Union Pacific Railroad:
Optimizing Waste Management

A high-level review of Union Pacific’s waste-to-landfill diversion opportunities and employee engagement strategy for waste management initiatives.

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MIT Sloan Sustainability Lab
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Project Background

Union Pacific Railroad (referred to hereafter as “Union Pacific” or “UP”) is North America’s premier railroad franchise, linking 23 US states and providing freight solutions and logistics expertise to the global supply chain. With $19.5B in revenue, the company has 32,200 miles of rail track, 8,400 locomotives, and 46,000 employees. With regard to sustainability, Union Pacific’s vision is to be “recognized as being the environmentally responsible transportation leader”\(^1\). This vision is grounded in Union Pacific’s belief that freight railroad transportation is in many ways more environmentally responsible than motor vehicle transportation (e.g., rail is four times more fuel-efficient than trucks).\(^2\)

UP has defined five types of environmental objectives (fields of concern) for its sustainability strategy: 1) water quality; 2) waste management; 3) air quality; 4) fuel management; and 5) Earth (i.e., all else). The company’s Sustainability-Lab collaboration with the MIT Sloan School of Management focused specifically on waste management.

Across its railroad network, UP generates approximately one million tons of waste per year. Although the company currently diverts approximately 75% of this waste from landfills into reuse and recycling processes, it continually seeks opportunities to increase its diversion rate and reduce the amount of generated waste. In particular, Union Pacific’s waste management challenges include: a) extensive railroad network with hundreds of remote locations and thousands of employees; b) variation in work requirements across departments; c) varying supplier capabilities, particularly for diversion; d) variety of laws and market structures.

However, the challenge is more complex than logistics and legal compliance. Union Pacific must also effectively communicate a consistent message across each of its functional divisions to ensure – and motivate – individual employee compliance and proactive behavior that supports the company’s environmental goals.

Summary of Findings: Diversion Opportunities & Internal Communication’s Strategy

The goal of this five-week project for the joint team of MIT Sloan graduate students and Union Pacific sustainability and communication senior management was twofold. First, the team set out to broadly analyze Union Pacific’s data to identify opportunities for increased waste diversion and then, at a high-level, develop those ideas for potential and feasibility by leveraging the resources available to the MIT community. Second, the team reviewed Union Pacific’s employee engagement and communications strategy as it pertained to internal waste-management and recycling initiatives and developed recommendations. Ultimately, the team determined the following:

1. There are real opportunities for Union Pacific to increase its waste-to-landfill diversion (by tonnage) beyond its current level of 75% through the resale or contracted distribution of used wood (pallets and scraps), alternative uses for petroleum-contaminated soil and oil sludge, and the diversion of rail yard waste\(^3\). Quantifying the sum of tonnage diversion and cost-savings for all of these opportunities across Union Pacific’s entire national rail operation was beyond the scope of this project. However, we prioritized and summarized those actions that provided Union Pacific the best chance to create business opportunities and financial value, all the while reducing the environmental impact of its railroad operations.

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\(^1\) Bob Toy, Union Pacific Sustainability Director, Interview by author, Cambridge, MA, April 9, 2013

\(^2\) UP Presentation to Sloan (at the beginning of the S-Lab project), April 2013

\(^3\) Union Pacific broadly defines rail yard waste as any waste that the company collects in and around its tracks and loading areas, which includes residual coal, grain, sawdust, etc.
2. Increasing employee engagement in waste management initiatives requires a structured, multi-level strategy. First, at the cross-company level, UP should integrate a waste management module into current employee trainings. This will create a shared platform of knowledge around UP’s waste management objectives and track record. Second, at the regional/service unit level, UP should add a small set of waste management metrics into operational scorecards used to compare regional performance. Third, at the local level, UP should create working groups and select local champions who would steward on-the-ground waste management initiatives (further in the document, we provide more detail on the structures that are needed to make this effective). Finally, across all of these levels, UP should continue to diversify the channels through which it communicates with its staff about waste management.

