Industrial Footprint Project

Final Report
State Innovation Grant
U.S. EPA Grant Number EI-96028401

by

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March 2014

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Olympia, Washington

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Acknowledgements

The authors of this report would like to thank the following people for their contribution to this study:

- Mill participants
- U.S. EPA Office of Innovation and Region 10
- Earth Economics
- Center for Sustainable Economy/Redefining Progress
- Dr. William Beyers
- Bill Kammin

Executive Summary

The primary goals of the Industrial Footprint Project were to:

- Develop a sustainability "footprint" tool for the pulp and paper industry, measuring environmental, social and economic performance at individual facilities.
- Use this tool to demonstrate how the current focus on environmental permitting and other regulatory work can be more directly tied to these three domains while improving environmental performance.

In the current regulatory world of environmental permitting, two things take place:

- It maintains the status quo, providing no positive incentive for a facility/business to improve their environmental performance. Permit limits often stay in place for long periods of time, as changes in regulation take time. When market mechanisms provide facilities with an incentive to improve, they then operate well below their permit limits and fear their choice to change will bring on stricter regulations.
- We focus on environmental performance, ignoring its interconnectedness to economic and social performance.

To provide businesses with incentive to improve, environmental management systems (EMS) and sustainability reporting came into existence. These reports give the company a chance to share a snapshot of what's happening, discuss their decision making process transparently, provide commitments of changes to make, and then report on progress toward those commitments.

However, most often these reports:

- Are largely narrative.
- Often present data rolled up as a percentage or rate rather than sharing discreet data points at individual locations.
- Present information in a way that does not reflect the interconnectedness between social, economic and environmental performance.

The footprint measurement tool is an attempt to fill the gap between these two worlds. Reporting a consistent numerical set of data over time can lead to better decision making, highlight trade-offs that may take place between domains, and lead to effective actions that minimize or improve impacts a facility has on its local community and environment.

Conclusions and Recommendations

We achieved the goal of developing a draft sustainability measurement ("footprint") tool and scores for 4 pulp and paper facilities. More resources are needed to provide greater insight into the analysis and remaining outcomes.

Findings:

- Replace all reference to "footprinting" with "sustainability measurement", as use of the word "footprint" is inaccurate.
- Investment in stakeholder work makes a stronger analysis.
- Set geographic boundaries early in the development stage.
- Invest in a robust quality assurance project plan (QAPP), amending as needed.
- Allow sufficient time to collect data.
    - Facility staff need time to collect data beyond their normal regulatory compliance requirements
    - Each facility may have different filing systems and some take longer than others to collect data
    - Facilities often need to consult legal counsel before releasing data
    - Confidentiality agreements may need drawn up and signed
- Assure the baseline year is reasonably representative of normal production for the facility.
- Review current ecological economics and sustainability reporting mechanisms to insure the analysis uses accepted economic practices.
- If not submitting data by using online forms, all participants need to use the same software when inputting data into the spreadsheets. Using different software versions corrupts files.

Recommendations:

- Collect more than two years of data to test:
    - Sensitivity of the footprint tool to detect change, determining how often to collect data, using resources efficiently
    - Usability to ensure reliability. The footprint tool is unstable in its current format and needs more testing before releasing for general use.
- Identify and implement priority projects, focusing on what provides the most significant improvement in overall score
- Analyze pulp and paper sector
    - Recruit mill's whose processes were not captured in this phase
- Recruit another industrial sector to test transferability of tool
- Incorporate this approach into Ecology's pollution prevention planning work
- Update tool as needed, keeping record of changes to maintain transparency
- Research target setting to:
    - Reduce reliance on the base year comparison scoring mechanism
    - Develop a scoring mechanism for targets set at 0
- Incorporate more indicators as appropriate

- Normalize the data set to allow comparison of mills
- Update QAPP
- Develop online reporting forms for collecting data
- Create inactive graphic to illustrate change over time
- Incorporate stakeholder suggestions not included in this phase, as appropriate
- Research incentives to encourage/retain facility participation

