Utah's Air Quality
REPORT

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Summary

Overview

The unique geography of Utah's Wasatch Front creates inversion. When warmer air forms at higher elevations, it creates a lid that traps cooler air in the valleys. This cooler layer traps toxic air particles released by natural and anthropogenic sources, and the higher concentration of pollution negatively impacts Utahns.[32]

Utah has successfully picked the low-hanging fruit in regard to pollution reduction. Individual stakeholder initiatives such as grant programs, industry regulation, and the expansion of public transit have reduced emissions.

However, the American Lung Association ranks the Wasatch Front—home to eighty percent of Utah's population—as the sixth-worst region for short-term episodes of particle pollution in the United States.[56] Air pollution generates grave health effects (between 1,000 and 2,000 Utahns die prematurely every year due to pollution), stifled economic growth, and general deterioration of the quality of life in the region.[20, 27, 36, 54]

Further improvement in Utah's air will require significant behavioral changes from a number of key stakeholders. Emissions from vehicles and residential sources combined represent about 87 percent of all emissions, and consumer choice is the largest driver behind those sources.[33] Inducing a behavioral change is essential to cleaning Utah's air. The history of Utah's air quality provides evidence that consumers will change individual behavior that improves air quality when presented with a sufficient value proposition.[63]

We identified two principal gaps that maintain the status quo: the consumer product landscape and the design of local communities.

To activate levers of change in the product landscape and community design, we recommend the establishment of a common framework focused on inducing a behavioral change in consumers.

Research Methods

- Conducted over 40 interviews with stakeholders (system leaders, policymakers, entrepreneurs, non-profit executives, historians, journalists, special interests, scientists, regulatory authorities, etc.);
- Analyzed over 30 pieces of air quality legislation;
- Examined a wide range of literature, including annual reports, scientific studies, and policy briefs;
- Examined positive evidence in Utah history concerning air quality improvement;
- Reviewed public opinion surveys;
- Conducted 1,200 consumer behavior surveys;
- Developed a multi-purpose "clean-air solution" prototype and tested it in a local neighborhood.

Stakeholder Activities

Non-Profits

Public awareness campaigns have successfully raised awareness about Utah's air quality.[25] However, these campaigns are ineffective in causing behavioral changes.[39] Instead, they fuel the false belief that the problem is getting worse which engenders a sense of helplessness in the public.[25, 116] Some non-profits, like UCAIR (Utah for Clean Air), also offer small grants to help convert mobile and area sources to cleaner technologies.[93, 94, 95]

Consumers

Pollution from vehicles and residential sources combined represent about 87 percent of all emissions, and consumer choice is the largest driver behind those sources.[33] Most clean air technologies that could reduce this footprint do not offer a sufficient value proposition to obtain a critical mass acceptance among consumers.[41] The rapid population growth of the Wasatch Front makes development of marketable clean air products imperative.[3]

State Government

To improve air quality, the state government uses seven general strategies. These strategies include regulating industry and consumers,[11, 31] expanding public transit, using grants to help area and mobile sources convert to cleaner technologies, developing clean air technologies, and providing financial incentives to consumers who purchase clean air technologies.[2, 11, 31, 37, 117, 120, 123]

Clean Air Technology Innovators

Marketing and developing clean air products require significant investments of time and capital.[37, 82] Additionally, government subsidies for clean air tech distort demand, which makes conducting consumer research more difficult.[42] The majority of clean air products in development never make it to market due to the difficulty of conducting market research and obtaining financial support.[5] This sequence of events is known as the "Valley of Death."[78, 82]

Planners and Developers

Communities along the Wasatch Front have traditionally been designed around car-commuting.[2, 3] The resulting effects have been that public transit is not easily accessible to and affordable for the majority of Utahns.[101]

Solutions Landscape

Vicious Cycle

Stakeholders enact a series of strategies that are occasionally coordinated. These efforts have successfully plucked the low-hanging fruit in regards to air quality, but they have also inadvertently created a feedback loop. This feedback loop describes the problem landscape.