Part I: Waste Diversion

Methodology: Reduce, Reuse, and Recycle

This is a simple but powerful framework that the team used for the analysis of the various UP waste streams. It is also the same framework that UP uses to organize and analyze its own approach to sustainable waste management. The team applied these three activities to each of the selected waste streams whenever possible in order to develop a balanced array of options but did not force the framework. For consistency, the team defined the terms as follows:

**Reduce** by definition is trying to limit the amount of waste by virtue of less consumption or impact in the first place.

**Reuse** is all about using the material (or waste) in its current form but for new purpose.

**Recycle** in this case means treating the waste under some procedure so that it can be used as something else.

Summary of Priority Waste Diversion Recommendations

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<thead>
<tr>
<th>High Implementation/Value Potential</th>
<th>Moderate Implementation/Value Potential</th>
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Recommendation 1: Wooden Pallets & Wood Scraps

| Reuse | Sell/Send Pallets to Regional Pallet Distributors: Wherever possible, the company already re-uses pallets for outbound shipments. The opportunity the S-Lab team explored is to address the additional surplus pallets. There are a number of commercial buyers and distributors of used pallets across the western United States, a few which operate in the vicinity of UP’s largest pallet-waste producing terminals. Companies buy used pallets of various conditions and either resell the pallets as is or make repairs before for resale. The application here would be for UP to establish regional contracts for pallet and wood retrieval from its highest-producing depots. |

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4 A full list of opportunities for diversion can be found in Appendix A.
Recycle Pallets through Regional Contractors: Several companies in the regional vicinity of UP create business opportunities by dismantling pallets and wood scraps to create products such as mulch, Oriented Strand Board (“OSB”) or pellets.

Although garden mulch is the most popular reuse for old pallets, processing used wood into pellets for fuel is a business that has experienced increased product demand in the form of exports to Europe. Even if UP pays a small fee to have such wood removed by these wood-focused recycling companies, it may be worth negotiating to beat the price UP currently pays to dispose of the wood.

Recommendation 2: Petroleum-Contaminated Soil

Reduce PCS through Engineering & Design Improvements: The best way for UP to reduce the amount of PCS sent to landfills is to focus its efforts on engineering new ways to capture petroleum before it hits the soil. Although derailments in remote areas are difficult to eliminate, any effort UP can make at main hubs to prevent petroleum spillages would be of greatest value, e.g. new engineering specifications that help to collect petroleum spilling from a locomotive.

Reuse PCS for Land/Construction Fill: The most common reuse of petroleum-contaminated soil – and one that most states have approved – is in site-fill for road and other construction. It can be reused to fill large tracts of land that require earth build-up for construction, i.e. interstate projects or large facility development.

Environmental Challenge - Nearly every state has its own unique requirements and standards for reuses of PCS. Therefore, if UP donates (or sells) its PCS to a construction firm that wants to use it for site-fill, UP (or the purchaser) will have to verify that the contaminated soil meets the local and state requirements for use in terms of contaminates parts per billion (PPB). Furthermore, the company accepting the soil would have to verify that the PCS would not affect groundwater, human health or cause any other nuisance characteristics. This can get quite complicated on a state-by-state basis. Yet, given the volume of soil that PCS removes after contamination each year, the prudent action for UP would be to identify the states in which UP generates the most PCS waste and contact the primary road construction companies in the area to discuss soil diversion and reuse opportunities. After all, each ton of PCS is a ton of earth the construction companies do not have to purchase or excavate themselves.

Sell/Send to Asphalt Manufacturing Companies: In the early ‘90s the EPA began approving recycling of PCS on a site-by-site basis through asphalt batching, which involves heat-treating PCS and aggregating it into the asphalt manufacturing process. However, few asphalt companies have actually incorporated PCS into their materials purchasing or manufacturing process. Thus, to implement this method, the challenge for UP will be to convince some of the larger asphalt producers around its rail network to accept PCS. That would involve a joint and thorough cost-benefit analysis demonstrating cost-savings for both companies.