Project Description

The Washington State Department of Ecology (Ecology) received a State Innovation Grant from the U.S. Environmental Protection Agency (EPA) to develop a sustainability performance measurement tool for the pulp and paper industry, complimenting sustainability reporting (such as the Global Reporting Initiative and Facility Reporting Project) and compliance-based permitting. The tool provides a numeric "footprint" score for the three recognized domains of sustainable development: environmental, economic and social impacts (also known as the triple bottom line or 3-legged stool of sustainability).

The project's goal was to evaluate whether such a footprint could be measured and, if so, to assess how it might form the basis of an innovative approach to permitting and regulation of a major industry sector. The desired outcome was to improve effectiveness of regulatory work, emphasizing environmental results rather than the means to achieve them (permits).

The initial proposed objective of the footprint tool was to produce a:

- Baseline sustainability measurement ("score") for:
  - Each participating facility.
  - The pulp and paper sector.
- Comparison of sustainability performance:
  - Between participating facilities.
  - Between facilities with an environmental management system (EMS) and those without.

Every mill in the state was contacted, with hopes that 8 would join the project. The following 5 volunteered to participate.

Table 1. Facility participants

Facility	Location	Description
Boise White Paper, LLC (Boise)	State Highway 12, Wallula, WA, on the Columbia River, approximately 12 miles SE of Pasco, WA	Kraft pulp and paper mill, producing about 1600 tons of bleached market pulp, fine coated paper, and corrugated medium each day. A container plant produces about 5.2 million square feet of corrugated boxes each day. These employ about 400 people.
Grays Harbor Paper (GHP)	801 23rd Street, Hoquiam, WA, on Grays Harbor and the Hoquiam River	Non-integrated paper mill, closed since this project took place. In 2006, the mill produced about 456 tons of fine paper each day using purchased bleach Kraft and process chlorine free post-consumer recycled pulp. It

Facility	Location	Description
		employed about 233 employees.
Nippon Paper Industries USA (NPI)	1902 Marine Drive, Port Angeles, WA, on the base of Ediz Hook in the Salish Sea	Thermomechanical newsprint and deinking pulp and paper mill, producing about 158,270 salable tons of telephone directory paper in 2011. Approximately 50% of the pulp came from deinking and recycling outdated newsprint papers and telephone directories. It employs about 246 employees.
Port Townsend Paper Corporation (PTPC)	100 Mill Road, Port Townsend, WA, on Port Townsend Bay in Glen Cove	Unbleached Kraft pulp and paper mill producing approximately 625 tons each day. An old corrugated cardboard recycling plant on site produces about 267 tons each day. These employ about 325 people.
Simpson Tacoma Kraft (Simpson)	801 Portland Avenue, Tacoma, WA, on Inner Commencement Bay	Kraft pulp and paper mill, producing about 1300 tons of bleached and unbleached packaging-grade paper and unbleached Kraft pulp each day. It employs about 400 people.

PTPC suspended their participation in the project in December 2009, to focus on mill improvement projects, prior to finishing collection of their data set. While some data was collected for this facility (Appendix B), we did not calculate a baseline footprint score for this facility due to the lack of a complete data set.

Each mill has diverse processes, products, ranges of production and permit requirements. We ultimately found it inappropriate, technically infeasible, and inadvisable to compare facility scores to one another. In a metaphorical sense, comparisons between mills would be similar to making a comparison between apples and oranges, resulting in conclusions that apples were redder and oranges more acidic than the other. While this observation is accurate, it isn't useful to achieving the goals of the project. Comparisons between mills could be made if the units of measure for each data point were relative (e.g. environmental impacts per million dollars gross revenue, per million dollars profit, per job created, per million dollars in tax revenue). This information is proprietary or confidential information and beyond the scope of this project.