1. The Environmental Protection Agency periodically releases stricter air quality standards as negative health effects are discovered at lower levels of pollution. [25, 55]

2. Utah's failure to meet these progressively stricter standards moves the state into "non-attainment status." [32]

3. In response to Utah's non-attainment designation, non-profits in the state spearhead messaging campaigns to generate public awareness. [40]

4. These campaigns successfully raise public awareness, but they fail to convince most Utahns to reduce personal emissions. [39]

5. While a small subset of the population does reduce their emissions, most do not because existing clean air products and services do not present a strong enough value proposition to warrant adoption. [40, 41]

6. Instead of reducing personal emission levels, many Utahns overestimate industry's contribution to the problem and resort to pressuring their elected officials to implement stricter regulations on industry. [116]

7. Elected officials enact several general strategies to reduce emission levels in Utah. These strategies have resulted in differing degrees of success:

   a. Regulating industry and providing grants for technology adoption have been effective. [143]

   b. Expanding public transit and providing subsidies for clean technology development have shown promise but have not met stakeholder expectations. [5, 20]

   c. Regulating consumers and attempting to update building codes have largely failed. [77, 149]

8. The results from these strategies have not moved Utah back into attainment status.[56] As a result, elected officials provide support for public awareness campaigns, hoping that the public will take responsibility and voluntarily reduce their emissions.

9. These public awareness campaigns do not induce a sufficient change in individual consumer behavior and cause the general public to falsely believe the problem is getting worse.[25]

10. The cycle repeats when the general public pressures their elected officials to "do something" about the air quality problem.

Major Gaps

Although other gaps exist, addressing these critical areas would yield long-term and sustainable improvements to Utah's air.

Product Landscape

Despite considerable state appropriations for clean air technology development, few marketable products have emerged from the state's technology incubator USTAR (Utah Science and Technology Research).[37] The grant model by which USTAR operates creates a culture of innovation, but it is ultimately ineffective at incentivizing researchers to create marketable clean air technologies.[5, 26, 41]

Concerning existing clean air technologies, many of them do not create sufficient value propositions, and adoption is therefore limited to a small subset of consumers.[41] The majority of consumers will continue to choose pollution-heavy products until cheaper and more reliable alternatives exist.[25]

Community Design

Public Transit: Despite significant investments in infrastructure expansion, only 91,000 jobs are within a 30-minute public transit trip along the Wasatch Front (for reference, 458,000 jobs are within a 30-minute drive).[101] This is because geography and community design encourage personal commuting over public transit.[2, 3]

Building Codes: The Clean Air Caucus has made multiple attempts to get updated building codes passed through the legislature. However, special-interest lobbying and a political culture averse to regulation have prevented implementation of updated building codes. While some building code legislation has become law in recent years, they have been stripped of meaningful provisions.[148, 149]

It is also worth noting that the Caucus System, the predominant means by which candidates for the state legislature attain a spot on the ballot, promotes the nomination and election of extreme-right candidates who are less likely to support environmentally friendly legislation, such as improving building codes.[76]

Lessons Learned

Multi-Purpose Solutions

Our survey data indicated that Utahns have a much higher willingness to adopt air quality solutions if they also promote some other public value. For example, 61 percent of our survey respondents indicated that they were significantly more willing to contribute financially to a solution that improved both air quality and crime rates.[112]

Lakeridge Project

In order to better understand this finding, we conducted a solar-lighting prototype in a local Utah Valley neighborhood. The neighborhood experiences higher than normal crime rates and lower than normal street light distribution for the area. Because of the demonstrated link between street lights and crime rates, we worked with Orem City to distribute motion-sensor solar lights to residents to hopefully reduce crime rates while reducing the neighborhood's carbon footprint. [87, 88]