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7 Ibid
Recommendation 3: Sludge

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<tr>
<th>Recycle</th>
<th><strong>Capture/Process/Sell Valuable Carbon:</strong> The best option for treating sludge is currently to utilize available technologies that process sludge into useable or at least more sustainably disposable byproducts.</th>
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<td>One method of treating sludge is with a technology called the Sludge Recycling System (SRS). This system was developed by eco/Technologies, LLC, and provides sludge processing at reduced disposal costs for producers. Although the cost of purchasing, deploying and maintaining these modular systems across UP’s network of 90 wastewater treatment plants is non-trivial, a pilot program for just one SRS may prove that the system is beneficial and cost effective.</td>
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Recommendation 4: Yard Sweepings

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<tr>
<th>Recycle</th>
<th><strong>Segregate/Sell to Organics Processors:</strong> The most important aspect of any landfill diversion plan for yard sweepings is the ability to segregate the different particles collected. The more UP is able to segregate the soda ash from the coal and the residual grain from sand, the greater the possibility of diverting and possibly reselling each stream of waste.</th>
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<td>One good opportunity here is selling the organic elements such as grain, coal, etc. to companies that pelletize these materials for burning and/or other such processes. Critical to the development of this process is UP’s adoption of rail-mounted vacuum trucks that would allow for significantly improved material separation.</td>
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<td>However, the primary challenge to this approach would be that the collection of spilled coal, for example, with or without the vacuum, will probably be an inefficient way to “sweep” the yard. Cargo spills do not occur in areas segregated by the type of cargo in each train car. Thus, for this approach to be effective, UP may have to allow third-party companies to operate similar vacuum trucks throughout its terminals to collect only the waste material that each company desires.</td>
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Part II: Employee Engagement

Even the most well-designed waste management initiatives are unlikely to gain traction without staff buy-in. Research across industries suggests that over 30% of companies that are engaged in some type of sustainability initiatives also have environmental employee engagement programs. Engaging the workforce improves worker motivation and retention. It also allows companies to have greater impact in their environmental initiatives, as workers are responsible for operations and implementation of those initiatives. Based on secondary research and interviews with MIT-affiliated waste management experts, we recommend that UP should pursue four recommendations with regard to employee engagement in waste management initiatives.

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**Recommendation 1: incorporate waste management/sustainability module in current employee trainings, in order to build a common foundation of knowledge around waste management**

Employee engagement around waste management needs to be based on a shared foundational layer of knowledge and awareness. The best way to create this foundational layer is by incorporating a new waste management module in current employee trainings. This module can create a common language around the topic and ensure that employees have a shared understanding of what UP’s waste management objectives are; what actions are already being taken across the company; what some best practices might be; and what are possible areas for improvement. All of these elements will effectively articulate UP’s “storyline” around waste management.

Training offers UP several distinct benefits:

1. Helps UP develop basic employee **awareness** about the company’s waste management program, at least putting those activities on the workers’ “radar screen”;

2. Develops a common understanding of – and buy-in into – UP’s waste management **objectives**;

3. In a work climate where many employees are often remote, offers rare opportunities to reach staff **across the geographic footprint**, leveraging meetings that have to happen regardless.

Overall, training gives UP a chance to communicate the importance of waste management objectives to its diverse workforce, and perhaps meaningfully **inspire** at least some employees.

In the railroad industry, French Railroad **SNCF** provides an example of a company that invests in employee training around waste management. SCNF’s waste management program recently involved creating new organizational roles and responsibilities (e.g., around the management of new waste platforms). Trainings – including formal trainings and communication through simple brochures – were used to teach employees specifically how to sort and group waste.