We were also unable to create a overall pulp and paper sector score due to the limited number of mills willing to participate. Such a score requires a more complete representation of the sector, including mills with other processes and products (such as a tissue paper manufacturer).

Indicators

Indicators are measureable data points of performance at a specific point in time. After hiring Earth Economics and Redefining Progress/Center for Sustainable Economy, we conducted research on possible indicators for the project based on:

- Knowledge of the pulp and paper sector.
- The Ceres' Facility Reporting Project.
- International sustainability reporting by pulp and paper organizations (Global Reporting Initiative, ISO 14001).

We then held public meetings in each mill's community to collect input on appropriate indicators for each domain.

Stakeholder Engagement

At least one initial public meeting was held in each mill's community to gather input on indicator selection. We employed several public involvement strategies, including:

- An e-mail distribution list of individuals and organizations interested in regular project updates and announcements.
- A regularly updated project webpage.
- Public notices in local newspapers a week or more before each public meeting.
- News releases to the associated press several days before each event.
- An on-line informal comment collection form.

Public meetings followed a similar formal at all locations:

1. General introduction and project overview presented by Ecology.
2. Presentation by mill representatives on project participation.
3. Small-group brainstorming session in which participants were given opportunity to generate potential indicators for each domain.
4. Full group review of indicator brainstorming results.
5. Large group preference rating process in which all participants were provided with 3 colored dot stickers to place on the indicators that held the greatest importance from their perspective on development of the final footprint tool indicator sets. Rating preference data were collected for general reference in subsequent stages of indicator selection and weighting, and it was explicitly stated that the preference rating process didn't in any way represent a voting process.
6. Summary of progress and next steps.

A second round of public meetings was held in all mill communities except Port Townsend. The agenda for these events followed a similar format:

1. Introduction and project review
2. Presentation of detailed information on indicator selection, the draft footprint tool, weighting and scoring.
3. Open discussion to gather stakeholder input on any aspect of the project and tool development, with emphasis on opportunities for future improvement.

Selected Indicators

We received over 800 indicator suggestions during our stakeholder involvement activities (see Appendix C). Of these, we combined similar indicator suggestions and reviewed each for feasibility, based on availability of data at all facilities to insure a consistent data set. At this point, we still hoped to achieve creation of an overall sector analysis. A consistent data set is key to this effort.

We ultimately selected 71 indicators (38 environmental, 14 economic, and 19 social). 22 of these are based on regulatory compliance. 49 are "beyond compliance", meaning there is no legal requirement for a pulp and paper mill to report this information. The participating facilities voluntarily chose to collect and report these data points.

Table 2 Environmental Indicators

Identifier	Aspect	Indictor
ENV1	Air Quality	Polycyclic Aromatic Hydrocarbon (PAH emissions National POM 71002 list: • Benz(a)anthracene • Benzo(a)pyrene • Benzo(b)fluoranthene • Chrysene • Dibenz(a,h)anthracene • Indeno(1,2,3-cd)pyrene • Acenaphthene • Benzo(ghi)perylene • Fluoranthene • Fluorene • Naphthalene • Phenanthrene • Pyrene
ENV2	Air Quality	Formaldehyde emissions
ENV3	Air Quality	Chloroform emissions
ENV4	Air Quality	Nitrogen oxide emissions
ENV5	Air Quality	Sulfur oxide emissions
ENV6	Air Quality	Particulate matter (PM) emissions
ENV7	Air Quality	Carbon dioxide (CO_2) emissions
ENV8	Air Quality	Total emissions to permit limit
ENV9	Air Quality	Total greenhouse gas emissions to CO_2 equivalents
ENV10	Air Quality	Total reduced sulfur (TRS) emissions
ENV11	Air Quality	Methylethylketone (MEK) emissions
ENV12	Air Quality	Lead emissions
ENV13	Air Quality	Mercury emissions
ENV14	Air Quality	Acetaldehyde emissions
ENV15	Air Quality	Propionaldehyde emissions
ENV16	Air Quality	Hydrochloric acid emissions

