

MANUFACTURING BYPRODUCT REUSE NEWARK, NEW JERSEY

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FALL 2013 COMMUNITY DEVELOPMENT STUDIO

In partnership with the **City of Newark Office of Sustainability**

RUTGERS

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PRESENTATION OVERVIEW

Introduction

Part 1 – Preliminary Research & Takeaways

- Research Scope
- Research Summary
- Reuse in Practice
- Reuse for Newark
- Evaluating Reuse Programs

Part 2 – Proposed Spring 2014 Studio Activities

- Objectives and Methodology
- Manufacturing Site Visits
- Site Visit Documentation
- Additional Research
- Spring 2014 Timeline

Conclusion

References

INTRODUCTION

Project Scope & Goals

Project Scope

City-led program to divert a portion of Newark's industrial discards from the waste stream for productive reuse

Office of Sustainability's Reuse Program Goals

- Create new businesses and jobs for Newark residents
- Divert waste from landfill and incineration
- Strengthen Newark's existing manufacturing sector

PART I

PRELIMINARY RESEARCH & TAKEAWAYS

RESEARCH SCOPE

- Fall 2013 research scanned activities achieving one or more of the City's goals
- Activities incorporate a range of waste streams and are led by both public and private actors

Waste Streams

Sector

- Industrial
 - Manufacturing byproducts
 - Shipping and packaging materials
- Residential
- Commercial/Business
- Construction/Demolition

Geography

- Municipal
- County/Regional
- National/International

Primary Actors

- Government
- For-profit company
- Non-profit organization

RESEARCH SUMMARY

Job Creation, Waste Diversion & Manufacturing Support

Job Creation Through Business Development

- “Waste-to-profit” businesses use discarded materials as primary inputs
 - Cost savings over virgin materials; generally reliable sourcing
- Materials drawn from all waste streams
- Typically small, for-profit companies; often locate near existing manufacturing
- Job types and quality range widely, from retail to product inspection
- Most viable when market demand for raw commodities is high
- Industry and type of reuse activity impact job generation potential
 - Remanufacturing > Recycling with disassembly > Conventional Recycling

RESEARCH SUMMARY

Job Creation, Waste Diversion & Manufacturing Support

Policy Strategies to Divert Waste

- 'Zero Waste' policies: Diversion activities through government regulation
- Generally focused on residential/commercial waste streams
- Landfill bans on particular materials; "Pay-as-you-throw" policies
- Construction/demolition waste recycling and deconstruction programs

RESEARCH SUMMARY

Job Creation, Waste Diversion & Manufacturing Support

“Industrial Symbiosis” Supports Existing Manufacturing

- Firms exchange byproducts to their collective competitive advantage, resulting in more efficient resource consumption
- Generally focused on industrial waste streams
- Cost savings from substituting neighboring firms' discards for more expensive virgin materials
- Relationships and information sharing fostered between firms

REUSE IN PRACTICE

Four Programs Profiled to Illustrate Range of Potential Activities

- Different waste streams
- Led by different types of actors
- All achieve some/all of City's reuse program goals

- Policy Approach
 - Zero Waste Program (San Francisco, CA)

- Industrial Symbiosis
 - Industrial Ecosystem Development Project (Research Triangle, NC)

- Materials Salvage and Retail
 - Urban Ore (Berkeley, CA)

- Recycling/Reuse Business
 - TerraCycle (Trenton, NJ)

REUSE IN PRACTICE

Policy Approach – Zero Waste Program (San Francisco, CA)

- Regulatory approach with environmental and economic goals
- Municipal waste reduction/reuse initiatives began in 1989
 - Led by SF Department of Environment
- 80% of waste diverted in 2011; Goal is 100% by 2020
- Initiatives follow waste reduction hierarchy: first reduce waste, then reuse, finally recycling and compost



SF Environment

Our home. Our city. Our planet.

A Department of the City and County of San Francisco

sfgov.org

REUSE IN PRACTICE

Policy Approach – Zero Waste Program (San Francisco, CA)

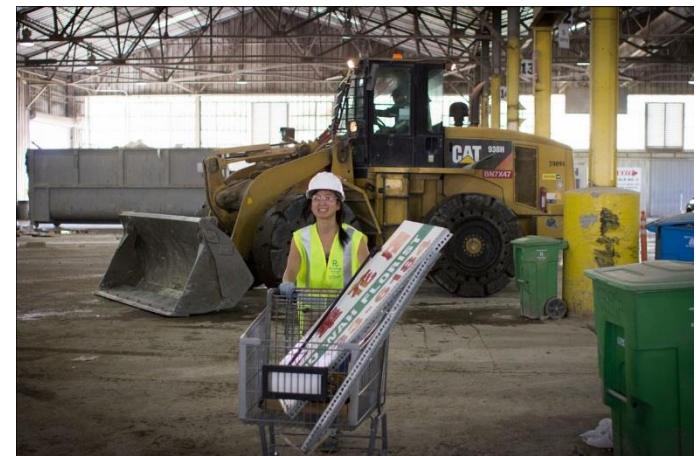
City Role in Waste Hauling & Management

- San Francisco contracts with a sole waste hauler, Recology
- Recology's mission: resource recovery (vs. simply managing waste)
- Single-hauler system enabled by Refuse Collection and Disposal Ordinance