With regard to **how sustainability training can be delivered**, there are several important considerations:

- Sustainability training can be a simple hour-long module in a broader training agenda (e.g., **Amtrak** does that). It is important that this module be rolled into standard and already existing training programs, so that the addition is not burdensome for employees. E.g., when Amtrak developed its training program, it integrated new topics into the current operational trainings without extending the training itself (new modules were added whereas former ones were condensed.
  - It is important that the addition of a new module does not reduce overall participation in training, which is why keeping the module short and to-the-point is critical (especially since we assume it would be unlikely that UP would drop any other topics from the current training agenda);

- Ideally the module should combine elements of lecture and discussion (below we also discuss some ways to make training interactive, e.g., using games);

- These modules can be offered at initial job trainings (i.e., when one joins the company) or at regular (e.g., annual) trainings;

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9 For engineering and transportation staff, Amtrak includes an environmental module in the annual training programs. For mechanical staff, Amtrak includes an environmental piece in the Safety Handbook distributed to employees. Source: Amtrak company website.
- If needed, the modules can be turned into standalone webinar-based trainings that employees can complete on a yearly basis (but again the caution here is not to create new burdensome/mandatory programs that employees can quickly grow to resent.

Training might not appeal to all UP staff (and may be perceived as a “must-sit-through” activity by some). However, it is possible to make training appealing. For example, Mobistar\(^{10}\) (a European telecom company) created a program where children taught Mobistar employees how to sort waste in the office through short informative sessions (the “Mobistar” initiative). By taking this unusual and innovative approach, Mobistar was able to mobilize employees around waste management\(^{11}\).

Mobistar also provides another example of how to make sustainability training (waste management training in UP’s case) more appealing, interesting, and memorable for employees. As illustrated by the exhibit below, one of Mobistar’s eco-trainings was delivered in the form of a game\(^{12}\). While it would not make sense for UP to pursue exclusively this approach, UP could consider interactive elements to incorporate in its more formal training approaches. The idea is to create a reinforcing feedback loop\(^{13}\) that would sustain improvement programs and help to build upon results of the previous ideas and initiatives. It is important to note that “serious games” of this nature are increasingly popular among large corporations as a way of employee training (and have in fact given way to extensive literature on the topic – the footnote citation is just an example)\(^{14}\).

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\(^{10}\) See appendix C for more details on Mobistar’s sustainability

\(^{11}\) BrusselsWasteNetwork, Mobistar awareness campaign, 2012-04-20

\(^{12}\) BrusselsWasteNetwork, Mobistar awareness campaign, 2012-04-20, Serious Game Master’s program at Michigan State University, and Serious Games by Clark C. Abt, March 2002


\(^{14}\) Michael, David, and Sande Chen. Serious Games: Games That Educate, Train, and Inform, Course Technology PTR, 2006.
Is there a storyline that gets the message across more effectively than others?

For training to be effective, it needs to address both:

- **Why** employees should engage in waste management activities (it is important to communicate why waste management is central to UP’s business and long-term success);
- **How** they should do it (e.g., are there specific waste management actions that employees can take on a day-to-day basis).

For UP, we recommend that sustainability training be **tailored to specific UP departments/employee roles** (i.e., engineering vs. mechanical vs. transportation). As an example, here is how Waste Management (the company) tailors environmental training:

- **“EP Learning Series (EPLS):** An online training program provided to Corporate, Area and Site Managers with environmental leadership responsibility. Comprised of monthly topic and LOB-specific environmental training modules, knowledge tested and tracked;
- **Environmental Self-Assessment (ESA):** Required for managers with responsibility for facility-specific environmental programs. Comprised of a series of questions covering different environmental subjects each month, and used as both a training and compliance assurance tool;
- **Environmental Compliance Awareness Program (ECAP):** A mandatory training program for front-line employees and managers, covering a different environmental subject each month. The program is knowledge tested and tracked at the site level.”\(^{15}\)

In crafting the waste management “storyline”, UP should keep several considerations in mind. We will discuss these one at a time.

First, this storyline should be **easy to remember and straightforward**. One way to achieve this effect is to start with a common symbol/mascot. A memorable mascot can allow the company to create identification and get traction with a topic that may seem time-consuming and boring. For example a few years ago in France a

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\(^{15}\) Waste Management, “2012 Sustainability Report”, 2012; LOB = Line of Business
large campaign was conducted to improve waste management. The government created this mascot and a slogan: “hunt the wasty!”