Identifier	Aspect	Indictor
ENV17	Air Quality	Barium emissions
ENV18	Air Quality	Manganese emissions
ENV19	Energy Consumption	Net consumption of purchased electricity and fuel
ENV20	Energy Consumption	Energy used/sold from cogeneration
ENV21	Energy Consumption	Intensity of energy used per unit of production
ENV22	Energy Consumption	Percent of energy use from renewable sources
ENV23	Environmental Management	Index of environmental management system levels
ENV24	Raw Materials	Percent of raw materials input from recycled/reused sources
ENV25	Raw Materials	Percent raw fiber and biomass energy materials from FSC/SFI certified sources
ENV26	Raw Materials	Average percent of recycled fiber content in products
ENV27	Raw Materials	Raw material intensity
ENV28	Regulatory Compliance	Percent of monitoring period in compliance
ENV29	Regulatory Compliance	Percent of time below permit limits
ENV30	Waste Disposal	Percent recycled, composted or re-used
ENV31	Waste Disposal	Percent landfilled to total tons
ENV32	Water Intensity	Net water consumption
ENV33	Water Intensity	Raw water intake per unit of production
ENV34	Water Quality	Temperature difference between incoming and outgoing water
ENV35	Water Quality	Discharge biological oxygen demand (BOD) as percent of permit limit
ENV36	Water Quality	Total suspended solids (TSS) discharged as percent of permit limit
ENV37	Water Quality	Adsorbable organic halide (AOX) output
ENV38	Biodiversity Conservation	Percent of undeveloped acres of facility owned land protected as habitat

Table 3 Economic Indicators

Identifier	Aspect	Indicator
ECON1	Economic Impact	Regional economic impact – income
ECON2	Economic Impact	Regional economic impact – tax revenue
ECON3	Economic Impact	Regional economic impact – jobs
ECON4	Regional Economy	Percent of purchases procured regionally
ECON5	Regional Economy	Percent of purchases procured regionally
ECON6	Economic Impact	Net capital investment in facility
ECON7	Community Involvement	Total spending on habitat conservation/restoration
ECON8	Community Involvement	Contributions to charities and non-profit organizations
ECON9	Community Involvement	Contributions to local education
ECON10	Economic Development	Recycled/reused market creation
ECON11	Jobs	Average compensation including benefits
ECON12	Jobs	Percent of total jobs at family wage level

Identifier	Aspect	Indicator
ECON13	Jobs	Percent of total jobs providing benefits
ECON14	Customer satisfaction	Claims paid including returns

Table 4 Social Indicators

Identifier	Aspect	Indicator
SOC1	Community Involvement	Volunteerism for local education
SOC2	Community Involvement	Volunteerism for community benefits
SOC3	Community Involvement	Number of social awards
SOC4	Environmental Nuisance	Number of odor complaints
SOC5	Environmental Nuisance	Intensity of operational traffic
SOC6	Health and Safety	OSHA Compliance
SOC7	Health and Safety	Safety incidents, injuries, accidents
SOC8	Health and Safety	Wellness programs and benefits
SOC9	Health and Safety	Trained incident responders
SOC10	Health and Safety	Emergency and safety planning
SOC11	Human Rights	Demographic diversity
SOC12	Employee Relations	Benefits for family leave
SOC13	Employee Relations	Workplace satisfaction
SOC14	Employee Relations	Wage distribution gap
SOC15	Employee Relations	Labor representation
SOC16	Employee Relations	Workforce turnover rate
SOC17	Employee Relations	Employee training
SOC18	Employee Relations	Benefits beyond compliance
SOC19	Employee Relations	Labor relation incidents

Data Collection

The first step in data collection was writing an EPA approved Quality Assurance Project Plan, available at https://fortress.wa.gov/ecy/publications/summarypages/0907046.html.

