increase, the supply or quantity of goods and services will fall, meaning fewer jobs. Suddenly, the migrant workers would be competing with the U.S. labor supply.
Could this competition and increase in price eventually drive Mexicans in the U.S. home to Mexico, where prices would still be cheaper? Would if force Mexico to develop more self-sustaining agriculture and industry sectors, rather than attaching itself onto the U.S. economy? What would happen to the labor tensions on border industries, typified by the U.S.-owned maquiladoras? And, central to ideas presented in this thesis, would Mexico begin to take seriously the development new agriculture technologies to remain competitive in a truly open NAFTA market?

I think the immediate answer is no. The Mexican government will not immediately be able to develop effective big programs to enable quick economic development within the country. This prediction further makes the case for developing projects, products, and systems that individuals alone can control. A project like the one laid out in this thesis might represent such a system – one that would involve a relatively little amount of initial investment and have a payoff that might affect social, economic, and spatial realms.
BIBLIOGRAPHY


This collection of projects by contemporary American architects and community-based organizations illustrates recent attempts to perform “good deeds” through design and construction services. In short synopses of the projects by students, architects, and community members involved, emphasis is placed on effective methods of providing design services to “the 98% without access to architects.” Part description of projects and part propaganda (in the most positive sense), the work illustrated is intended to motivate architects and students to reevaluate their practices, and to begin to incorporate new territories to remain relevant in the contemporary cultural landscape.


Easterling analyzes organizations traditionally overlooked by architectural discourse (highways, house construction) as designs themselves. Tries to develop new venues for architects to work in/reterritorize.


Freire examines and speaks out about the role of education in the lives of oppressed people across the world. He maintains that “top down” information-based educational strategies, typifying situations all over the world, do not em
power students, maintaining an oppressed condition. Students do not learn how live, act, and interact with the world. In short, students do not learn cognition - the transfer of information fails to create sustainable communities among the oppressed. Fundamentally, Freire optimistically envisions oppressed communities “learning to perceive social, political, and economic contradictions, and to take action against the oppressive elements of reality.”


This collection of essays by J.B. Jackson, the “inventor” of cultural landscape studies, examines American landscapes and how man-made environments and inventions interface with it. Jackson looks historically at the types of use of the American landscape, from Native American settlement patterns, to mobile home communities, to highways and contemporary city infrastructure.


“The Savage Mind” is a cornerstone of Structuralist thinking. In it, Levi-Straus lays out specific methods of working, finding common contingent approaches in the “savage” and engineering modes. Paticularly interesting is the method of the bricoleur - appropriating and recombining found and adjusted material with specific effects in mind.

Lucy Lippard interweaves narrative and critical writing on contemporary art, history, land use, and cultural geography to produce a vivid image of the meaning of the “local” contemporary America. She finds meaning in contemporary places in unexpected locations. She explains how we perceive the landscape and how landscape affects our politics, social customs, designs, and art.


A key book in 60's and 70's optimistm, in line with Illich. Schumacher is a humanist economist - and remains optimistic that if methods of capitalist production include the human factor, prosperity among all people of the world can come about.


I'm interested in Smithson's personal yet systematic approach to understanding and documenting landscapes.

Willis argues for a return to a “heavy” architecture. Citing ideas found in convivial societies, he criticizes current architectural production as lacking “fulfillment, spirituality, a sense of belonging, weight.” He ultimately offers some hints at a new direction, but fails to be precise in his prescriptions.