Employee response is usually better if the mascot is not too serious and if it is memorable. Yet, the fit of such a mascot with Union Pacific’s railroad business, which is of course quite serious, is best assessed by internal communication experts at UP.

Another example of how to achieve the simplicity/memorability effect comes (again) from Mobistar. To make the waste management “story” simple for employees to engage with, Mobistar used a system of signs, signals, and colors. For example, one of such memorable symbols was Mobistar’s blue trash bag; other symbols involved colored waste management codes below:

The above codes (e.g., red/green dots) were displayed prominently across the company: next to bins, coffee corners, etc. and this was done consistently/repeatedly. Overall, repetition of the same story/message seems to be a key success factor in all of the successful waste management projects that we have reviewed in the course of our analysis.

Another key success factor for waste management storylines is alignment toward one simple and understandable goal. The storylines that work are those that set a clear goal. For example in the case of Mobistar, the goal was to have the employees sort waste properly (only that!), as a first global simple step.

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17 PMC means plastic bottles, metal cans and cardboard drinks
Finally, as mentioned earlier, the storyline should be **focused on employees** and not on waste management in general: What should *they* do (e.g., use specific bins, set target quantities used)? What results are expected from their efforts (e.g., a decrease of x% of waste production, etc.)? Employees must feel that they are respected and recognized for their efforts. In this respect, it would be helpful for employees to know that efforts are being taken at all levels of the company (i.e., including by senior staff). Mobistar, for example, articulated and propagated a slogan (“ExCo does sort it!”) that accompanied photos of the top management sorting their waste. These symbolic image and slogan helped stimulate everyone to continue to sort waste. Visuals were published on magnetic boards near coffee corners.

Moreover, the message should also highlight why waste management is necessary to stay competitive in the business. For example, it could be mention that other railroads companies are implementing it.

**Recommendation 2: Define cross-service unit sustainability metrics to develop regional ownership over waste management**

Conceptually speaking employee engagement rests on both intrinsic and extrinsic motivation. Many companies that achieve effective employee engagement introduce an element of competitiveness into their operations. UP could consider experimenting with two different types of competitive activities: collective (discussed in this section) and individual (discussed with the next recommendation).

**Collective** activities that drive regional ownership of waste management initiatives could involve contests and challenges to set goals and track comparative successes of different departments/service units within the company (e.g., across the 21 transportation service units, or across the different mechanical shops, or across the three engineering regions).

As an example, this approach is successfully pursued by the Massachusetts Bay Transportation Authority (MBTA). As explained by the MBTA representative, the company motivates its departments to reduce waste by giving those departments $0.5 back for every $1 saved through recycling. The money that the departments receive back can be spent on those departments’ local needs. This reinvestment and gain-sharing approach motivates MBTA employees to participate in local sustainability efforts, presumably at least partly because they can see the direct impact of their efforts (incl. tangible benefits). Interestingly this approach works well despite heavy unionization of MBTA’s staff (important, given similarities at UP).

**What in the waste story resonates most with people like our employee base?**

The reason regional ownership is important is that local priorities are likely to resonate more than high-level national goals with on-the-ground employees as they should be more concrete and close to them. Regional ownership of the metrics, fostered by a possible constructive competition among the different regions, could therefore be helpful in taking the message from senior leadership down to the ranks of lower-level employees.

It is well-known management dogma that “you cannot manage what you are not measuring”. Therefore, UP should clearly communicate metrics around waste management in the different regions. A “living” cross-regional/cross-unit dashboard could include key figures and tips (e.g., annual cost of waste management is xx, our firm generates xx tons of waste, we reduced our waste by xx tons, a ton of recycled paper allows to make 900kg of new paper, etc.). So that the dashboard fosters properly waste management within the company, it would be crucial for UP to ensure that managers are also evaluated on the development of waste management.