Takeaways

- Multifaceted, impactful regulatory approach to waste diversion
- City relationship with mission-aligned private hauler is critical to success
- For further research:
 - Implementation challenges
 - Participation of/impact on small manufacturing businesses
 - Cost savings and economic development impacts



recology.com

REUSE IN PRACTICE

Industrial Symbiosis – Industrial Ecosystem Development Project (Research Triangle, NC)

- **Regional manufacturing network developed 1997-1999 by North Carolina's Triangle J Council of Governments**
- **Primary project funding: \$162,888 US EPA grant**
- **Industrial businesses throughout 6-county region surveyed to identify opportunities for byproduct exchange between firms**
- **Resulted in potential matches for 48% of participating firms concerning exchange of 49 different materials**



REUSE IN PRACTICE

Industrial Symbiosis – Industrial Ecosystem Development Project (Research Triangle, NC)

Survey Methodology

- 182 of targeted businesses (53%) completed survey
- Traditional survey instrument and on-site interview components
- Businesses asked to identify their inputs and outputs from materials list
- GIS maps created to indicate location of materials throughout region
- Extensive local partnerships involved in survey development/execution

Takeaways

- Regional scale may have been critical to success
- Some cost savings generated, but environmental benefits found to outweigh economic gains
- For further research:
 - Long-term project results
 - Logistics of creating partnerships between firms

REUSE IN PRACTICE

Materials Salvage and Retail – Urban Ore (Berkeley, CA)

- For-profit materials salvage and retail enterprise founded in 1980 with mission to ‘end the age of waste’
- Core activities include
 - Onsite materials recovery and resale
 - Offsite materials salvage
 - Consulting on development of resource recovery facilities
- Operates 3-acre ‘Ecopark’ with 30,000 SF warehouse and outdoor sales floor



urbanore.com

REUSE IN PRACTICE

Materials Salvage and Retail – Urban Ore (Berkeley, CA)

Job Creation

- Approximately 40 full-time employees
- Living wage, extensive benefits; Required weekend work, physical labor

City Role

- City of Berkeley contracts Urban Ore as waste salvage operation
- Provided first location rent-free
- Continued business and fiscal support

Takeaways

- Successful for-profit salvage and resale business model
- City incubation and ongoing support critical to success
- Access to warehouse/resale space can pose significant challenge
- For further research
 - Portion of waste from manufacturing
 - Details of construction/demolition waste recovery
 - Pay range for different job types

REUSE IN PRACTICE

Recycling/Reuse Business – TerraCycle (Trenton, NJ)

- For-profit company upcycles and recycles previously non-recyclable waste into new products
 - **Upcycling** – Reusing discarded items in their original form to create a new product
 - **Recycling** – Processing discarded items to create new products
- Partners with major corporations, local organizations, and individuals to collect post-consumer and post-industrial waste
- In-house R&D teams develop products with these waste streams to be sold by major retailers



terracycle.com

REUSE IN PRACTICE

Recycling/Reuse Business – TerraCycle (Trenton, NJ)

Corporation Role

- Pay TerraCycle to collect their non-recyclable products/packaging
- Send some manufacturing and shipping byproducts directly
- Relationships ensure consistent, high-volume waste streams and ongoing expansion potential

Takeaways

- Profitable manufacturing business using otherwise discarded materials as inputs
- Upcycling potential constrained by consistent access to large volume of intact discards
- Recycling model requires less waste stream consistency if sufficient pool of discards can be collected to reprocess into raw material
- For further research
 - Details of plastics recycling process (costs, equipment, jobs, etc.)

REUSE FOR NEWARK

Theoretical Models for Byproduct Reuse

Internal Manufacturer Reuse
Manufacturer



Manufacturer-to-Manufacturer Byproduct Exchange

Manufacturer → **Manufacturer**

Conventional Industrial Recycling

Manufacturer → **Recycling Facility**

Byproduct Warehouse or Retail Facility

Manufacturer → **Retail Facility** → **Consumer**

New Reuse Business

Manufacturer → **New Reuse Business**

Byproduct Processing Facility

Manufacturer → **Processing Facility** → **Manufacturer**

REUSE FOR NEWARK

Manufacturer-to-Manufacturer Byproduct Exchange

Manufacturer  Manufacturer

- Technical expertise (Industrial Resource Center) might facilitate matches
- Short distances between firms may enable easy transportation
- Limited by variable discard streams, low volume, and cost-efficiency of transporting and processing discarded materials