We collected 2006 data as a baseline for each facility, and 2007 data as a comparison year to calculate a footprint score.

We hired Dr. William Beyers to adapt Washington State's Input-Output (I/O) Model to produce the economic multiplier effect of each mill on its community. The I/O model quantitatively represents the interdependency of two economies, in this case each individual mill and its specific community. The model generates the economic multiplier effect, showing the ripple effect of how each dollar generated by the mill increases income and consumption in the community greater than what was initially spent. Indicators ECON1 – ECON5 contain this data. With the exception of Grays Harbor Paper (GHP), each mills signed confidentially agreements with Dr. Beyers. He received all data, ran the calculation and submitted the final data points to Ecology. Appendix D contains GHP's data.

Ecology gathered data for ENV2-ENV6, ENV10, ENV12-ENV18 and ENV 35-37. Participating facilities collected and submitted data for the remaining indicators.

Footprint Tool

A perfect sustainability score achievable in each domain is 100. Stakeholders clearly expressed a preference for the highest scores as the most desirable. A total of 300 is possible for each facility's overall score.

Scoring Methods

The scoring system uses one of the following approaches for each indicator:

- Change from base year (2006)
- Targets derived from industry best practices, industry sustainability reports, or academic literature
- Permit limits
- Ranges based on industry best and industry worst values
- Assigned scores based on responses to yes/no questions or indicator values that fall above or below specified values

It's desirable to have as many indicators as possible scored by a target, permit limit, range or assignment. This phase of the project relies heavily on change from base year as the most common scoring method. However, when a facility performs much better than is required by the standards, even a small increase over the base year results in a score of 0, even though a facility may perform at or near the industry's best.

We developed a scoring protocol for each of the scoring methods, combining minimizing/maximizing impacts of each indicator with scoring approaches to calculate raw indicator scores.

Table 5 Scoring protocols for footprint tool

Protocol Type	Minimize or Maximize	Scoring Formula – indicators expressed as absolute values or %
Base year	Minimize	If percent change from 2006-2007>0, 0, otherwise percent decrease
Base year	Maximize	If percent change from 2006-2007>100, 100, if <0, 0, otherwise percent increase
Target	Minimize	If 2007 < target, 100, otherwise [(1/2007)/(1/target)*100] Note: targets must be >0
Target	Maximize	(2007/target)*100
Permit limit	Minimize	If 2007 < permit limit, 100, otherwise [(1/2007)/(1/permit

Protocol Type	Minimize or Maximize	Scoring Formula – indicators expressed as absolute values or %
		limit)*100] Note: permit limit must be >0
Range	Minimize	If 2007 > high, 0, if 2007 < low, 100, otherwise [100/(high-low)*abs (2007-high)]
Range	Maximize	If 2007 < low, 0, if 2007 > high, 100, otherwise [100/(high-low)*abs(2007-low)]

Because each domain contains a different number of indicators, the footprint tool applies a scaling down method to insure that no matter how many indicators in a domain, the score for the domain falls on a scale of 1 to 100. To illustrate the scaling down method, suppose within the environmental domain, there are just 4 indicators: A, B, C and D, each scored on a scale of 0 to 100. To insure the maximum domain score is 100, we divide 1 by the number of indicators, which here, is 4, and multiply the result by each indicator's raw score. That way each indicator has a maximum value of 25 (i.e. .25 x 100 = 25) and the domain a maximum value of 100. This process assumes each domain has the same number of indicators and they are weighted equally.

Using this method, each indicator in the environmental domain is worth ~2.63 (100/38), each indicator in the economic domain is worth ~7.14 (100/14), and each indicator in the social domain is worth ~5.26 (100/19).

A scoring protocol when the desired target is 0 needs to be developed. ENV31, SOC11 and ECON14 are examples where we've used a base year comparison when a target of 0 would best achieve the goal of these indicators.