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18 MBTA site visit, April 1, 2013.
initiatives. For example, such initiatives could be linked to safety. As an example, Du Pont\textsuperscript{19} takes a holistic approach of sustainability and links it to safety throughout the value chain. It appears that UP has not pursued the safety angle for the waste management messages, so this might be an interesting idea to pursue both in defining new waste management metrics for operational dashboards and in communicating the importance of waste management to employees.

The dashboard that summarizes performance across the units can then be posted on the Intranet portal, and can be updated on a regular (e.g., quarterly) basis. The dashboard can be integrated into a more comprehensive balanced scorecard (or other types of operational dashboards that UP already uses). If UP didn't already have operational dashboards, it would be too big of a change to implement it and UP would have to consider other ways to evaluate managers on those issues.

**Recommendation 3: Appoint local champions/form working groups, in order to promote individual ownership and build on local ideas**

**How does UP make the conversation relevant where the vast majority of people are mobile?**

To build momentum across the company and to reach remote staff, UP should consider soliciting volunteers to be local waste management stewards/champions – people who are intrinsically interested in waste management objectives and can build momentum for others.

As an example, Mobistar appointed “eco-ambassadors” who spearheaded local waste management initiatives (see exhibits below)\textsuperscript{20}.

In UP’s case, these champions could be focal points with local networks (important, given high geographic mobility of UP’s employees). These people could create/manage local “sharepoints” that employees could familiarize themselves with when they do come to the same office/location (e.g., sharepoints could be informational boards/tables managed by the champions).

Champions could be publicly praised for their efforts (incl. being recognized by new sustainability-related titles, if appropriate; being invited to celebratory events/dinners), and could help encourage others to step up (research shows that word of mouth is the most effective communication tool for initiatives that require


employee participation). In this respect, personal incentives can be used to motivate participation (e.g., Qantas Airlines has an eXcel Environment Award for staff that take initiative on environment-related projects, incl. waste-to-landfill). The idea is to create a “virtuous cycle of employee pull”, i.e. in this case a positive reinforcement loop where employee action that leads to results is publicly communicated/celebrated, which further improves engagement and leads to more action. This having said, it is important that local champions are people who are motivated both intrinsically and extrinsically (recent research shows that awards/incentives alone can be counter-productive).

Another interesting option for UP would be to involve the unions as champions or vectors to foster waste management initiatives. Two reasons to this point: (1) unions are able to reach out to employees in spite of the mobility constraint; (2) waste management is linked to safety, which is usually an important topic for unions.

In addition to appointing local champions, UP could form local waste management working groups. The idea behind such working groups is that the best way to ensure “ownership” of sustainability objectives by UP staff is to make sure that employees have an opportunity to be engaged in designing waste management initiatives, not just executing them. Working groups would essentially build upon the current employee voice mechanisms that UP already has (e.g., with the Intranet portal).

As an example, at SNCF, working groups have been defined around three main axes of improvement identified during a first inventory of the situation:

1. Organization, procedures and responsibilities (i.e., how will waste management be organized: by platforms, locally or not, and who will supervise the initiatives);
2. Traceability, control of waste stream (i.e., how to collect data on the waste stream and track improvements);
3. Communication, raising awareness and training (i.e., how to foster the momentum around waste management).

For SNCF’s employees, working groups represent a place where they can express ideas in a relatively informal way. They are also a place where employees can debate the constraints they face in the field. The working groups develop shared knowledge and a sense of cross-company cohesion. They offer a way to de-compartmentalize the company and create lateral exchanges. Working groups are also an auditing tool: they help identify what concerns employees have and how those concerns can be addressed. Finally, SNCF has already seen the working groups create several types of output including:

1. Software that traces wastes;
2. A booklet to raise awareness among employees about waste management;
3. Definition of new responsibilities/new positions with afferent course of action.