As we implemented and evaluated our prototype, the response we received from residents was overwhelmingly positive and validated our survey findings. People are far more willing to adopt air-quality improving solutions if they also promote another public value.[112]

Product Landscape

Historical Evidence: In the 1930's and 40's, the general public along the Wasatch Front relied on coal furnaces to heat their homes. These furnaces generated staggering amounts of pollution. Public emission levels were not significantly reduced until gas heating technology became available. The increased availability of cheap and clean gas furnaces generated a shift in consumer behavior that regulatory authorities and community organizations were unable to induce. [6, 12, 63]

Grant programs: To avoid the issues inherent in grant programs and expedite clean air technology development, Utah could look to other state technology development programs as models.

I2E: Innovation to Enterprise is an Oklahoma-based private not-for-profit corporation that started on a grant model, but then pivoted to incorporate a venture capital model. It was formed as a response to Oklahoma's energy crisis. I2E will only fund 50 percent of a deal, but will assist their clients in landing investors and identifying commercial opportunities. They also provide venture advisory services such

as evaluating product-market fit, determining market strategies, business planning, and determining capital needs and positioning for funding. [26, 81]

ARPA-E: Advanced Research Projects Agency-Energy is a federal agency that promotes research and the development of advanced energy technology. ARPA-E does not issue grants. To ensure that innovators have skin in the game, they make cooperative research agreements that incorporate cost-sharing requirements and schedule-based milestones. ARPA-E actively manages the projects it funds, visits them onsite, assists with market research, and helps create a path towards commercialization. [41, 66]

Community Design

Changing demographics and economics are exerting a strong influence on the housing market. As the demand for housing along the Wasatch Front exceeds supply, lot sizes are decreasing and high-density housing rates are increasing. These are promising trends for the future of public transit in the region. [51, 111]

Concerning building codes, 47 percent of Utahns are very willing to embrace higher upfront costs to build energy efficient homes. [80] For example, adopting the 2015 codes would increase the sticker price of the average home by $2,200. However, the increased energy efficiency of the home would save the average homeowner $3,760 over the course of a 30-year mortgage. [77] This represents a potentially marketable value proposition.

Ivory Homes, Utah's largest home builder, has voluntarily switched to adopting updated building codes. [20]

Daybreak is a community in the Salt Lake Valley that has fully embraced ecological sustainability as a core value. It has proven that a community designed around sustainable principles can thrive in Utah. [96]

Levers of Change

Collective Impact Initiative

Stakeholders have identified and addressed the easiest and least controversial solutions for pollution reduction. The next hurdle in improving Utah's air quality requires a number of significant behavioral changes from key stakeholders. To activate levers of change, we recommend the establishment of a collective impact initiative focused on inducing a behavioral change in consumers by addressing two major gaps: clean air technology development/adoption and community design. By aligning priorities, funding streams, and measurement systems, stakeholders can engage in mutually reinforcing activities that empower them to create long-lasting change.

Recommended Elements of the Collective Impact Initiative

Stakeholders should focus on providing multipurpose solutions. Involved stakeholders should pursue strategies to develop air quality solutions that promote multiple public values.

Non-profit messaging campaigns should shift their strategy. Non-profits could promote clean air technologies that provide Utahns with high value propositions.

Non-profits could also work with the Department of Environmental Quality to create awareness around the improvements made in air quality during recent years, specifically highlighting industry's improvements.

The government could work in conjunction with the private sector to create stronger green technology incubators and advisory resources. These organizations would incorporate the best practices of models like I2E and ARPA-E. Resource networks could be improved and expanded to make robust market research available. Clean--air-technology entrepreneurs could partner with venture advisory organizations to understand commercial opportunities and product-market fit.

Stakeholders should implement best practices used by modern sustainable communities. Daybreak provides a successful example of a low-emission community that could accommodate projected population growth. Leaders in the housing industry who voluntarily adhere to updated building codes could also work with elected officials and non-profits to help developers understand the market value for energy-efficient homes.