Byproduct Warehouse or Retail Facility

Manufacturer  Retail Facility  Consumer

- Some end users may value lack of uniformity across discards
- City-operated warehouse would require extensive ongoing involvement
- Job generation potential and financial sustainability may be limited

REUSE FOR NEWARK

New Reuse Business

Manufacturer → New Reuse Business

- City could incubate (provide space, equipment, technical assistance, etc.)
- Variability and low volume of byproduct streams may favor unique, artisanal products over mass production/standardization

Byproduct Processing Facility

Manufacturer → Processing Facility → Manufacturer

- Potential for aggregating and reprocessing depends on volumes of common raw materials discarded by different firms
- City assistance in collecting and distributing discards might be needed to make business models work

EVALUATING REUSE PROGRAMS

- Tool created to guide decision making for any proposed reuse program
- Series of questions grouped into 5 types of program considerations
- Evaluative framework for use in early program conceptualization phases and throughout program development

CRITERIA FOR EVALUATING REUSE PROGRAMS

Waste Diversion and Environmental Impact

What volume of discards will this reuse model divert from landfill and incineration?

Does the model require substantial transportation of materials? Will it generate substantial traffic or pollution from hauling?

Do end user activities (such as remanufacturing businesses) generate any harmful environmental impacts?

Job Creation and Economic Development Impact

How many jobs will this type of reuse activity create?

What kinds of jobs will be created (including but not limited to: hauling, processing, sorting, retail, disassembly, production, reassembly, research & development, product inspection)?

How many new jobs will be for city employees? How many will be private-sector jobs?

What wages are associated with these jobs?

What occupational hazards are associated with these jobs?

Are they part-time, full-time, or seasonal jobs?

Are these jobs accessible to the local workforce?

Benefits and Costs to Manufacturers

Does this model generate savings in hauling costs for existing manufacturers?

Does this model provide existing manufacturers with new, cheaper inputs for their production process? Will it require them to process or treat discarded materials before reusing them in production?

Does this model promote useful partnerships between existing manufacturers?

Does this model help existing manufacturers to make their production processes more efficient or sustainable?

Will this model require ongoing time investments from manufacturers (including but not limited to: time spent updating a website, time spent sorting discards)?

Will this model require manufacturers to provide additional space to house materials awaiting reuse?

Will this model require manufacturers to transport any materials for exchange?

Will this model incentivize or incubate new manufacturing businesses?

Requirements for Discarded Materials

Does the model work best with a greater volume of inputs? Are there benefits to expanding the waste stream in terms of geography, or sourcing non-manufacturer waste?

Does the model require a consistent volume of inputs?

Does the model require inputs to be uniform (in shape, size, color, or other characteristics)?

Does the model work best with small scraps or with intact materials?

How high is market demand/pricing for the materials to be reused?

City Involvement and Resource Requirements

What up-front and ongoing financial investment will this model require?

Will the city need to rent or purchase a space?

Will the city need to facilitate materials transportation?

Will the city be involved in ongoing program management?

Will the city be involved in identifying markets or institutional buyers for reused products?

Will the city be involved in creating exchanges or partnerships between existing manufacturers?

Will the city be involved in incubating small businesses? Will it provide space, equipment, or other expertise?

Will the city use any regulatory incentives to promote waste diversion?

EVALUATING REUSE PROGRAMS

- 1 Job Creation and Economic Development**
- 2 Waste Diversion and Environmental Impact**
- 3 Benefits and Costs to Manufacturers**
- 4 Requirements for Discarded Materials**
- 5 City Involvement and Resource Requirements**

PART 2

PROPOSED SPRING 2014 STUDIO ACTIVITIES

SPRING 2014 OBJECTIVES & METHODOLOGY

Objectives

- Learn about Newark manufacturing firms' discarded durable materials and waste removal processes
- Gather Newark manufacturers' feedback on potential reuse programs, including perceived benefits and challenges
- Explore opportunities for expanding waste stream beyond Newark's manufacturing discards
- Further investigate existing reuse programs

Methodology

- Manufacturer Site Visits
- Expanded Case Study Research
- Consultation with Experts

MANUFACTURER SITE VISITS

Benefits

- Comprehensive, multimedia data collection
- Adaptable to different business types and time constraints
- Clear communication of project goals

Logistics

- 25-30 Site visits/interviews
- Length: Approx. 30 minutes
- Interviewee: Member of firm management team
- Interviewers: 2-3 studio team members
- Documentation: written notes and photographs

MANUFACTURER SITE VISITS

Components

- 1 Durable materials currently discarded
- 2 Waste removal process and costs
- 3 Manufacturer feedback on benefits and challenges of reuse