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21 John Sterman, interview by authors, Cambridge MA, April 2013
24 Matthew Amengual, interview by authors, Cambridge MA, April 2013
25 Brighter Planet, “Employee Engagement Survey”, 2010
Recommendation 4: Continue frequent communication via Intranet and consider expanding email, in order to keep sustainability topics on the employee “radar screen”

Cross-industry research suggests that companies that achieve effective employee engagement with regard to sustainability experiment with a range of communication channels. The following chart shows how effective are the different channels used by employers when raising awareness about sustainability (“Effectiveness of engagement programs, based on channels used by employer to communicate to staff about sustainability” (dark green = very effective; …; grey = no probing results)). Specifically, the chart illustrates two of Brighter Planet’s findings: a) that those employers who communicate with their staff about sustainability efforts tend to use a variety of channels, and b) that communication through word-of-mouth (“conversation”) and social media sites is generally perceived as most effective:\textsuperscript{26}

![Communication Channel Effectiveness Chart]

For example, social media sites are very effective in broadcasting sustainability messages to employees for roughly 35% of the companies surveyed.

Applying this logic to UP, the company should continue using a broad range of communication channels to spread its waste management message across the company, including:

- **Current methods**
  - Using the Intranet portal to continue building awareness and raising the profile of success stories;
  - Profiling of sustainability activities in the bimonthly print newsletters;
  - Continuing with special events (e.g., Earth Day, etc.) as a way to mobilize employees around specific waste management activities (e.g., see Mobistar’s mobilization approach in the exhibit below; the company took pictures and displayed them prominently after the event).

\textsuperscript{26} Ibid.
• Newer methods
  - Using simple print tools like **posters** (e.g., broadcasting slogans/mascot around the company); **stickers** (e.g., that employees can wear if they participate in a particular waste management activity); **brochures** (e.g., informational booklets on waste management activities) to build waste management “symbolism” around UP;
  - Investing in **email** access for employees (i.e., creating work email addresses for employees, using those emails for work-related communication (to ensure that employees actually read their emails), then adding on sustainability-related messages to email outreach);
  - Developing mandatory **“trash talk”** meetings/webinars that staff members participate in on a regular (e.g., quarterly) basis.\(^\text{27}\)
  - Involving unions in the ongoing waste management process (e.g., using their newsletters)

**Do certain words connect with people more than others? Conversely, are there words to avoid?**

In any communication, it is important to use the right language. For example, the words for UP to avoid are any words linked to time-consuming activity and complexity. The words to use are ones that **convey excitement and show examples of success** (e.g., how many blue bags collected/trees saved this month by the employees (calculated from the quantity of paper waste spared))\(^\text{28}\)

From psychology/marketing research (esp. research by Cialdini\(^\text{29}\)), we know that **social proof** provides another tool to strengthen the appeal of any message. For example, to have customers reuse hotel towels, it proved to be 66% more effective (in terms of the number of reuses) to have signs saying “75% of the clients of this hotel have reused their towel” instead of “please reuse this towel to save x gallons of water”. UP could apply this logic by saying things like “X% of employees participated in Earth Day last year” vs. “please participate in Earth Day this year”.

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\(^{27}\) Waste Management does this. The term is borrowed from them as well. Source: Waste Management’s 2012 Sustainability Report.

\(^{28}\) See Mobistar example, p10, on signalizations.

It is important to note that the above recommendations on basic principles for crafting the storyline should be viewed as foundational only. It is our belief, supported by the expert interviews that we have conducted, that only an internal communications group at UP can develop an effective “message” around waste management (e.g., the right choice of words to use). Company cultures vary widely, keeping us from providing more specific recommendations without knowing the unique UP culture.