Weighting

We chose to weight the indicators because some are more urgent or imperative than others. For example, compliance with OSHA health and safety laws is more important than whether a facility provides a wellness program for its employees. We recognize any weighting process includes bias. The footprint tool calculates both an unweighted (raw) and weighted score.

Subjective weights for each indicator were developed through an internal process. Each indicator received a subjective weight of 1, 2, or 3, with 3 being the highest weight.

- Staff from Ecology, our contractors and each of the mills participated.
- We reviewed the stakeholder dot ranking summary.
- Each participant voted for the weight they felt was most appropriate for each indicator.
- We used the weight most often chosen. If there was an equal split between those who chose 1 and those who chose 3, we gave the indicator a weight of 2.

Facility Scores

After obtaining domain scores, the final overall score is calculated as the sum of the three domain scores. The footprint tool and facility scores in this report are preliminary. Additional years of data is needed to test the usability and sensitivity of the tool in order to finalize any of these scores.

Table 6 Preliminary Facility Footprint Scores

Raw Scores				
	ENV	**ECON**	**SOC**	**Overall score**
Boise	29.4	78.6	49.3	157.3
GHP	24.5	78.6	49.0	152.1
NPI	27.4	80.4	39.3	147.1
Simpson	20.0	82.1	24.0	126.1
Weighted Scores				
	ENV	**ECON**	**SOC**	**Overall score**
Boise	31.4	86.4	44.5	162.3
GHP	23.9	86.4	53.7	164
NPI	27.8	87.4	37.3	152.5
Simpson	21.7	88.6	24.7	135

Appendix E contains each facility's full footprint tool calculation.

- Red highlighted cells indicate data not submitted by that facility, as they felt it was proprietary information. No two mills had the same proprietary concerns.
- Blue highlighted cells indicate data the mill does not collect or have access to.
- Yellow highlighted cells indicate data gap issues.

Priority Projects

We planned to implement a priority project at each facility, in order to test the footprint tool's sensitivity to detect change and trade-offs between domains. Resources did not allow this to take place. To supplement the activity, our contract team conducted research on waste stream reduction opportunities (Appendix F) and resource efficiency and pollution prevention (Appendix G) for the pulp and paper sector.

Incentives

The current regulatory framework focuses primarily on companies and permitting processes and has been successfully applied in many areas. The fact that industries, including pulp and paper, are far less polluting per unit of output than just a decade ago shows economic incentives and regulation can reduce negative impacts on the rest of society while sustaining or increasing profitability.

However, the scope of our environmental problems is increasingly complex and systematically connected to the economy. Overarching issues such as climate change, peak oil, regional air pollution, loss of habitat and impact of toxics and other pollutants on human health cannot easily be solved within a traditional regulatory framework. While regulation is important, complementary incentives that tie environmental stewardship to economic success can move companies to take actions beyond compliance. These incentives utilize the agility and speed of market mechanisms, providing an extra impetus to innovative companies. By promoting demand for green products, reducing mill costs and increasing mill profits, incentive (used in complement to a strong regulatory structure) can catalyze a more rapid transition to greater sustainability.

In addition, globalization and global environmental issues have changed the landscape of environmental regulation. Firms and entire industry sectors have moved overseas where labor is cheap and production processes unfettered by regulation. Some pulp and paper mills in Washington State have closed their doors and their paper production has been displaced by companies in other countries that may have a larger ecological or human health impact than Washington based facilities, especially those committed to abiding by regulatory requirements and voluntarily reducing their footprint.

Existing incentives

Washington State has a number of existing incentives for the pulp and paper industry to reduce their ecological footprint. These include:

- Local and state tax incentives, primarily promoting investment in pollution control equipment.
- Public investment in research and development at state universities and agencies.
- Export promotion.
- Efficiency standards.
- Regulatory requirements.