Implications

- Nature and volume of discards suggests certain reuse models
- Waste removal process indicates feasibility of materials recovery
- Current inputs inform potential demand for recycled materials
- Waste management details inform cost savings potential
- Frequently used waste hauler(s) could be contracted to transport discards

SITE VISIT DOCUMENTATION

Site Visit Review Documents

- Created for each firm visited
- Snapshot of manufacturing process, discards, waste removal, and feedback on a potential materials reuse program
- Images of products, discards, and removal process help illustrate each manufacturer's 'story'
- Could be shared with end users or used for program/firm publicity

Textiles and Foam

Textile byproducts include cotton, synthetic fabrics, and leather. During the manufacturing process these materials, as well as foam, are cut out with a pattern. The negative pieces from the pattern are considered byproducts (seen in the images). Currently textile byproducts are kept in a separate container during the manufacturing process but are added to the trash dumpster and collected by the trash hauler.



SITE VISIT DOCUMENTATION

Manufacturer Database

Relational Database

- Catalogues information in discrete tables
- Firm info and site visit details
- All durable materials discarded
- Waste removal details

Benefits

- Tables linked via Manufacturer code
- Standard values/measures for streamlined analysis
- Sortable to easily identify trends
- Office of Sustainability can manage after Spring 2014 studio
- Potential basis for online inventory/exchange platform to support City's ultimate reuse program

SITE VISIT DOCUMENTATION

Manufacturer Database

Discards Inventory

- Item Description
- Classification
- Raw Material
- Frequency
- Volume
- Variation in Volume

Manufacturer	Item Description (100 Characters or Less)	Classification	Raw Material	Frequency	Volume	Volume Variation
ZaGO	Stainless steel scraps: Curly shavings, shortened ends of screws	Byproduct	Metals	Monthly	1.5 barrels	Highly Variable
ZaGO	Metal drums	Shipping Material	Metals	Sporadic	1 in several months	Highly Variable
Unionwear	Corrugated Cardboard Boxes	Shipping Material	Paper	Weekly	1 cart	Some Variation
Unionwear	Paper scraps from cut-out sewing patterns	Byproduct	Paper	Weekly	Small?	Constant
ZaGO	Corrugated Cardboard Boxes	Shipping Material	Paper	Unknown	Unknown	Unknown
ZaGO	Polyurethane and resin mix shavings ("sawdust")	Byproduct	Polymers	Unknown	Unknown	Some Variation
ZaGO	Rubber: shavings and larger pieces with extracted patterns	Byproduct	Polymers	Daily	30-32 rubber circles	Highly Variable
ZaGO	Office furniture: chairs, drawers, filing cabinets	Other	Reusable Goods	One-time	Unknown	Not Applicable
Unionwear	Cotton & synthetic fabric scraps, leather scraps, sheet foam scraps	Byproduct	Textiles	Weekly	1-2 carts	Constant
Unionwear	Shipping pallets	Shipping Material	Wood	Weekly	25 pallets	Constant
ZaGO	Sample moldings carved from wood	Byproduct	Wood	Unknown	Years' worth of old samples	Unknown
ZaGO	Shipping pallets	Shipping Material	Wood	Unknown	Unknown	Unknown

ADDITIONAL RESEARCH

Waste Stream Expansion

- Successful examples source waste from broad geography and incorporate participation across multiple sectors

Sector

- Residential waste
- Commercial/business waste
- Building materials and construction waste

Geography

- Neighboring municipalities
- Essex County / Broader region
- Waste transfer station catchment area

ADDITIONAL RESEARCH

Existing Programs

Reuse & Recycling Businesses

- Recycling-based manufacturing
- Salvage and retail
- Shipping pallet reuse
- Waste management and resource recovery

Waste Diversion Policies

- Manufacturing-focused Zero Waste policies
- “Recycling Market Development Zones”
- Municipality-Hauler relationships

SPRING 2014 TIMELINE

January (Before Semester)

- Schedule initial manufacturer site visits
- Schedule studio orientation activities
- Outreach to experts
- Map Newark manufacturing businesses

January (Semester Start)

- Studio orientation: group tours and outside speakers
- Train expanded studio team for site visits
- Begin additional research activities

February – April

- Conduct and document manufacturer site visits
- Continue additional research

May

- Complete research documentation
- Present research findings to Office of Sustainability

CONCLUSION

Takeaways & Directions for Further Investigation

Preliminary Research Takeaways

- Program design depends largely on City's preferred role
- Prioritize programs with highest proven job creation potential
- Consider hybrid programs and co-locating different reuse activities
- To achieve waste diversion and job creation goals, consider expanding program inputs beyond Newark's manufacturing discards

Proposed Activities for Spring 2014

- Site visits offer critical insight into Newark's manufacturing sector and discards
- Explore augmenting waste streams and further research existing reuse programs

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