CONCLUSION

Union Pacific Railroad has made impressive progress to improve the sustainability of its business. Particularly, the fact that it has managed to responsibly divert 75% or 750,000 tons of its annual waste from landfills is a monumental achievement. Nevertheless, the collaborative project between MIT Sloan students and UP has uncovered some possible areas for further improvements – and UP has clearly demonstrated its commitment to advancing its practice and communication of environmental sustainability. Thus, not only can UP expand its recycling program to include more wood waste, PCS and sludge given reasonable market demand in regions surrounding its terminals, but it can also strengthen its internal communication about waste management initiatives by adopting a more structured and integrated approach. Ultimately, the exploration, selective development and deployment of these recommendations will augment the company’s already robust and detailed environmental sustainability and communications strategy.
APPENDIX A: Resources & Acknowledgements

The MIT Sloan team leveraged the resources of the Institute, greater Cambridge/Boston community, Harvard University and other professional networks across academia and industry to gather expert analysis and opinions about the project and its findings. Throughout the project, the team solicited and received valuable feedback from its project mentor, John Sterman, Ph.D., Professor of System Dynamics and Engineering Systems and Director of MIT System Dynamics Group.

Additionally, the team sought expertise from the following sources, organized by work stream:

Waste Diversion:

To gather new ideas and evaluate current ones, the team primarily consulted MIT’s Material Science department, namely, Randolph Kirchain, Ph.D., Principal Research Scientist, and Elsa Olivetti, Ph.D., Research Scientist. The expertise of these researchers was then augmented by discussions with lumber industry experts, and fellow classmates with oil services industry experience.

Employee Engagement:

The team solicited help from several individuals to assist with developing ideas about waste management communications issues at UP. In particular, we reached out to Professors John Sterman, Matthew Amengual, Richard Locke, and Emilio Castilla of MIT; Professor Andrew Hoffman of the Department of Sustainability at the University of Michigan; and Professor Michael Toffel from the Environmental Economic Program at the Harvard Business School.
APPENDIX B: Alternative Diversion Opportunities & Projects

These methods were not mentioned in the main report due to their lack of operational feasibility for a company of Union Pacific’s size and scale. Still, the team wanted to list them for the sake of discussion.

Wood Pallets and Scraps

Recycle: UP may choose to process wood in order to produce marketable byproducts internally, but it would make more sense to sell the scrap wood to a third party than to break into a new industry.

Reduce: UP might consider encourage customers or shipping its own maintenance and repair parts on paper pallets, sold as Pregis Hexacomb®. Made from pulp byproducts, these paper pallets do not impact the environment as negatively as traditional wood pallets and could drastically reduce national wood use and deforestation. UP could experiment by offering to provide a discount on freight charges to those customers who use paper-based pallets. Of course, a thorough CBA would be necessary to determine feasibility.

Petroleum-Contaminated Soil

Recycle: There are Soil Redemption/Remediation technologies on the market but are likely very expensive and inefficient to incorporate into UP’s PCS excavation process. One such technology uses thermal desorption and was first mobilized by Alaska Soil Recycling. See Alaska Soil Recycling @ www.anchsand.com.

Possible Follow-On Projects

This short study ends here for the MIT Sloan S-Lab team, but there are several beneficial projects that UP can pursue that should add more depth to this analysis. These include the following:

1. Develop a list of firms that recycle/reuse/resell pallets, and pursue contracts for pickup or storage on-site at Union Pacific’s highest wood waste-producing terminals.

2. Conduct a Cost/Benefit Analysis for implementation of full-scale wood/pallet collection along Union Pacific rail network, including shipment of wood from smaller locations to larger terminals on deadhead (empty) cars.

3. Price industrial wood chippers to see if business opportunity exists to reprocess and sell scrap wood on site (e.g. North Platte, NE) for resale. If market exists along routes, it may be worthwhile to ship/sell reprocessed wood via otherwise empty train cars.

4. Identify States in which Union Pacific tends to generate the most Petroleum-Contaminated Soil (by tonnage), and pursue opportunities to transfer the PCS to road construction companies or asphalt producers. A fair amount of State-based regulatory research will be necessary for full implementation and compliance.

5. Conduct Cost/Benefit Analysis for purchase and implementation of new technology “SRS” into wastewater treatment plant operations.
This relates Mobistar overall sustainability to all companies average in this sector. Mobistar has gone from below average to above average. May 2012, the environment curve went from 49 to 51. The waste management campaign happened in April, even though there is no certain link between this rating and the campaign.