Incentive Suggestions

Demand expansion is a powerful motivation for raising environmental compliance above regulatory compliance because it increases product demand and profits. Traditionally, demand expansion is focused on expanding the market for products. By using an improving footprint score to labeling products as sustainable, we can capture market share from firms with greater ecological footprints. By increasing the value added, or segmenting the market, companies can increase profits while reducing their overall footprint. Insuring paper products consumed are produced with a smaller footprint also results in a greater community economic multiplier effect by keeping production and the associated jobs and benefits within the state. Washington State maintains perhaps the largest network of international trade offices in the nation and far more than many countries. Promotion of the products produced by manufacturers who measure and work toward reducing their footprints may result in a greater substitution away from less sustainable produced paper products from competitors.

Washington State owns significant forestlands and larger areas of state lands are entering into certified sustainable programs. Most of the lands are school trust lands and required to maximize income. This is difficult across time because timber prices fluctuate. Often, uncertainty and volatility in prices are problematic for both sellers and buyers of timber products. One financial mechanism for reducing the forest footprint of the state's pulp and paper mills would be the development of long term contracts with some price flexibility to source chips on certified lands owned by the state and private firms. This would require investigation of legal requirements, and facilitation of contract negotiations. The agreement could target a median chip price across a designated period of time, such as a year, or five years. This would provide greater certainty to both parties of a market, providing greater benefit to schools and timber owner during periods of lower than average market price across the contract period, but effectively reducing uncertainty and risk, all of which have significant costs.

Taxes could be remitted back to producers for footprint improvement measures. Consumers and producers of paper products would share this tax burden. Paper producers meeting a set footprint standard would not pay a tax. This would encourage all companies exporting to Washington to improve their production processes. This program would be comprehensive and could provide both a push and pull incentive structure.

In general, taxing "bads" and subsidizing "goods" can help achieve environmental goals, greater fairness and efficiency in resource allocation. Taxes on environmental bads can be good policy because they help correct negative impacts.

Generally, environmental regulatory agencies have not been involved in financing environmental improvements in industries with the exception of reducing fines or promoting some tax exemptions. This may be something to reconsider. The paper industry is highly capital intensive. Much of the industry's footprint is determined by capital equipment replacement. Washington State could maintain a revolving loan fund provided to pulp and paper mills for capital improvement projects that reduce their ecological footprint. The program would be more effective and larger if the State also acted as co-financer. That is, the State would provide only part of the needed loan requiring private financing. Another possibility would be the State simply helping a facility arrange co-financing from a set of lenders. Much of the industry's footprint is determined by the technology, chemicals and processes they employ, which is determined by capital equipment. Reducing the investment cost for better technology can be a powerful incentive for implementing equipment, reducing the industrial footprint, saving money, and producing a better product over the long run.

Reviews

The Footprint Network and Gund Institute of Vermont provided review of the project and footprint tool. The Footprint Network found our use of the term "footprint" inaccurately applied to this project. Having themselves created the practice of footprinting, they feel our project is better described as a database, giving a numeric impact of a facility, rather than measuring the biocapacity needed to support the activity. They provided direction on how to reframe the project to meet the definition of footprinting.

Dr. Joshua Farley provided a review of the project for the Gund Institute of Ecological Economics. He is also a Director at Earth Economics. He also suggested we remove the use of the term “footprint” from the project. He provided comment and suggestions on calculating scores in a way that allows comparability of facilities, indicator standardization, and changes to the scoring protocols and weighting mechanisms.

Appendix H contains these reviews.

Appendices

Appendix A

Financial Report

NOTE: This table was redacted because of confidential business information (CBI) contained within.

Appendix B

PTPC Incomplete Data Set

Appendix C

Full List of Stakeholder Indicator Suggestions

Appendix D

GHP I/O model data

Appendix E

Footprint Calculations

Appendix F

Waste Stream Reduction and Re-use in the Pulp and Paper Sector

Appendix G

Resource Efficiency and Pollution Prevention and Control in the Pulp and Paper Industry

Appendix H

Project Reviews by The Footprint Network and The Gund Institute